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THE OPERATION OF EXPERIMENT HFR-B1 IN THE PETTEN HIGH FLUX REACTOR

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Metals and Ceramics Division

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Commission of the European Communities
Joint Research Centre, Petten Site

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THE OPERATION OF EXPERIMENT HFR-B1 IN THE PETTEN HIGH-FLUX REACTOR*

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ABSTRACT

This is the final operation report on the HFR-B1 experiment. This experiment was conducted at the Joint Research Centre (JRC), The Petten Establishment of the Commission of European Communities in collaboration with the Forschungszentrum Jülich (KFA) and General Atomics (GA) under the US/FRG‡ Umbrella Agreement for Cooperation in Gas-Cooled Reactor Development. The experiments were designed to provide for measurement of fission gas release and metallic fission product transport in simulated, prismatic core, fuel elements over the range of normal operating conditions and in the presence of significant quantities of water vapor. The irradiation was begun in April 1987 and ended in July 1989, during which 444 effective full-power days (EFPD) were accumulated. In this report, the following topics are addressed: the objectives and experimental configuration; the high-flux reactor (HFR) facility at Petten, The Netherlands; the test specimens; quality assurance; the irradiation history of the three capsules irradiated; the experimental data comprising temperatures, nuclear quantities, fission gas release, reactor, and process data; neutron metrology; methods of conducting the water-vapor injection tests; and gas chromatographic results. The total number of data accumulated during the HFR experiment is so large as to preclude presenting most of them in a single report. The data on tape consist of 270,464 blocks, and there are, in addition, laboratory recorded data, chart records, additional graphical presentations, correspondence among the involved laboratories, and periodic summaries. Nevertheless, a basic set of the irradiation data is assembled and presented in textual and graphical form in Sect. 6 of this report; this assemblage will be a convenient source in the process of analyzing the results of the HFR-B1 experiment.

1. INTRODUCTION

This report is the final operation report for the HFR-B1 experiment. The experiment designation D214.01 was used within The Petten Establishment. This experiment was conducted

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‡Previously the Federal Republic of Germany.

at the Joint Research Centre (JRC), The Petten Establishment of the Commission of European Communities, in collaboration with the Forschungszentrum Jülich (KFA) and General Atomics (GA) under the US/FRG Umbrella Agreement for Cooperation in Gas-Cooled Reactor Development. The experiment was designed[1,2] to provide for measurement of fission gas release and metallic fission product transport in simulated, prismatic core, fuel elements over the range of normal operating conditions and in the presence of significant quantities of water vapor. The Petten staff designed[3] and assembled the irradiation rig using fuel elements and other samples fabricated by GA. The overall management was the responsibility of the KFA; the supervision and conduction of the experiment were the responsibility of the JRC. The irradiation was begun in April 1987 and ended in July 1989 during which 444 effective full-power days (EFPD) were accumulated. After completion, the irradiation rig was disassembled and the contents sent to KFA in December 1991. The postirradiation examination (PIE) is being conducted at the KFA.

1.1 OBJECTIVES

The main objectives of the HFR-B1 experiment involved the transport of metallic fission products and the release of fission gas in fuel elements under conditions simulating those of the high-temperature gas-cooled reactor (HTGR) in the presence and absence of water vapor. Experiments were conducted in three separate capsules contained within the irradiation rig.[3] The temperature range was between 820 and 1230°C, and in one capsule, water vapor was injected at partial pressures between 18 and 1060 Pa.

The main objectives of the HFR-B1 experiment were as follows:

1. measurement of the transport and distribution of condensible fission products in a fuel element representative of the HTGR;

2. measurement of the release of fission gases at temperatures near and above the upper limit of HTGR normal operating temperatures;

3. measurement of the effect of hydrolysis on coated fuel particles with exposed uranium oxycarbide (UCO) kernels and on the surrounding fuel compact matrix material and graphite;

4. measurement of fission product release from and distribution in coated fuel particles with different artificial defects encapsulated under a controlled atmosphere;

5. provision of irradiated fuel compacts for use in postirradiation heating tests simulating accident conditions and of unbonded, coated fuel particles for postirradiation tests;

6. measurement of the irradiation response of grades H-451 and H-451I graphite and SiC samples and of inert compacts fired in alumina and silicon carbide molds; and

7. measurement of the fraction of iodine isotopes whose decay products could be detected and of the amount of iodine released in volatile form.

The last objective was adopted only after the beginning of the irradiation.

1.2 EXPERIMENTAL CONFIGURATION

The irradiation rig has been described in detail.[3] The rig contained three vertically arrayed capsules designated as 1, 2, and 3 or A, B, and C, respectively. Each capsule consisted of a fueled graphite body within a sealed, stainless steel container. In each container there were thermocouples (TCs), self-powered neutron (SPN) detectors, fluence detectors, and gamma scan wires; the first two detectors could be monitored. Each container also had separate inlet and outlet gas lines; the composition of the influent and effluent gases was monitored. The temperature of each capsule was finely controlled by adjusting the neon content of the helium-neon carrier gas.

In the graphite body of each capsule, there were 12 fuel compacts and various piggyback samples. The fuel compacts contained TRISO-coated fissile and fertile particles; the kernels of the particles were ThO_2 and low-enriched uranium (LEU) UCO, respectively.[4] Of the fissile particles, 8.9% by number were specially fabricated as "designed to fail" (dtf) particles; these particles had a UCO kernel coated with a 23-μm pyrocarbon layer. Within several hundred hours of the beginning of irradiation, the pyrocarbon coating cracked and thereby provided a known source of exposed kernels from which fission products could escape. A detailed description of the coated fuel particles, the fuel compacts, the graphite bodies, and the nature of the piggyback samples has been presented.[4]

The relation between the capsules and the objectives was as follows: capsule 1 was devoted to meeting objective 1; capsule 2 to objectives 2 and 6; and capsule 3 to objectives 3, 4, and 6. All capsules were devoted to meeting objectives 5 and 7.

1.3 PURPOSE AND SCOPE OF THE REPORT

The purpose of this report is the documentation of the operational data from experiment HFR-B1 and the provision of a data base with which the analysis of the experimental results may proceed. Discussions and conclusions regarding fuel performance and fission product behavior are beyond the scope of this report.

The topics addressed in this report include the objectives and experimental configuration; the HFR facility at Petten, The Netherlands; the test specimens; quality assurance (QA); the irradiation history of the three capsules irradiated; experimental data comprising temperatures, nuclear quantities, fission gas release, reactor, and process data; neutron metrology; methods of conducting water-vapor injection tests; and gas chromatographic results. More specifically, the data presented include the following:

1. nuclear data including neutron fluxes and fluences, nuclear heating, burnups, and fuel loadings;

2. thermal data including temperatures measured by the 18 TCs per compact at selected times during each cycle and the temperature profiles of selected TCs during each cycle;

3. fission gas release data in terms of the R/B, the ratio of the release rate to the birth rate, in both numerical and graphical form;

4. the composition of the influent and effluent gases including He, Ne, H_2O, H_2, CO, CO_2, and CH_4; and

5. selected profiles of the reactor power, the capsule positions, the downstream activity, temperatures, flow rates, and system pressures.

The data files are contained in Disk DUA3:[CONRAD.RUBY_214] with Tape format 6250 Bpi. These files are possessed by both the JRC and the Oak Ridge National Laboratory (ORNL). These files contain 3 directories, 1457 files, and 270,464 blocks of data.

2. DESCRIPTION OF EQUIPMENT

2.1 HFR PETTEN

The HFR at Petten, The Netherlands, is a materials test reactor which contains water as coolant and moderator. The normal operating power is 45 MW. The core lattice is a 9 by 9 array (729 by 750.4 mm), containing 33 fuel assemblies, 6 control members, 19 experimental positions, and 23 beryllium reflector elements. The reactor is normally operated at full power for 11 cycles per year of 25.7 d each, with 2- to 6-d shutdown between cycles for refueling, maintenance, and for installation or removal of test rigs. There are two month-long shutdowns for extended maintenance and holidays per year, in March and in August. In-core test positions can provide a thermal flux up to $2.1 \times 10^{18} m^{-2}s^{-1}$ and a fast flux up to $5.1 \times 10^{18}\ m^{-2}s^{-1}$. The HFR staff provides all activities associated with the reactor and also the 24-h operation of all irradiation experiments.

2.2 TEST FACILITY

2.2.1 In-Pile Rig

The irradiation rig was completely designed and fabricated at JRC Petten.[5-8] The rig, designated D214.01, was a modification of the Brennelementsegment (BEST) rig type, which was successfully used in the irradiation of German high-temperature reactor (HTR) fuel spheres.[7-10] The D214.01 in-pile rig was connected to the out-of-pile equipment, called the Sweeploop,[10] which has provision for controlling and monitoring up to 6 independent capsules. The rig consisted of three capsules, in-line, each of which was independently temperature controlled and monitored, and had independent gas purge lines for the introduction of various gas mixtures, including He, Ne, H_2, and H_2O. Temperatures were adjusted by the introduction of He-Ne mixtures in the sweep gas. The capsules were contained by a stainless steel tube of 74 mm diam, which ended at approximately 975 mm above the core center line. This tube served as a protection tube and bounded the cooling water channel on the interior. Capsules 1 and 2 were connected to each other and could be adjusted vertically by means of an electrically driven vertical displacement unit (VDU) for the purpose of changing temperature or flux. Capsule 3 could be moved by an independent VDU.

Of primary importance in this test was the monitoring of individual gas lines for the measurement of fission gas release and the gaseous products of fuel hydrolysis and graphite oxidation. Figure 2.2.1 is a schematic of the gas lines within the rig and rig head, showing the separate lines in and out for each capsule. Two gas lines enter each capsule, the inlet at the bottom and the exit at the top. The exit gas could flow directly to the sampling stations, or before entering the sampling station in the case of elevated radioactivity levels, through an empty 360-cm^3 delay tank or through a 360-cm^3 charcoal delay bed. These flow paths could be chosen by means of remotely operated solenoid valves within the rig head.

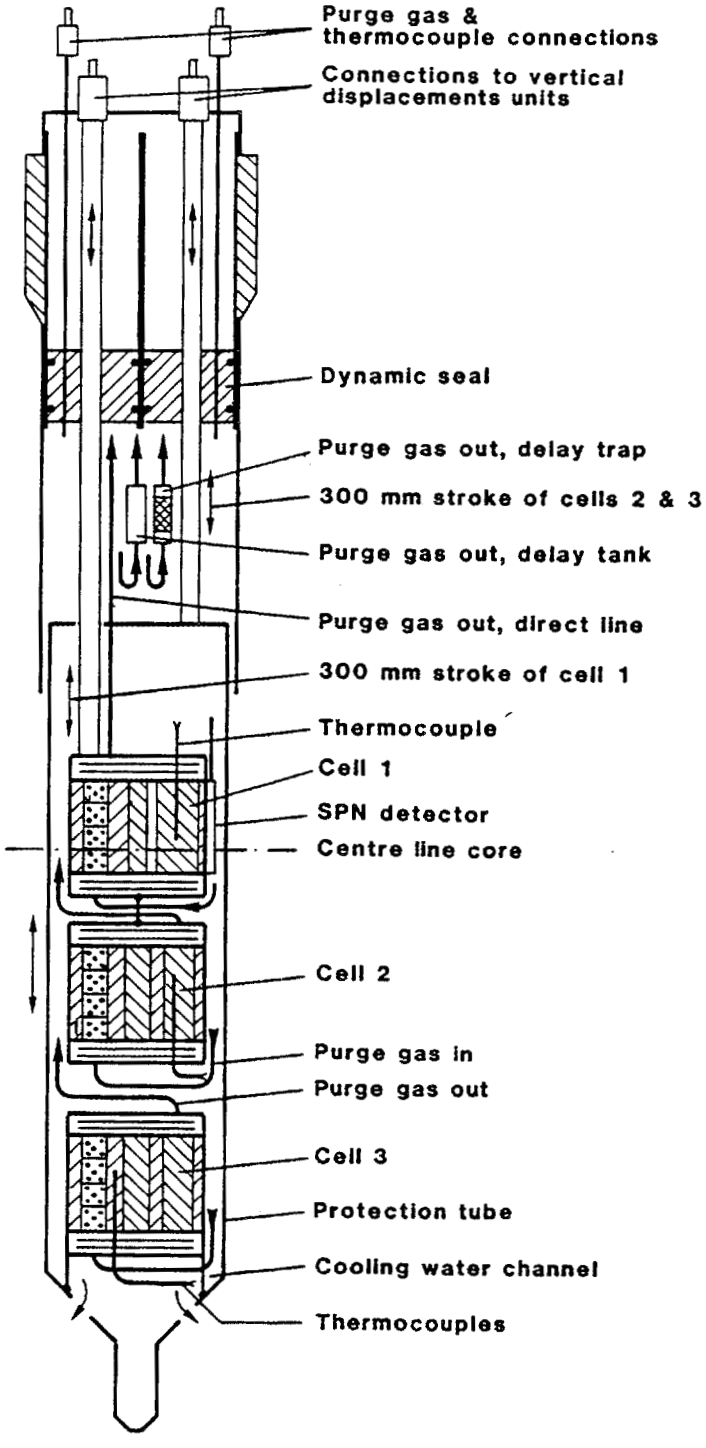

Fig. 2.2.1. Schematic drawing of the irradiation rig, D214.01.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

2.2.2 Out-of-Pile Facility

The out-of-pile system, the Sweeploop,[10] was designed and constructed specifically for the irradiation of HTR fuel and graphite specimens. Before the HFR-B1 test, the Sweeploop had been used in a number of irradiations of German pebble bed fuel.[7-10]

The major component of the Sweeploop system[3,11] is a "once-through" system which provides purified gases at controlled pressures and flows and permits the sampling and monitoring of fission gases and gaseous products of hydrolysis and oxidation in as many as six separate capsules.

The major components of the Sweeploop include:

1. liquid-nitrogen-cooled filters for purification of inlet He and Ne;
2. provision for injection of controlled concentrations of neon, hydrogen, and other gases of choice;
3. a system for the steady injection and analysis of known concentrations of water vapor (see Appendix A for details);
4. flow, pressure, and temperature control systems;
5. sampling and counting stations for quantitative analysis of fission product gases;
6. activity monitors for safety provisions and semi-quantitative analysis;
7. gas chromatography for analysis of effluent gases (see Appendix B for details);
8. computer and trend recorder data acquisition and storage; and
9. application of transgression limits on flow, pressure, temperature, and radioactivity.

2.3 TEST SPECIMENS

2.3.1 Fueled Graphite Bodies

The H-451 graphite bodies, depicted in Figs. 2.3.1 and 2.3.2, contained the primary fuel dispersed in 12 fuel compacts; four compacts each were placed in 3 holes, 120° apart. Figure 2.3.1 shows that capsule 1 contained six graphite wedges held in place by inner and outer graphite annuli. The non-fueled wedges are impregnated graphite and serve as sorptive sinks for condensible fission products. Between each pair of wedges are gaps which simulate gaps in the reactor. During PIE, the concentrations of fission products in the graphite body of capsule 1 will be measured as a function of spacial location. Capsules 2 and 3 differed from capsule 1 in having a solid graphite body with three holes in which the fuel compacts were placed; see Fig. 2.3.2. The measurements in these two capsules were of fission gas release mainly as a function of

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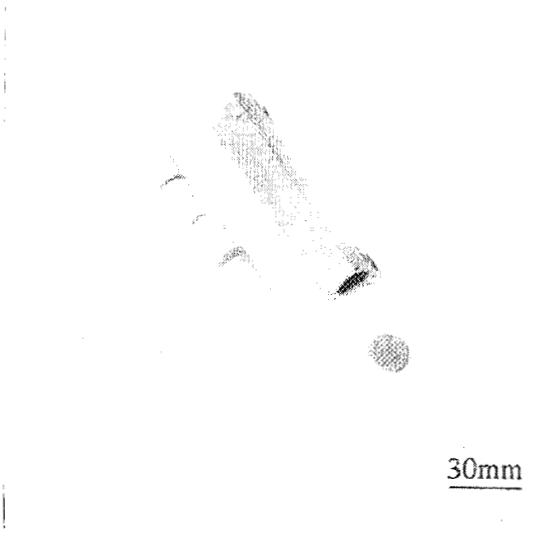

FUEL WEDGE WITH COMPACTS AND CAP

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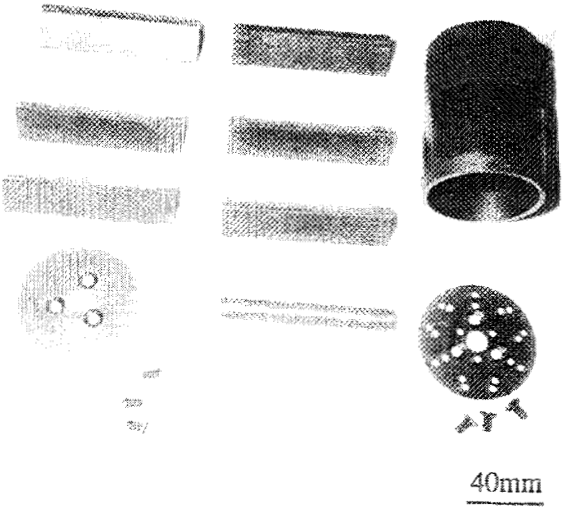

SEPARATE PARTS OF FUEL BODY 1

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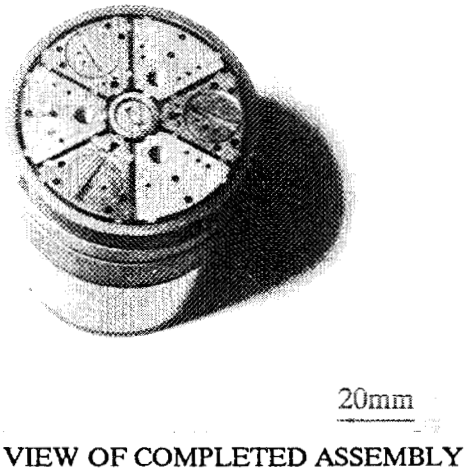

TOP END VIEW OF COMPLETED ASSEMBLY

Figure 2.3.1. Capsule 1 graphite fuel body with components separately and collectively shown.

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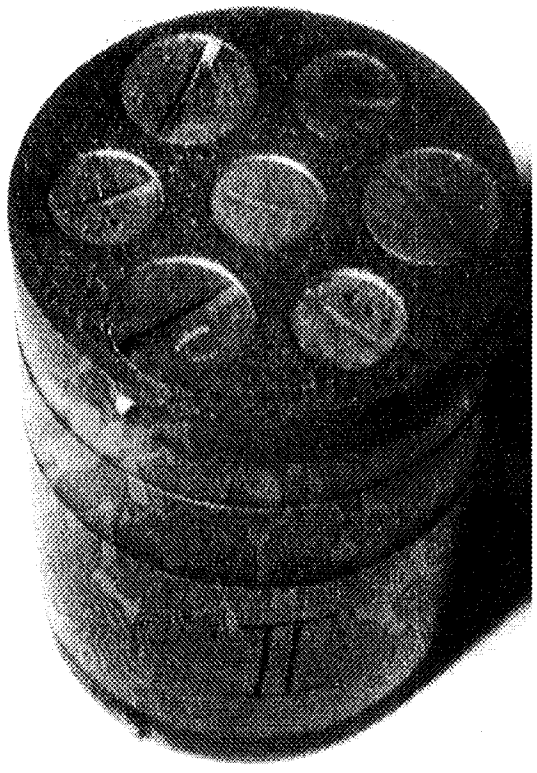

TOP VIEW

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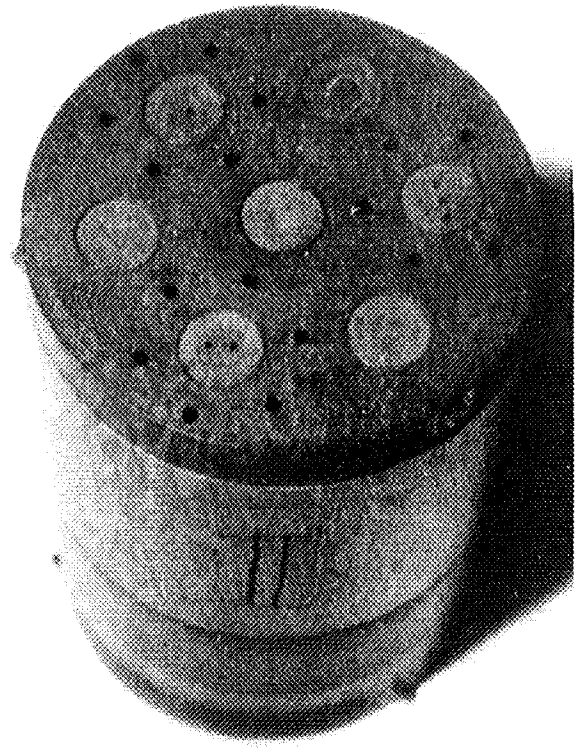

BOTTOM VIEW

Figure 2.3.2. Capsule 2 graphite fuel body assembled.

temperature in capsule 2 and as a function of water vapor pressure and temperature in capsule 3. All three capsules contained, in addition, so-called piggyback samples located in the central hole of capsule 1 and in simulated coolant holes, displaced alternately by 60° from the fuel holes, in capsules 2 and 3. Details of the piggyback samples are given in ref. 4.

2.3.2 Fuel Compacts

The fuel compacts consisted of fissile and fertile coated fuel particles plus graphite shim particles compacted with a carbonaceous matrix into cylinders of 12.85 mm diam and 19 mm length. Within a mold, the contained fuel and graphite particles and the fluid matrix material were carbonized at 800° C and then heated for 1 h at 1500° C in an argon atmosphere. Four fuel compacts were stacked in each of the three fuel holes of the graphite bodies. Initially, the gap between the fuel compacts and the wall of the fuel holes was about 0.2 mm. During irradiation, the gap increased at first but eventually decreased to a distance comparable to the initial gap size. The loading of the compacts in terms of the uranium and thorium isotopes, as well as the number of fissile and fertile particles, is given in Table 2.3.1.

2.3.3 Coated Fuel Particles

The coated fuel particles contained in the fuel compacts consist of fissile and fertile particles with TRISO coatings and of dtf particles having only a single pyrocarbon coating. The TRISO coating on the fuel kernels consists of four layers; from the innermost to the outer, the layers are of a buffer or low-density carbon, a pyrocarbon, SiC, and an outer pyrocarbon. The TRISO-coated fissile particles have a UCO kernel with the initial composition $UC_{0.5}O_{1.5}$, a nominal diameter of 350 μm, and are enriched in ^{235}U to 19.6%. The fertile particles have a ThO_2 kernel with a nominal diameter of 450 μm. The dtf particles have an initial composition of $UC_{0.4}O_{1.6}$, an enrichment of 19.6%, and are coated only with a pyrocarbon layer of 23 μm. The dtf particles fail from fission fragment damage within several hundred hours of the beginning of irradiation and thus provide a known source of exposed kernels. Earlier experience with the behavior of these particles is described in ref. 12.

2.3.4 Piggyback Samples

The piggyback samples in capsule 1 consisted of: (1) SiC rings in a graphite crucible and (2) niobium-encapsulated coated fuel particles of various configurations including the dtf particles, all contained in a graphite crucible; in capsules 2 and 3 of (1) cylindrical graphite samples of grade H-451 and H-451I, (2) inert compacts fired in Al_2O_3 and in SiC, and (3) unbonded, fissile and fertile, normally coated fuel particles. The loading of the encapsulated and unbonded fuel particles is given in Table 2.3.2.

2.3.5 Metallic Components

In capsule 3, in which significant amounts of water vapor were added, the possible reaction with or adsorption of water vapor on the metallic components of the capsule has to be considered. The metallic components included (1) the stainless steel container, (2) the heat shields at the ends of the capsule consisting of one molybdenum and two stainless steel shields, (3) the niobium tubes protecting the TCs, and (4) the niobium tubes containing the piggyback samples. These metallic components were in all three capsules. In another experiment,[12] niobium tubes were attached by

Table 2.3.1. The uranium and thorium loading of the fuel compacts

Capsule	Isotope	Fissile Particles[a] loading (g/compact)	dtf-Particles[b] loading (g/compact)	Fertile Particles[c] loading (g/compact)
1	U	0.1715	0.0185	
2	U	0.1715	0.0185	
3	U	0.1715	0.0185	
1	^{235}U	0.0336	0.0036	
2	^{235}U	0.0336	0.0036	
3	^{235}U	0.0336	0.0036	
1	^{238}U	0.1379	0.0149	
2	^{238}U	0.1379	0.0149	
3	^{238}U	0.1379	0.0149	
1	^{232}Th			0.2168
2	^{232}Th			0.2168
3	^{232}Th			0.2168
Number of particles/compact		896	87	500
Number of particles/capsule		10752	1044	6000

[a] Particles from batch number 6157-11-010
[b] Particles from batch number 6450-00-010
[c] Particles from batch number 6252-12 COMP

Table 2.3.2. The uranium and thorium loading of the unbonded and piggyback fuel particles

Capsule	Isotope	Unbonded Fissile Particles[a] loading (g/capsule)	Unbonded Fertile Particles[c] loading (g/capsule)	Piggyback Fissile Particles[a] loading (g/capsule)	Piggyback dtf-Particles[b] loading (g/capsule)	Piggyback DepletedUO_2[d] loading (g/capsule)
1	U	0.0000		5.7E-04	6.4E-04	1.59E-02
2	U	0.1053			6.4E-04	6.13E-03
3	U	0.1053			6.4E-04	6.74E-03
1	^{235}U	0.0000		1.1E-04	1.3E-04	1.11E-04
2	^{235}U	0.0207			1.3E-04	4.29E-05
3	^{235}U	0.0207			1.3E-04	4.72E-05
1	^{238}U	0.000		4.6E-04	5.1E-04	1.58E-02
2	^{238}U	0.0847			5.1E-04	6.08E-03
3	^{238}U	0.0847			5.1E-04	6.69E-03
1	^{232}Th		0.0000			
2	^{232}Th		0.1084			
3	^{232}Th		0.1084			
Number of particles/capsule		550	250	3 (1)[e]	3	26 (1)[e] 10 (2) 11 (3)

[a] Particles from batch number 6157-11-010
[b] Particles from batch number 6450-00-010
[c] Particles from batch number 6252-12 COMP
[d] Particles of KFA type EUO-2428
[e] The number of particles, p, in capsule c is p (c)

water vapor and did swell to the extent that it made their removal from a hole in the graphite body difficult; similar samples under the same conditions, but not exposed to the water vapor, did not swell. The consequence of the reaction between water vapor and the metallic components, particularly niobium, must be assessed in the complete analysis of the present experiment. It is likely that this is important only in capsule 3 and not in capsules 1 and 2. The possibility that niobium could act as a getter for iodine needs also to be assessed.

2.4 QUALITY ASSURANCE, ASSEMBLY, AND COMMISSIONING

2.4.1 Quality Assurance

There are two QA departments at Petten, in the HFR division and in the JRC. The main function of the QA department at JRC Petten is to inspect and approve all experiments that are inserted in the HFR. The HFR QA department provides the final inspections for all in-reactor tests. Details on the JRC and HFR QA departments have been reported.[13-15] In addition, there is a separate department which performs calibration of instruments at the request of the HFR, with particular emphasis on safety.

Once the experiment is accepted and installed in the HFR, the lead engineer of the experiment becomes responsible for calibrations and other QA functions. In the case of the HFR-B1 experiment, the lead engineer was encouraged and helped by the technical review function performed by the experiment cosponsors, KFA and GA. In this particular case, however, there was a unique relationship between the test operator, JRC, and the clients, KFA and GA. KFA and GA essentially functioned as independent reviewers and have required that the tests be conducted in accordance with their QA systems. At this stage, the QA on-site was regarded as being in compliance with the intent of 10 CFR 50, Appendix B, criteria 5, 6, 11, and 12. A document on the QA of experiment HFR-B1[15] is a result of cooperation among the JRC, KFA, and GA.

2.4.2 Assembly and Commissioning

The irradiation rig was designed by JRC Petten and manufactured and assembled by subcontractors, i.e., the in-pile part by ECN Petten and the instrumentation rig head by NTG Gelnhausen. The fuel compacts and graphite bodies were assembled by GA according to JRC plans, including dimensions and provisions for TCs and gamma-scan wires. The bodies were shipped to Petten fully assembled except for the KFA SiC rings, which were inserted by JRC into the central hole of the fuel body in capsule 1. The final commissioning of the rig was accomplished by JRC QA. The following items were addressed during the assembly and final checkout of the rig:

1. All dimensions were checked.

2. All parts were cleaned by pickling and rinsing; some parts were cleaned ultrasonically, and tubes and capsules were purged with He at 200° C.

3. Electrical checks of TCs, SPNs, VDU solenoid valves and extension cables were performed.

4. The orientation of detectors and specimens with respect to arrow North was checked.

5. All welds and brazings were leak checked; the maximum leak rate allowed was 3×10^{-7} torr L/s.

6. All containments were pressure tested at about 9 MPa and the rig head at about 5 MPa. The maximum allowed leakage was 0.5 MPa in 72 h.

7. Checks of all identification marks on all parts, tubes, cables, connectors, and valves were performed.

8. All tube passages were checked for continuity.

9. All solenoid valves were checked.

10. The polarity of all electrical circuits was checked.

11. All handling parts, such as the transport cover and special top lid adapter, were checked.

12. X-radiography of assembled capsules was performed.[3]

All the above checkout test were accomplished by ECN Petten during and after assembly. The checks are described and registered in the assembly report.[16] The final checkout of the rig was accomplished by JRC QA. They repeated all the above tests before and after installation and connection to the Sweeploop system. A final check on the safety and function of the test was accomplished by the HFR Review Committee.

3. IRRADIATION HISTORY

The irradiation of the HFR-B1 experiment was carried out in 20 reactor cycles, starting on April 7, 1987, and ending on July 10, 1989. During the first year of operation, the rig was removed from the core for a total of five cycles. The length of each HFR cycle was between 20 and 26 d, and the duration of the irradiation was 444 EFPD. There were normally 3 to 6 d between each cycle with the exception of the maintenance shutdowns which occurred in March and August for periods of 30 and 45 d, respectively.

The D214.01 rig was irradiated in core position F8 or F2. The rig was turned 180° after each cycle. The vertical displacement units were used only in the first four cycles; thus, the axial positions were constant for the remaining 16 cycles. Capsules 1 and 2 were in the axial center of the core and received similar neutron fluences, while capsule 3 was below centerline. Table 3.0.1 shows HFR start dates, stop dates, EFPD, and average cycle power.

Before the start of each cycle, instructions on the conduct of the experiments in the cycle were given to technicians and reactor operators. The instructions included (1) values of flow rates, pressures, and temperatures; (2) the specific TCs to be monitored; (3) the times and dates for neon and other gas additions or removals; and (4) schedules for all measurements including the measurement of released fission gas using the multi-channel analysis (MCA) equipment and the measurement of the composition of effluent gases using the gas chromatograph (GC). Instructions for special tests, such as the addition of water vapor and hydrogen to capsule 3, were included, along with any requests to accelerate monitoring via the GC and/or the MCA. At least 24 h before the start of each cycle, flows and pressures were re-established in all capsules. The HFR was normally brought to power, 42 to 45 MW, within about 8 h. Scheduled reactor stops were either at 24 or 16 h of the last day of the cycle and were accomplished by rapid insertion of control rods. Consequently, temperatures in all experiments declined rather quickly.

The helium used in all capsules was the normal reactor "service He" and was purified by a "deox" and by molecular sieve beds for the removal of oxygen and water vapor, respectively. A final ultrapurification was accomplished with the use of a bed of activated carbon at liquid nitrogen temperature. The Ne used was purified by only the deox and molecular sieve methods.

MCA measurements were usually started on the second day of the cycle. Nine isotopes of Xe and Kr were measured in the effluent gas from each capsule once daily, except during special tests involving, for example, water vapor addition to capsule 3 or temperature cycling in capsule 2; in such cases, data were taken more frequently. Procedures for and conditions of the specific capsules are given below.

3.1 CAPSULE 1

Capsule 1 was intended to operate at steady conditions of temperature, neutron flux, and gas environment. Neon was never added, and temperatures tended to fluctuate from cycle to cycle due to changes in reactor power, declining capsule power, changes in gas gaps and thermal conductivity in the fuel body, and occasional changes in neutron moderation or absorption in adjacent tests in the reactor.

Table 3.0.1. HFR cycle start and stop dates, cycle and cumulative power days, and average cycle power
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle	Start	End			Ave. Power
y. no	d. mo	d. mo	FPD	∑FPD	<MW>
87.03	07.04	04.05	21.27	21.27	44.1
87.05	02.06	29.06	23.65	44.92	44.1
87.09	27.10	16.11	20.03	64.95	44.1
87.10	18.11	14.12	24.63	89.58	44.1
88.01	06.01	1.02	25.76	115.34	NA
88.02	04.02	29.02	25.44	140.78	47.7
88.04	28.04	23.05	25.75	166.53	47.5
88.05	26.05	20.06	25.21	191.74	47.5
88.06	23.06	15.07	20.79	212.53	45.1
88.07	08.09	28.09	21.04	233.57	45.3
88.08	05.10	24.10	21.44	255.01	45.3
88.09	27.10	17.11	21.26	276.27	45.1
88.10	21.11	12.12	20.92	297.19	45.1
88.11	15.12	05.01	21.40	318.59	45.1
89.01	16.01	06.02	20.96	339.55	41.7
89.02	10.02	04.03	18.80	358.35	45.1
89.03	04.04	24.04	19.75	378.10	45.5
89.04	28.04	20.05	22.75	400.85	45.3
89.05	25.05	14.06	21.14	421.99	44.7
89.06	18.06	10.07	21.60	443.59	42.0

Y.No = Year; cycle number
d.mo = day.month
FPD = full power days
∑FPD = cumulative number of full power days
Ave. Power = average power per cycle taken from Figs. 6.6.1, 6.6.1, and 6.6.3
NA = not available; data for cycle 88.01 not included in Fig. 6.6.2

The mean temperature of the graphite body was 790 ± 30°C; the estimated fuel temperatures were between 880 and 990°C. The gas environment was pure helium with less than 1 ppm of impurities, such as CO, CO_2, O_2, or H_2. During operation at temperature, the outlet gas usually showed trace impurities of about 2 ppmv H_2, and about 0.1 ppmv CO and CO_2. The gas flow rate was constant at 300 ± 10 cm^3/min at standard conditions of 0.1 MPa and 298 K; the inlet pressure was nominally 0.4 ± 0.02 MPa, while the outlet pressure was 0. 36 ± 0.02 MPa.

3.2 CAPSULE 2

Capsule 2 was intended to operate over the accessible range of temperatures with the maximum being near the highest temperature expected in the core of an HTGR. The mean temperature of the graphite body was 870 ± 35°C, but the estimated fuel temperatures were between 880 and 1230°C. The latter range in temperature was achieved by adding neon to the sweep gas in half of the reactor cycles to a maximum fractional concentration of 1. For each 1% of neon added, the temperature increased about 3.5%; the maximum increase was 350°C. The effect of temperature on fission gas release at constant nuclear conditions was determined by varying the temperature in some cycles as frequently as two to five times. The flow rates, pressures, and gas impurity concentrations were similar to those of capsule 1. Whenever neon was added, however, impurity measurements could not be made with the gas chromatograph due to the overlap of the huge neon elution peak with that of the trace impurities. During these periods, the outlet impurities were inferred from the capsule 1 data and from the inlet gas measurements.

3.3 CAPSULE 3

The purpose of capsule 3 was to measure the effect of water vapor on fission gas release from exposed UCO fuel over a temperature range for which the graphite surrounding the exposed fuel would not react with the water vapor at the lowest temperatures but would react at the higher temperatures. The mean temperature of the graphite body was 742 ± 30°C, but the estimated fuel temperatures were between 820 and 1050°C.

There were 16 water vapor injections which, except for two, had a duration of 4 to 10 d. The partial pressures ranged from 18 to 1060 Pa. The final water vapor injection was started 16 hours before the end of the irradiation for the special purpose of determining whether volatile iodine (such as methyl iodide) would be formed.

Water vapor was added to the capsule 3 inlet gas in the following way: First, the normal He inlet was replaced with a special source which was part of the "water vapor generator" system. This system comprised a bypass flow which bubbled through a water column at ambient temperature, after which it was mixed with dry helium. Knowing the temperature of the water column and therefore the partial pressure of water vapor, the flow rate through the water, the total mixed flow rate, and the absolute pressures above the water column and at the inlet to the capsule, the concentration of water vapor in the mixed gas inlet could be calculated.

In several of the tests, an absolute frostpoint-type moisture monitor (General Eastern Model MI-1) was used to calibrate the water vapor generator system and to check on the accuracy of the methods of calculation. The calibrations corroborated the moisture generation system

performance and calculations; the water vapor concentrations were known in the last 11 tests to be better than ±10%. In the first five injection tests, the flow rate through the bubbler was not known; rather, reliance was placed on readings of Panametrics capacitance-type cells. These cells were found later to yield low values; the true water vapor concentrations in these tests were inferred from an analysis based on the rate of graphite oxidation as determined by the GC measurements.

In two of the cycles, 100 Pa of hydrogen were added to the inlet gas, along with the water vapor, to determine the effect of H_2 on the interaction of water vapor with the UO_2. This was accomplished by switching the normal He supply to a special tank containing 1000 ppm hydrogen. The valving was arranged so that the H_2 could be turned on or off at any time during the test.

GC measurements were normally performed once a day for all capsules except capsule 3 during the water vapor injection tests when measurements were made more frequently. Often, the GC was put on automatic cycle, so that any changes in oxidation rate would be readily detected.

A complete description of the water vapor generator and GC systems, methods of use, and calibrations is given in Appendices A and B, respectively.

4. EXPERIMENTAL DATA

4.1 GENERAL

The number of experimental data accumulated during the HFR-B1 experiment is so large as to preclude presenting most of them in this final irradiation report. The data of experiment HFR-B1 are briefly described in the categories of (1) data files, (2) laboratory recorded data, (3) graphics and associated data, (4) GC data, and (5) postirradiation iodine decay data. These data have been given by Petten to the ORNL Nuclear Fuel Section of the Metals and Ceramics Division.

4.1.1 Data Files

A magnetic tape was generated in the HFR Vax-4300 System at Petten: a copy of this tape is available at ORNL. This tape contains 1457 files and 270,464 blocks of data in 3 directories for the HFR-B1 experiment. The files include those with (1) the steady-state fission gas release values (R/B) for all capsules and cycles for both the total fissile loading and for the loading in the dtf particles only; (2) the plots of these R/B data as a function of time along with a reference temperature profile; (3) the vertical displacement history; (4) the activity history for the three capsules; (5) all TC temperature histories; (6) power and control rod histories; (7) shape factors (related to the axial distribution of neutron fluxes); (8) process data including flow, hygrometer, and pressure data; and (9) Sweeploop data including gas composition, pressure, hygrometer, and reference temperature data. A list of the files in two of the directories is presented in Sect. 6.

4.1.2 Laboratory Recorded Data

The principal data relate to the counting of the gaseous isotopes ^{85m}Kr, ^{87}Kr, ^{88}Kr, ^{89}Kr, ^{90}Kr, ^{133}Xe, ^{135}Xe, ^{135m}Xe, ^{137}Xe, and ^{138}Xe. Associated with each counting are the specific capsule, date, spectrum number, sample collection time, start of counting time, reference temperature, flow rate and pressure, and the net number of counts for each isotope which is used in computing the steady-state fractional fission gas release, R/B. These data obtained during the irradiation, as well as associated data for all 20 cycles, were recorded in 11 ring-binder notebooks.

In addition, there are:

1. Post-cycle calculations of the flux and fluence in seven energy groups, damage to activation ratios for graphite, damage fluence, equivalent DIDO nickel fluence, axial shape factors, and the number of EFPD.

2. HFR-Vax graphics for (per cycle per capsule): (a) temperature profiles; (b) gaseous activity; (c) vertical position; (d) neutron flux from the monitoring of the SPN detectors, SPN1, SPN3, and SPN5; (e) flow histories; (f) downstream moisture profiles; and (g) upstream moisture profiles.

3. DACOS files consisting of: (a) temperature data from the 54 TCs; (b) process data including flow, hygrometer, activity, pressure, and position data; and (c) Sweeploop data including gas composition, pressure, hygrometer, and reference temperature data.

4. Weekly experimental data summaries (these reports are useful for an overall view but were not issued for all weeks).

5. Operating instructions and data logger information.

6. Discussions by fax on the course of the experiments (GA, ORNL, and JRC Petten).

4.1.3 Graphics and Associated Data

The graphic displays and associated data obtained include (1) power profiles in fuel compacts and piggyback samples; (2) burnup profiles with separate contributions from ^{235}U, ^{239}Pu, ^{241}Pu, and ^{233}U for fuel compacts and piggyback samples; (3) tabular power data and neutron fluxes; (4) tabular ORIGEN calculational data for each cycle for the profiles of (1) and (2) at nominal and maximum fluxes; (5) R/B profiles at 8.9 and 100% fissile power and corresponding reference temperature profiles for each cycle of each capsule; (6) profiles of the activity, pressure, hygrometer readings, and purge flow, and the SPN detector outputs; (7) comparison profiles of the reference temperatures in capsules 1, 2, and 3 for each cycle; and (8) temperature profiles for each cycle associated with three fuel compacts and with each fueled graphite wedge in each capsule.

4.1.4 Gas Chromatographic Data

The GC data consist of the time history of the products of hydrolysis of the carbonaceous components of the fuel elements in the three capsules, mainly CO, CO_2, H_2, and CH_4. In addition, the chart records of the multichannel recorder for pressures, selected temperatures, flow rates, and other process and Sweeploop quantities accompany the GC records.

4.1.5 Postirradiation Iodine Decay Data

The postirradiation measurements of the xenon isotopes resulting from the radioactive decay of iodine released from exposed kernels during irradiation and the corresponding spectral analyses leading to the net area counts for the xenon isotopes ^{133}Xe, ^{135}Xe, and ^{135m}Xe were obtained in the form of computer printouts. These data covered the measurements of the xenon isotopes after the termination of irradiation in cycles 88.10, 89.02, 89.04, 89.05, and 89.06.

4.2 TEMPERATURES

For measuring the temperature, there were 18 TCs in each capsule located at three depths in the graphite bodies. The arrangements are shown in Figs. 4.2.1, 4.2.2, and 4.2.3 taken from the design and safety report.[3] The TCs in capsules 1 and 3 were type "K" with a sustained temperature limit of 1000° C. In capsule 2, where temperatures were sometimes higher, 12 type "N" TCs (1150° C sustained limit) were used along with 6 type K. The type K TCs were sheathed in stainless steel, and the type N had Inconel sheaths. All TCs were surrounded by niobium protection tubes.

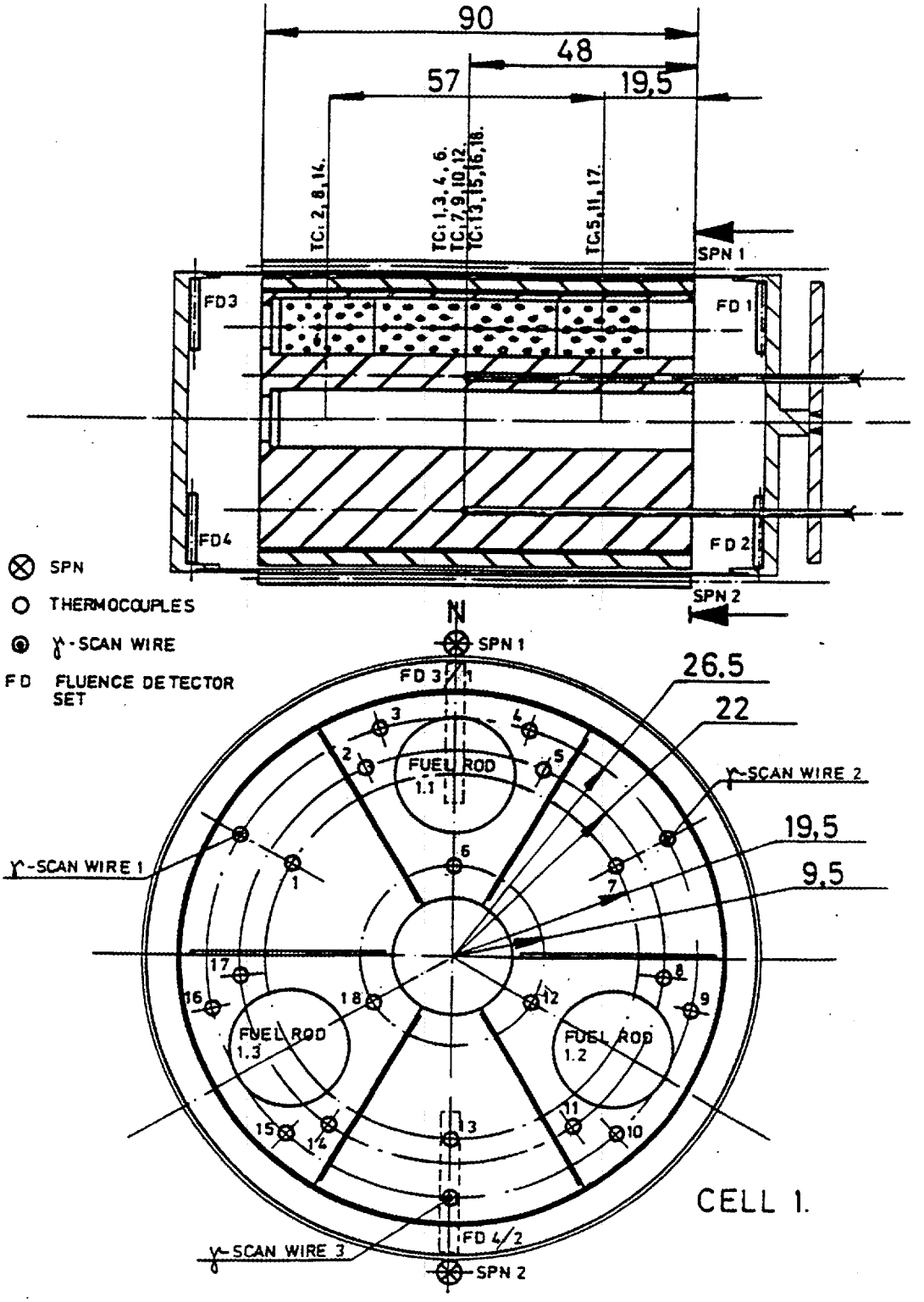

Fig. 4.2.1. Instrumentation of capsule 1 (also designated as capsule A).
Source: JRC-IAM Petten, HFR Unit, The Netherlands

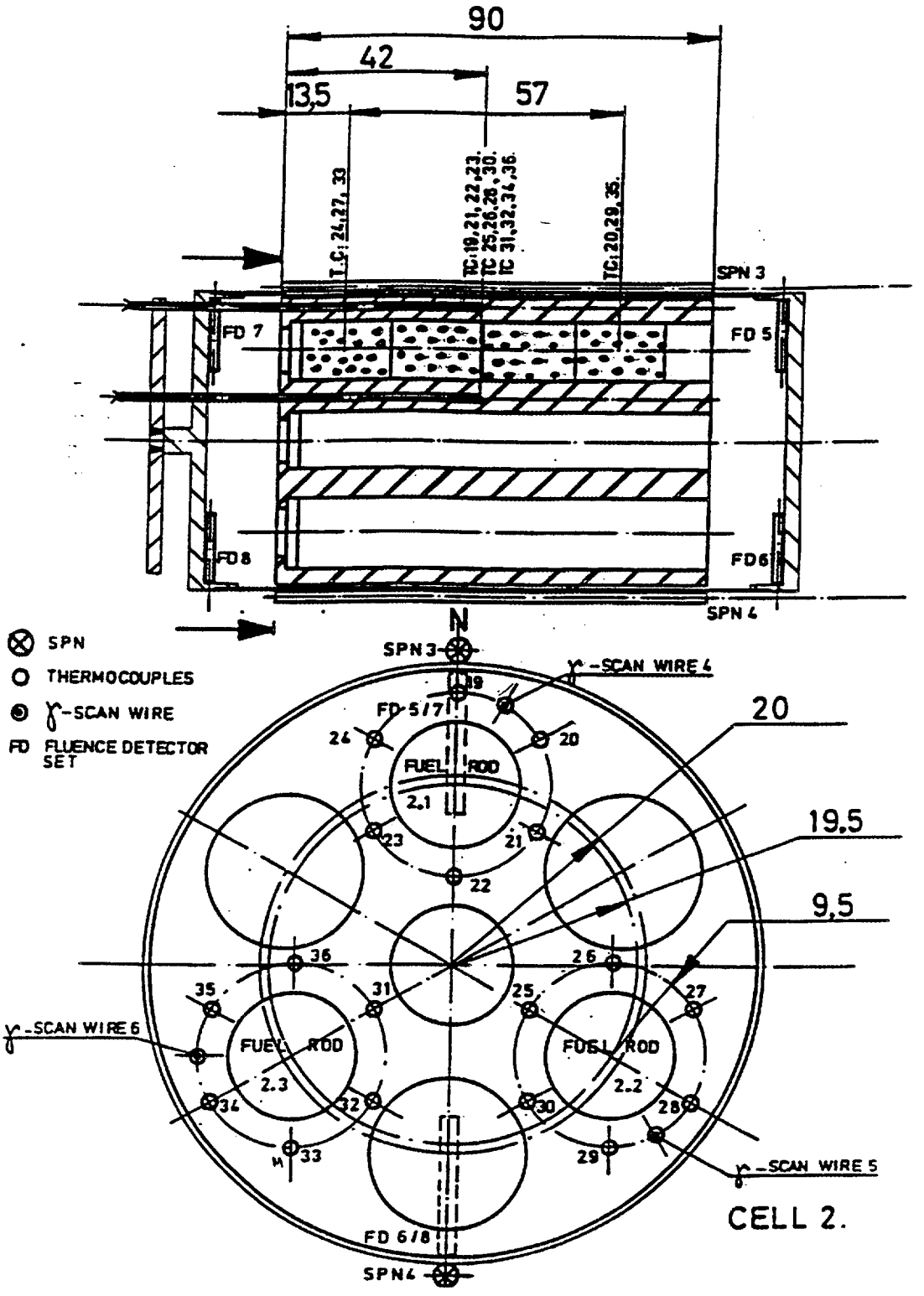

Fig. 4.2.2. Instrumentation of capsule 2 (also designated as capsule B).
Source: JRC-IAM Petten, HFR Unit, The Netherlands

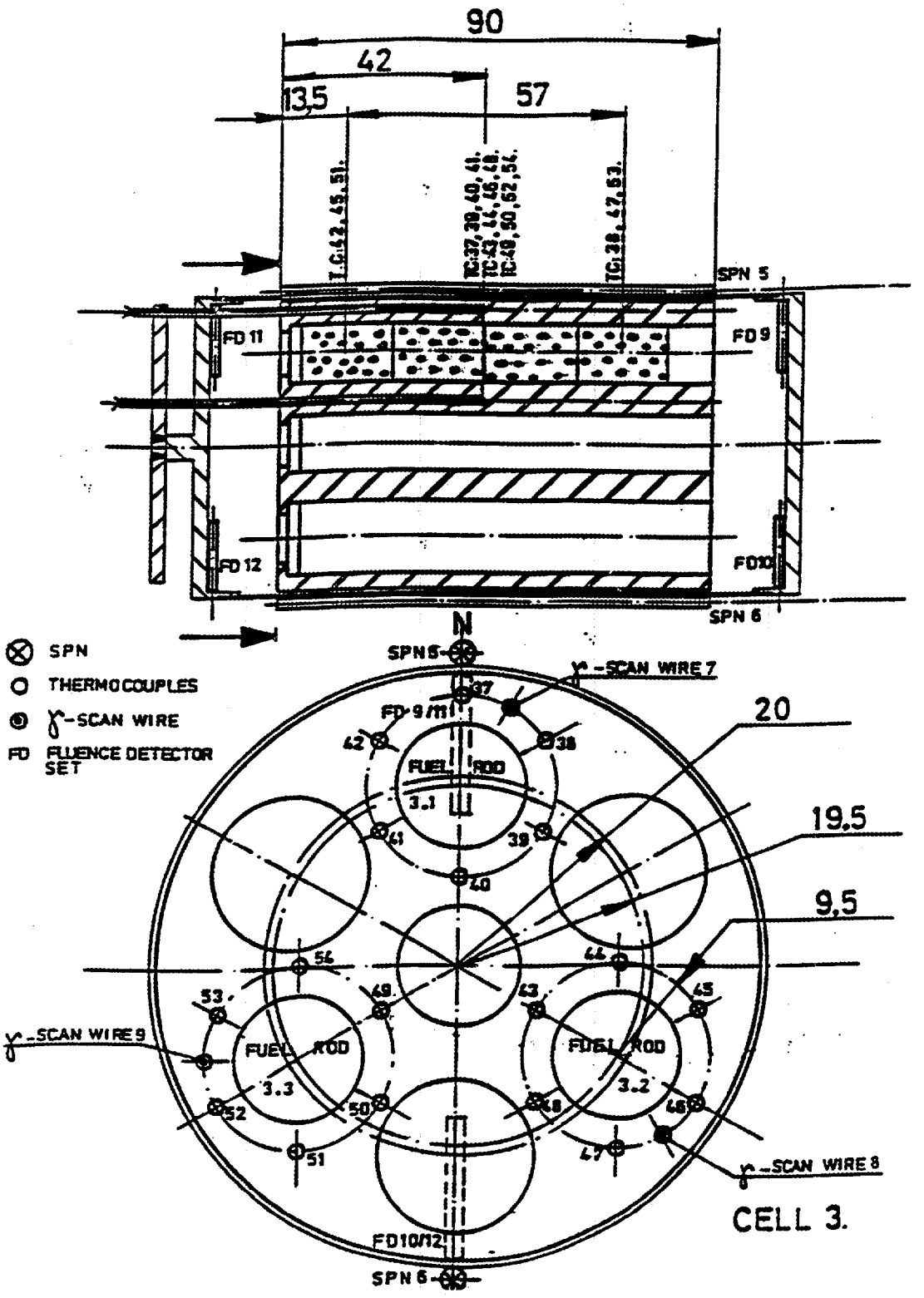

Fig. 4.2.3. Instrumentation of capsule 3 (also designated as capsule C).
Source: JRC-IAM Petten, HFR Unit, The Netherlands

In capsule 1, each stack of fuel compacts in alternate graphite wedges was surrounded by five TCs located at three radial distances, and in the sink graphite wedges, there was one TC; see Fig. 4.2.1. In capsules 2 and 3, each of the stacks of fuel compacts per capsule was surrounded by six uniformly spaced TCs at a common radial distance from the centerline of the fuel compact stack; see Figs. 4.2.2 and 4.2.3. The TC temperature histories were recorded and stored on the magnetic tape by the HFR Vax-4300 System as stated in Sect. 4.1 above. Two examples of the temperature histories are presented in Figs. 4.2.4 and 4.2.5 for cycles 88.05 and 89.05, respectively. In both cases, TCs profiles in capsules A, B, and C (also more generally referred to as capsules 1, 2, and 3, respectively) for thermocouples numbered 12, 30, and 43, respectively, are shown. Very often, the temperature in a capsule during a single cycle was approximately constant as shown in Figs. 4.2.4 and 4.2.5; however, in capsule B (capsule 2), the temperature was changed occasionally to probe the effect of temperature on the release of fission gases from fuel at temperatures above 1100°C. Note that in Figs. 4.2.4 and 4.2.5, the temperature values are those of the graphite bodies; the fuel temperatures will be higher by approximately 100 to 150°C. For convenience of use, a table of temperatures was constructed in which average values were deduced for the time segments during which the temperature was constant or only slowly varying. An example from this large table is presented in Table 4.2.1. (Note: The complete set of temperature values is presented in Sect. 6, Tables 6.2.1, 6.2.2, and 6.2.3 for capsules 1, 2, and 3 in which TCs numbered 1 through 18, 19 through 36, and 37 through 54, respectively, were monitored.) The tables also provide information on the cycle number, date, time, EFPD, the capsule orientation (see Sect. 4.3), the location of the VDU, the neon content of the purge gas, the power, and the control rod position with respect to the central reactor top lid (Crtl). A comparison of the data in Figs. 4.2.4 and 4.2.5 with the appropriate data in Tables 6.2.1, 6.2.2, or 6.2.3 will reveal the relationship of the average temperature to the temperature values of the profile and the small errors introduced in using the averages. In making the comparison, one must note that calendar days are the units of the abscissae whereas Tables 6.2.1, 6.2.2, and 6.2.3 list the number of EFPD for a given date. In the special cases of Figs. 4.2.4 and 4.2.5, the conversion from calendar days to EFPD is made by adding 168.3 and 402.6 to the appropriate number of calendar days for cycles 88.05 and 89.05, respectively, to obtain the EFPD corresponding to the time of interest in the chosen cycle.

4.3 NUCLEAR QUANTITIES

The nuclear quantities and the fission power per capsule and fuel compact stack for each cycle and fuel element position are calculated, post-cycle, using the HIP-TEDDI computer code.[3] This calculation yields volume average data over a vertical distance (length) of 60 cm; the neutron flux and fluence values for a specific vertical location are obtained by using the curve of relative vertical neutron flux distribution for the fuel element positions used, F2 and F8,[3] and the shape factor which is the ratio of a specific flux to the average neutron flux. An example of the post-cycle, HIP-TEDDI volume average data for cycle 88.05 is shown in Table 4.3.1. The post- cycle data for all cycles are presented in Sect. 6.3. Of note in Table 4.3.1 is the orientation of the graphite body in the capsule. The orientation alternates between a reference north and south from cycle to cycle to compensate for an unsymmetrical radial neutron fluence. The latter is a consequence of the peripheral core positions (F2 and F8) which have reflector elements on one side and fuel and other experimental positions on the other sides. By rotating the fuel bodies, the neutron flux and fluence exposures of the three fuel compact stacks are made more uniform. As shown in Table 4.3.1, the initial and cycle average flux and the neutron fluence are given for each

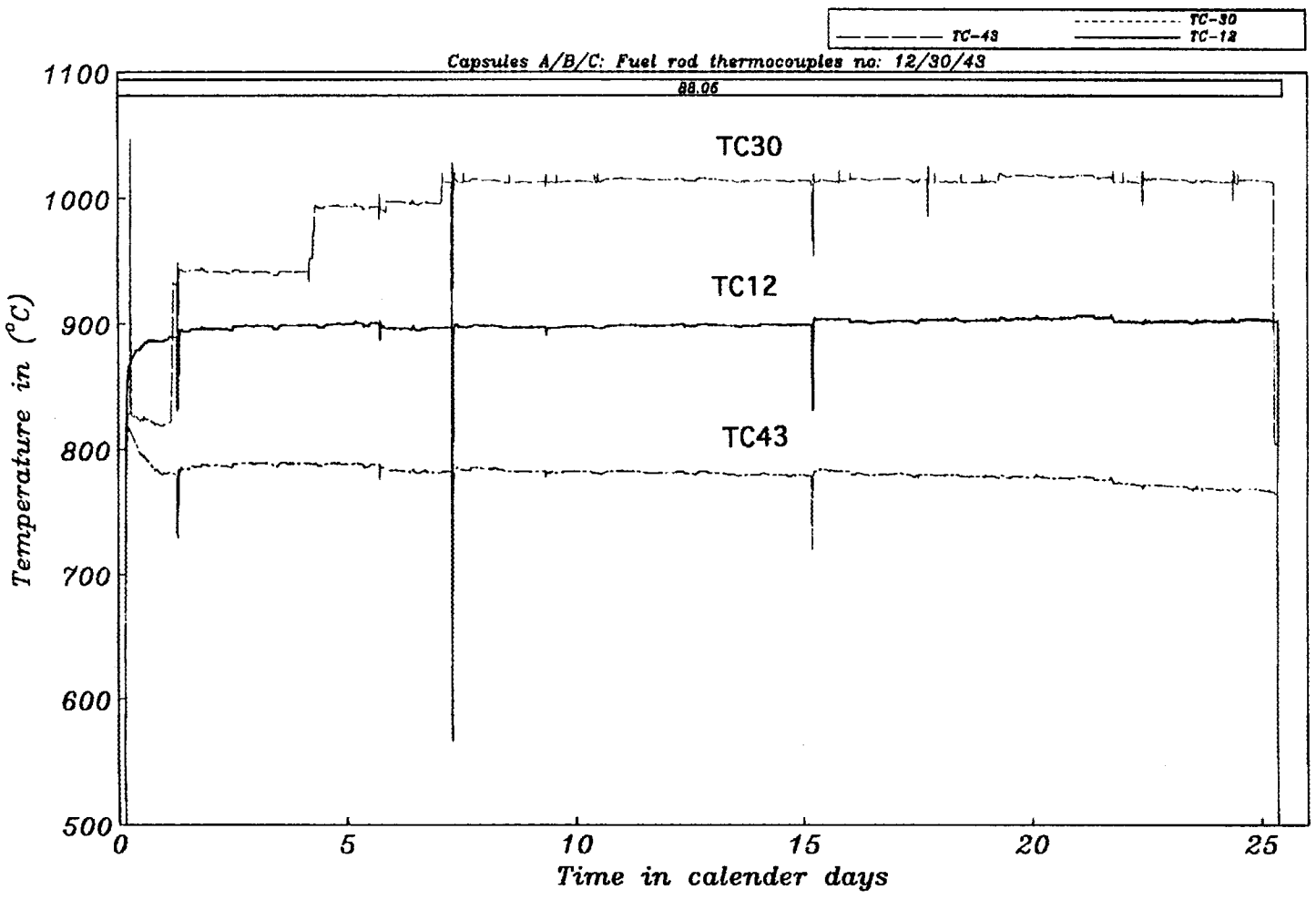

Fig. 4.2.4. Temperature history D-214 Cycle 88.05.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

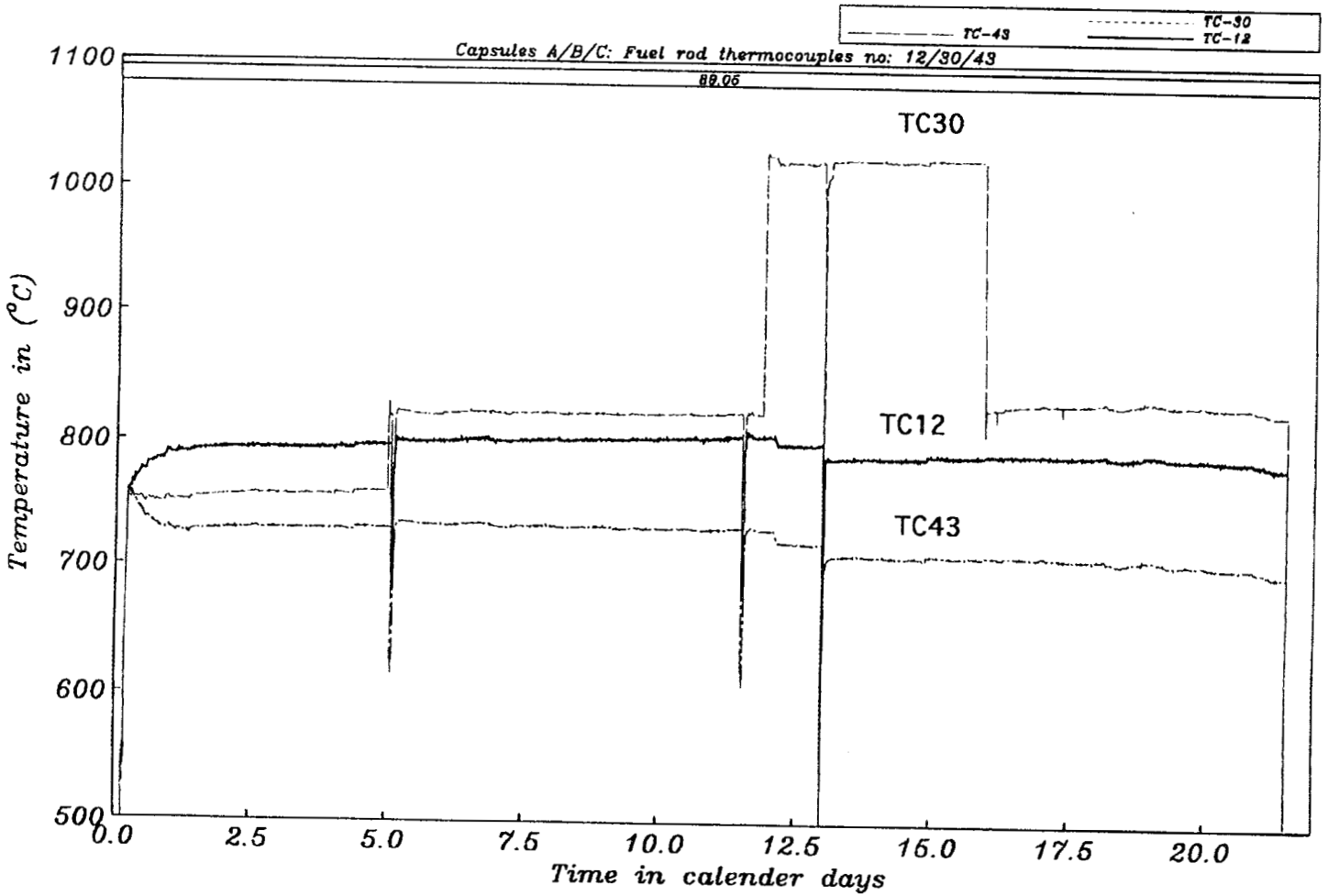

Fig. 4.2.5. Temperature history D-214 Cycle 89.05.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Table 4.2.1. Capsule 1: Representative temperatures at selected times, capsule and control rod position, gas composition and reactor power
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle	87.03			87.05			87.09		87.10		88.01		88.02	
Date	13.04	22.04	4.05	8.06	9.06	29.06	28.10	16.11	20.11	14.12	11.01	1.02	4.02	29.02
Time	8.36	11.24	14.48	12.34	15.10	11.18	8.06	14.00	8.40	10.16	10.00	14.46	12.54	11.30
FPD	4	10	23	26	27	46	47	66	67	91	96	117	118	142
Orient.	F 8 N			F 8 S			F 8 N		F 8 S		F 2 S		F 2 N	
VDU	+93	+118	+118	+255	+255	+255	+110	+110	+110	+110	+65	+65	+65	+65
%Ne	0	0	0	0	86	0	0	0	0	0	0	0	0	0
Mw	45			45			45			45	47.5	47.5	47.5	
Crtl	65	66	72	64	64	69	57	59	55	57	55	57	57	60
TC No.	Temperature (°C)													
1	774	753	769	479	733	507	758	771	698	720	709	733	712	749
2	744	721	739	454	703	482	780	791	731	747	725	747	750	791
3	823	800	820	504	761	534	833	844	767	783	782	805	767	800
4	795	767	786	509	767	542	835	849	766	781	784	808	756	788
5	783	761	782	473	722	502	795	811	728	749	753	780	727	763
6	0	0	0	0	0	0	862	876	798	821	816	843	794	831
7	748	723	742	456	705	483	756	771	709	729	733	760	700	736
8	750	729	746	485	739	514	768	779	747	759	739	761	728	757
9	797	764	782	503	761	535	799	810	775	792	770	794	756	790
10	823	795	815	500	756	530	804	814	784	802	773	797	767	802
11	755	726	745	473	724	505	756	768	733	757	730	755	725	764
12	822	802	822	520	777	553	843	856	817	841	813	840	801	840
13	756	728	743	485	736	512	736	748	720	743	704	727	721	760
14	724	702	720	464	715	492	773	782	732	748	713	733	738	772
15	806	778	796	501	759	533	821	829	762	782	759	781	778	816
16	799	768	786	508	767	541	823	832	767	788	752	772	776	813
17	765	739	759	478	729	509	789	802	727	741	736	757	722	749
18	687	680	669	537	581	550	847	857	795	822	790	813	807	848

Table 4.3.1. Post-cycle HIP-TEDDIE volume average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 87.05
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle average fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	.508	.105	.514
Neutron flux 2 1.353MeV>E>.0674MeV	.914	.190	.930
Neutron flux 3 .0674MeV>E>.683 eV	1.211	.252	1.233
Neutron flux 4 E<.683 eV	.748	.159	.778
Fission flux	.678	.139	.680
2200 m/s flux	.687	.145	.710
Neutron flux E>1 MeV	.640	.133	.651
Neutron flux E>.1 MeV	1.331	.276	1.351
DAR Graphite (1)	2.23	-	-
Damage flux Graphite	1.582	.328	1.605
EDN flux (2)	.869	.180	.881
Nuclear heating W/g	2.932	3.083	-
DPA Graphite (3)	-	.238	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	23.650	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

of four energy groups, for specific fluxes [fission, 2200 m/s, graphite damage, and equivalent DIDO nickel fluence (EDN)] and for two cutoff energies (0.1 and 1.0 MeV). In addition, the damage-to-activation ratio (DAR) for graphite, the displacement per atom (DPA) for graphite, the nuclear heating, the axial shape factors, and the number of EFPD are given.

The nuclear quantities appropriate to each capsule, the fast fluence, and power and burnup are derived from the calculations.

4.3.1 Fast Neutron Fluence

The fast neutron fluences at E > 0.1 MeV in the HFR at the end of each cycle are presented in Table 4.3.2. The complete set of fluence data including end of cycle values, mean cycle values adjusted to the end of irradiation values, both for E > 0.1 MeV and the equivalent HTGR fluence values for E > 0.18 MeV, are presented in Sect. 6.3.

4.3.2 Power and Burnup

The power and burnup were calculated for the fuel compacts and for the piggyback samples of GA and KFA in the HFR-B1 experiment. The applied method had been verified by comparing measurements for experiment D138.05 with the calculations.[17] In D138.05, HTR fuel spheres of German manufacture were irradiated for 34 HFR cycles, a time period of 3 years. In this method, the following steps were taken:

1. The (1) thermal capture and fission cross sections of ^{232}Th, ^{233}Th, ^{233}Pa, ^{233}U, ^{234}U, ^{235}U, ^{238}U, ^{239}U, ^{239}Np, ^{239}Pu, ^{240}Pu, and ^{241}Pu, (2) energy released per fission for ^{233}U, ^{235}U, ^{239}Pu, and ^{241}Pu, and (3) value of the neutron temperature, T_n, used in the calculation of the ORIGEN[18] spectrum parameter THERM were calculated using the one-dimensional, rotationally symmetrical transport code MICROFLUX.[19]

2. The epithermal, fast capture, and fission cross sections of ^{232}Th, ^{233}Th, ^{233}Pa, ^{233}U, ^{234}U, ^{235}U, ^{238}U, ^{239}U, ^{239}Np, ^{239}Pu, ^{240}Pu, and ^{241}Pu were calculated with a two-neutron group code, GAM.[20] No resonance self-shielding calculations were performed for ^{238}U. The first energy group corresponds to $\phi_{>1MeV}$ in the HFR-TEDDIE code; the second one corresponds to the sum of ϕ_2 and ϕ_3 in the HFR-TEDDIE code.[21] HFR-TEDDI is the two-dimensional, four-group, diffusion code that is used to calculate neutron fluence rates (fluxes) in the HFR core.

3. The standard light-water reactor (LWR) library of ORIGEN_S was overwritten with cross sections for items 1 and 2 above.

4. The following steps were taken after each reactor cycle:

   4.1 The ORIGEN spectrum parameters RES and FAST were calculated from $\phi_{>1MeV}$, ϕ_2, and ϕ_3, the width of the lethargy interval of ϕ_2 and ϕ_3 being 14.5.

   4.2 Input to the ORIGEN_S code includes the cycle identification; the parameters THERM, RES, FAST, and ϕ_4; the number of HFR EFPD; and the number of

Table 4.3.2. Fast neutron fluence for E > 0.1 MeV at the end of each cycle in the HFR
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Index	Cycle	Fast Neutron Fluence, f,[a] E > 0.1 MeV		
		Capsule 1	Capsule 2	Capsule 3
1	87.03	0.26	0.34	0.30
2	87.05	0.39	0.60	0.62
3	87.09	0.67	0.95	0.92
4	87.10	1.0	1.4	1.3
5	88.01	1.32	1.8	1.6
6	88.02	1.67	2.2	1.87
7	88.04	2.04	2.5	2.17
8	88.05	2.4	2.9	2.46
9	88.06	2.7	3.2	2.7
10	88.07	3.0	3.5	2.9
11	88.08	3.3	3.8	3.1
12	88.09	3.6	4.1	3.3
13	88.10	3.9	4.4	3.4
14	88.11	4.2	4.7	3.6
15	89.01	4.5	5.0	3.8
16	89.02	4.8	5.3	4.1
17	89.03	5.1	5.6	4.3
18	89.04	5.4	6.0	4.6
19	89.05	5.7	6.3	4.9
20	89.06	6.0	6.6	5.1
Final Data (after gamma scan)		6.3	6.8	5.0

[a] f = the fast neutron fluence in units of 10^{25}n/m^2

zero-power days (between cycles). Both the irradiation and cooling period are divided into ten intervals.

4.3 A FORTRAN-77 program, burnup_D214.01, is executed and performs the following calculations for every interval: The fission power at the start and end of the cycle is calculated for each of the nuclides ^{233}U, ^{235}U, ^{239}Pu, and ^{241}Pu according to the relationship:

$$P_j = N_j \sigma_f \phi_{4,j} E_f, \tag{4.1}$$

where

j = the interval in the irradiation period,
P_j = power in interval j (W),
N_j = number of atoms of the nuclide in the interval (atom),
σ_f = the fission cross section as constructed by ORIGEN_S (m^2/atom),
ϕ_{fj} = the thermal group neutron fluence rate in the interval ($n/m^2 \cdot s$),
E_f = energy released per fission with
$E_f(^{233}U)$ = 3.040E-11 J/fission,
$E_f(^{235}U)$ = 3.205E-11 J/fission,
$E_f(^{239}Pu)$ = 3.300E-11 J/fission,
$E_f(^{241}Pu)$ = 3.300E-11 J/fission.

4.4 The burnup (B_u) is calculated for each of the nuclides ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu according to the relationship;

$$B_u = 100\{\Sigma_{i=1,10} N_i \sigma_f \phi_{4,i} \Delta t\}/N_o, \tag{4.2}$$

where

B_u = burnup (%FIMA),
%FIMA = 100 fissions per initial metal atom],
i = interval number in irradiation period,
N_i = number of atoms at start of interval (atom),
σ_f = the fission cross section as constructed by ORIGEN_S (m^2/atom),
$\phi_{4,i}$ = the thermal group neutron fluence rate in the interval ($n/m^2.s$),
Δt = time period in the interval (s),
N_o = number of initial metal atoms (atom).

Spectrum and initial fuel loading data used in the calculations of power and burnup are presented in Table 4.3.3. A summary of the neutron fluence rates by cycle and the full-and zero-power days used in the ORIGEN_S calculation are presented in Table 4.3.4. The calculation of the power and burnup for each cycle and each fissionable nuclide, for both the uranium and thorium chains, and for the fuel compacts and the piggyback samples are presented in Sect. 6, entitled "Final Irradiation Data," along with graphs of the power and burnup profiles. An example of these data is presented in Figs. 4.3.1 and 4.3.2 and Table 4.3.5; in the table, the volume averaged values of the power and burnup in the fuel compacts for the case of the uranium chain are listed for each cycle or segment thereof and each fissionable nuclide. The total power and burnup per cycle

Table 4.3.3. Selected data used in the ORIGEN_S calculation
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Spectrum Parameters:	THERM	=	0.55
	RES	=	0.18 (average over all cycles)
	FAST	=	1.12 (average over all cycles)

	INITIAL FUEL LOADING/CAPSULE		
	^{232}Th (g)	^{235}U (g)	^{238}U (g)
GA Fuel Compacts	2.60	0.4464	1.8336
Piggyback Specimens of GA	0.084	0.0207	0.0847
Piggyback Specimens of KFA	0.0000	4.29E-5	6.09E-3

Table 4.3.4. HFR-TEDDI volume fluence rates $\Phi(10^{18} n/m^2 s)$ and irradiation times
Source: JRC-IAM Petten, HFR Unit, The Netherlands

	HFR-TEDDIE broad group number						Time Intervals	
Y·C	1	2	3	4	> 1 MeV	2200 m/s	FPD	ZPD
87.031	0.562	1.003	1.320	0.856	0.706	0.437	7.52	1.90
87.032	0.559	1.008	1.332	0.867	0.709	0.442	14.69	30.58
87.051	0.514	0.930	1.233	0.778	0.651	0.400	0.64	1.94
87.052	0.514	0.930	1.233	0.778	0.651	0.400	23.01	120.02
87.092	0.653	1.196	1.606	1.115	0.826	0.564	20.03	2.47
87.101	0.631	1.153	1.552	1.081	0.798	0.547	15.96	0.88
87.102	0.641	1.171	1.562	1.108	0.814	0.560	8.67	23.28
88.01	0.512	0.957	1.263	0.791	0.652	0.405	25.76	2.77
88.02	0.569	1.060	1.401	0.915	0.723	0.467	25.44	58.40
88.04	0.589	1.061	1.420	0.957	0.742	0.486	25.75	2.80
88.05	0.606	1.097	1.460	0.955	0.767	0.487	25.21	3.00
88.061	0.540	0.984	1.304	0.869	0.683	0.442	10.36	1.55
88.062	0.544	0.991	1.314	0.890	0.690	0.452	10.43	54.06
88.07	0.539	0.985	1.303	0.875	0.682	0.445	21.04	4.61
88.08	0.545	0.993	1.323	0.891	0.691	0.453	21.44	2.78
88.09	0.550	0.996	1.323	0.920	0.691	0.466	21.26	4.09
88.10	0.598	1.073	1.427	1.029	0.752	0.519	20.92	2.67
88.11	0.557	1.060	1.352	0.957	0.703	0.485	21.40	10.57
89.01	0.569	1.011	1.358	0.972	0.712	0.491	20.96	3.34
89.021	0.622	1.120	1.508	1.096	0.788	0.552	2.27	2.00
89.022	0.622	1.120	1.508	1.096	0.788	0.552	14.42	1.89
89.023	0.622	1.120	1.508	1.096	0.788	0.552	2.31	29.73
89.03	0.580	1.030	1.365	0.979	0.733	0.494	19.75	3.34
89.04	0.580	1.040	1.380	0.982	0.734	0.496	22.75	3.69
89.05	0.580	1.046	1.396	0.854	0.734	0.438	21.14	2.95
89.06	0.579	1.040	1.388	0.857	0.729	0.440	21.60	1000.

Y • C = year • cycle; EFPD = full-power days; ZPD = zero-power days

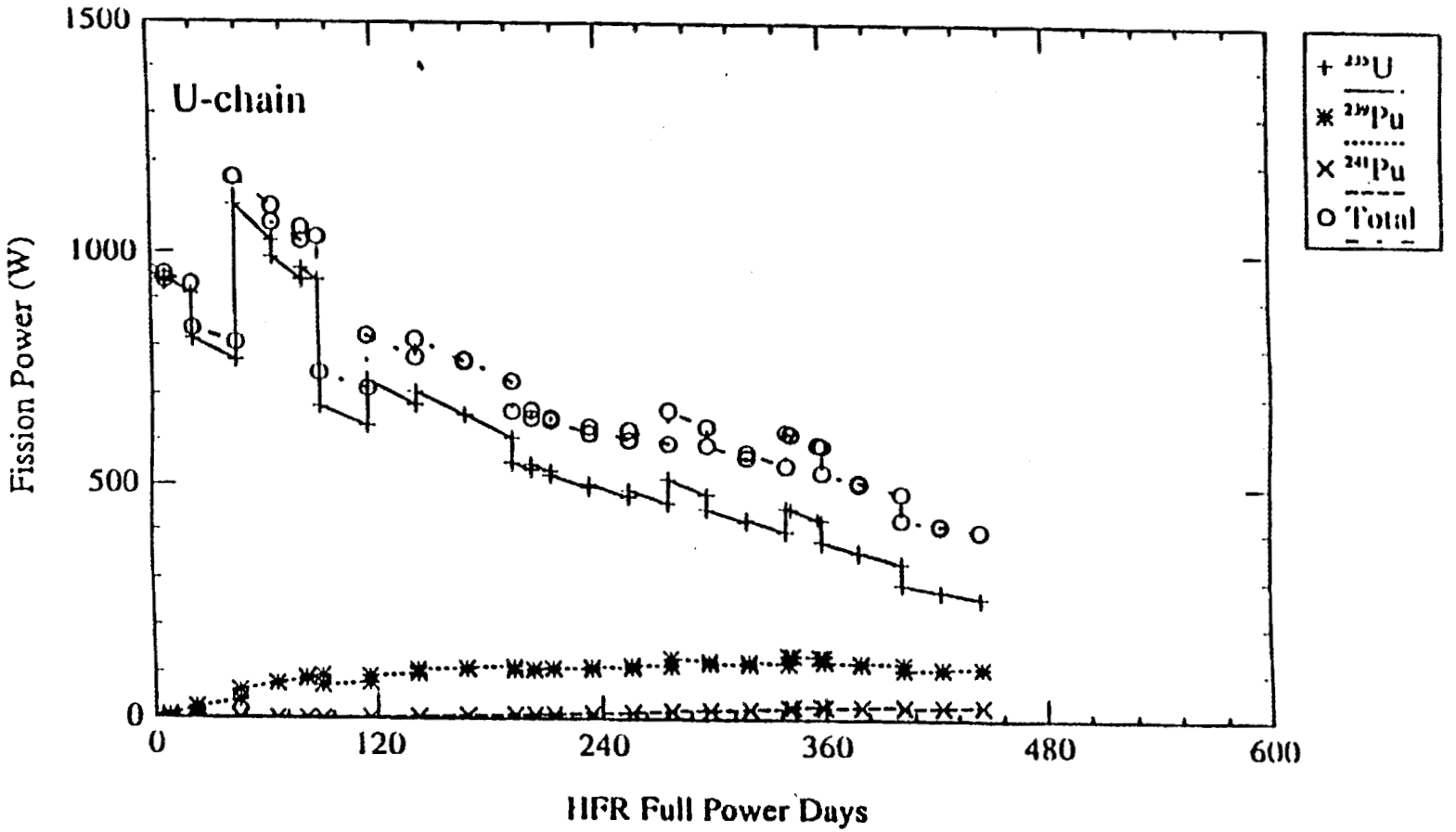

Fig. 4.3.1. Power production in the U-chain nuclides in GA compacts.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

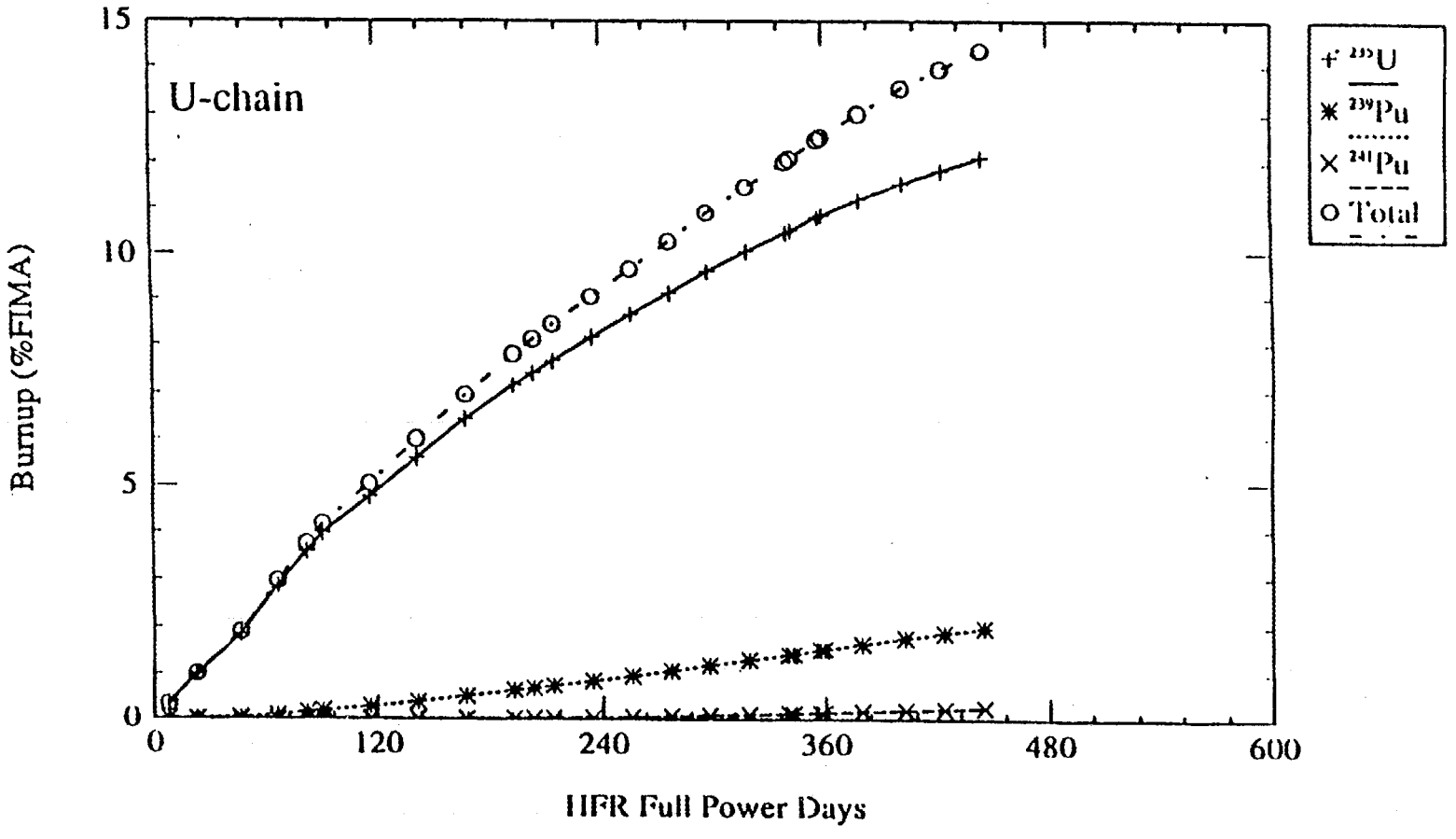

Fig. 4.3.2. Burnup of the U-chain nuclides in GA compacts.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Table 4.3.5. Power and burnup volume averaged data for GA compacts in D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Date: November 29, 1991
Reactor Chain: Uranium Chain

FPD	Power (W)				Burnup (% FIMA)			
	^{235}U	^{239}Pu	^{241}Pu	Total	^{235}U	^{239}Pu	^{241}Pu	Total
7.5800	945.7285	1.8776	0.0001	947.6062	0.3343	0.0006	0.0000	0.3350
14.6900	929.9030	13.4004	0.0070	943.3104	0.6371	0.0089	0.0000	0.6460
0.6400	817.0997	23.3668	0.0211	840.4876	0.0244	0.0007	0.0000	0.0251
23.0100	796.5581	29.2575	0.0718	825.8875	0.8549	0.0305	0.0001	0.8854
20.0300	1072.2058	64.8689	0.4590	1137.5337	1.0017	0.0589	0.0004	1.0609
15.9600	970.7537	79.2378	1.0974	1051.0890	0.7226	0.0573	0.0008	0.7807
8.6700	955.5254	90.8710	1.7946	1048.1909	0.3864	0.0357	0.0007	0.4228
25.7600	652.9997	72.9220	1.9559	727.8776	0.7845	0.0851	0.0023	0.8719
25.4400	705.9749	93.9309	3.7143	803.6200	0.8377	0.1082	0.0043	0.9502
25.7500	682.7838	106.3003	5.8091	794.8932	0.8200	0.1240	0.0068	0.9508
25.2100	633.1757	111.5026	8.1097	752.7880	0.7445	0.1273	0.0093	0.8811
10.3600	544.2778	105.4156	8.9915	658.6849	0.2630	0.0495	0.0042	0.3167
10.4300	541.2960	108.7232	10.0953	660.1144	0.2633	0.0514	0.0048	0.3195
21.0400	510.5790	108.5256	11.1696	630.2742	0.5010	0.1034	0.0106	0.6151
21.4400	490.4754	111.8066	13.2829	615.5649	0.4905	0.1086	0.0129	0.6119
21.2600	476.2943	116.2224	15.7123	608.7289	0.4728	0.1119	0.0151	0.5998
20.9200	499.1407	129.8780	19.8180	648.8367	0.4870	0.1231	0.0188	0.6289
21.4000	435.6944	120.5871	20.6080	576.8895	0.4349	0.1169	0.0200	0.5717
20.9600	413.8684	122.9137	22.9319	559.7141	0.4046	0.1167	0.0218	0.5431
2.2700	450.6094	139.8935	27.2539	617.7567	0.0477	0.0144	0.0028	0.0649
14.4200	438.9402	137.5051	28.1342	604.5795	0.2952	0.0898	0.0184	0.4034
2.1100	425.7322	138.0775	29.1246	592.9343	0.0419	0.0132	0.0028	0.0579
19.7500	368.6486	122.6205	26.7689	518.0380	0.3396	0.1097	0.0239	0.4732
22.7500	346.6348	122.3259	28.7197	497.6804	0.3678	0.1261	0.0296	0.5235
21.1400	283.7571	108.0619	26.8283	418.6473	0.2798	0.1035	0.0257	0.4089
21.6000	268.8645	110.9103	28.6187	408.3934	0.2709	0.1085	0.0280	0.4074

or segment thereof are also given. The power and the cumulative burnup profiles for each fissionable nuclide and for their sum are plotted in Figs. 4.3.1 and 4.3.2.

4.4 FISSION GAS RELEASE

The concentration of released noble gases was monitored using a Canberra MCA along with a Canberra high-efficiency Ge(Li) gamma detector. The system was calibrated once or twice a year, during reactor stop periods, as described in ref. 15. Four isotopes of krypton and five isotopes of xenon were routinely measured during irradiation. At the end of several cycles, measurements of Xe isotopes continued, for the purpose of determining the fraction of plated-out iodine. The method of measurement was to flow the capsule effluent gas through a flat cylindrical or disk-shaped sample chamber of 30 cm^3 which was positioned 20 cm above the shielded detector. Radioactive gas measurement was accomplished by the following steps. After an hour or more purge of clean He, the capsule gas to be measured was purged through the chamber for 30 min to ensure constant concentration. While the gas was flowing, the MCA counted the gas directly for 80 s. In this way the short-lived species were assayed with no decay corrections, except for delay time from the capsule. Then the chamber was sealed, and counts were obtained after 15, 60, and 120 min of decay time. In this way, with four separate spectra, analysis of short-, medium-, and long-lived species was ensured. A classification of the isotopes and their characteristic parameters is given in Table 4.4.1.

The Canberra MCA assays the entire gamma spectrum, and with the use of the Spectran F (version 2.07) program, integrates the number of counts above background in each photopeak, prints out the net counts associated with each gamma line, and identifies each line with possible isotopes. Later the counts per minute (cpm) data for each isotope are used to calculate R/B, using a computer code called RUBICON, as described below.

4.4.1 Calculation of Steady-state Fractional Fission Gas Release (R/B)

The RUBICON computer code uses the equations in the following two subsections for the isotopes listed in Table 4.4.1. The R/B values calculated with the RUBICON code are correct at the beginning of the irradiation; further calculations are necessary as discussed in Sect. 4.4.4.3.

4.4.1.1 On-line method, short-lived isotopes

$$R/B = [C \cdot \exp(\lambda t_1)]/[\epsilon \cdot b \cdot t_c \cdot (1-\exp\{\lambda t_2\} \cdot B], \tag{4.3}$$

where

C = net counts under spectral peak,
λ = decay constant (1/s),
t_1 = transport time from capsule to sampling station (see Appendix C),
ϵ = detector efficiency,
b = gamma yield,
t_c = counting time (s),
t_2 = transport time through the counting volume (s),
B = birth rate (atom/s). B is calculated as follows:

$$B = P \cdot f_J \cdot {}^{235}Y \tag{4.4}$$

Table 4.4.1. Krypton and xenon isotopes

Isotope	$t_{1/2}$[a]	Decay Const (1/s)	Gamma Line (keV)	Gamma Yield (%)	^{235}U Yield (%)	Group[b]
^{89}Kr	3.2 min	3.61 (-3)	221	0.20	4.59	short
^{137}Xe	3.8 min	3.03 (-3)	456	0.31	6.2	short
^{138}Xe	14.2 min	8.15 (-4)	258	0.31	6.4	short
^{135m}Xe	15.6 min	7.40 (-4)	527	0.81	0.7	short
^{87}Kr	1.27 h	1.52 (-4)	403	0.50	2.54	medium
^{88}Kr	2.8 h	6.88 (-5)	196	0.38	3.6	medium
^{85m}Kr	4.4 h	4.38 (-5)	151	0.74	1.31	medium
^{135}Xe	9.2 h	2.10 (-5)	250	0.90	6.4	long
^{133}Xe	5.27 d	1.52 (-6)	81	0.37	6.7	long
^{131m}Xe	11.7 d	6.8 (-7)	163	0.019	0.029	long

[a]$t^{1/2}$ = half life of the isotope (min, h, d).
[b]Group = the isotopes grouped according to half life.

where

P = power (W)
f_J = fissions/J = 3.12×10^{10}
^{235}Y = the yield from fissioning of ^{235}U.

4.4.1.2 Stop-flow method for medium- and long-lived isotopes

$$R/B = [C \cdot f \cdot \exp(\lambda t_1)]/[\epsilon \cdot b \cdot V \cdot (1-\exp\{\lambda t_c\}) \cdot B], \tag{4.5}$$

where

f = flow rate ($\mu m^3/s$), nominally 5 $\mu m^3/s$,
V = counting volume (μm^3), 30 μm^3.

4.4.1.3 Calculations of the R/B for Xe and Kr

The R/B values are calculated with the RUBICON code but only for the following three restrictive conditions characteristic of the beginning of the irradiation:

1. Fission gas is released from only those fuel particles with exposed kernels. Shortly after the beginning of irradiation, the number of particles with exposed kernels is equal to the number of dtf particles; the dtf particles fail shortly after the beginning of irradiation leaving the kernels exposed. The dtf particles contain UCO, and the fission gas generated is the result of the fissioning of ^{235}U only.

2. The power in the UCO particles with exposed kernels is that at the beginning of irradiation in the dtf particles.*

3. The yields of fission products are those corresponding to the fissioning of ^{235}U only.

To account for the changes in the number of exposed kernels, power, and yields as irradiation proceeds, the R/B values calculated under these restrictive conditions must be corrected.

At the beginning of irradiation, there were fertile fuel particles containing ^{232}Th and fissile fuel particles containing ^{235}U and ^{238}U. The weight ratio of $^{232}Th/^{235}U$ was 5.82 at the beginning. As the irradiation proceeded, the concentration of the fissionable isotopes ^{233}U in fertile fuel particles and ^{239}Pu and ^{241}Pu in fissile particles grew while the concentration of ^{235}U declined. Thus, the power has to be calculated as a function of time for the fertile and fissile particles.

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*The fraction of the fissile power in dtf particles is proportional to the fractional ^{235}U loading in them at the beginning of the irradiation. However, in the R/B calculations, the fraction of the fissile power in dtf particles was assumed to be equal to the number fraction of dtf particles (0.089). Because the loading in the kernels of the dtf particles is larger than in the kernels of the normally configured fissile particles (see Table 2.3.1), a correction for this difference must be made.

Table 4.4.2. Yields of fission product isotopes from ^{233}U, ^{235}U, ^{239}Pu, and ^{241}Pu

	FISSION YIELDS (%)[a]				
Fission Product	^{233}U	^{235}U	^{235}U[b]	^{239}Pu	^{241}Pu
^{85m}Kr	2.14	1.29	1.31	0.564	0.404
^{87}Kr	3.93	2.55	2.54	0.990	0.752
^{88}Kr	5.45	3.50	3.60	1.26	0.978
^{89}Kr	5.22	4.50	4.59	1.44	1.16
^{131m}Xe	0.05	0.04		0.05	0.04
^{133}Xe	6.06	6.69	6.7	7.02	6.73
^{135}Xe	6.27	6.54	6.4	7.61	7.17
^{135m}Xe	1.57	1.10	0.7	1.69	1.18
^{137}Xe	6.06	6.12	6.2	6.02	6.57
^{138}Xe	4.89	6.27	6.4	5.18	6.26
^{131}I	3.59	2.89	3.86	3.10	
^{133}I	6.00	6.69	6.97	6.73	
^{135}I	5.00	6.28	6.50	6.95	

[a]The fission yields are from ref. 22.
[b]These values are used in the RUBICON code.

Likewise, as the isotopic composition of the fuel particles changes with time, the yield of any fission product isotope has to be recalculated to account for the various contributions to the overall yield by the fissionable isotopes. The yields of the relevant fission product isotopes for ^{233}U, ^{235}U, ^{239}Pu and ^{241}Pu, are presented in Table 4.4.2.

Shortly after the beginning of irradiation, the dtf particles failed in a manner that exposed the UCO kernels. Previously, experience in experiment HBR-17/18 (ref. 12) demonstrated that all dtf particles failed within 50 h of beginning irradiation. The failure of each dtf particle was recorded as a distinct spike in the signal from an on-line ionization chamber. In the HFR-B1 experiment, the R/B profile reached a plateau after 500 h indicating the completion of the failure of the dtf particles. The longer time for complete failure in the HFR-B1, as compared with the HRB-17/18 experiment, is attributable to the difference in fission rate density which was an order of magnitude smaller in the HFR-B1 experiment.[23] Thus, shortly after the beginning of irradiation, there were 87 exposed kernels per compact and 1044 exposed kernels per capsule. During the remainder of the irradiation, the possibility of failure of the normally configured particles has to be addressed. On the basis of an experiment in another reactor, the R2 reactor at Studsvik, Sweden (a reactor with similar neutron spectral characteristics),[24] one would expect the failure of normally configured fertile or fissile particles during irradiation for about the same reactor time (444 EFPD) to be 0.5 ± 0.1% The latter corresponds to about 7 particles per compact which would be expected to fail during the irradiation. This number corresponds to 8% of the dtf particles; the uncertainty in the R/B is estimated to be, prior to analyzing the R/B data for the uncertainty, about ±15 %. If so, then the particle failure during irradiation will not

introduce a significant error. In practice, however, the R/B data have to be examined for unexpected and sudden increases that might reflect the failure of normally configured particles during irradiation.

In addition to failure of particles during irradiation, an account must be taken of the heavy metal contamination existing in the compacts after fabrication. The heavy metal contamination consists of the true contamination in the compact materials including the surfaces of particles, as well as the as-manufactured particles, and particles that fail during the compaction process which have exposed kernels or which are exposed as a result of the stresses in the compaction process. This can be estimated from the R/B of the capsule prior to the start of the failure of the dtf particles and by leaching unirradiated compacts during the pre-irradiation examination.

4.4.2 Derived Values of the Steady-state Fractional Fission Gas Release, R/B

An example of the output of the RUBICON code is presented in Table 4.4.3 for capsule 1 (A), in cycle 88.05. The calculations are based on the assumptions that only dtf particles are releasing fission gas and that the power in dtf particles is 8.9% of the power in all fissile particles (see footnote on page 4-21). As discussed above, these R/B values are valid only under conditions existing at the beginning of the irradiation and after being corrected for particle loading differences. Companion calculations have also been made for the case of 100% of the power in the fissile particles. In Table 4.4.3, the R/B values are grouped according to the counting time designated by one of the SV values 10, 20, or 30. The isotopes measured for specific SV values are ^{89}Kr, ^{90}Kr, ^{135m}Xe, ^{137}Xe, and ^{138}Xe at SV = 10, ^{133}Xe and ^{135}Xe at SV = 20, and ^{85m}Kr, ^{87}Kr, and ^{88}Kr at SV = 30. In addition to the R/B values, the date and time of sampling, and the reactor power, a representative TC temperature and the number of EFPD are given. Time profiles of the R/B values for all the measured isotopes and the representative TC temperature from the RUBICON output based on the calculated power in the dtf particles are presented in Figs. 4.4.1, 4.4.2, and 4.4.3. In Fig. 4.4.1, data for capsule 1 (A) for cycle 88.05 are shown; in this case, the temperature is approximately constant, and the R/B values are declining. This decline will be mitigated or reversed when the corrections, discussed in Sect. 4.4.1.3, are made. In Fig. 4.4.2, data for capsule 2 (B) for cycle 88.10 are shown; as the temperature rises, so do the R/B values. The rise will be enhanced after the corrections are made. Note that the rise reflects the response of the exposed fuel kernels to the temperature of the fuel kernel; the latter is of the order of 120° C higher than the temperatures of the temperature profile in Fig. 4.4.2. Noting this is important as the rise in R/B is significantly larger above 1100° C than below. In Fig. 4.4.3, data for capsule 3 (C) for cycle 88.01 are shown; in this case, the temperature is constant, but at 95.6 d, 90 Pa of water vapor was added to the capsule, and the addition was terminated at 99.7 d. The increase and decrease in R/B during and after water vapor injection is clearly recognized in Fig. 4.4.3.

4.5 INFLUENT AND EFFLUENT GAS COMPOSITION

The composition of the influent and effluent gases consisted of helium and selected additions of neon, impurities in source gases and from leakage, and reaction products of fuel and the carbonaceous material in the fuel elements with added water vapor and hydrogen. The catalytic decomposition of water vapor from reaction with metallic components is also a possible source of impurity gas.

Table 4.4.3. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
27. 5.88	45						885
0. 0	10						168.29
27. 5.88	45			4.885E-03	3.622E-03	5.020E-03	894
16.28	30						169
27. 5.88	45						894
16.28	20	6.037E-03	2.678E-03				169
28. 5.88	45		5.864E-04				895
16.14	10			2.156E-03	3.326E-04	7.031E-04	170
28. 5.88	45			4.824E-03	3.559E-03	4.904E-03	895
16.14	30						170
28. 5.88	45						895
16.14	20	6.266E-03	2.857E-03				170
29. 5.88	45		7.215E-04				898
16.26	10			2.123E-03	3.291E-04	6.121E-04	171
29. 5.88	45			4.377E-03	3.499E-03	4.863E-03	898
16.26	30						171
29. 5.88	45						898
16.26	20	7.072E-03	2.806E-03				171
30. 5.88	45		5.610E-04				896
18.3	10			1.910E-03	3.464E-04	6.354E-04	172.1
31. 5.88	45			3.715E-03	2.520E-03	3.797E-03	898
16.55	30						173
31. 5.88	45						898
16.55	20	6.955E-03	2.145E-03				173
1. 6.88	45		4.823E-04				894
17. 5	10			1.651E-03	2.828E-04	6.252E-04	174
1. 6.88	45			3.403E-03	2.592E-03	3.797E-03	894
17. 5	30						174
1. 6.88	45						894
17. 5	20	6.448E-03	2.077E-03				174
3. 6.88	45		3.759E-04				897
17.19	10			1.358E-03	2.168E-04	4.835E-04	176
3. 6.88	45			3.136E-03	2.296E-03	3.598E-03	897
17.19	30						176
3. 6.88	45						897
17.19	20	6.324E-03	1.937E-03				176
4. 6.88	45		3.998E-04				890
16.15	10			1.316E-03	2.287E-04	4.961E-04	177
4. 6.88	45			3.065E-03	2.285E-03	3.589E-03	890
16.15	30						177
4. 6.88	45						890
16.15	20	6.585E-03	1.851E-03				177
5. 6.88	45		3.948E-04				897
16.29	10			1.366E-03	2.359E-04	4.803E-04	178
5. 6.88	45			2.856E-03	2.054E-03	2.814E-03	897
16.29	30						178
5. 6.88	45						897
16.29	20	5.989E-03	1.813E-03				178
6. 6.88	45						898
17. 1	10			1.674E-03	2.530E-04	6.008E-04	179
6. 6.88	45			3.443E-03	2.558E-03	4.036E-03	898
17. 1	30						179

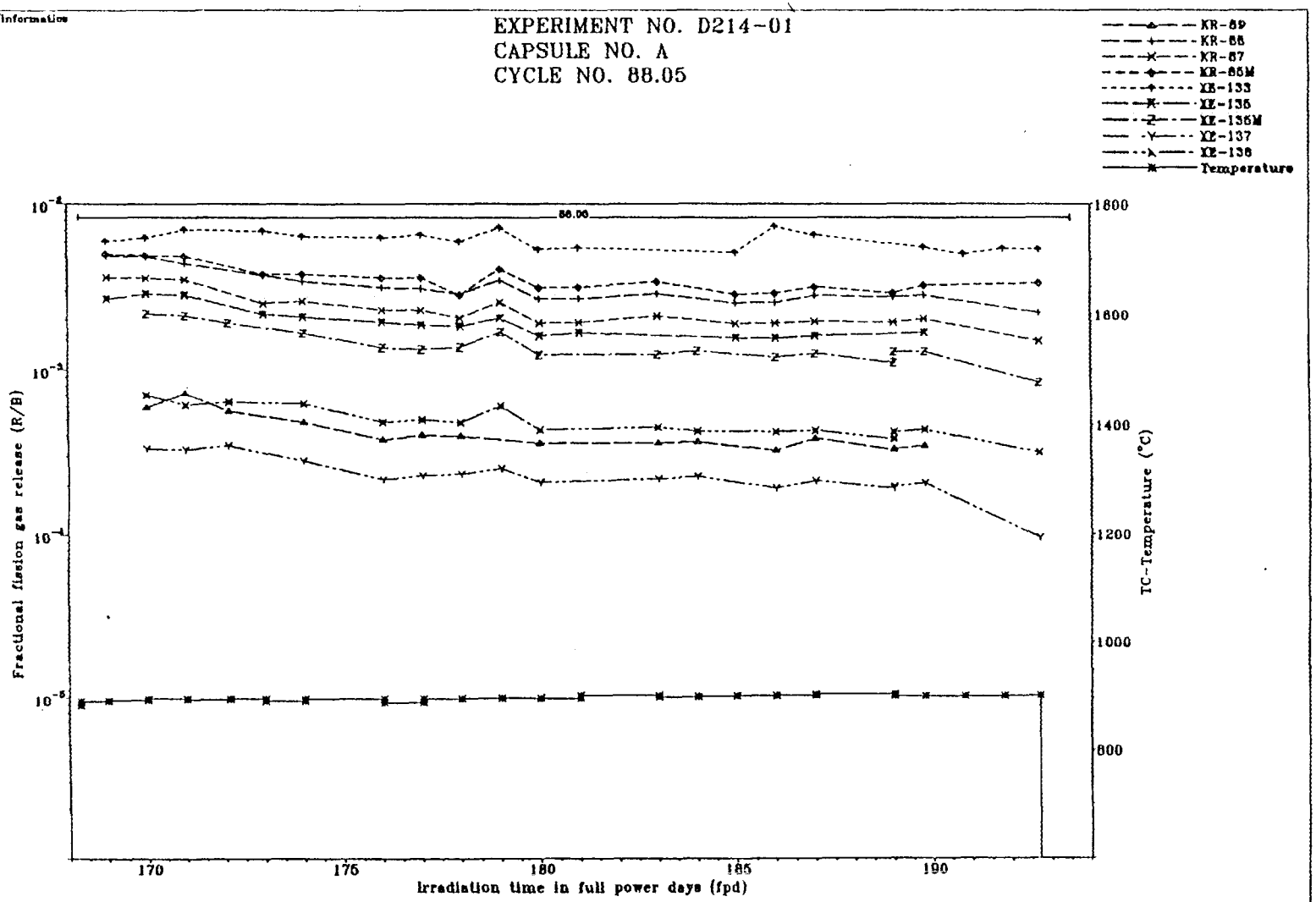


Fig. 4.4.1. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

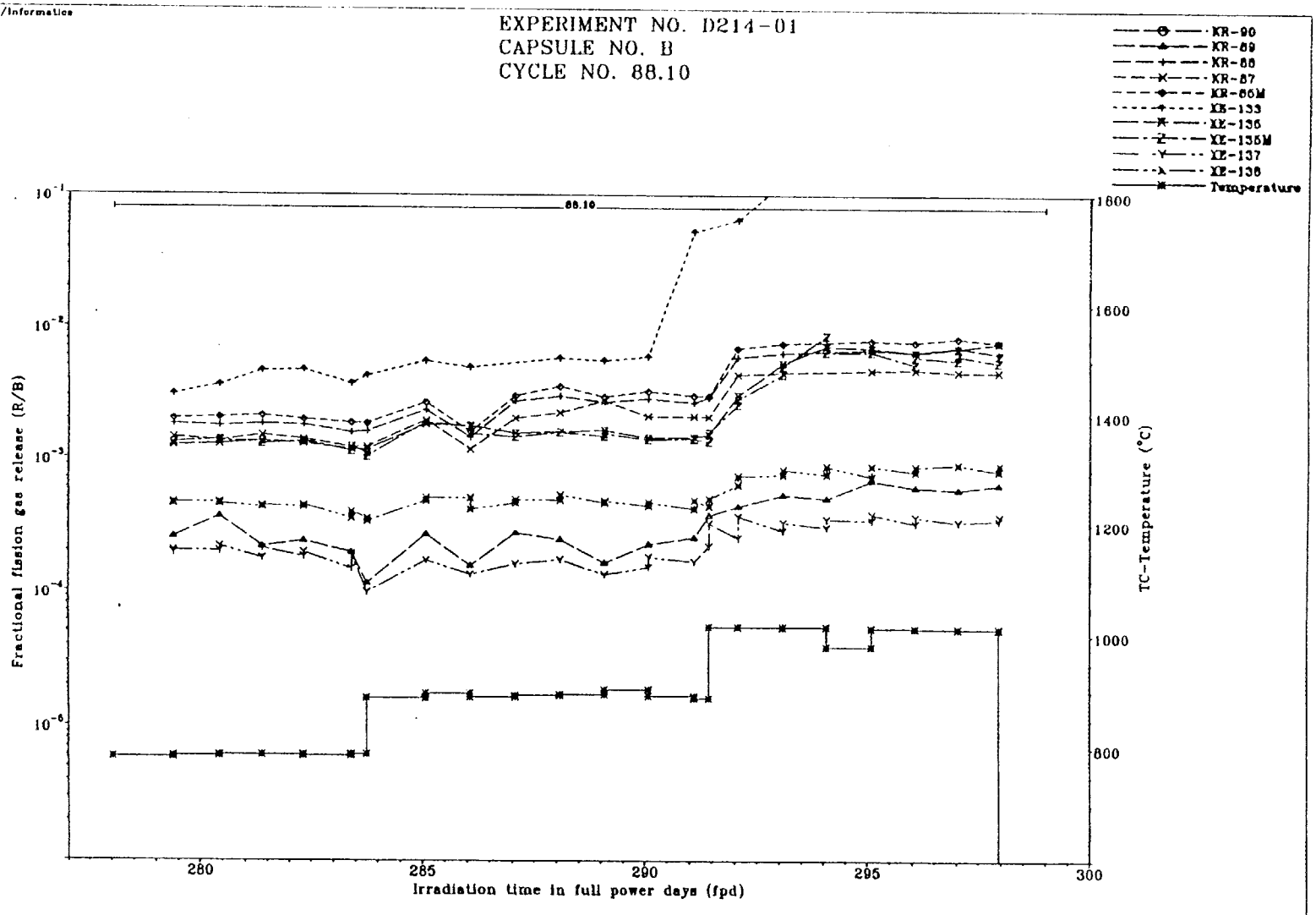


Fig. 4.4.2. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

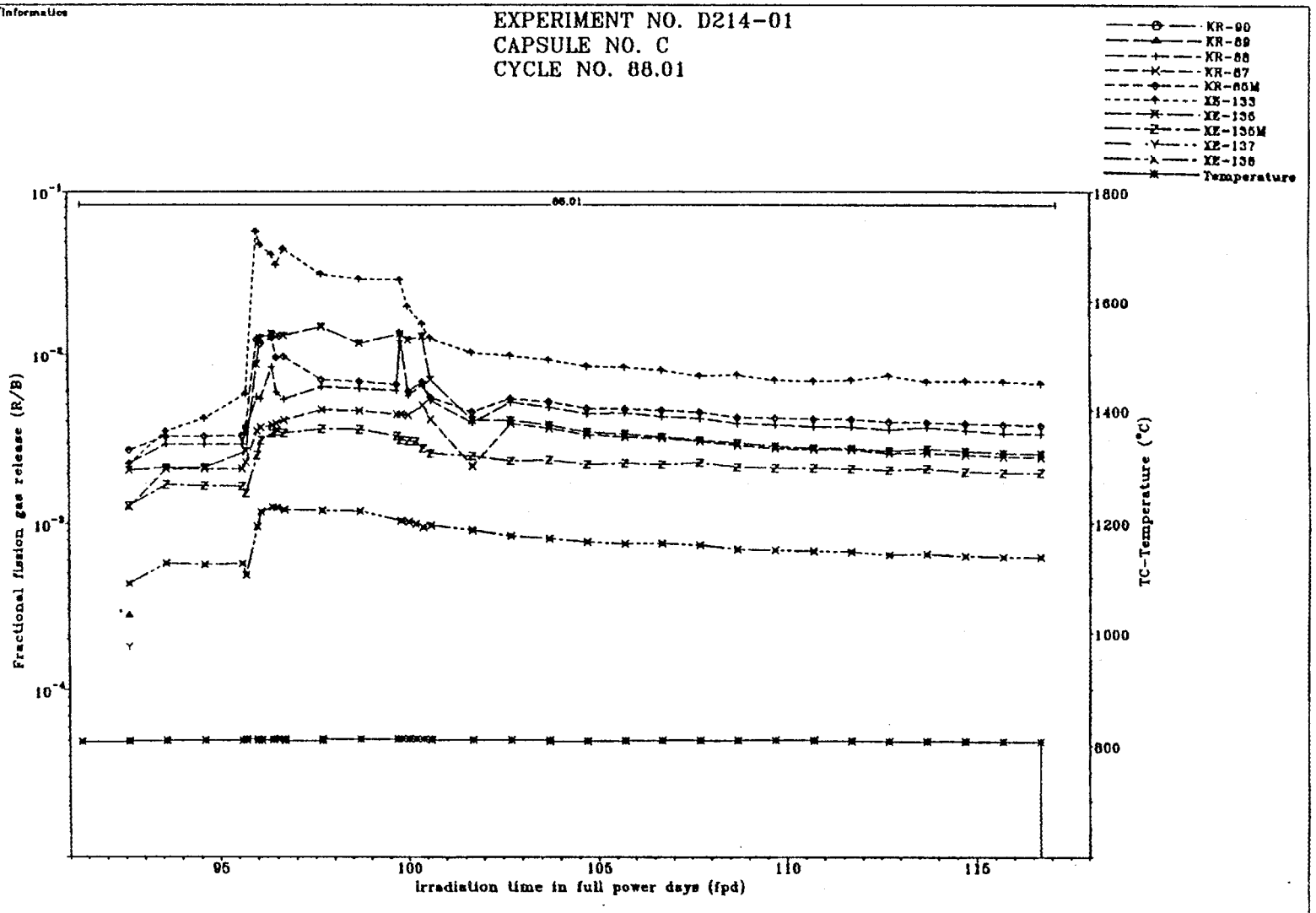


Fig. 4.4.3. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

The impurities of interest in the inlet gas were O_2 and N_2 which, if present, would indicate contamination by air. Obviously, the oxygen impurity is undesirable because it would react with the hot graphite fuel bodies. The inlet gases to the Sweeploop system contain Oxysorb filters which remove oxygen from the Ne and He streams. Consequently, oxygen was rarely detected in the inlet gas to the capsules. At the end of cycle 88.08, however, about 35 ppmv N_2 and 1 to 2 ppm O_2 was detected in the service He and in the Sweeploop inlet gas, possibly indicating air contamination during bottle changeover. Consequently, prior to cycle 88.10, liquid-nitrogen-cooled, activated carbon traps were placed in the inlet streams of Ne and He. This effectively reduced the N_2 contamination to less than about 0.5 ppmv. In capsule 3, water vapor was injected into the capsule periodically as indicated in Table 4.5.1. The reaction of water vapor with the carbonaceous material in the fuel element led to the appearance of the hydrolysis product gases CO, CO_2, CH_4, and H_2 in the effluent gas. These products were usually in the range 5 to 100 ppmv, and unreacted water vapor was in the range 100 to several thousand ppmv, depending on the particular test.

A GC was used to monitor the compositions of the influent and effluent gases of all capsules for trace impurities and in capsule 3 for the reaction products of the hydrolysis of the exposed fuel and the carbonaceous material in the fuel elements. The GC used at Petten is a model TBT manufactured by L'aire Liquide/Orthodyne in France. This instrument utilizes an He ionization detector. A detailed description of the instrument, the method of use, and calibration is presented in Appendix B.

An example of the measurement of gas composition during water vapor injection in capsule 3 during cycle 89.02 is shown in Fig. 4.5.1. The concentrations of H_2, CO, and CO_2 rise and decline rapidly after the initiation and termination of water vapor injection, respectively. This behavior reflects the reaction of water vapor with the carbonaceous components of the fuel elements. The data plotted in Fig. 4.5.1 are gathered in Table 4.5.2. The complete set of data is given in Sect. 6.

4.6 REACTOR AND PROCESS DATA

The reactor and process data presented in this report include the cycle start and stop dates; graphs of the power and control rod positions; and histories of the activity, pressure, hygrometry, purge flow, and the SPN detectors. Examples of the time profiles of the power and control rod positions, the pressure, and the purge gas flow are given in Figs. 4.6.1, 4.6.2, and 4.6.3, respectively. Note that in Fig. 4.6.1, the control rod position is measured from the central reactor top lid.[25] In Fig. 4.6.2, the pressure is in bars and the ordinate scale to be divided by 100; the mean pressure in Fig. 4.6.2 is of the order of 0.3 MPa. In Fig 4.6.3, the flow rate is to be in cm^3/min under standard conditions of 0.1 MPa and 298°C. The complete set of the reactor and process data identified above is presented in Sect. 6.6. These time profile data are presented in graphical form in Sect. 6.6 and can be recovered in digital form from the DACOS files identified in Sect. 4.1.

Table 4.5.1. Water-vapor injection data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle	Injection No.	Start d.mo; time	End d.mo; time	Duration (h)	Inlet P°_{H2O} (Pa)	Outlet P_{H2O} (Pa)	Delay (h)	Delay (mmol)
87.05	1	16.06; 1030	16.06; 1630	6	45	18.3	4.5	0.37
87.05	2	20.06; 1226	24.06; 1130	95	18	10.4	8.0	0.26
87.09	3	02.11; 1000	10.11; 1000	192	45	3.5	4.5	0.37
87.10	4	23.11; 1115	27.11; 1000	95	90	30.3	2.3	0.38
88.01	5	11.01; 1015	15.01; 1010	96	90	65.7	2.8	0.46
88.05	6	09.06; 1008	09.06; 1018	168	132	110.9	3.0	0.72
88.06	7	28.06; 0900	04.07; 0001	135	136	117.	1.75	0.44
88.07	8	14.09; 0943	19.09; 0943	120	122	109.4	3.8	0.85
88.08	9	10.10; 1100	18.10; 1100	192	118	103.	3.5	0.76
88.09	10	31.10; 1040	10.11; 1145	241	130.5	125.5; 113	3.1	0.74
88.10	11	28.11; 1100	05.12; 1350	172	123.	53.	4.5	1.0
89.01	12	23.01; 1000	31.01; 1000	192	112.	106.; 98	5.0	1.0
89.02	13	20.02; 0940	24.10; 0940	96	250.	220	2.6	1.2
89.04	14	08.05; 0853	12.05; 0853	96	550.	520	1.78	1.8
89.06	15	26.06; 0818	03.07; 1018	170.5	1060.	1040	1.1	2.4
89.06	16	10.07; 0900	10.07; 2400	15	250.	220.	3.1	1.5

Injection No. = water-vapor injection number
d.mo. time = day.month; clock time
P°_{H2O} = inlet pressure of water vapor
P_{H2O} = outlet pressure of water vapor
delay (h) = time of injectin - time of appearance of water-vapor in the outlet gas
delay (mmol) = quality of water-vapor retained by fuel element prior to appearance of water-vapor in the outlet gas

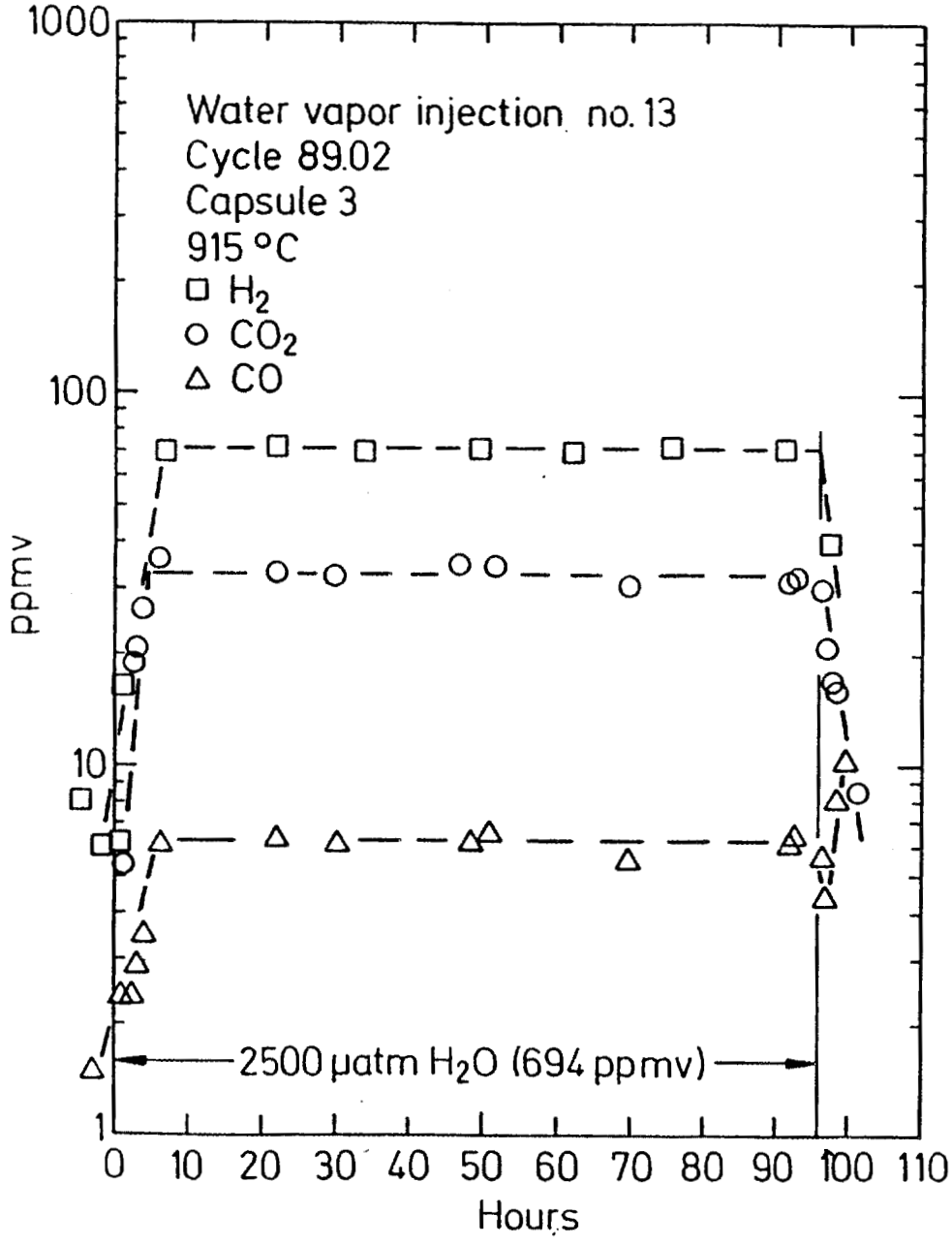


Fig. 4.5.1. Gas composition data for capsule 3 in cycles 89.02 before, during, and after water-vapor injection.

Source: JRC-IAM Petten, HFR Unit, The Netherlands

Table 4.5.2. Gas composition data, capsule 3, cycle 89.02, water-vapor injection No. 13, duration 96 h
Source: JRC-IAM Petten, HFR Unit, The Netherlands

			H_2O-vapor Injection			Concentration of Effluent Gases (ppmv)				
cycle	date	time	Press. (Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
89.02	10.02	1020				2.6	1.7	15.9	1.6	0.2
	14.02	1300								
	15.02	0844				2.6	tr	9.5	2.0	0.4
	16.02	0854				1.5	tr	8.0	1.0	0.3
	20.02	0905				0.55	tr	6.1	1.5	0.1
		0940	250	xxxx						
		1034				tr	tr	6.1	6.0	tr
		1202				2.4	5.4	17.2	6	0.2
		1212				2.4	19	70	5.1	0.35
		1222				2.9	20.8	70	4.9	0.32
		1312				3.7	26.6	70	4.3	0.3
		1547				6.1	36	70	3.0	0.33
	21.02	1135				6.4	33	70	1.7	0.37
		1459				6.1	33	70	1.9	0.5
	22.02	0912				6.2	34.5	70	2.1	0.5
		1414				6.5	34.8	70	1.6	0.4
	23.02	0851				5.5	31.2	70	1.5	0.37
		0901				5.8	31.4	70	1.4	0.39
	24.02	0900			xxxx	6.1	31.8	70	1.9	0.4
		0910				6.3	31.7	70	1.6	0.4
		0940								
		1018				5.6	29.9	70	2.2	0.4
		1048				4.3	21.4		1.9	0.3
		1118				4.6	17.3	40	1.4	0.4
		1218				8.1	16.1		1.2	0.6
		1356				10.3	12.5		1.9	0.9
		1546				8.8	8.5		1.1	1.0
	20.02	0925				1.3	tr	12	3.0	0.17
	30.06	153				1.3	tr	6	1	tr

Note: The Shimadzu integrations were found to be correct except for hydrogen, which was estimated to be 70 ppm, by the multipoint peak height method. Between 10.02, 1020 and 14.02, 1300, the reactor was down for two days.

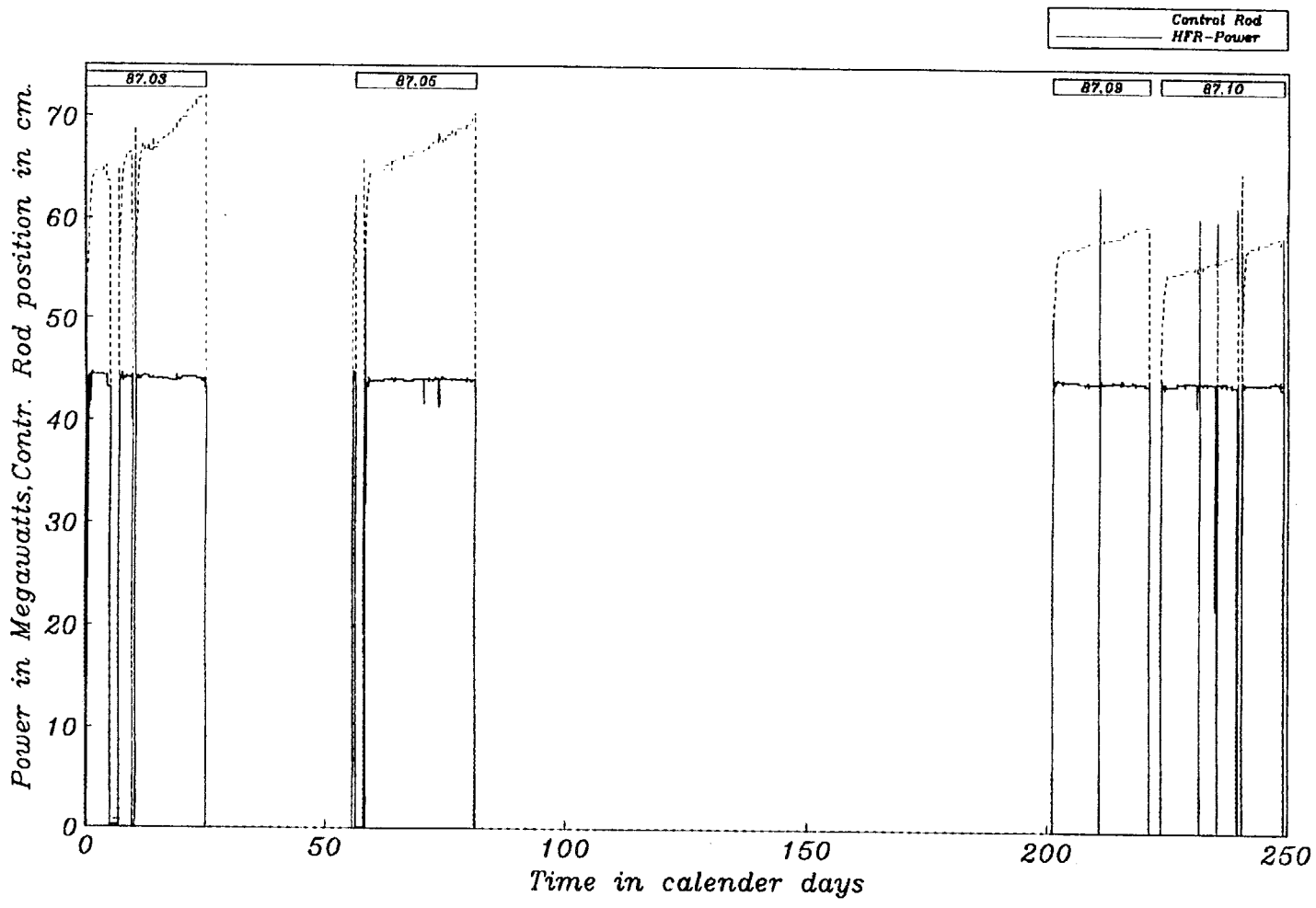


Fig. 4.6.1. HFR power and control-rod history cycles 87.03-87.10.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

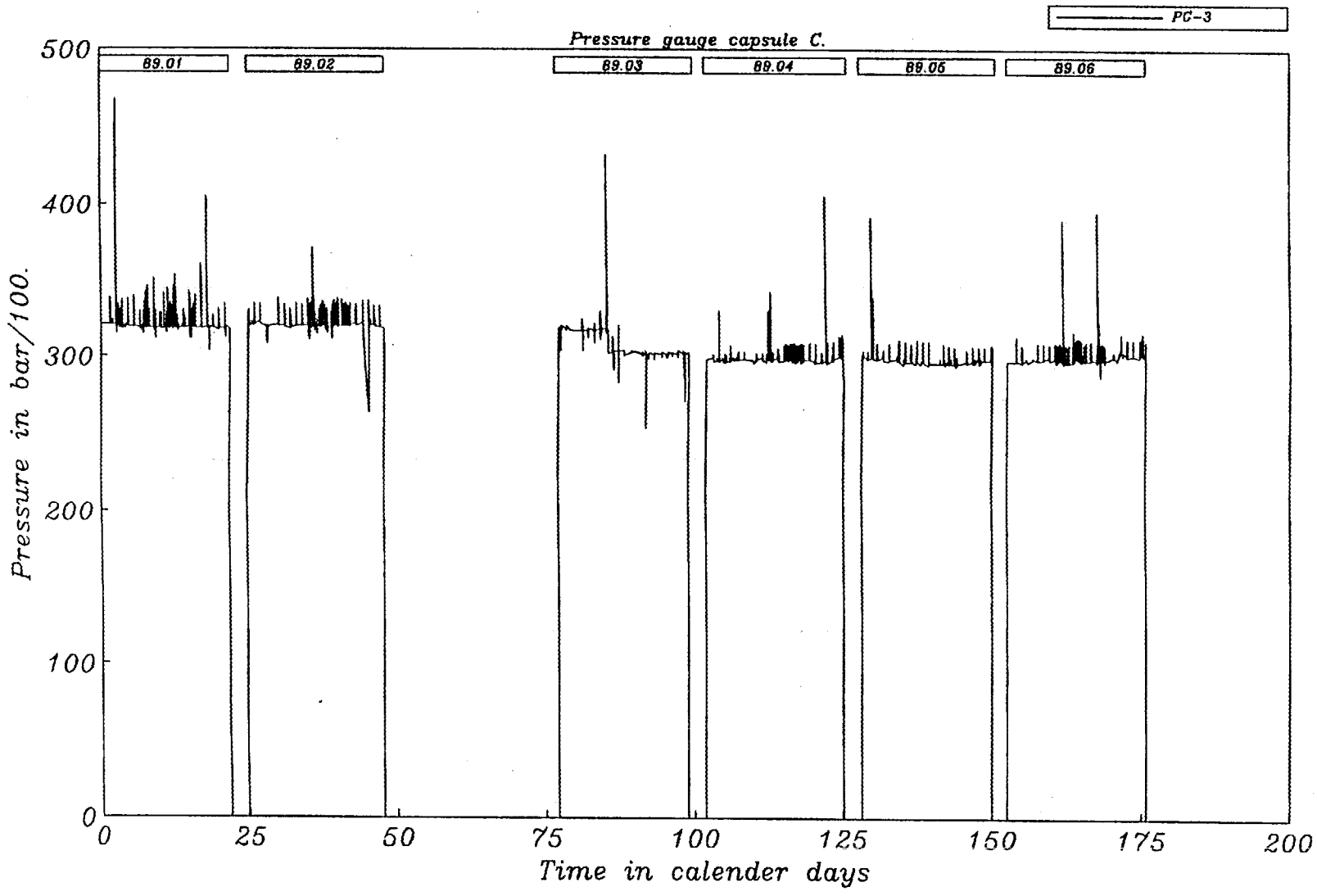


Fig. 4.6.2. Pressure history D-214 Cycles 89.01 – 89.06.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

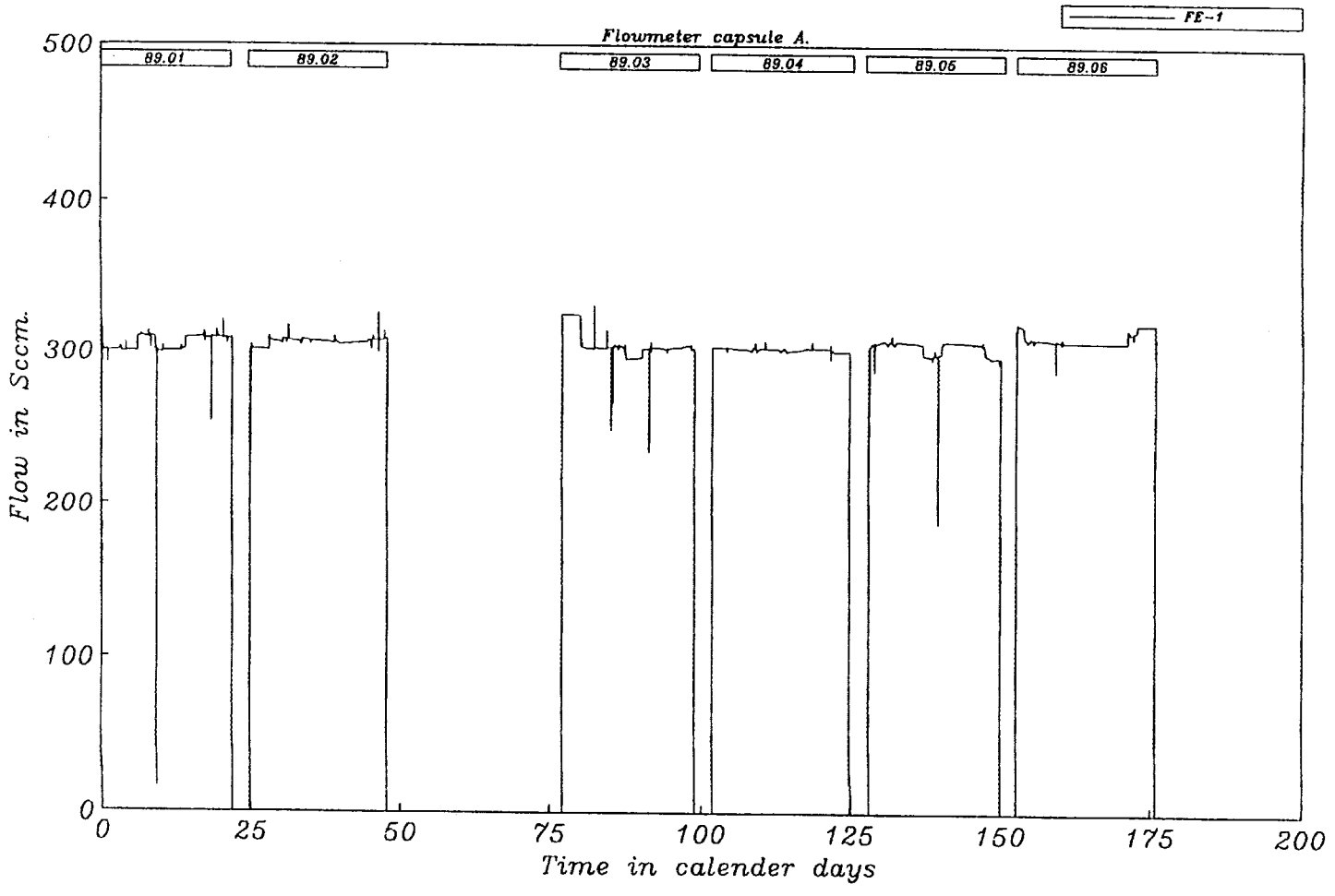


Fig. 4.6.3. Purge flow history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

5. NEUTRON FLUX AND FLUENCE MEASUREMENTS

Before and after irradiation, spectroscopic measurements on nuclides activated during irradiation were made. The analysis of these led to axial and circumferential distributions of the neutron flux (fluence rate) and fluence and, in some cases, to estimates of the absolute values of the fluxes and fluences. Gamma spectroscopy was conducted on the protection tube containing the three capsules,[25] activation monitor sets, gamma-scanning wires, SPN detectors from the HFR-B1 experiment,[26-28] and foils and wires in a simulation test in the HFR[27] prior to the start of the HFR-B1 experiment.

5.1 GAMMA SCANNING

The outer tube within which the three capsules were located during irradiation[3] was gamma scanned[25] to determine the distribution of certain nuclides which are a measure of the thermal and fast neutron fluence distributions incident on the interior and exterior walls of the tube. The nuclides measured in the tube are ^{58}Co, ^{54}Mn, ^{51}Cr, and ^{60}Co; the former two are products of and characteristic for fast neutron reactions and the latter two, for thermal neutron reactions. The tube was axially gamma scanned on the outside on the side designated north and on the opposite side designated south. As the tube and contents were rotated every cycle by 180°, the actual gamma scans for these two orientations would be expected to be similar. In addition, three circumferential scans at distances relative to the core centerline, of -270, -114, and +22 mm, corresponding to the core centerline of capsules 1, 2, and 3, respectively, were made.

The profiles of the absolute number of counts versus either the axial displacement or the rotation are shown in Figs. 5.1.1 through 5.1.6. The results shown have been selected from the measurements of ^{58}Co reflecting the fast neutron fluence distribution and of ^{60}Co reflecting the thermal neutron fluence distribution. The counts are represented on the figures by the thin, continuous curve and polynomial least-squares fit segments by the heavier curve. In comparing the two curves or segments thereof, deviations appear in the counts curves; there are increments for the thermal neutrons and decrements for the fast neutrons. Less material in certain regions of the capsules results in these deviations. Thermal neutrons will be more effective in those regions with more water present, whereas fast neutrons will be moderated by water and be less effective. The polynomials are calculated excluding the regions of significant deviations in the axial profiles.

The axial gamma scans in the north and south orientations for ^{58}Co and ^{60}Co are shown, respectively, in Figs. 5.1.1 through 5.1.4. The three left-most polynomial segments in the axial profiles correspond to the location of the capsules. Capsule 3 occupies the axial range 20 to 120 mm with mean at 70 mm relative to the bottom; capsule 2, the range 170 to 270 mm with mean at 220 mm; and capsule 1, the range 310 to 420 mm with mean at 365 mm. Comparison of the north and south orientation gamma-scan profiles for each nuclide confirms that the differences in the shape and in the number of counts is small. Comparison of the north orientation gamma-scan profiles for the different nuclides shows that (1) the ^{60}Co profile, reflecting the thermal neutron fluence distribution, is larger in count number by a factor of 1.8 than the ^{58}Co profile, reflecting the fast neutron fluence distribution; and (2) the maximum in the profile, as indicated by the downward pointing arrow, is shifted from about 300 mm, relative to the bottom, for ^{58}Co to about 220 mm for ^{60}Co. For the south orientation, the results are similar.

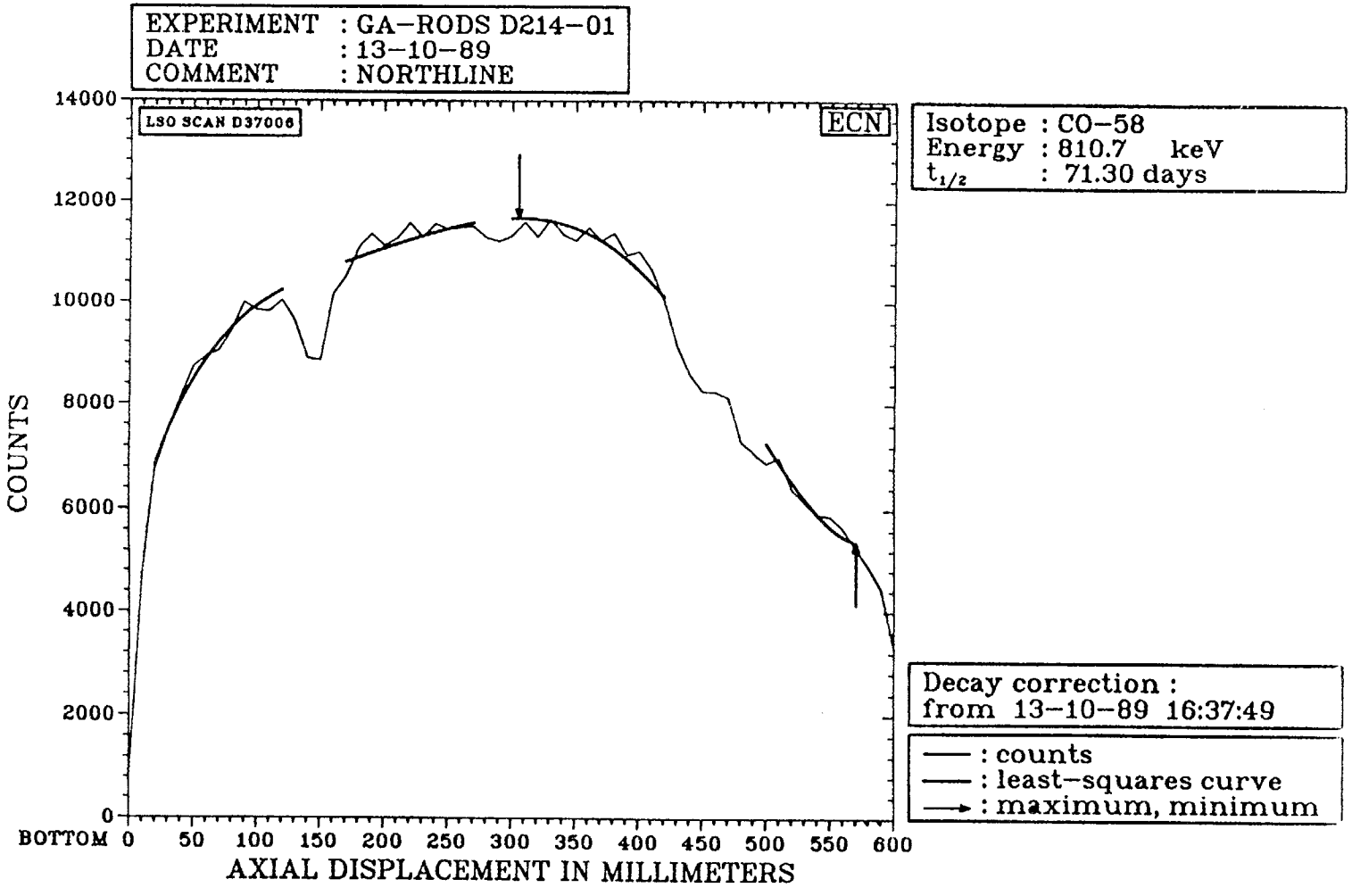


Fig. 5.1.1. Axial gamma scan along northline for ^{58}Co.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

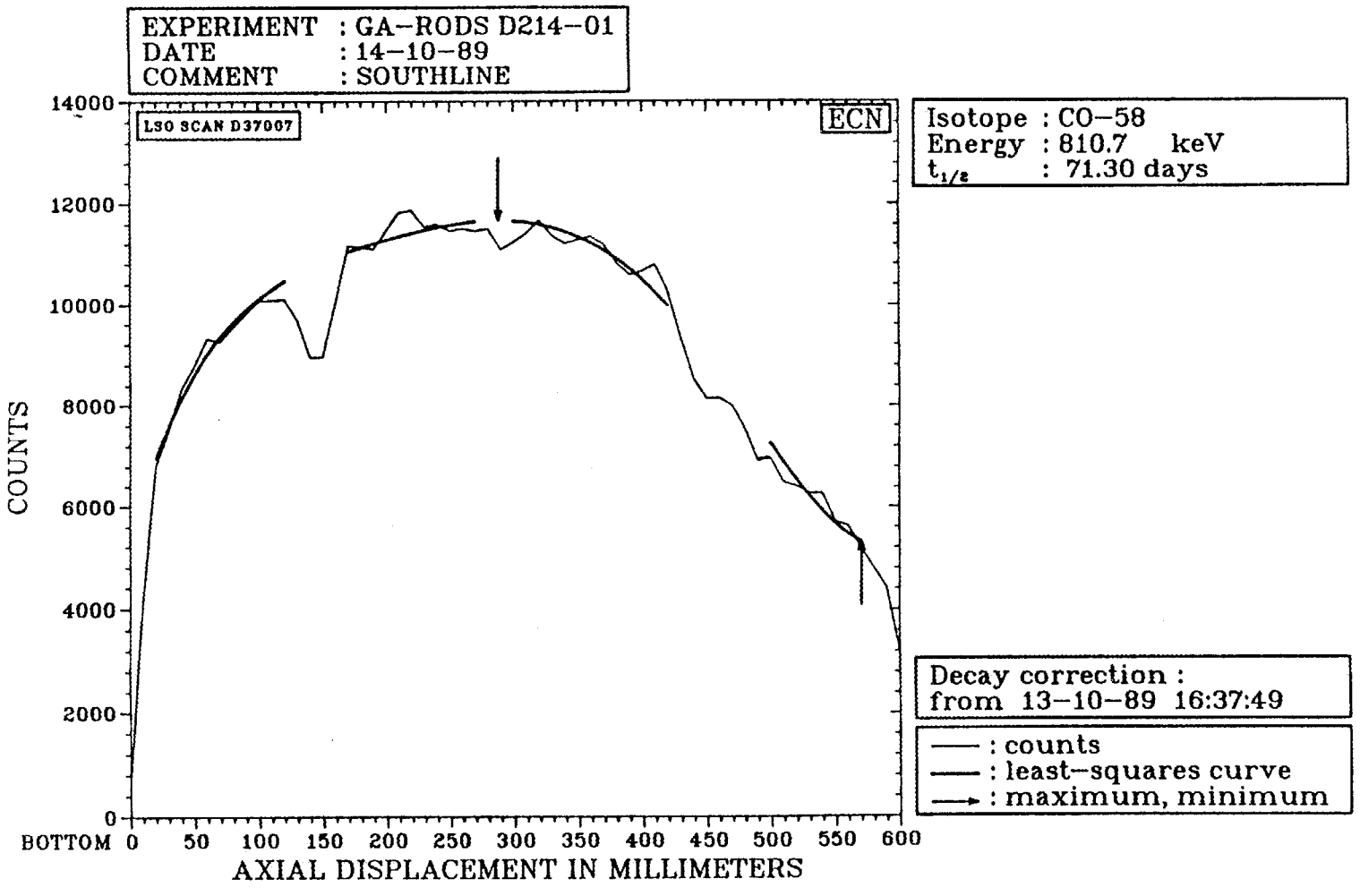


Fig. 5.1.2. Axial gamma scan along southline for ^{58}Co.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

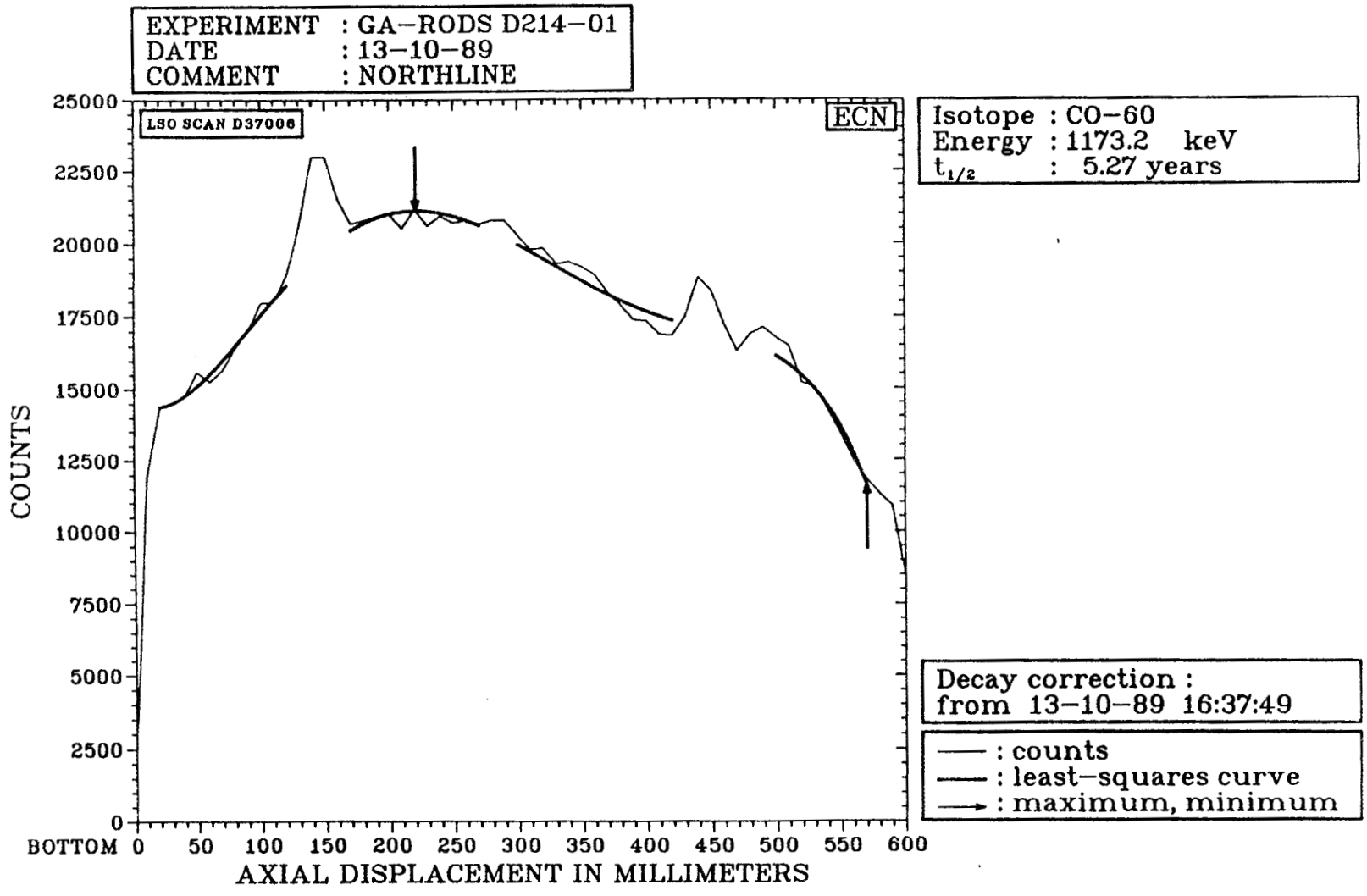


Fig. 5.1.3. Axial gamma scan along northline for ^{60}Co.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

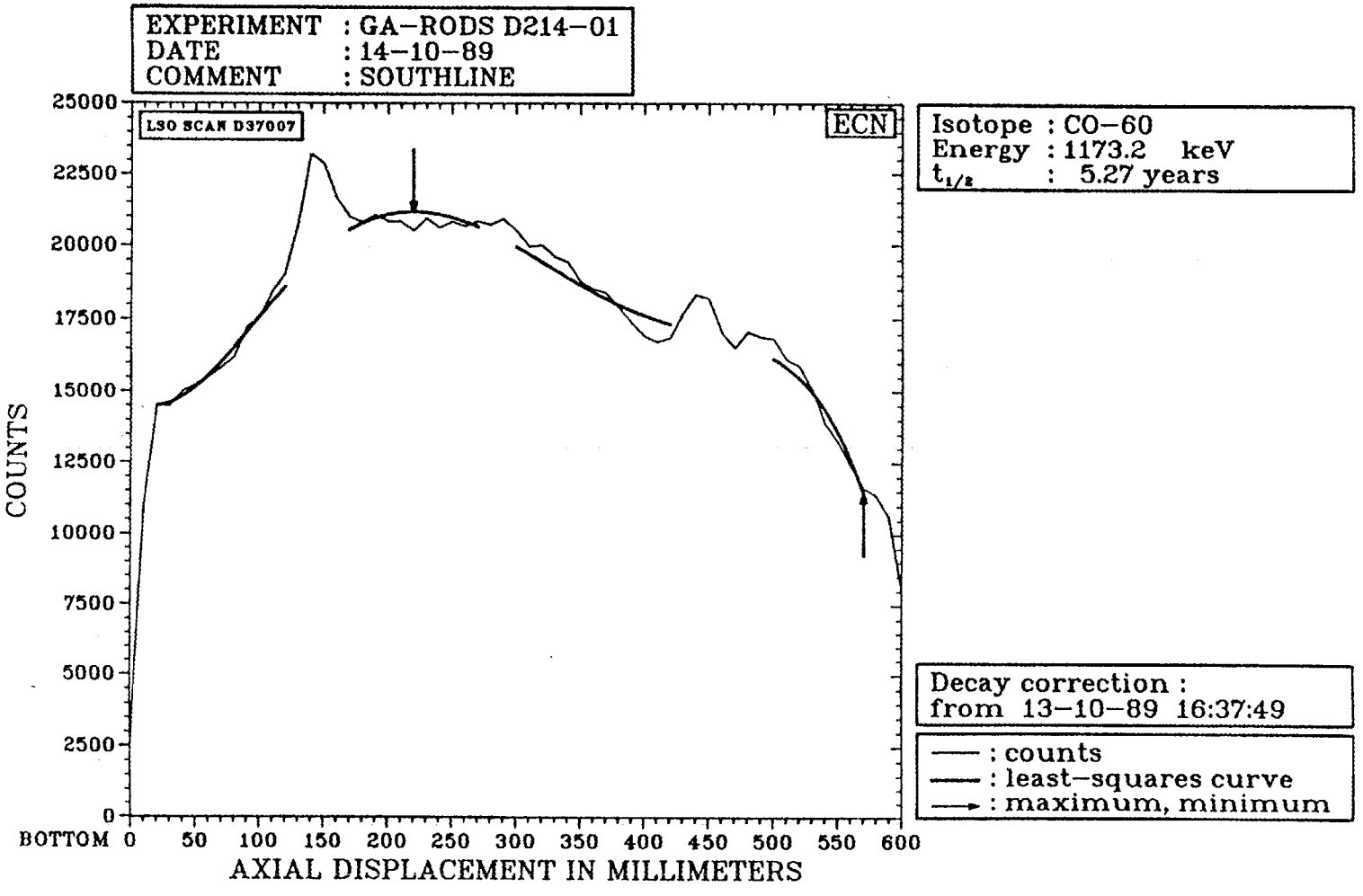


Fig. 5.1.4. Axial gamma scan along southline for ^{60}Co.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

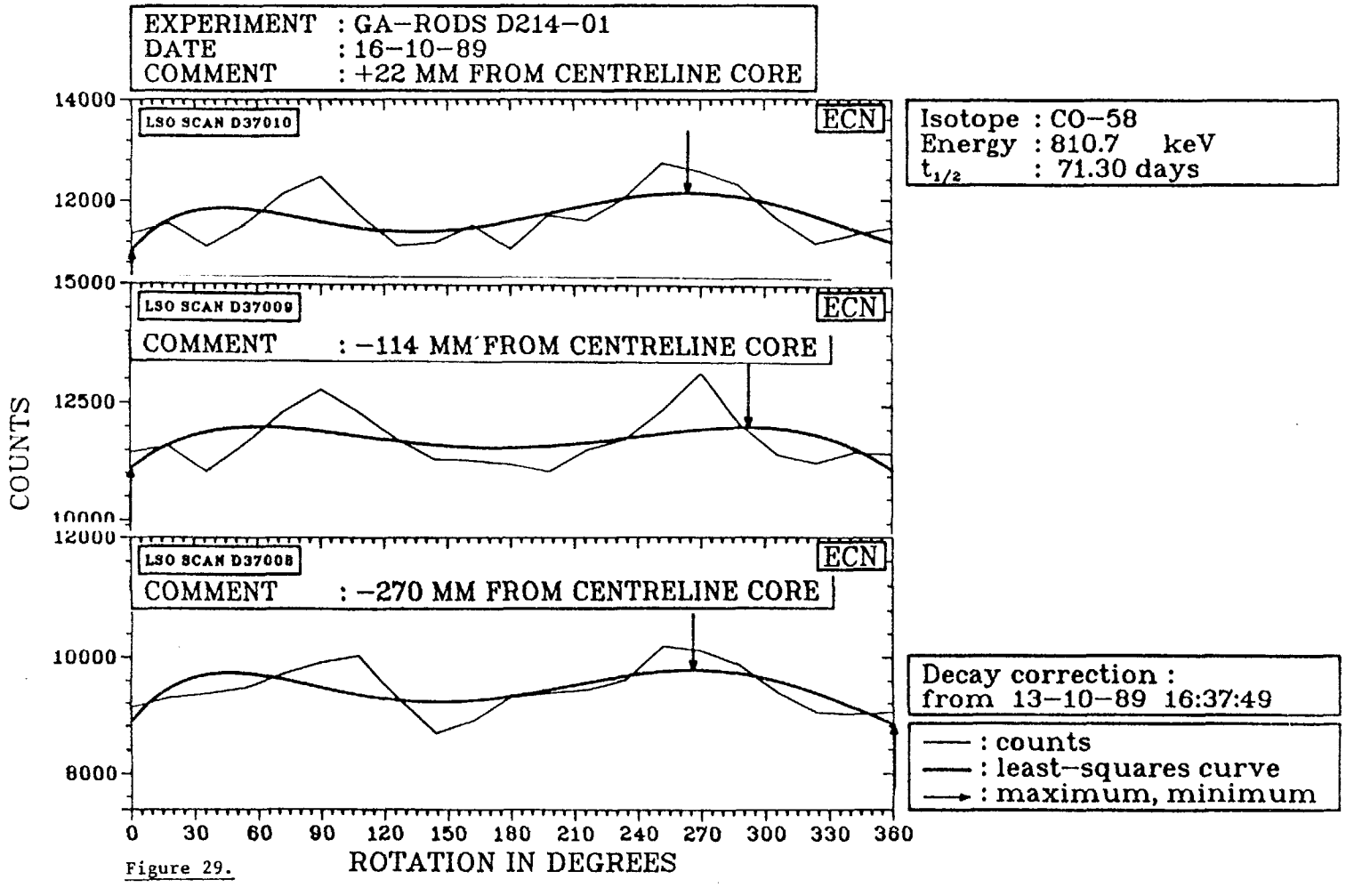


Figure 29.

Fig. 5.1.5. Circumferential gamma scans at three axial locations for ^{58}Co.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

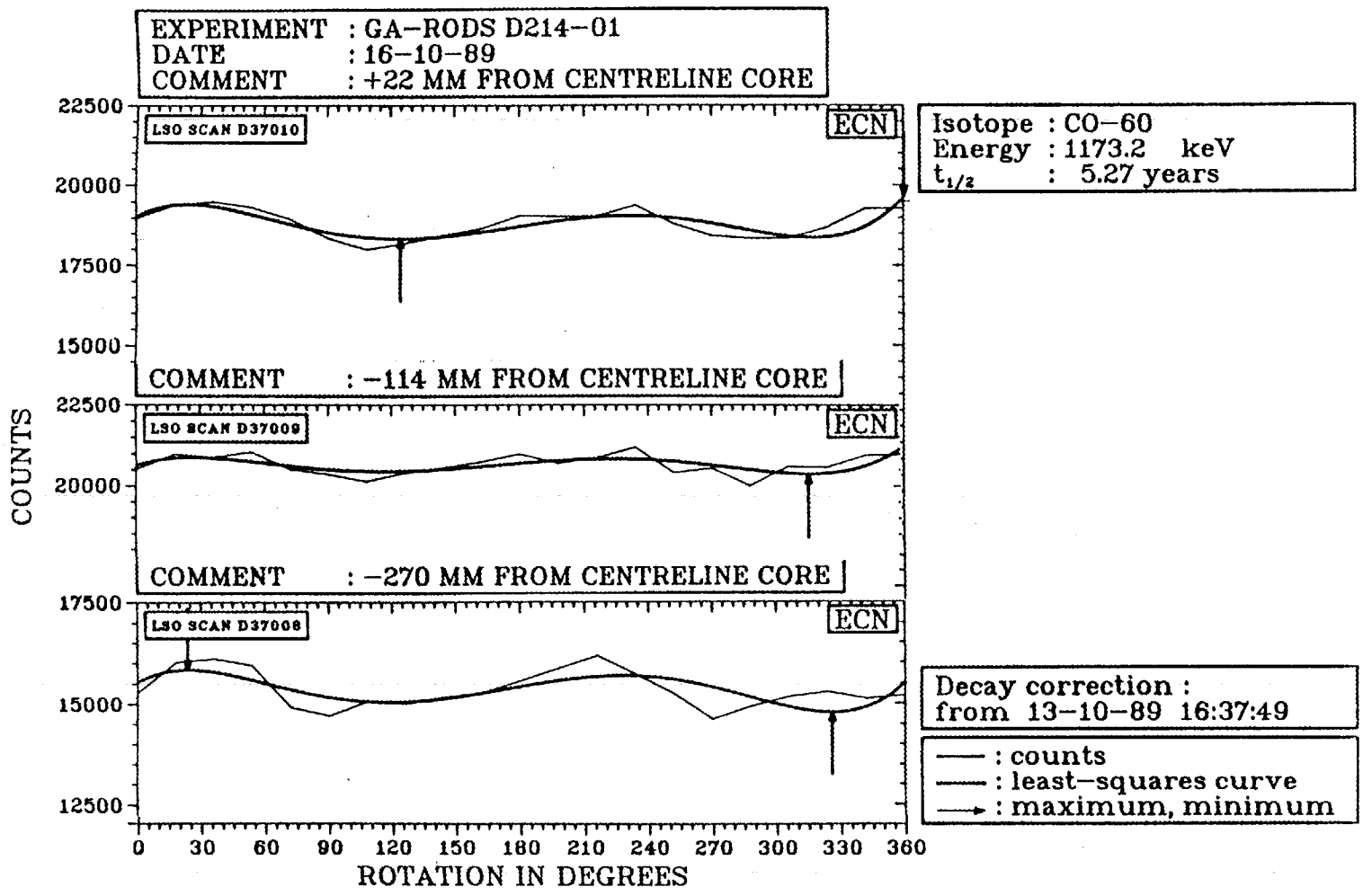


Fig. 5.1.6. Circumferential gamma scans at three axial locations for ^{60}Co.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

The circumferential gamma scans, made at three axial locations, are presented in Figs. 5.1.5 and 5.1.6 for ^{58}Co and ^{60}Co, respectively. The axial locations with respect to the core centerline are +22, -114, and -270 mm. The circumferential variational in the number of counts is $< \pm 5\%$ of the average number at all three axial locations. In each circumferential scan, two peaks, separated by about 180°, can be distinguished. For ^{58}Co, reflecting the fast neutron fluence distribution, one peak is near 90°, and for ^{60}Co, one peak is near 30°. The ratio of the number of counts, $^{60}Co/^{58}Co$, ranges from 1.5 to 1.8 as a function of distance from the core centerline. For both nuclides, the number of counts, with increasing distance from the core centerline, either rises slightly or remains constant and then declines below -114 mm from the centerline.

5.2 NEUTRON METROLOGY

Measurements of the neutron flux and fluence were made using activation monitors,[26,27] gamma-scanning wires,[3,28] and SPN detectors;[3] see Sect. 6.6.

5.2.1 Activation Monitor Sets

Each capsule contained four of the activation monitor sets located in the heat shield regions at each end of each capsule.[3] Thermal and fast neutron fluxes and fluences were derived from an analysis[26] of the nuclear reactions undergone by the stainless steel- and quartz-encased specimens of ^{59}Co, ^{54}Fe, ^{93}Nb, and ^{46}Ti. Location in the heat shields at a temperature of about 300° C was necessitated by the detrimental effects the monitors would have experienced in the fuel elements under the high temperatures (900 to 1250° C) to which the latter were subjected. The results of the analysis are presented in Table 5.2.1; for the north orientation, the neutron flux distributions are shown in Fig. 5.2.1. These results are based on the analysis of the activity monitor sets from capsules 2 and 3; hence, only 8 of the 12 sets were analyzed. Throughout the irradiation, the locations of capsule 3 were in the range, with respect to the core centerline, -0.22 to -0.32 m, and of capsule 2, in the range -0.07 to -0.17 m; the corresponding mean values were -0.27 and -0.12 m, respectively. The change in the thermal and fast fluences with increasing distance from the core centerline is qualitatively consistent with the gamma-scan profiles of the capsule protective tube as shown in Figs. 5.1.1 through 5.1.4. Nevertheless, the flux and fluence values determined with monitors in the heat shield are affected to some degree by the presence of water nearby, and extrapolation of the values into the region of the fuel elements is uncertain.

The data of Table 5.2.1 are compared in Fig. 5.2.2 with the volume-averaged thermal and fast neutron fluences calculated with the HFR-TEDDIE code. Three of the four pairs of data lie very close to the calculated, volume-averaged thermal and fast neutron fluence values. This is unexpected. For example, by assuming that the HFR-TEDDIE volume-averaged fluences are correct and deducing a shape factor of 1.2 at the mean location of capsule 2, -114 mm below the core centerline, the calculated thermal fluence is $4.4 \times 10^{25} n/m^2$, and the calculated fast neutron fluence is $3.5 \times 10^{25} n/m^2$. The measured values are approximately $3.6 \times 10^{25} n/m^2$ and $3.0 \times 10^{25} n/m^2$, respectively. Thus, under the assumption employed, the calculated thermal and fast neutron fluences are larger than the measured fluences by factors of 1.2. The consequences of the alternate assumption, i.e., that the measurements are correct, requires a more elaborate analysis which is beyond the scope of this report.

Table 5.2.1. Results of neutron metrology in experiment D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

The fluence rate values are valid for HRF core position F8 and a reactor power of 45MW.

distance to cL core (in mm)	orien-tation	capsule	monitor set code	thermal fl. rate (in 10^{18} $m^{-2} \cdot s^{-1}$)	thermal fluence (in $10^{25} m^{-2}$)	fast fl. rate (in 10^{18} $m^{-2} \cdot s^{-1}$	fast fluence (in 10^{25} m^{-2})	fluence E>.1MeV (in $10^{25} M^{-2}$)	fluence [1] E>.18MeV (in $10^{25} m^{-2}$)
— 35	north	2	05	0.857	3.57	0.728	2.80	6.26	5.68
—35	south	2	06	0.851	3.54	0.804	3.08	6.18	5.64
—150	north	2	07	0.872	3.63	0.743	2.85	6.37	5.79
—150	south	2	08	0.894	3.73	0.834	3.20	6.41	5.86
—192	north	3	09	0.817	3.40	.0688	2.64	5.91	5.36
—192	south	3	10	0.833	3.47	0.776	2.98	5.99	5.46
—307	north	3	11	0.584	2.43	0.419	1.61	3.58	3.26
—307	south	3	12	0.594	2.48	0.455	1.75	3.51	3.20

[1] calculated from ABBN groups (CHARDAT package)

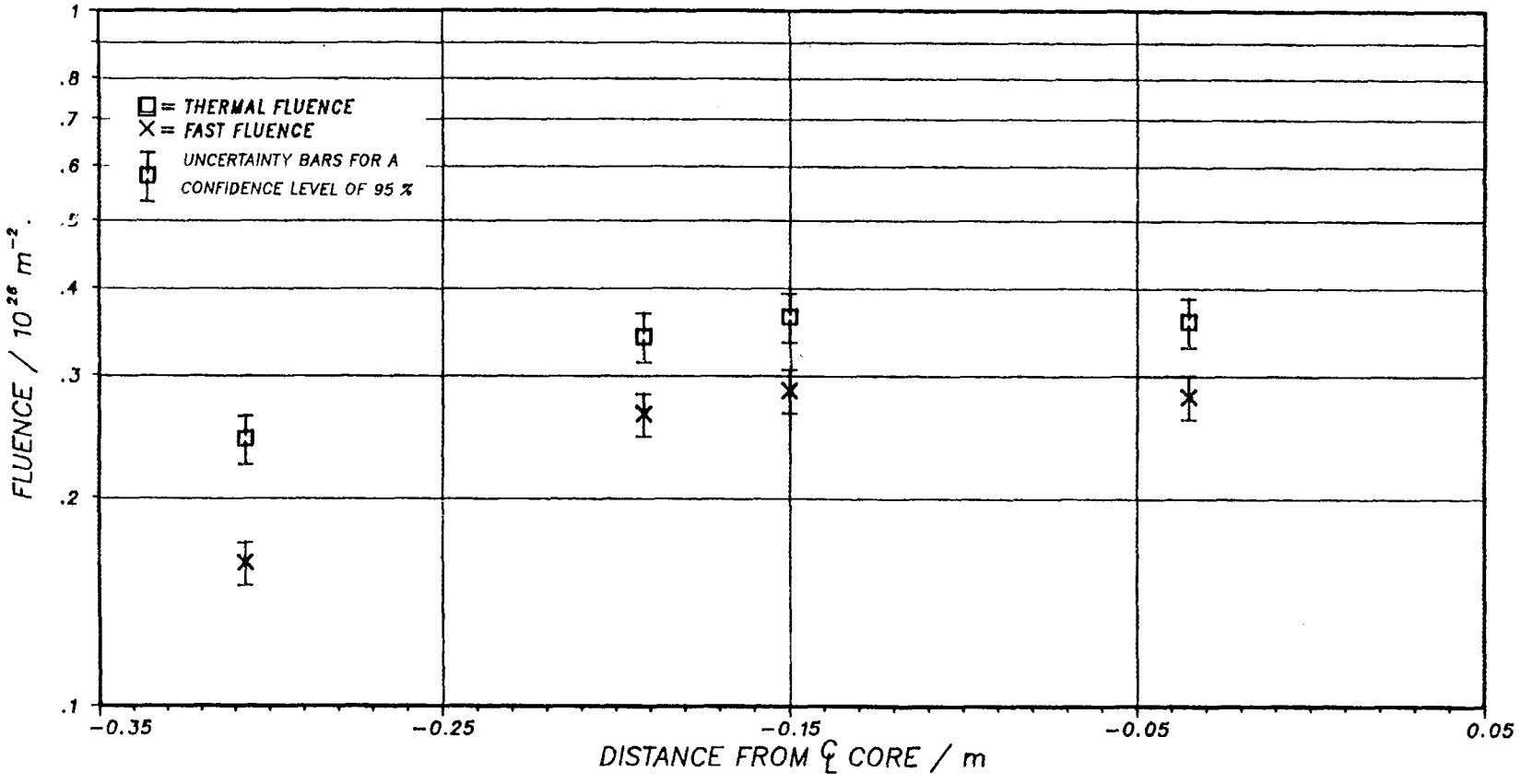
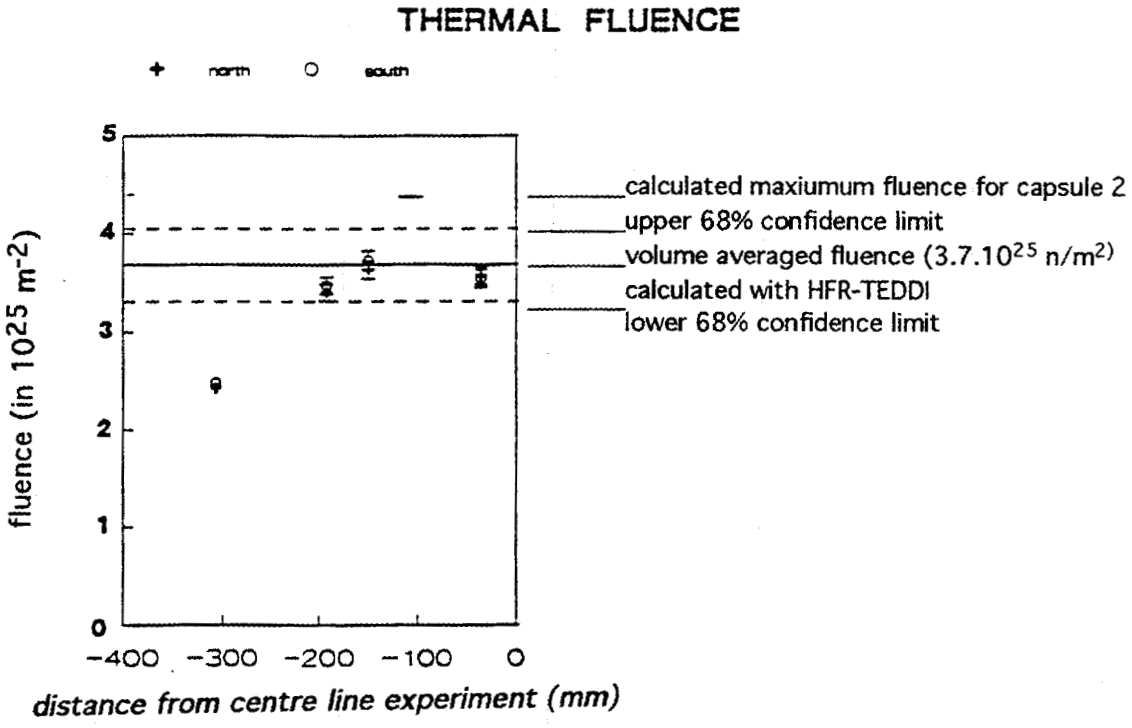


Fig. 5.2.1. Vertical neutron fluence distributions along the north side of capsules 2 and 3.
Source: JRC-IAM Petten, HFR Unit, The Netherlands



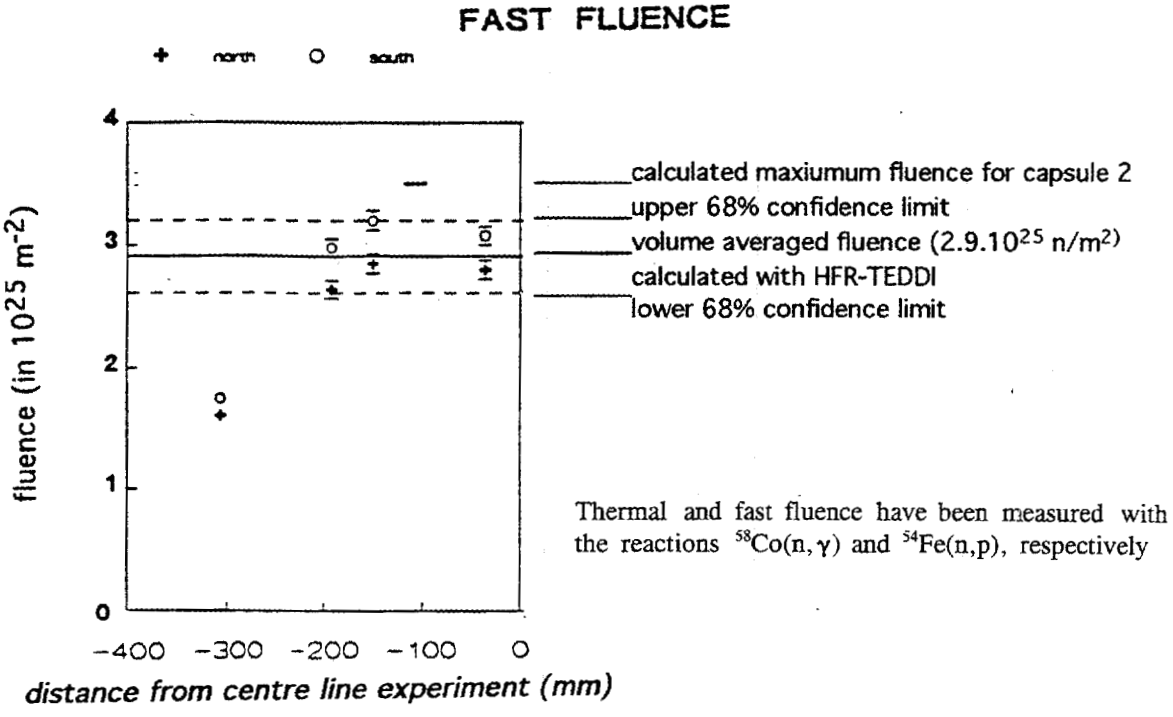


Fig. 5.2.2. Comparison of calculated and measured fluence data.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

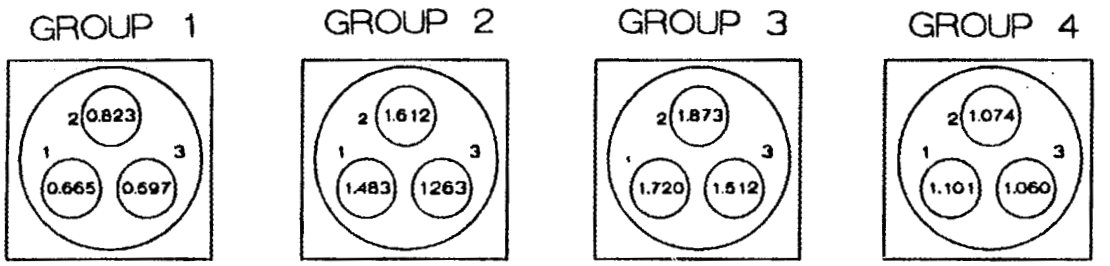
The activation monitor sets were restricted to the heat shield regions of the capsules and consequently yielded no information for the locations of the fueled graphite body, the locations of primary importance. Information on the neutron spectra was obtained at these locations in a simulation of the HFR-B1 experiment in the F8 position of the HFR during a 3-h irradiation at 5 MW (ref. 27). The inner contents of the assembly for the simulation experiment, representing the irradiation rig, consisted of three separated capsules with water in between. Each capsule contained a graphite cylinder between heat shields. The graphite cylinders had, in place of the stacked sets of fuel compacts as in HFR-B1, stacks of fission monitors separated by disks of graphite.[27] In addition, each capsule contained three stainless steel wires. The monitors and wires yielded fluence rate data at specific axial positions and fluence rate axial distributions, respectively.

Neutron fluence rates were measured at the position of the maximum fluence rate, 92 mm below the centerline. These data were then multiplied by the shape factor (=0.805 or 0.80 in two instances) so that comparison with the volume-averaged HFR-TEDDI calculations could be made. The measured fluence rate data were linearly interpolated between the measurement positions so as to match the mesh points in the HFR-TEDDI calculation. The results are shown in Fig. 5.2.3. The fluence rate data differ at the three locations in the chosen plane at 92 mm below the centerline; recall that during the short irradiation of the simulation experiment, the fuel bodies were not rotated as in the HFR-B1 experiment and that environmental conditions did not vary significantly. For comparison, therefore, an average of the three values may be taken as a reasonable approximation in simulating the effect of the rotation. In this approximation, the ratios of the mean calculated to the mean measured fluence rates (⟨calculated rate⟩/⟨measured rate⟩) are 0.77 for the thermal neutron fluence and 0.83 for the fast neutron fluence.

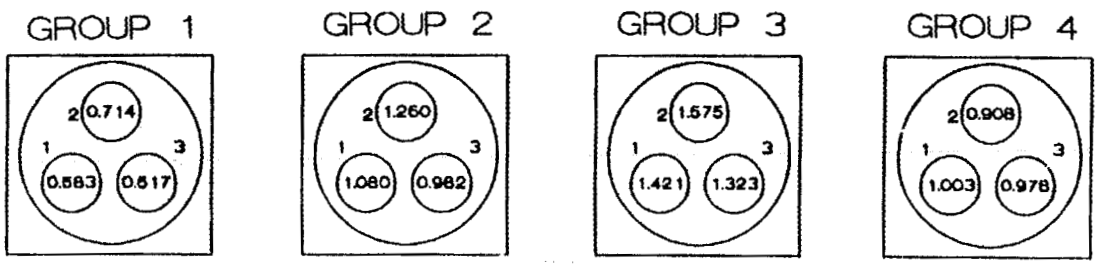
A large discrepancy is now apparent. The calculated-to-measured ratio derived for neutron fluences in relation to the activation monitor sets in the HFR-B1 experiment was deduced to be 1.2 for both the thermal and fast neutron fluences, whereas from the simulation experiment, the calculated-to-measured ratio for neutron fluence rates is deduced to be about 0.8. This discrepancy has not been and remains to be resolved.[27]

From the foil sets and the stainless steel wires in the simulation experiment,[27] the axial distributions of the thermal and fast neutron fluence rates were derived. (Note that the values of these rates are true for the various axial locations and have not been multiplied by shape factors.) The distributions are shown in Figs. 5.2.4 and 5.2.5 for the fast and thermal fluence rates, respectively. Also shown as an insert, are the fluence rate values at -92 mm below the centerline. The location of these values with respect to the distributed fluence rates is indicated in the figures by the short horizontal line segments centered on the -92 mm vertical. In the case of the fast fluence rates of Fig. 5.2.4, the relation between the fluence rate values and the plotted data at -92 mm is not clear from the figure or from the report.[27] The same can be written about the thermal neutron fluence rates in Fig. 5.2.5; here, in addition, there is the complication at -92 mm resulting from the influence of the cadmium foil box on the activity of the stainless steel wires. In any event, however, the use of these distributions, if possible, depends on resolving the discrepancy identified in the previous paragraph.

Average fluence rate spectrum data derived from the irradiation of foil stacks in the mock-up assembly



Volume averaged neutron fluence rate spectrum data for the mock-up calculated with HFR-TEDDI



Ratio of the measured to calculated fluence rate data

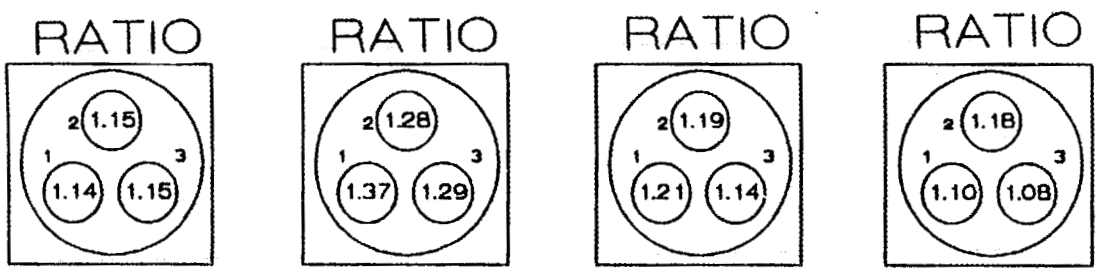


Fig. 5.2.3. Comparison of measured and calculated fluence rates (10^{18} $m^{-2}s^{-1}$) in the three horizontal positions in the simulation experiment in the axial plane 92 mm below the centerline.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

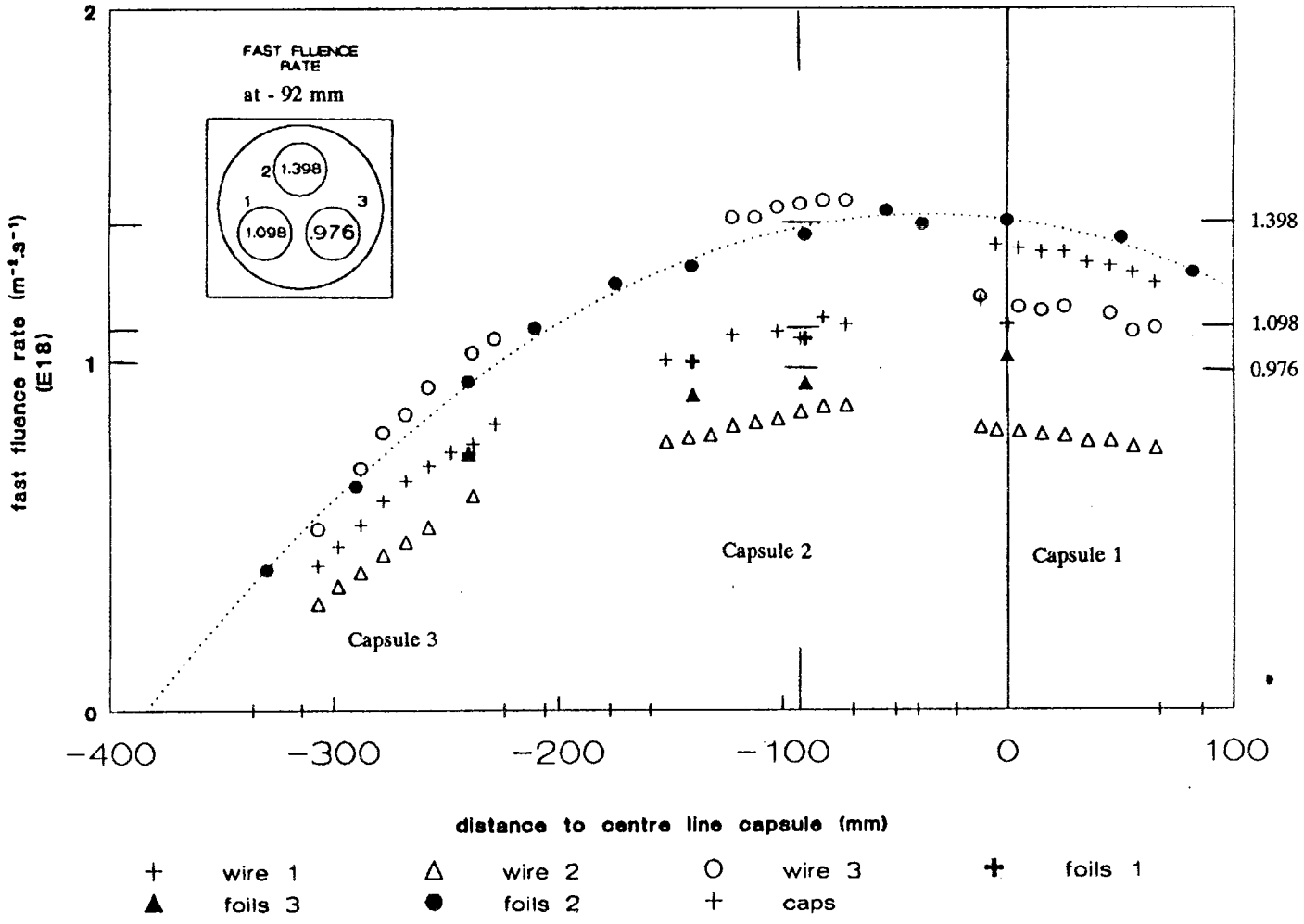


Fig. 5.2.4. Fast fluence rate distributions measured in the simulation of experiment D214.01.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

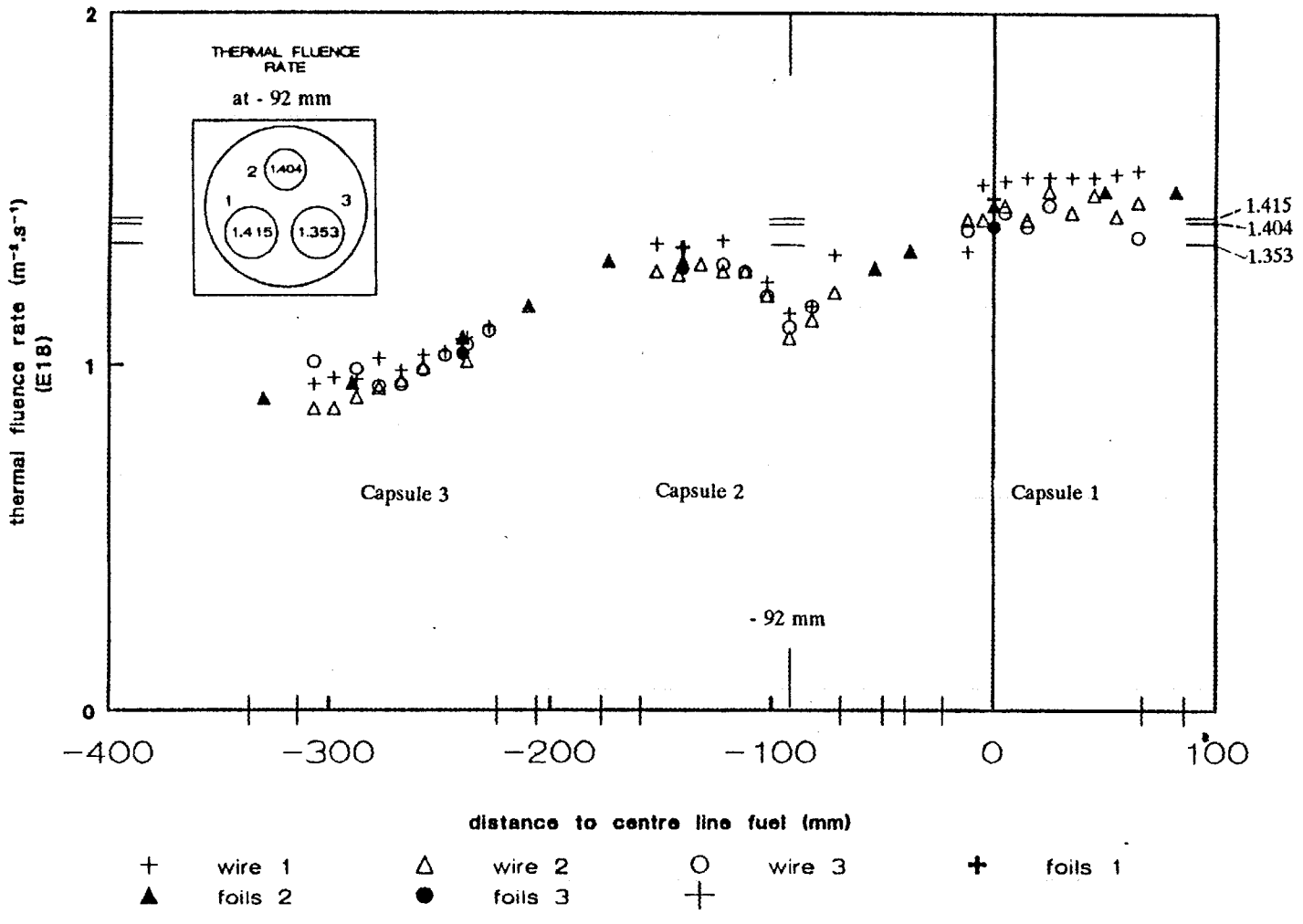


Fig. 5.2.5. Thermal fluence rate distributions measured in the simulation of experiment D214.01.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

5.2.2 Gamma Scan Wires

The gamma-scan wires from capsules 2 and 3 were analyzed at KFA.[28] Each capsule contained three niobium-encased wires located about 3 mm from a stacked set of four fuel compacts and extending more than the length of the stack. Each compact was 19 mm in length resulting in a total length of 76 mm; the scans covered a distance of 109 mm. Scans for the nuclides ^{51}Cr, ^{58}Co, ^{54}Mn, and ^{60}Co were made; adequate numbers of counts were obtained only for ^{54}Mn and ^{60}Co. The wires were positioned during the scans as they were during irradiation. Counts were accumulated every millimeter increment for 500 s (except for one gamma-scan wire in capsule 3 for which the measurement time was 300 s). The relative number of counts as a function of scan distance for the gamma-scan wire designated 1 is shown in Fig. 5.2.6 for capsules 2 and 3 and nuclides ^{54}Mn and ^{60}Co. The ^{60}Co scans reflect the thermal neutron fluence distribution and the ^{54}Mn scans, the fast neutron fluence distribution. Qualitatively, these scans are consistent with the scans of the outer protection tube at the locations of capsules 2 and 3 as shown in Figs. 5.1.3 and 5.1.4 and in Figs. 8 and 19 of ref. 25. Within the uncertainty of the profiles of Fig. 5.2.6, the gamma scans for scan wires designated 2 and 3* are identical to those of gamma scan wire 1 for ^{60}Co; for ^{54}Mn, the number of counts is 15 ± 1% larger for gamma-scan wire 2 as compared to 1 and is 9 ± 1% larger for gamma scan wire 3* as compared to 1 for both capsules 2 and 3. Thus, there is some rotational variation in the number of counts measured for ^{54}Mn but not for ^{60}Co.

5.2.3 Self-Powered Neutron Detectors

The SPN detectors[3] are used to measure the instantaneous thermal neutron flux. As shown below in Figs. 6.6.39 through 6.6.54, no relatively significant response is recorded until the 14th cycle; this behavior occurs for all capsules and for both the north and south orientations. Thus, there is a consistency in the responses of detectors at a variety of locations, but the response is difficult to understand.

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*Note that the number in Fig. 5.2.6 to the left of the decimal point represents the capsule number, and that to the right identifies the gamma-scan wire.

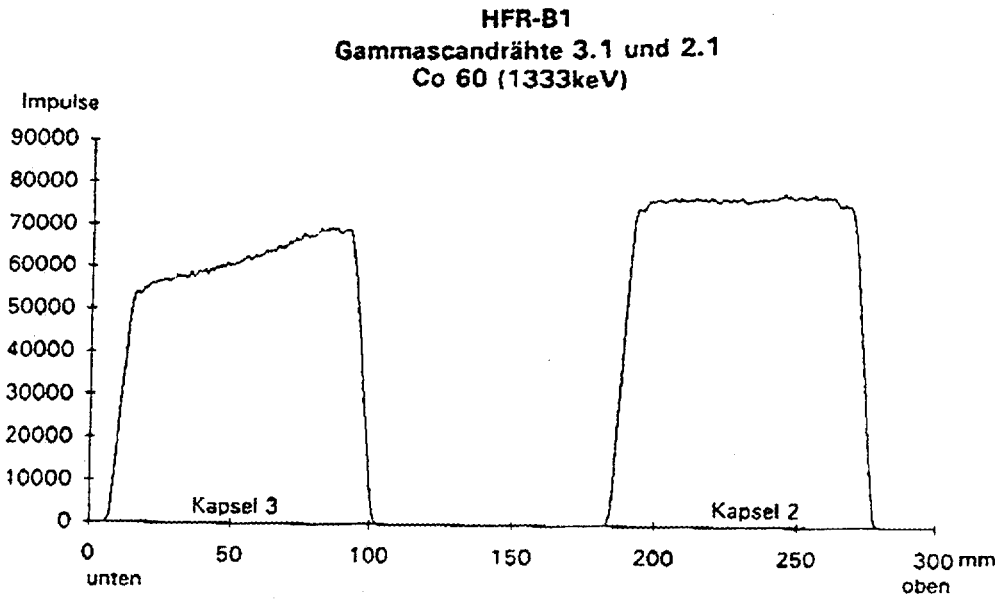

Abb:1b

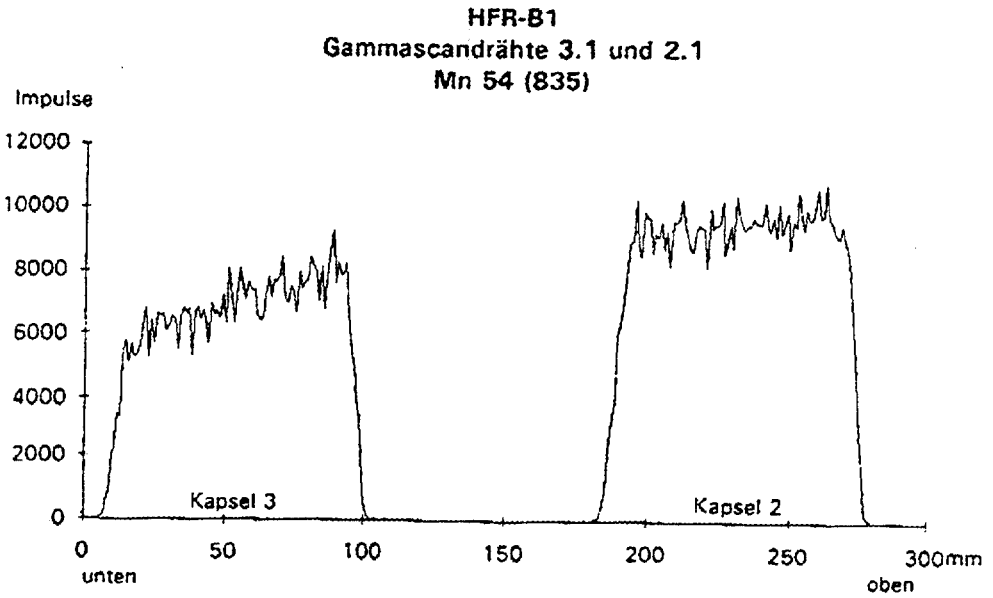

Fig. 5.2.6. Measurement of the gamma-scan wires from capsules 2 and 3.
Source: Forschungszentrum, Jülich, Germany

6. FINAL IRRADIATION DATA

The data in this section comprise a basic set with which the analysis of the HFR-B1 experiment may be pursued. Certain auxiliary data to which attention may be directed during the analysis can be obtained by consulting the extensive directory files, discussed in Sect. 4, and chart records now in the possession of the ORNL Nuclear Fuel Section of the M&C Division. The data presented here are in numerical and graphical form; the precise values of the graphed data can be obtained from the appropriate directory file. The detailed contents of this section are outlined in Table 6.0.0. The neutron metrology data are not included as they have been presented adequately in Sect. 5 in terms of an extended discussion of the data and associated problems.

Immediately preceding each subsection, a brief explanation of the contents is given.

6.1 DIRECTORY LISTINGS

The directory listings for two directories are presented in Tables 6.1.1 and 6.1.2. The third directory listing is not available, but the files may be obtained by access to the tape on which all files are located. Copies of the tape are in the possession of ORNL as well as JRC.

The file names include, generally, the cycle number, a reference to the particular capsule, where appropriate, in the form of the letters A, B, and C (corresponding to capsules 1, 2, and 3, respectively), to the reactor power (REAPWR) and the Sweeploop (SWEEP). A further explanation of file names is as follows.

All files with the extension *.D01 are plots in the metafile form.

All files with the extension *.R0B are R/B data files.

All files with an extra **9****.DAT or ******9.DAT are files where 8.9% of the power is used.

All files with ******N.DAT are data files where the original DACOS temperatures and new powers are used.

All files with *******T.DAT are total data files.

All files with only ******F.DAT are the original final data files.

All data files with IJ****.DAT or INJ****.DAT are files with water-vapor injection data.

All files with D214*******.DAT and SWEEP****.DAT are the original DACOS data files.

Table 6.0.0. The contents of Sect. 6

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Table 6.1.1. HRF VAX-4300 directory listing of experiment D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Directory DUA3: [CONRAD.RUBY_214]

2141AT.DAT;1	386	5-JUL-1990	15:59:26.57
2141AT.ROB;1	482	5-JUL-1990	16:54:01.58
2141BT.DAT;1	464	5-JUL-1990	15:59:42.77
2141BT.ROB;4	579	7-FEB-1991	09:33:22.91
214AT.ROB;5	482	12-AUG-1992	14:57:41.47
214BT.ROB;26	581	12-AUG-1992	15:05:56.97
214CT.ROB;6	817	13-AUG-1992	15:19:45.44
214AT.DAT;4	386	10-AUG-1992	15:27:45.15
214BT.DAT;4	465	11-AUG-1992	10:28:53.58
214CT.DAT;5	653	13-AUG-1992	11:51:09.79
214AT.DO1;1	1290	12-AUG-1992	14:57:48.47
214BT.DO1;1	1530	12-AUG-1992	15:06:03.84
214CT.DO1;1	1940	12-AUG-1992	15:11:58.60
214TST.DAT;3	2	7-JUN-1990	16:37:19.26
214TST.ROB;3	3	7-JUN-1990	16:41:16.68
214AT9.ROB;5	482	12-AUG-1992	15:03:54.42
214BT9.ROB;2	581	12-AUG-1992	15:07:48.97
214CT9.ROB;5	817	13-AUG-1992	16:31:06.91
214AT9.DAT;2	386	10-AUG-1992	15:52:35.48
214BT9.DAT;1	465	11-AUG-1992	10:45:47.41
214CT9.DAT;3	653	13-AUG-1992	11:55:14.99
214AT9.DO1;1	1290	12-AUG-1992	15:04:00.24
214BT9.DO1;1	1521	12-AUG-1992	15:07:55.67
214CT9.DO1;1	1927	12-AUG-1992	15:13:29.17
8703AFN.DO1;1	97	24-AUG-1992	20:00:05.97
8703AFN.DAT;2	8	24-AUG-1992	16:29:48.89
8703AFN.ROB;1	10	24-AUG-1992	20:00:03.42
8703AS.DAT;16	8	5-DEC-1988	13:54:21.14
8703BFN.DO1;3	105	26-AUG-1992	16:31:43.69
8703BFN.DAT;2	7	21-AUG-1992	15:59:59.71
8703BFN.ROB;3	9	26-AUG-1992	16:31:42.23
8703BS.DAT;13	7	5-DEC-1988	14:27:12.70
8703CFN.DO1;2	96	25-AUG-1992	10:13:26.10
8703CFN.DAT;7	7	21-AUG-1992	10:02:11.99
8703CFN.ROB;9	8	25-AUG-1992	10:13:24.55
8703CS.DAT;8	7	5-DEC-1988	13:51:37.57
8705AFN.DO1;1	106	24-AUG-1992	20:00:38.34
8705AFN.DAT;2	13	24-AUG-1992	16:29:49.18
8705AFN.ROB;1	17	24-AUG-1992	20:00:36.85
8705AS.DAT;16	13	9-DEC-1988	15:09:12.09
8705BFN.DO1;2	95	25-AUG-1992	09:53:20.37
8705BFN.DAT;2	10	21-AUG-1992	16:00:00.27
8705BFN.ROB;2	14	25-AUG-1992	09:53:18.83
8705BS.DAT;14	10	13-SEP-1988	08:58:25.40
8705CFN.DO1;2	137	25-AUG-1992	10:13:59.72
8705CFN.DAT;2	21	21-AUG-1992	10:45:01.77
8705CFN.ROB;1	27	25-AUG-1992	10:13:58.18
8705CS.DAT;19	21	13-SEP-1988	10:35:01.60
8709AFN.DO1;1	87	24-AUG-1992	20:01:14.61
8709AFN.DAT;2	12	24-AUG-1992	16:29:49.64
8709AFN.ROB;1	15	24-AUG-1992	20:01:13.15
8703AFN9.DO1;1	100	25-AUG-1992	14:56:44.43
8709AS.DAT;11	12	5-DEC-1988	12:03:31.65
8709BFN.DO1;2	86	25-AUG-1992	09:53:54.98
8709BFN.DAT;2	12	21-AUG-1992	16:00:00.60
8709BFN.ROB;1	15	25-AUG-1992	09:53:53.53
8709BS.DAT;18	13	5-DEC-1988	09:01:21.15
8709CFN.DO1;1	151	25-AUG-1992	10:14:37.12
8709CFN.DAT;2	32	21-AUG-1992	10:45:02.64
8709CFN.ROB;1	40	25-AUG-1992	10:14:35.34
8709CS.DAT;33	31	5-DEC-1988	09:22:56.94
8710AFN.DO1;1	91	24-AUG-1992	20:01:46.45
8710AFN.DAT;2	12	24-AUG-1992	16:29:50.12
8710AFN.ROB;1	15	24-AUG-1992	20:01:45.02
8710AS.DAT;6	12	20-JAN-1989	10:49:54.82
8710BFN.DO1;1	87	25-AUG-1992	09:54:31.10
8710BFN.DAT;2	12	21-AUG-1992	16:00:00.92
8710BFN.ROB;3	15	25-AUG-1992	09:54:29.36
8710BS.DAT;5	12	2-DEC-1988	14:12:54.11
8710CF.ROB;1	29	17-JUL-1989	15:33:03.82
8710CFN.DO1;1	149	25-AUG-1992	10:15:15.55
8710CFN.DAT;2	31	21-AUG-1992	10:45:03.44
8710CFN.ROB;1	39	25-AUG-1992	10:15:13.74
8710CS.DAT;5	31	2-DEC-1988	14:38:31.67
8789AT.DAT;7	386	27-JUL-1989	13:29:27.10
8789AT.ROB;1	482	3-AUG-1992	14:25:12.74
8789BT.DAT;5	464	3-AUG-1992	14:44:03.86
8789BT.ROB;1	579	3-AUG-1992	14:41:19.38
8789CT.DAT;3	654	31-JUL-1992	15:03:24.92
8789CT.ROB;4	817	31-JUL-1992	15:08:23.98
8801AFN.DO1;2	93	25-AUG-1992	09:32:27.70
8801AFN.DAT;2	13	24-AUG-1992	16:29:50.51
8801AFN.ROB;1	17	25-AUG-1992	09:32:26.17
8801AS.DAT;5	13	2-DEC-1988	13:26:01.77
8801BFN.DO1;1	94	25-AUG-1992	09:55:06.17
8801BFN.DAT;2	14	21-AUG-1992	16:00:01.27
8801BFN.ROB;1	18	25-AUG-1992	09:55:04.50
8801BS.DAT;5	14	2-DEC-1988	13:30:25.64
8801CFN.DO1;2	155	25-AUG-1992	10:18:09.72
8801CFN.DAT;2	36	21-AUG-1992	10:45:04.16
8801CFN.ROB;1	45	25-AUG-1992	10:18:07.88
8801CS.DAT;5	36	2-DEC-1988	13:50:10.69
8802AFN.DO1;1	88	25-AUG-1992	09:33:00.04
8802AFN.DAT;2	12	24-AUG-1992	16:29:50.86
8802AFN.ROB;1	15	25-AUG-1992	09:32:58.53
8802AS.DAT;8	12	2-DEC-1988	10:11:26.00
8802BFN.DO1;1	88	25-AUG-1992	09:55:41.46
8802BFN.DAT;2	12	21-AUG-1992	16:00:01.59
8802BFN.ROB;1	15	25-AUG-1992	09:55:39.68
8802BS.DAT;4	12	2-DEC-1988	10:09:27.20
8802CFN.DO1;1	88	25-AUG-1992	10:18:47.60
8802CFN.DAT;2	12	21-AUG-1992	10:45:05.12
8802CFN.ROB;1	15	25-AUG-1992	10:18:45.47
8802CS.DAT;5	11	2-DEC-1988	10:24:29.10
8804AFN.DO1;1	91	25-AUG-1992	09:33:36.21
8804AFN.DAT;2	10	24-AUG-1992	16:29:51.27
8804AFN.ROB;1	12	25-AUG-1992	09:33:34.77
8804AS.DAT;8	10	1-DEC-1988	16:04:17.34
8804BFN.DO1;1	95	25-AUG-1992	09:56:19.13
8804BFN.DAT;2	12	21-AUG-1992	16:00:01.92
8804BFN.ROB;1	15	25-AUG-1992	09:56:17.61
8804BS.DAT;5	12	1-DEC-1988	16:07:30.11
8804CFN.DO1;1	96	25-AUG-1992	10:19:23.92
8804CFN.DAT;2	13	21-AUG-1992	10:45:05.84

Table 6.1.1. (continued)

Directory DUA3: [CONRAD.RUBY_214]

8804CFN.ROB;1	17	25-AUG-1992	10:19:22.38
8804CS.DAT;5	13	1-DEC-1988	16:15:08.24
8805AFN.DO1;1	126	25-AUG-1992	09:34:09.80
8805AFN.DAT;2	20	24-AUG-1992	16:29:51.63
8805AFN.ROB;1	26	25-AUG-1992	09:34:08.30
8805AS.DAT;8	21	1-FEB-1989	17:30:42.90
8703AF.DAT;3	8	20-JUL-1989	13:55:32.50
8703BF.DAT;2	7	20-JUL-1989	14:01:56.05
8703CF.DAT;3	7	20-JUL-1989	14:08:43.62
8705AF.DAT;3	13	20-JUL-1989	13:55:45.47
8705BF.DAT;2	10	20-JUL-1989	14:02:06.54
8705CF.DAT;2	21	20-JUL-1989	14:09:03.87
8709AF.DAT;2	12	20-JUL-1989	13:55:57.72
8709BF.DAT;2	12	20-JUL-1989	14:02:17.27
8709CF.DAT;2	31	20-JUL-1989	14:09:21.72
8710AF.DAT;2	12	20-JUL-1989	13:56:10.45
8710BF.DAT;2	12	20-JUL-1989	14:02:29.36
8710CF.DAT;3	31	20-SEP-1990	15:59:46.67
8801AF.DAT;2	13	20-JUL-1989	13:56:24.70
8801BF.DAT;2	14	20-JUL-1989	14:02:43.45
8801CF.DAT;2	36	20-JUL-1989	14:09:47.90
8802AF.DAT;2	12	20-JUL-1989	13:56:38.15
8802BF.DAT;2	12	20-JUL-1989	14:02:53.69
8802CF.DAT;2	11	20-JUL-1989	14:09:58.63
8804AF.DAT;2	10	20-JUL-1989	13:56:56.08
8804BF.DAT;3	12	20-JUL-1989	14:03:19.79
8804CF.DAT;2	13	20-JUL-1989	14:10:10.16
8805AF.DAT;3	20	20-JUL-1989	13:57:06.89
8805BF.DAT;3	20	20-JUL-1989	14:03:32.76
8805BFN.DO1;3	126	1-SEP-1992	12:04:35.57
8805BFN.DO1;2	126	26-AUG-1992	16:32:19.09
8805BFN.DAT;3	21	1-SEP-1992	12:03:36.91
8805BFN.DAT;2	21	21-AUG-1992	16:00:02.26
8805BFN.ROB;5	27	1-SEP-1992	12:04:31.56
8805BFN.ROB;4	27	1-SEP-1992	12:03:40.44
8805BFN.ROB;3	27	1-SEP-1992	12:03:00.48
8805BFN.ROB;2	27	26-AUG-1992	16:32:17.60
8805BS.DAT;4	20	1-DEC-1988	13:52:45.70
8805CF.DAT;5	34	20-JUL-1989	14:10:22.49
8805CFN.DO1;1	183	25-AUG-1992	10:19:58.72
8805CFN.DAT;2	34	21-AUG-1992	10:45:06.56
8805CFN.ROB;1	42	25-AUG-1992	10:19:56.91
8805CS.DAT;7	36	2-DEC-1988	09:13:28.68
8806AF.DAT;2	17	20-JUL-1989	13:57:20.10
8806AFN.DO1;1	107	25-AUG-1992	09:34:47.56
8806AFN.DAT;2	17	24-AUG-1992	16:29:52.04
8806AFN.ROB;1	21	25-AUG-1992	09:34:45.97
8806AS.DAT;9	17	1-DEC-1988	09:37:03.10
8806BF.DAT;2	19	20-JUL-1989	14:03:44.13
8806BFN.DO1;2	120	26-AUG-1992	16:32:55.09
8806BFN.DAT;2	19	21-AUG-1992	16:00:02.71
8806BFN.ROB;2	24	26-AUG-1992	16:32:53.59
8806BS.DAT;8	19	1-DEC-1988	10:04:48.94
8806CF.DAT;4	22	21-JUL-1989	07:58:23.05
8806CFN.DO1;1	132	25-AUG-1992	10:20:40.95
8806CFN.DAT;2	22	21-AUG-1992	10:45:00.79
8806CFN.ROB;1	28	25-AUG-1992	10:20:39.14
8806CS.DAT;6	22	1-DEC-1988	16:50:16.53
8807AF.DAT;3	27	20-JUL-1989	14:34:19.51
8807AFN.DO1;1	141	25-AUG-1992	09:35:24.43
8807AFN.DAT;2	27	24-AUG-1992	16:29:52.41
8807AFN.ROB;1	34	25-AUG-1992	09:35:22.69
8807AS.DAT;23	27	25-NOV-1988	10:55:26.92
8807BF.DAT;2	26	20-JUL-1989	14:03:57.26
8807BFN.DO1;2	141	26-AUG-1992	16:33:31.96
8807BFN.DAT;2	27	21-AUG-1992	16:00:03.08
8807BFN.ROB;2	33	26-AUG-1992	16:33:30.30
8807BS.DAT;19	26	8-FEB-1989	13:04:00.53
8807CF.DAT;3	41	20-JUL-1989	15:27:15.63
8807CFN.DO1;1	198	25-AUG-1992	10:21:22.06
8807CFN.DAT;2	41	21-AUG-1992	14:46:22.97
8807CFN.ROB;1	52	25-AUG-1992	10:21:20.12
8807CS.DAT;1	41	25-NOV-1988	11:41:39.39
8808AF.DAT;3	23	20-JUL-1989	13:57:45.08
8808AFN.DO1;1	130	25-AUG-1992	09:36:02.88
8808AFN.DAT;2	23	24-AUG-1992	16:29:52.82
8808AFN.ROB;1	30	25-AUG-1992	09:36:01.28
8808AS.DAT;10	23	25-NOV-1988	15:06:51.27
8808BF.DAT;4	20	20-JUL-1989	14:04:09.03
8808BFN.DO1;2	118	26-AUG-1992	16:34:10.09
8808BFN.DAT;2	20	21-AUG-1992	16:00:03.48
8808BFN.ROB;2	25	26-AUG-1992	16:34:08.46
8808BS.DAT;12	19	25-NOV-1988	15:13:08.63
8808CF.DAT;4	46	20-JUL-1989	16:18:30.45
8808CFN.DO1;1	180	25-AUG-1992	10:22:05.10
8808CFN.DAT;2	46	21-AUG-1992	14:46:23.49
8808CFN.ROB;1	58	25-AUG-1992	10:22:03.29
8808CK.DAT;1	48	20-JUL-1989	14:10:58.11
8808CS.DAT;2	48	7-FEB-1989	13:30:07.94
8809AF.DAT;2	28	20-JUL-1989	13:57:55.08
8809AFN.DO1;1	138	25-AUG-1992	09:36:40.17
8809AFN.DAT;2	28	24-AUG-1992	16:29:53.25
8809AFN.ROB;1	35	25-AUG-1992	09:36:37.63
8809AS.DAT;15	28	1-FEB-1989	17:29:42.30
8809BF.DAT;2	25	20-JUL-1989	14:04:22.56
8809BFN.DO1;2	132	26-AUG-1992	16:34:45.55
8809BFN.DAT;2	25	21-AUG-1992	16:00:03.84
8809BFN.ROB;2	31	26-AUG-1992	16:34:43.90
8809BS.DAT;13	25	30-NOV-1988	15:08:05.24
8809CF.DAT;1	33	24-JUL-1989	08:49:28.55
8809CFN.DO1;1	146	25-AUG-1992	10:22:48.61
8809CFN.DAT;2	33	21-AUG-1992	14:46:24.13
8809CFN.ROB;1	41	25-AUG-1992	10:22:46.83
8809CK.DAT;1	33	20-JUL-1989	14:11:11.08
8809CS.DAT;11	33	30-NOV-1988	15:59:33.80
8810AF.DAT;7	29	20-JUL-1989	13:58:20.06
8810AFN.DO1;1	138	25-AUG-1992	09:37:17.14
8810AFN.DAT;2	29	24-AUG-1992	16:29:53.70
8810AFN.ROB;1	38	25-AUG-1992	09:37:15.40
8810AS.DAT;24	29	1-FEB-1989	17:31:32.53
8810BF.DAT;6	32	20-JUL-1989	14:04:34.41
8810BFN.DO1;2	156	26-AUG-1992	16:35:23.39
8810BFN.DAT;2	32	21-AUG-1992	16:00:04.23
8810BFN.ROB;2	40	26-AUG-1992	16:35:21.64
8810BS.DAT;12	31	19-APR-1989	16:53:24.34
8810CF.DAT;2	334	1-AUG-1989	14:46:19.27

Table 6.1.1. (continued)

Directory DUA3: [CONRAD.RUBY_214]

8903AF.DAT;6	26	20-JUL-1989	13:59:07.14
8903AFN.DO1;1	132	25-AUG-1992	09:39:43.17
8903AFN.DAT;2	27	24-AUG-1992	16:29:56.64
8903AFN.ROB;1	33	25-AUG-1992	09:39:41.53
8903AS.DAT;18	26	17-JUL-1989	12:08:09.42
8903BF.DAT;5	25	25-JUL-1989	09:07:39.76
8903BFN.DO1;1	126	25-AUG-1992	10:02:50.12
8903BFN.DAT;2	25	21-AUG-1992	16:00:09.55
8903BFN.ROB;1	31	25-AUG-1992	10:02:48.54
8903BS.DAT;12	25	2-MAY-1989	15:45:30.27
8903CF.DAT;5	26	20-JUL-1989	14:12:10.57
8903CFN.DO1;1	135	25-AUG-1992	10:26:12.61
8903CFN.DAT;2	26	21-AUG-1992	14:46:28.57
8903CFN.ROB;1	33	25-AUG-1992	10:26:10.96
8903CS.DAT;14	26	3-MAY-1989	13:45:54.06
8904AF.DAT;6	25	21-JUL-1989	13:35:16.32
8904AFN.DO1;1	134	25-AUG-1992	09:40:20.87
8904AFN.DAT;2	25	24-AUG-1992	16:30:02.32
8904AFN.ROB;1	32	25-AUG-1992	09:40:19.27
8904AS.DAT;8	25	25-MAY-1989	13:08:09.42
8904BF.DAT;8	31	21-JUL-1989	11:43:55.95
8904BFN.DO1;1	148	25-AUG-1992	10:03:27.76
8904BFN.DAT;2	31	21-AUG-1992	16:00:10.59
8904BFN.ROB;1	40	25-AUG-1992	10:03:25.99
8904BS.DAT;17	31	25-MAY-1989	13:07:09.30
8904CF.DAT;16	62	20-JUL-1989	15:57:24.81
8904CFN.DO1;1	220	25-AUG-1992	10:26:56.28
8904CFN.DAT;2	62	21-AUG-1992	14:46:28.95
8904CFN.ROB;1	78	25-AUG-1992	10:26:54.29
8904CK.DAT;2	65	21-JUL-1989	11:43:08.96
8904CS.DAT;22	64	25-MAY-1989	13:09:55.24
8905AF.DAT;9	25	21-JUL-1989	09:38:39.06
8905AFN.DO1;1	127	25-AUG-1992	09:40:57.88
8905AFN.DAT;2	25	24-AUG-1992	16:29:47.90
8905AFN.ROB;1	32	25-AUG-1992	09:40:56.33
8905AS.DAT;14	25	22-JAN-1990	16:03:28.93
8905BF.DAT;9	61	25-JUL-1989	09:07:06.94
8905BFN.DO1;2	242	26-AUG-1992	16:37:17.69
8905BFN.DAT;4	61	26-AUG-1992	16:14:49.36
8905BFN.ROB;2	76	26-AUG-1992	16:37:15.49
8905BS.DAT;39	60	16-JUN-1989	09:20:54.01
8905CF.DAT;7	25	21-JUL-1989	14:39:20.60
8905CFN.DO1;1	132	25-AUG-1992	10:27:42.76
8905CFN.DAT;3	25	2-SEP-1992	15:10:15.02
8905CFN.DAT;2	25	21-AUG-1992	14:46:29.58
8905CFN.ROB;2	32	2-SEP-1992	15:10:31.95
8905CFN.ROB;1	32	25-AUG-1992	10:27:41.22
8905CS.DAT;10	25	15-JUN-1989	09:16:07.74
8906AF.DAT;1	23	21-JUL-1989	12:05:04.57
8906AFN.DO1;1	125	25-AUG-1992	09:41:32.99
8906AFN.DAT;2	23	24-AUG-1992	16:30:05.12
8906AFN.ROB;1	29	25-AUG-1992	09:41:31.37
8906AS.DAT;30	23	20-JUL-1989	13:59:46.08
8906BF.DAT;1	55	21-JUL-1989	12:05:12.23
8906BFN.DO1;2	231	26-AUG-1992	16:38:03.65
8906BFN.DAT;3	55	26-AUG-1992	16:15:17.84
8906BFN.ROB;2	69	26-AUG-1992	16:38:01.46
8906BS.DAT;29	55	20-JUL-1989	09:46:15.67
8906CF.DAT;2	69	24-JUL-1989	08:34:14.48
8906CFN.DO1;1	229	25-AUG-1992	10:28:21.92
8906CFN.DAT;3	69	24-AUG-1992	16:55:16.89
8906CFN.ROB;1	87	25-AUG-1992	10:28:18.78
8906CK.DAT;1	70	21-JUL-1989	12:05:21.60
8906CS.DAT;39	70	20-JUL-1989	14:13:16.85
8906CS.ROB;11	87	31-MAY-1990	12:35:14.16
8703AFN9.DAT;2	8	24-AUG-1992	16:45:23.89
8703AFN9.ROB;5	10	25-AUG-1992	14:56:42.99
8703BFN9.DO1;1	105	25-AUG-1992	15:09:45.76
8703BFN9.DAT;2	7	26-AUG-1992	16:17:42.30
8703BFN9.ROB;1	9	25-AUG-1992	15:09:44.27
8703CFN9.DO1;1	96	25-AUG-1992	15:23:16.85
8703CFN9.DAT;1	7	24-AUG-1992	16:51:08.45
8703CFN9.ROB;1	8	25-AUG-1992	15:23:15.37
8705AFN9.DO1;1	106	25-AUG-1992	14:57:23.51
8705AFN9.DAT;1	13	24-AUG-1992	16:45:26.70
8705AFN9.ROB;1	17	25-AUG-1992	14:57:21.88
8705BFN9.DO1;1	95	25-AUG-1992	15:10:22.71
8705BFN9.DAT;1	10	24-AUG-1992	16:46:41.09
8705BFN9.ROB;1	14	25-AUG-1992	15:10:21.22
8705CFN9.DO1;1	137	25-AUG-1992	15:23:55.33
8705CFN9.DAT;1	21	24-AUG-1992	16:51:13.85
8705CFN9.ROB;1	27	25-AUG-1992	15:23:53.76
8709AFN9.DO1;1	87	25-AUG-1992	14:58:02.48
8709AFN9.DAT;1	12	24-AUG-1992	16:45:29.33
8709AFN9.ROB;1	15	25-AUG-1992	14:58:00.90
8709BFN9.DO1;1	86	25-AUG-1992	15:10:59.33
8709BFN9.DAT;1	12	24-AUG-1992	16:46:43.73
8709BFN9.ROB;1	15	25-AUG-1992	15:10:57.85
8709CFN9.DO1;1	147	25-AUG-1992	15:24:37.25
8709CFN9.DAT;1	32	24-AUG-1992	16:51:18.56
8709CFN9.ROB;1	40	25-AUG-1992	15:24:35.44
8710AFN9.DO1;1	91	25-AUG-1992	14:58:39.90
8710AFN9.DAT;1	12	24-AUG-1992	16:45:31.97
8710AFN9.ROB;1	15	25-AUG-1992	14:58:38.34
8710BFN9.DO1;1	87	25-AUG-1992	15:11:35.66
8710BFN9.DAT;1	12	24-AUG-1992	16:46:47.56
8710BFN9.ROB;1	15	25-AUG-1992	15:11:34.17
8710CFN9.DO1;1	146	25-AUG-1992	15:25:20.12
8710CFN9.DAT;1	31	24-AUG-1992	16:51:23.21
8710CFN9.ROB;1	39	25-AUG-1992	15:25:18.39
8801AFN9.DO1;1	93	25-AUG-1992	14:59:14.46
8801AFN9.DAT;1	13	24-AUG-1992	16:45:34.78
8801AFN9.ROB;1	17	25-AUG-1992	14:59:12.92
8801BFN9.DO1;1	94	25-AUG-1992	15:12:11.98
8801BFN9.DAT;1	14	24-AUG-1992	16:46:50.48
8801BFN9.ROB;1	18	25-AUG-1992	15:12:10.33
8801CFN9.DO1;1	155	25-AUG-1992	15:26:02.92
8801CFN9.DAT;1	36	24-AUG-1992	16:51:28.45
8801CFN9.ROB;1	45	25-AUG-1992	15:26:01.03
8802AFN9.DO1;1	88	25-AUG-1992	14:59:52.05
8802AFN9.DAT;1	12	24-AUG-1992	16:45:37.51
8802AFN9.ROB;1	15	25-AUG-1992	14:59:50.52
8802BFN9.DO1;1	88	25-AUG-1992	15:12:49.09
8802BFN9.DAT;1	12	24-AUG-1992	16:46:53.25
8802BFN9.ROB;1	15	25-AUG-1992	15:12:47.60
8802CFN9.DO1;1	88	25-AUG-1992	15:26:44.85

Table 6.1.1. (continued)

Directory DUA3: [CONRAD.RUBY_214]

8802CFN9.DAT;1	12	24-AUG-1992	16:51:31.09
8802CFN9.ROB;1	15	25-AUG-1992	15:26:43.31
8804AFN9.DO1;1	92	25-AUG-1992	15:00:29.65
8804AFN9.DAT;1	10	24-AUG-1992	16:45:39.97
8804AFN9.ROB;1	12	25-AUG-1992	15:00:28.17
8804BFN9.DO1;1	95	25-AUG-1992	15:13:26.77
8804BFN9.DAT;1	12	24-AUG-1992	16:46:56.07
8804BFN9.ROB;1	15	25-AUG-1992	15:13:25.20
8804CFN9.DO1;1	96	25-AUG-1992	15:27:23.55
8804CFN9.DAT;1	13	24-AUG-1992	16:51:34.04
8804CFN9.ROB;1	17	25-AUG-1992	15:27:21.98
8805AFN9.DO1;1	126	25-AUG-1992	15:01:06.37
8805AFN9.DAT;1	20	24-AUG-1992	16:45:43.43
8805AFN9.ROB;1	26	25-AUG-1992	15:01:04.80
8805BFN9.DO1;2	130	1-SEP-1992	12:05:31.64
8805BFN9.DAT;2	21	1-SEP-1992	12:04:21.08
8805BFN9.ROB;2	27	1-SEP-1992	12:05:27.36
8805CFN9.DO1;1	179	25-AUG-1992	15:28:02.53
8805CFN9.DAT;1	34	24-AUG-1992	16:51:39.02
8805CFN9.ROB;1	42	25-AUG-1992	15:28:00.81
8806AFN9.DO1;1	107	25-AUG-1992	15:01:45.88
8806AFN9.DAT;1	17	24-AUG-1992	16:45:46.73
8806AFN9.ROB;1	21	25-AUG-1992	15:01:44.32
8806BFN9.DO1;1	120	25-AUG-1992	15:14:43.56
8806BFN9.DAT;1	19	24-AUG-1992	16:47:03.21
8806BFN9.ROB;1	24	25-AUG-1992	15:14:41.91
8806CFN9.DO1;1	132	25-AUG-1992	15:28:48.39
8806CFN9.DAT;1	22	24-AUG-1992	16:51:43.98
8806CFN9.ROB;1	28	25-AUG-1992	15:28:46.86
8807AFN9.DO1;1	141	25-AUG-1992	15:02:23.75
8807AFN9.DAT;1	27	24-AUG-1992	16:45:50.85
8807AFN9.ROB;1	34	25-AUG-1992	15:02:21.99
8807BFN9.DO1;1	141	25-AUG-1992	15:15:23.08
8807BFN9.DAT;1	27	24-AUG-1992	16:47:07.34
8807BFN9.ROB;1	33	25-AUG-1992	15:15:21.43
8807CFN9.DO1;1	195	25-AUG-1992	15:29:29.65
8807CFN9.DAT;1	41	24-AUG-1992	16:51:50.00
8807CFN9.ROB;1	52	25-AUG-1992	15:29:27.73
8808AFN9.DO1;1	130	25-AUG-1992	15:03:05.48
8808AFN9.DAT;1	23	24-AUG-1992	16:45:54.70
8808AFN9.ROB;1	30	25-AUG-1992	15:03:03.91
8808BFN9.DO1;1	118	25-AUG-1992	15:16:03.71
8808BFN9.DAT;1	20	24-AUG-1992	16:47:11.03
8808BFN9.ROB;1	25	25-AUG-1992	15:16:02.14
8808CFN9.DO1;1	177	25-AUG-1992	15:30:18.24
8808CFN9.DAT;1	46	24-AUG-1992	16:51:56.47
8808CFN9.ROB;1	58	25-AUG-1992	15:30:16.37
8809AFN9.DO1;1	138	25-AUG-1992	15:03:45.06
8809AFN9.DAT;1	28	24-AUG-1992	16:45:59.06
8809AFN9.ROB;1	35	25-AUG-1992	15:03:43.34
8809BFN9.DO1;1	128	25-AUG-1992	15:16:44.19
8809BFN9.DAT;1	25	24-AUG-1992	16:47:15.20
8809BFN9.ROB;1	31	25-AUG-1992	15:16:42.54
8809CFN9.DO1;1	146	25-AUG-1992	15:31:02.01
8809CFN9.DAT;1	33	24-AUG-1992	16:52:01.34
8809CFN9.ROB;1	41	25-AUG-1992	15:31:00.20
8810AFN9.DO1;1	141	25-AUG-1992	15:04:25.15
8810AFN9.DAT;1	29	24-AUG-1992	16:46:03.59
8810AFN9.ROB;1	38	25-AUG-1992	15:04:23.42
8810BFN9.DO1;1	152	25-AUG-1992	15:17:24.77
8810BFN9.DAT;1	32	24-AUG-1992	16:47:20.17
8810BFN9.ROB;1	40	25-AUG-1992	15:17:23.01
8810CFN9.DO1;1	127	25-AUG-1992	15:31:46.08
8810CFN9.DAT;1	27	24-AUG-1992	16:52:05.61
8810CFN9.ROB;1	33	25-AUG-1992	15:31:44.53
8811AFN9.DO1;1	143	25-AUG-1992	15:05:08.03
8811AFN9.DAT;1	29	24-AUG-1992	16:46:08.16
8811AFN9.ROB;1	38	25-AUG-1992	15:05:06.30
8811BFN9.DO1;1	139	25-AUG-1992	15:18:07.61
8811BFN9.DAT;1	29	24-AUG-1992	16:47:24.79
8811BFN9.ROB;1	37	25-AUG-1992	15:18:05.89
8811CFN9.DO1;1	149	25-AUG-1992	15:32:28.92
8811CFN9.DAT;1	31	24-AUG-1992	16:52:10.32
8811CFN9.ROB;1	39	25-AUG-1992	15:32:27.25
8901AFN9.DO1;1	131	25-AUG-1992	15:05:48.98
8901AFN9.DAT;1	25	24-AUG-1992	16:46:15.04
8901AFN9.ROB;1	32	25-AUG-1992	15:05:47.33
8901BFN9.DO1;1	122	25-AUG-1992	15:18:49.69
8901BFN9.DAT;2	22	26-AUG-1992	16:17:00.30
8901BFN9.ROB;1	29	25-AUG-1992	15:18:48.12
8901CFN9.DO1;1	178	25-AUG-1992	15:33:11.00
8901CFN9.DAT;1	48	24-AUG-1992	16:52:16.70
8901CFN9.ROB;1	61	25-AUG-1992	15:33:08.97
8902AFN9.DO1;1	112	25-AUG-1992	15:06:30.97
8902AFN9.DAT;1	18	24-AUG-1992	16:46:18.37
8902AFN9.ROB;1	23	25-AUG-1992	15:06:29.23
8902BFN9.DO1;1	145	25-AUG-1992	15:19:30.16
8902BFN9.DAT;2	31	26-AUG-1992	16:17:02.46
8902BFN9.ROB;1	40	25-AUG-1992	15:19:28.36
8902CFN9.DO1;1	180	25-AUG-1992	15:33:55.27
8902CFN9.DAT;1	50	24-AUG-1992	16:52:23.38
8902CFN9.ROB;1	63	25-AUG-1992	15:33:53.39
8903AFN9.DO1;1	135	25-AUG-1992	15:07:07.93
8903AFN9.DAT;1	27	24-AUG-1992	16:46:22.53
8903AFN9.ROB;1	33	25-AUG-1992	15:07:06.28
8903BFN9.DO1;1	126	25-AUG-1992	15:20:12.16
8903BFN9.DAT;1	25	24-AUG-1992	16:47:37.62
8903BFN9.ROB;1	31	25-AUG-1992	15:20:10.51
8903CFN9.DO1;1	135	25-AUG-1992	15:34:38.39
8903CFN9.DAT;1	26	24-AUG-1992	16:52:27.95
8903CFN9.ROB;1	33	25-AUG-1992	15:34:36.74
8904AFN9.DO1;1	134	25-AUG-1992	15:07:47.45
8904AFN9.DAT;1	25	24-AUG-1992	16:46:26.46
8904AFN9.ROB;1	32	25-AUG-1992	15:07:45.80
8904BFN9.DO1;1	148	25-AUG-1992	15:20:52.96
8904BFN9.DAT;2	31	24-AUG-1992	16:50:51.42
8904BFN9.ROB;1	40	25-AUG-1992	15:20:50.99
8904CFN9.DO1;1	214	25-AUG-1992	15:35:20.14
8904CFN9.DAT;1	62	24-AUG-1992	16:52:36.09
8904CFN9.ROB;1	78	25-AUG-1992	15:35:18.10
8905AFN9.DO1;1	127	25-AUG-1992	15:08:27.20
8905AFN9.DAT;1	25	24-AUG-1992	16:46:30.55
8905AFN9.ROB;1	32	25-AUG-1992	15:08:25.63
8905BFN9.DO1;1	239	25-AUG-1992	15:21:37.68
8905BFN9.DAT;2	61	26-AUG-1992	16:17:01.81
8905BFN9.ROB;1	76	25-AUG-1992	15:21:35.62

Table 6.1.1. (continued)

Directory DUA3: [CONRAD.RUBY_214]

8905CFN9.DO1;1	132	25-AUG-1992	15:36:06.53
8905CFN9.DAT;2	25	2-SEP-1992	15:03:08.52
8905CFN9.ROB;3	32	2-SEP-1992	15:04:00.06
8906BFN9.DO1;1	225	25-AUG-1992	15:22:27.91
8906BFN9.DAT;2	55	26-AUG-1992	16:17:01.20
8906BFN9.ROB;1	69	25-AUG-1992	15:22:25.78
8906AFN9.DO1;1	125	25-AUG-1992	15:09:05.41
8906AFN9.DAT;1	23	24-AUG-1992	16:46:35.43
8906AFN9.ROB;1	29	25-AUG-1992	15:09:03.71
8906CFN9.DO1;1	220	25-AUG-1992	15:36:47.65
8906CFN9.DAT;1	69	24-AUG-1992	16:58:07.62
8906CFN9.ROB;1	87	25-AUG-1992	15:36:45.61
DP83.DAT;6	21	15-SEP-1987	10:44:10.00
DP84.DAT;2	21	15-SEP-1987	10:44:16.00
DP85.DAT;3	21	15-SEP-1987	10:44:51.00
INJ8705.DAT;6	12	23-JUN-1989	11:20:49.78
INJ8709.DAT;1	31	19-JUN-1989	14:24:15.08
INJ8710.DAT;1	31	19-JUN-1989	14:24:33.26
INJ8801.DAT;1	36	19-JUN-1989	14:24:59.76
INJ8805.DAT;1	34	19-JUN-1989	14:25:24.26
INJ8806.DAT;1	22	19-JUN-1989	14:25:40.05
INJ8807.DAT;1	41	19-JUN-1989	14:25:54.53
INJ8808.DAT;1	48	19-JUN-1989	14:26:12.76
INJ8809.DAT;1	33	19-JUN-1989	14:26:23.43
INJ8810.DAT;1	28	19-JUN-1989	14:26:42.87
INJ8901.DAT;5	33	23-JUN-1989	13:25:16.61
INJ8902.DAT;1	52	19-JUN-1989	14:27:19.57
INJ8904.DAT;1	64	19-JUN-1989	14:27:31.65
IJ98705N.DO1;1	100	17-AUG-1992	20:08:42.95
IJ98705N.DAT;1	12	14-AUG-1992	10:53:41.01
IJ98705N.ROB;2	15	17-AUG-1992	20:08:41.46
IJ98709N.DO1;1	147	17-AUG-1992	20:09:19.03
IJ98709N.DAT;2	31	17-AUG-1992	10:48:05.61
IJ98709N.ROB;2	40	17-AUG-1992	20:09:17.40
IJ98710N.DO1;1	147	17-AUG-1992	20:09:58.04
IJ98710N.DAT;2	31	17-AUG-1992	10:48:36.02
IJ98710N.ROB;2	39	17-AUG-1992	20:09:56.02
IJ98801N.DO1;1	156	17-AUG-1992	20:10:37.41
IJ98801N.DAT;1	36	14-AUG-1992	10:55:05.26
IJ98801N.ROB;2	45	17-AUG-1992	20:10:35.68
IJ98805N.DO1;1	181	17-AUG-1992	20:11:17.12
IJ98805N.DAT;1	34	14-AUG-1992	10:55:30.93
IJ98805N.ROB;2	43	17-AUG-1992	20:11:15.41
IJ98806N.DO1;1	136	17-AUG-1992	20:11:58.84
IJ98806N.DAT;1	22	14-AUG-1992	10:55:50.23
IJ98806N.ROB;2	29	17-AUG-1992	20:11:57.32
IJ98807N.DO1;1	199	17-AUG-1992	20:12:40.59
IJ98807N.DAT;1	41	14-AUG-1992	10:56:09.41
IJ98807N.ROB;2	52	17-AUG-1992	20:12:38.85
IJ98808N.DO1;1	204	17-AUG-1992	20:13:23.05
IJ98808N.DAT;1	48	14-AUG-1992	10:56:29.02
IJ98808N.ROB;2	61	17-AUG-1992	20:13:21.29
IJ98809N.DO1;1	161	17-AUG-1992	20:14:06.77
IJ98809N.DAT;2	33	17-AUG-1992	10:51:21.60
IJ98809N.ROB;3	42	17-AUG-1992	20:14:05.12
IJ98810N.DO1;1	140	17-AUG-1992	20:14:46.78
IJ98810N.DAT;4	28	17-AUG-1992	10:55:32.81
IJ98810N.ROB;3	35	17-AUG-1992	20:14:45.14
8810CFN.DO1;1	127	25-AUG-1992	10:23:27.97
8810CFN.DAT;2	27	21-AUG-1992	14:46:24.59
8810CFN.ROB;1	33	25-AUG-1992	10:23:26.32
8810CK.DAT;1	28	20-JUL-1989	14:11:22.29
8810CS.DAT;15	28	8-FEB-1989	15:42:51.19
8811AF.DAT;5	29	20-JUL-1989	13:58:34.55
8811AFN.DO1;1	142	25-AUG-1992	09:37:54.21
8811AFN.DAT;2	29	24-AUG-1992	16:29:54.21
8811AFN.ROB;1	38	25-AUG-1992	09:37:52.34
8811AS.DAT;19	29	8-FEB-1989	13:26:09.31
8811BF.DAT;7	29	25-JUL-1989	09:06:39.24
8811BFN.DO1;1	139	25-AUG-1992	10:00:49.97
8811BFN.DAT;2	29	21-AUG-1992	16:00:04.65
8811BFN.ROB;1	37	25-AUG-1992	10:00:48.23
8811BS.DAT;26	29	8-FEB-1989	13:09:01.30
8811CF.DAT;5	31	20-JUL-1989	14:11:32.78
8811CFN.DO1;1	149	25-AUG-1992	10:24:06.05
8811CFN.DAT;2	31	21-AUG-1992	14:46:25.04
8811CFN.ROB;1	39	25-AUG-1992	10:24:04.24
8811CS.DAT;13	31	8-FEB-1989	13:32:19.08
8901AF.DAT;7	25	20-JUL-1989	13:58:45.76
8901AFN.DO1;1	131	25-AUG-1992	09:38:31.64
8901AFN.DAT;2	25	24-AUG-1992	16:29:54.62
8901AFN.ROB;1	32	25-AUG-1992	09:38:30.02
8901AS.DAT;33	25	9-FEB-1989	14:20:38.46
8901BF.DAT;6	22	20-JUL-1989	14:04:58.26
8901BFN.DO1;2	127	26-AUG-1992	16:36:02.82
8901BFN.DAT;3	22	26-AUG-1992	16:12:28.10
8901BFN.ROB;4	29	2-SEP-1992	15:21:49.99
8901BFN.ROB;3	29	2-SEP-1992	15:21:26.59
8901BFN.ROB;2	29	26-AUG-1992	16:36:01.09
8901BS.DAT;20	22	9-FEB-1989	14:29:52.28
8901CF.DAT;8	48	24-JUL-1989	09:14:07.10
8901CFN.DO1;1	178	25-AUG-1992	10:24:46.37
8901CFN.DAT;2	48	21-AUG-1992	14:46:25.47
8901CFN.ROB;1	61	25-AUG-1992	10:24:44.48
8901CK.DAT;2	52	24-JUL-1989	09:15:30.03
8901CS.DAT;31	52	9-FEB-1989	14:43:42.37
8901TES.DAT;2	27	19-JUN-1990	14:30:39.87
8901TES.ROB;9	31	20-JUN-1990	15:29:29.18
8901TST.DAT;19	27	13-JUN-1990	09:03:12.62
8901TST.ROB;14	31	18-JUN-1990	16:11:30.01
8902AF.DAT;5	18	20-JUL-1989	13:58:55.69
8902AFN.DO1;1	112	25-AUG-1992	09:39:08.13
8902AFN.DAT;2	18	24-AUG-1992	16:29:56.24
8902AFN.ROB;1	23	25-AUG-1992	09:39:06.59
8902AS.DAT;17	18	11-APR-1989	11:32:38.00
8902BF.DAT;5	31	20-JUL-1989	14:05:08.03
8902BFN.DO1;2	145	26-AUG-1992	16:36:39.26
8902BFN.DAT;3	31	26-AUG-1992	16:13:24.73
8902BFN.ROB;2	40	26-AUG-1992	16:36:37.56
8902BS.DAT;29	31	11-APR-1989	14:09:33.32
8902CF.DAT;1	50	24-JUL-1989	09:28:29.85
8902CFN.DO1;1	183	25-AUG-1992	10:25:30.06
8902CFN.DAT;2	50	21-AUG-1992	14:46:26.05
8902CFN.ROB;1	63	25-AUG-1992	10:25:28.16
8902CK.DAT;1	52	20-JUL-1989	14:11:58.16
8902CS.DAT;22	52	11-APR-1989	14:13:01.87

Table 6.1.1. (continued)

Directory DUA3: [CONRAD.RUBY_214]

IJ98901N.DO1;1	141	17-AUG-1992	20:15:26.27
IJ98901N.DAT;2	33	17-AUG-1992	10:56:24.00
IJ98901N.ROB;3	42	17-AUG-1992	20:15:24.59
IJ98902N.DO1;1	206	17-AUG-1992	20:16:06.84
IJ98902N.DAT;2	52	17-AUG-1992	10:57:58.32
IJ98902N.ROB;3	65	17-AUG-1992	20:16:04.99
IJ98904N.DO1;1	237	17-AUG-1992	20:16:49.92
IJ98904N.DAT;1	64	14-AUG-1992	10:58:19.43
IJ98904N.ROB;4	80	17-AUG-1992	20:16:47.91
IJ98789T.DAT;3	458	17-AUG-1992	11:33:20.33
IJ98789T.ROB;5	574	17-AUG-1992	13:53:00.05
INJ8705N.DO1;1	100	17-AUG-1992	20:00:05.42
INJ8705N.DAT;5	12	13-AUG-1992	12:02:12.56
INJ8705N.ROB;6	15	17-AUG-1992	20:00:03.99
INJ8709N.DO1;1	151	17-AUG-1992	20:00:40.54
INJ8709N.DAT;5	31	17-AUG-1992	10:24:52.17
INJ8709N.ROB;6	40	17-AUG-1992	20:00:38.89
INJ8710N.DO1;1	150	17-AUG-1992	20:01:18.54
INJ8710N.DAT;4	31	17-AUG-1992	10:27:10.17
INJ8710N.ROB;4	39	17-AUG-1992	20:01:16.84
INJ8801N.DO1;1	156	17-AUG-1992	20:01:57.01
INJ8801N.DAT;3	36	13-AUG-1992	12:04:33.77
INJ8801N.ROB;3	45	17-AUG-1992	20:01:55.24
INJ8805N.DO1;1	185	17-AUG-1992	20:02:36.97
INJ8805N.DAT;4	34	13-AUG-1992	12:05:50.62
INJ8805N.ROB;4	43	17-AUG-1992	20:02:35.17
INJ8806N.DO1;1	136	17-AUG-1992	20:03:17.35
INJ8806N.DAT;4	22	13-AUG-1992	12:06:52.55
INJ8806N.ROB;3	29	17-AUG-1992	20:03:15.80
INJ8807N.DO1;1	199	17-AUG-1992	20:03:57.50
INJ8807N.DAT;8	41	13-AUG-1992	12:08:03.10
INJ8807N.ROB;8	52	17-AUG-1992	20:03:55.73
INJ8808N.DO1;1	204	17-AUG-1992	20:04:40.54
INJ8808N.DAT;3	48	13-AUG-1992	12:09:14.04
INJ8808N.ROB;5	61	17-AUG-1992	20:04:38.72
INJ8809N.DO1;1	122	17-AUG-1992	20:05:21.85
INJ8809N.DAT;3	33	21-AUG-1992	08:49:49.59
INJ8809N.ROB;8	42	24-AUG-1992	13:59:54.47
INJ8810N.DO1;1	140	17-AUG-1992	20:05:58.73
INJ8810N.DAT;5	28	17-AUG-1992	10:37:39.89
INJ8810N.ROB;4	35	17-AUG-1992	20:05:57.12
INJ8901N.DO1;1	141	17-AUG-1992	20:06:37.00
INJ8901N.DAT;3	33	17-AUG-1992	10:40:02.76
INJ8901N.ROB;3	42	17-AUG-1992	20:06:35.34
INJ8902N.DO1;1	209	17-AUG-1992	20:07:15.37
INJ8902N.DAT;4	52	17-AUG-1992	10:42:48.36
INJ8902N.ROB;4	65	17-AUG-1992	20:07:13.49
INJ8904N.DO1;1	243	17-AUG-1992	20:07:58.98
INJ8904N.DAT;9	64	13-AUG-1992	12:17:07.82
INJ8904N.ROB;9	80	17-AUG-1992	20:07:56.91
INJ8789T.DAT;5	458	17-AUG-1992	11:31:05.83
INJ8789T.ROB;7	574	24-AUG-1992	12:09:28.47
INJC07.DAT;16	22	23-SEP-1988	15:12:59.26
INJC08.DAT;19	33	30-NOV-1988	12:20:39.63
INJC08.ROB;1	41	30-JUL-1992	14:21:39.96

Total of 869 files, 92677 blocks.

Table 6.1.2. HFR VAX-4300 directory listing of experiment D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Directory DUA3: [CONRAD.RUBY_214DACOS]

D2148703.DAT;11	569	14-NOV-1991	11:16:39.52
D2148705.DAT;8	3467	14-NOV-1991	10:23:32.36
D2148709.DAT;12	2735	14-NOV-1991	11:34:26.16
D2148709_CORR.DAT;25	3269	29-JUN-1990	14:37:24.14
D2148710.DAT;10	3479	14-NOV-1991	11:35:09.27
D2148710_CORR.DAT;1	4159	29-JUN-1990	14:39:39.31
D2148801.DAT;9	3515	14-NOV-1991	10:00:16.48
D2148801_CORR.DAT;1	4202	29-JUN-1990	14:41:06.91
D2148802.DAT;7	3468	14-NOV-1991	10:19:34.74
D2148804.DAT;5	3486	14-NOV-1991	10:18:25.17
D2148805.DAT;3	3439	13-NOV-1991	10:46:45.73
D2148806.DAT;5	3359	14-NOV-1991	10:16:25.97
D2148807.DAT;5	2876	14-NOV-1991	10:15:19.87
D2148808.DAT;5	2914	14-NOV-1991	10:14:21.38
D2148809.DAT;7	2921	14-NOV-1991	10:12:18.01
D2148810.DAT;3	2872	27-JUL-1989	13:14:47.37
D2148811.DAT;3	2920	14-NOV-1991	10:10:39.64
D2148901.DAT;3	2948	14-NOV-1991	10:09:27.42
D2148902.DAT;3	3098	14-NOV-1991	10:02:11.20
D2148903.DAT;5	2948	14-NOV-1991	10:04:14.97
D2148904.DAT;3	3154	14-NOV-1991	10:05:55.43
D2148905.DAT;3	2948	14-NOV-1991	10:07:21.89
D2148906.DAT;5	3144	14-NOV-1991	10:08:17.16
D214ABC8703.DAT;12	258	15-NOV-1991	16:49:57.96
D214ABC8705.DAT;8	263	18-NOV-1991	17:05:52.15
D214ABC8709.DAT;4	1242	15-NOV-1991	16:41:52.08
D214ABC8710.DAT;5	1580	15-NOV-1991	16:42:36.13
D214ABC8801.DAT;3	1597	25-JUL-1989	13:30:40.53
D214ABC8802.DAT;3	1575	25-JUL-1989	13:31:48.82
D214ABC8804.DAT;7	1576	26-JUL-1989	09:43:37.73
D214ABC8805.DAT;3	1562	25-JUL-1989	14:20:19.41
D214ABC8806.DAT;6	1523	26-JUL-1989	09:18:01.05
D214ABC8807.DAT;4	1305	26-JUL-1989	09:21:05.75
D214ABC8808.DAT;2	1324	25-JUL-1989	14:26:16.47
D214ABC8809.DAT;3	1327	26-JUL-1989	12:24:46.70
D214ABC8810.DAT;4	1304	26-JUL-1989	12:25:30.74
D214ABC8811.DAT;4	1325	25-JUL-1989	14:53:26.00
D214ABC8901.DAT;2	1339	25-JUL-1989	13:16:22.34
D214ABC8902.DAT;3	1405	26-JUL-1989	09:24:14.43
D214ABC8903.DAT;2	1338	25-JUL-1989	13:22:48.69
D214ABC8904.DAT;2	1432	25-JUL-1989	13:26:52.94
D214ABC8905.DAT;2	1339	25-JUL-1989	14:05:01.26
D214ABC8906.DAT;7	1429	2-AUG-1989	09:46:04.14
REAPWR_C8709.DAT;1	251	12-JUN-1990	11:30:35.00
REAPWR_C8710.DAT;1	319	12-JUN-1990	09:20:00.00
REAPWR_C8801.DAT;1	323	11-JUN-1990	16:10:26.00
SWEEP8703.DAT;3	165	4-AUG-1989	08:59:50.78
SWEEP8705.DAT;2	131	4-AUG-1989	08:47:02.68
SWEEP8709.DAT;1	786	19-JUL-1989	00:00:00.00
SWEEP8710.DAT;2	1000	4-AUG-1989	08:39:25.99
SWEEP8801.DAT;3	1011	4-AUG-1989	08:40:03.43
SWEEP8802.DAT;1	997	4-MAR-1988	00:00:00.00
SWEEP8804.DAT;1	1002	26-MAY-1988	00:00:00.00
SWEEP8805.DAT;1	989	24-JUN-1988	00:00:00.00
SWEEP8806.DAT;1	966	18-JUL-1988	00:00:00.00
SWEEP8807.DAT;1	827	5-OCT-1988	00:00:00.00
SWEEP8808.DAT;1	838	31-OCT-1988	00:00:00.00
SWEEP8809.DAT;1	841	22-NOV-1988	00:00:00.00
SWEEP8810.DAT;1	826	13-DEC-1988	00:00:00.00
SWEEP8811.DAT;1	839	10-JAN-1989	00:00:00.00
SWEEP8901.DAT;1	847	8-FEB-1989	00:00:00.00
SWEEP8902.DAT;1	890	7-MAR-1989	00:00:00.00
SWEEP8903.DAT;1	847	26-APR-1989	00:00:00.00
SWEEP8904.DAT;1	907	23-MAY-1989	00:00:00.00
SWEEP8905.DAT;1	847	15-JUN-1989	00:00:00.00
SWEEP8906.DAT;2	905	4-AUG-1989	08:32:14.54

Total of 523 files, 166493 blocks.

6.2 REPRESENTATIVE TEMPERATURE DATA

Representative temperatures (see Sect. 4.2) have been chosen for selected times. Used in conjunction with the time intervals of constant temperature, these temperatures provide a convenience in analysis. The temperatures have been chosen for all 54 TCs employed in the HFR-B1 experiment. See also Figs. 4.2.1, 4.2.2, and 4.2.3. The data are presented in Tables 6.2.1, 6.2.2, and 6.2.3 for capsules 1, 2, and 3, respectively. On these tables, the data include:

the cycle number,

the date and time,

the number of EFPD,

the orientation (with respect to a reference north and corresponding south),

the relative location of the VDUs,

the neon content (%) of the purge gas,

the power (MW),

the control rod position with respect to the central reactor top lid (Crtl),

the TC number (TC No.), and

the TC responses (°C).

Table 6.2.1. Capsule 1: Representative temperatures at selected times, capsule and control rod position, gas composition and reactor power

Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle	87.03			87.05			87.09		87.10		88.01		88.02	
Date	13.04	22.04	4.05	8.06	9.06	29.06	28.10	16.11	20.11	14.12	11.01	1.02	4.02	29.02
Time	8.36	11.24	14.48	12.34	15.10	11.18	8.06	14.00	8.40	10.16	10.00	14.46	12.54	11.30
FPD	4	10	23	26	27	46	47	66	67	91	96	117	118	142
Orient.	F 8 N			F 8 S			F 8 N		F 8 S		F 2 S		F 2 N	
VDU	+93	+118	+118	+255	+255	+255	+110	+110	+110	+110	+65	+65	+65	+65
%Ne	0	0	0	0	86	0	0	0	0	0	0	0	0	0
MW	45			45			45			45	47.5	47.5	47.5	
Crtl	65	66	72	64	64	69	57	59	55	57	55	57	57	60
TC No.	Temperature (°C)													
1	774	753	769	479	733	507	758	771	698	720	709	733	712	749
2	744	721	739	454	703	482	780	791	731	747	725	747	750	791
3	823	800	820	504	761	534	833	844	767	783	782	805	767	800
4	795	767	786	509	767	542	835	849	766	781	784	808	756	788
5	783	761	782	473	722	502	795	811	728	749	753	780	727	763
6	0	0	0	0	0	0	862	876	798	821	816	843	794	831
7	748	723	742	456	705	483	756	771	709	729	733	760	700	736
8	750	729	746	485	739	514	768	779	747	759	739	761	728	757
9	797	764	782	503	761	535	799	810	775	792	770	794	756	790
10	823	795	815	500	756	530	804	814	784	802	773	797	767	802
11	755	726	745	473	724	505	756	768	733	757	730	755	725	764
12	822	802	822	520	777	553	843	856	817	841	813	840	801	840
13	756	728	743	485	736	512	736	748	720	743	704	727	721	760
14	724	702	720	464	715	492	773	782	732	748	713	733	738	772
15	806	778	796	501	759	533	821	829	762	782	759	781	778	816
16	799	768	786	508	767	541	823	832	767	788	752	772	776	813
17	765	739	759	478	729	509	789	802	727	741	736	757	722	749
18	687	680	669	537	581	550	847	857	795	822	790	813	807	848

Table 6.2.1. (continued)

Cycle		88.04			88.05					88.06				88.07	
Date	29.02	29.04	23.05	23.05	27.05	27.05	1.06	20.06	20.06	24.06	24.06	15.07	15.07	8.09	28.09
Time	12.16	8.54	12.00	14.18	10.16	16.32	11.52	13.42	15.34	9.06	14.48	11.12	15.28	10.54	16.23
FPD	142	144	168	168	169	169	174	193	193	194	194	216	216	217	217
Orient.		F 8 N			F 8 S					F 8 N				F 8 S	
VDU	+65	+45	+45	+45	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42
%Ne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW		47.5			47.5	47.5	47.5	47.5	47.5	45	45	45	45	45	45
Crtl	60	62	68	68	62	62	63	68	68	67	67	63	63	58	61
TC No.	Temperature (°C)														
1	748	770	777	778	780	786	787	792	792	754	757	773	773	723	749
2	791	810	815	816	811	817	818	824	823	761	764	780	780	728	749
3	800	820	824	825	830	835	835	838	838	820	823	838	838	773	798
4	788	819	823	825	832	836	836	838	838	814	816	836	836	763	786
5	763	800	807	808	808	813	815	820	820	797	800	817	817	745	773
6	831	861	866	867	870	877	877	881	881	855	858	873	873	808	833
7	736	779	784	786	791	796	797	803	803	760	762	779	779	735	762
8	757	798	797	798	800	805	806	810	809	742	745	757	757	753	774
9	790	835	836	838	841	846	847	852	852	776	778	788	788	783	805
10	802	846	847	849	849	854	855	860	860	775	778	789	789	797	819
11	764	809	816	818	814	820	822	830	830	745	747	763	763	761	787
12	840	891	895	897	889	895	896	902	902	817	820	838	838	835	860
13	760	798	802	803	799	805	807	813	813	719	722	737	737	749	775
14	772	791	791	793	788	794	796	799	798	730	732	747	747	744	764
15	816	827	831	832	827	833	834	839	838	769	771	789	789	779	802
16	813	832	835	836	829	835	836	839	839	781	783	789	789	768	789
17	749	771	774	776	784	790	790	792	792	770	772	794	794	752	780
18	848	878	882	883	881	887	888	893	893	815	818	836	836	822	847

Table 6.2.1. (continued)

Cycle		88.08		88.09	88.10				88.11	89.01		89.02		89.03	89.04
Date	28.09	5.10	18.10	17.11	22.11	28.11	5.12	12.12	16.12	17.01	24.01	16.02	27.02	6.04	1.05
Time	18.25	7.33	10.16	8.48	10.24	9.22	8.18	8.41	8.54	10.47	9.02	8.08	8.09	13.29	8.07
FPD	234	237	250	278	278	284	291	298	300	321	328	345	356	362	382
Orient.		F 8 N		F 8 S	F 8 N				F 8 S	F 8 N		F 8 S		F 8 N	F 8 S
VDU	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42
%Ne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW	45	45	45	45	45	45	45	45	45	41.5	41.5	45	45	45	45
Crtl	61	58	59	62	55	62	65	66	61	55	56	62	65	65	58
TC No.	Temperature (°C)														
1	748	747	736	753	770	786	794	796	746	0	0	798	0	767	0
2	750	743	734	745	785	799	806	807	741	765	767	788	791	765	738
3	797	788	778	794	835	851	860	860	782	810	811	831	836	813	778
4	789	780	772	789	828	843	850	852	771	797	801	821	825	799	766
5	775	770	761	779	807	826	835	837	757	780	784	813	820	789	758
6	833	832	819	833	865	884	889	893	815	837	841	871	875	842	814
7	762	758	744	766	779	799	804	808	747	752	755	803	807	759	749
8	777	766	757	779	760	775	780	784	757	736	738	813	820	737	759
9	808	799	789	813	784	801	805	808	787	758	762	846	851	764	787
10	819	813	801	827	782	797	804	805	796	757	761	856	863	766	801
11	787	783	767	795	757	774	782	786	771	735	738	832	839	748	779
12	861	850	838	865	838	856	864	862	839	809	812	900	907	815	842
13	776	772	758	784	737	754	761	764	767	722	728	825	834	737	775
14	766	765	753	769	742	757	762	762	761	736	740	814	820	746	767
15	804	798	785	806	772	788	795	795	792	768	770	847	853	774	791
16	791	783	773	800	778	794	801	802	784	771	773	839	846	781	789
17	778	777	762	791	768	785	797	797	775	759	764	830	839	774	773
18	847	847	834	849	833	851	858	858	835	813	818	892	897	823	836

Table 6.2.1. (continued)

Cycle		89.05					89.06							
Date	8.05	29.05	5.06	5.06	9.06	14.06	21.06	21.06	29.06	5.07	5.07	7.07	10.07	10.07
Time	9.02	8.14	8.09	13.11	8.49	14.50	8.31	13.57	9.47	9.01	13.15	8.48	8.44	23.44
FPD	390	407	414	414	418	423	426	426	434	440	440	442	442	445
Orient.		F 8 N					F 8 S						F 8 S	
VDU	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42	+42
%Ne	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW	45	45	45	45	44	44	42	42	41.5	40.7	40.7	40.4	45	45
Crtl	59	58	60	60	63	65	60	60	61	62	62	62	63	63
TC No.	Temperature (°C)													
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	733	762	769	768	758	752	701	702	701	692	693	690	738	740
2	772	802	809	811	798	792	734	735	733	724	725	722	773	773
3	761	792	800	799	787	781	725	726	725	717	717	715	765	765
4	751	776	785	785	773	769	718	717	718	709	709	708	758	760
5	806	830	839	840	826	819	767	768	768	759	759	757	810	812
6	744	754	760	761	749	743	714	715	714	706	706	704	753	755
7	753	728	735	734	719	715	718	719	718	711	711	708	755	757
8	780	744	751	752	738	733	744	744	743	737	736	733	785	785
9	793	742	749	748	735	730	749	750	751	743	743	740	793	793
10	773	730	737	739	726	720	734	733	734	727	727	724	777	779
11	833	797	804	804	789	784	790	791	791	782	783	781	834	838
12	767	720	727	728	713	709	721	724	723	716	715	713	764	767
13	760	725	732	732	719	713	706	707	706	699	698	696	748	749
14	785	754	762	762	750	743	735	735	736	729	729	727	779	781
15	783	754	761	761	749	743	724	725	725	717	717	714	768	768
16	766	751	758	758	746	742	721	722	722	714	715	711	765	766
17	830	803	811	812	798	792	776	777	778	769	768	766	822	822
18														

Table 6.2.2. Capsule 2: Representative temperatures at selected times, capsule and control rod position, gas composition and reactor power
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle	87.03			87.05			87.09		87.10		88.01		88.02
Date	13.04	22.04	4.05	8.06	9.06	29.06	28.10	16.11	20.11	14.12	11.01	1.02	4.02
Time	8.36	11.24	14.48	12.34	15.10	11.18	8.06	14.00	8.40	10.16	10.00	14.46	12.54
FPD	4	10	23	2			47	66	67	91	96	117	118
Orient.	F 8 N			F 8 S			F 8 N			F 8 S	F 2 S		F 8 N
VDU	-42	-17	-17	+120	+120	+120	-25	-25	-25	-25	-70	-70	-70
%Ne	0	0	0	0	22	0	0	0	0	0	0	0	0
MW	45			45			45		45		47.5	47.5	47.5
Crtl	65	66	72	64	64	69	57	59	55	57	55	57	57
TC No.	Temperature (°C)												
19	947	925	947	621	897	656	834	833	784	773	748	748	729
20	0	0	0	0	0	0	836	835	787	770	751	751	732
21	806	796	786	636	682	651	888	889	846	833	802	805	789
22	844	835	826	680	727	697	913	911	870	862	821	823	817
23	862	854	846	696	744	715	887	886	838	832	792	793	789
24	724	715	706	568	613	585	839	838	788	782	750	752	742
25	916	909	901	761	814	777	895	892	874	868	814	816	811
26	733	842	832	591	747	719	866	864	847	839	792	794	782
27	709	702	693	574	618	591	796	793	784	773	730	732	722
28	883	876	867	764	816	779	791	789	783	773	726	725	727
29	0	0	0	0	0	0	805	801	797	791	735	735	737
30	792	772	761	644	689	659	862	858	846	843	785	784	788
31	956	1097	963	1010	1015	1021	904	918	869	868	844	812	826
32	853	847	838	700	748	720	867	865	844	838	779	779	799
33	709	700	691	581	627	600	806	800	783	772	712	713	739
34	885	872	864	766	820	782	813	806	784	768	714	712	738
35	946	965	948	796	871	846	830	820	780	774	728	731	747
36	793	780	768	636	683	651	885	880	840	837	787	787	801

Table 6.2.2. (continued)

Cycle			88.04			88.05					88.06				88.07
Date	29.02	29.02	29.04	23.05	23.05	27.05	27.05	1.06	20.06	20.06	24.06	24.06	15.07	15.07	8.09
Time	11.30	12.16	8.54	12.00	14.18	10.16	16.32	11.52	13.42	15.34	9.06	14.48	11.12	15.28	10.54
FPD	142	142	144	168	168	169	169	174	193	193	194	194	216	216	216
Orient.			F 8 N			F 8 S					F 8 N				F 8 S
VDU	-70	-70	-90	-90	-90	-93	-93	-93	-93	-93	-93	-93	-93	-93	-93
%Ne	40	0	0	60	0	0	30	35	40	0	0	60	60	0	0
MW			47.5			47.5	47.5	47.5	47.5	47.5	45	45	45	45	45
Crtl	60	60	62	68	68	62	62	63	68	68	67	67	63	63	58
TC No.	Temperature (°C)														
19	899	724	737	919	725	740	862	918	935	728	715	937	926	730	710
20	890	725	736	908	726	744	861	912	929	734	711	922	910	726	711
21	950	772	794	975	778	801	922	976	996	785	754	978	969	772	766
22	977	796	818	997	798	824	949	1003	1018	806	771	1000	984	788	0
23	952	772	789	970	771	793	918	973	989	778	753	981	966	768	758
24	910	732	740	920	724	742	866	923	938	731	710	932	926	729	713
25	974	794	830	1011	812	837	961	1015	1030	819	762	991	972	776	799
26	946	768	800	982	786	805	930	984	1001	791	739	964	949	755	774
27	891	713	735	923	725	743	868	925	943	733	680	901	895	701	717
28	897	724	742	926	735	753	874	929	948	744	680	896	890	702	718
29	897	733	765	937	755	778	893	943	959	767	697	906	895	716	738
30	952	774	809	990	794	821	943	997	1012	805	739	964	945	752	781
31	988	807	831	1001	814	827	1006	990	1027	885	764	993	977	781	795
32	963	785	808	987	790	813	937	991	1005	798	737	964	948	754	776
33	907	728	740	923	725	743	868	925	939	733	676	898	889	695	717
34	910	733	743	923	729	748	870	925	942	740	692	911	893	704	714
35	907	740	751	922	737	757	873	924	941	748	697	909	892	712	712
36	966	786	805	985	785	808	932	984	1001	793	748	976	960	763	770

Table 6.2.2. (continued)

Cycle			88.08		88.09	88.10				88.11	89.01		89.02		89.03
Date	28.09	28.09	5.10	18.10	17.11	22.11	28.11	5.12	12.12	16.12	17.01	24.01	16.02	27.02	6.04
Time	16.23	18.25	7.33	10.16	8.48	10.24	9.22	8.18	8.41	8.54	10.47	9.02	8.08	8.09	13.29
FPD	217	234	237	250	278	278	284	291	298	300	321	328	345	356	362
Orient.			F 8 N		F 8 S	F 8 N				F 8 S	F 8 N		F 8 S		F 8 N
VDU	-93	-93	-93	-93	-93	-93	-93	-9	-93	-93	-93	-93	-93	-93	-93
%Ne	40	0	40	0	0	0	0	20	40	0	100	100	0	50	40
MW	45	45	45	45	45	45	45	45	45	45	41.5	41.5	45	45	45
Crtl	61	61	58	59	62	55	62	65	66	61	55	56	62	65	65
TC No.	Temperature (°C)														
19	873	704	711	914	705	759	759	871	1000	717	1008	1010	768	909	907
20	867	708	715	904	711	756	759	865	984	718	986	988	767	903	895
21	931	758	768	967	771	810	811	915	1037	768	1043	1044	821	960	941
22	0	0	0	0	0	0	0	0	1057	790	0	0	0	0	959
23	922	750	770	970	769	808	810	916	1042	767	1049	1050	823	964	946
24	879	711	718	923	715	766	763	872	996	719	1007	1008	765	913	905
25	964	794	805	1001	805	817	817	922	1042	801	1047	1048	858	999	947
26	939	770	777	973	780	795	795	899	1022	776	1027	1030	766	972	927
27	881	710	721	923	718	727	728	834	957	718	966	970	771	912	869
28	880	714	727	925	715	716	715	823	948	720	954	959	794	917	861
29	895	739	752	937	736	733	732	829	948	737	951	954	841	925	869
30	944	776	793	987	787	788	789	888	1010	783	1017	1018	859	982	921
31	961	790	809	1005	810	824	824	927	1047	803	1056	1057	841	1001	954
32	938	770	788	986	793	792	794	895	1016	786	1028	1026	777	981	925
33	881	713	726	930	732	727	727	834	956	728	969	971	782	921	872
34	880	713	726	923	731	732	739	845	968	739	983	984	785	924	880
35	869	711	725	909	731	747	755	855	973	742	981	984	833	919	885
36	936	763	781	980	782	802	804	909	1033	780	1043	1044		976	939

Table 6.2.2. (continued)

Cycle	89.04		89.05					89.06							
Date	1.05	8.05	29.05	5.06	5.06	9.06	14.06	21.06	21.06	29.06	5.07	5.07	7.07	10.07	10.07
Time	8.07	9.02	8.14	8.09	13.11	8.49	14.50	8.31	13.57	9.47	9.01	13.15	8.48	8.44	23.44
FPD	382	390	407	414	414	418	423	426	426	434	440	440	442	442	445
Orient.	F 8 S		F 8 N					F 8 S						F 8 S	
VDU	-93	-93	-93	-93	-93	-93	-93	-93	-93	-93	-93	-93	-93	-93	-93
%Ne	0	28	0	28	80	80	28	0	85	85	85	100	100	100	0
MW	45	45	45	45	45	44	44	42	42	41.5	40.7	40.7	40.4	45	45
Crtl	58	59	58	60	60	63	65	60	60	61	62	62	62	63	63
TC No.	Temperature (°C)														
19	815	715	738	803	1014	1017	812	688	969	971	962	997	993	1038	714
20	809	714	730	792	989	993	801	690	955	959	950	983	979	1024	716
21	863	767	766	820	1022	1009	797	726	994	994	983	1035	1036	1085	756
22	888	794	798	861	1067	0	604	0	0	0	0	0	0	0	0
23	866	769	783	847	1054	1052	849	739	1015	1015	1005	1040	1036	1087	756
24	822	719	743	808	1015	1015	811	693	969	970	961	995	992	1037	714
25	898	805	784	847	1053	1050	850	774	1045	1046	1035	1072	1067	1120	789
26	874	781	762	827	1033	1033	833	751	1024	1027	1017	1053	1048	1099	770
27	823	723	704	772	978	982	779	699	976	980	970	1006	1001	1049	721
28	819	726	692	758	961	964	768	704	973	979	970	1005	1003	1052	731
29	832	747	707	770	959	962	780	720	969	975	968	1001	997	1045	745
30	883	791	759	822	1025	1022	827	761	1029	1031	1021	1057	1053	1104	778
31	898	805	792	854	1060	1057	857	774	1045	1045	1035	1070	1066	1118	789
32	881	789	765	828	1031	1029	830	758	1028	1029	1019	1054	1050	1102	775
33	831	736	710	777	982	985	780	704	980	986	973	1011	1005	1054	726
34	830	735	722	786	987	988	794	709	980	983	973	1009	1006	1053	737
35	829	740	731	791	979	982	800	712	967	971	963	995	992	1038	738
36	874	779	775	838	1047	1046	844	751	1026	1027	1016	1052	1047	1097	769

Table 6.2.3. Capsule 3: Representative temperatures at selected times, capsule and control rod position, gas composition and reactor power
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle	87.03			87.05			87.09		87.10		88.01		88.02
Date	13.04	22.04	4.05	8.06	9.06	29.06	28.10	16.11	20.11	14.12	11.01	1.02	4.02
Time	8.36	11.24	14.48	12.34	15.10	11.18	8.06	14.00	8.40	10.16	10.00	14.46	12.54
FPD	4	10	23	2		46	47	66	67	91	96	117	118
Orient.	F 8 N			F 8 S			F 8 N		F 8 S		F 2 S		F 2 N
VDU	-214	-171	-171	-32	-32	-32	-180	-180	-180	-180	-225	-225	-225
%Ne	0	34	0	0	0	0	0	0	0	0	0	0	0
MW	45			45			45		45		47.5	47.5	47.5
Crtl	65	66	72	64	64	69	57	59	55	57	55	57	57
TC No.	Temperature (°C)												
37	715	708	698	569	614	587	857	859	843	819	756	752	746
38	782	913	785	820	825	825	843	848	835	812	750	747	744
39	781	904	778	807	810	812	894	906	894	876	802	800	799
40	671	650	638	542	587	555	916	928	914	893	814	811	816
41	811	947	819	863	868	873	902	910	890	866	794	790	793
42	711	699	689	578	623	595	841	849	832	811	747	742	739
43	769	903	779	814	820	819	912	922	924	905	810	806	824
44	819	952	824	860	865	868	889	901	908	886	797	794	803
45	821	955	828	892	897	904	826	838	849	829	744	739	747
46	808	940	813	877	882	887	724	948	1078	914	670	712	576
47	763	887	764	837	842	843	833	836	857	835	741	736	761
48	0	893	769	763	646	847	886	893	903	884	785	781	806
49	771	894	769	835	839	841	917	926	918	896	806	802	824
50	802	931	805	875	880	886	892	900	899	876	780	775	804
51	824	957	829	886	892	897	833	841	839	816	725	718	748
52	803	935	807	869	874	879	844	850	836	815	729	723	752
53	757	889	765	826	832	834	911	848	887	869	725	777	773
54	770	832	776	831	776	823	901	910	894	874	792	786	807

Table 6.2.3. (continued)

Cycle			88.04			88.05					88.06				88.07
Date	29.02	29.02	29.04	23.05	23.05	27.05	27.05	1.06	20.06	20.06	24.06	24.06	15.07	15.07	8.09
Time	11.30	12.16	8.54	12.00	14.18	10.16	16.32	11.52	13.42	15.34	9.06	14.48	11.12	15.28	10.54
FPD	142	142	144	168	168	169	169	174	193	193	194	194	216	216	217
Orient.			F 8 N			F 8 S					F 8 N				F 8 S
VDU	-225	-225	-230	-230	-230	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250
%Ne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW			47.5			47.5	47.5	47.5	47.5	47.5	45	45	45	45	45
Crtl	60		62	68	68	62	62	63	68	68	67	67	63	63	58
TC No.	Temperature (°C)														
37	721	721	703	686	687	703	706	704	687	686	670	667	694	694	679
38	721	720	707	692	693	710	713	711	697	696	676	674	692	691	684
39	773	773	756	739	740	758	761	759	741	740	709	705	734	734	733
40	789	789	770	752	754	771	774	772	754	752	718	716	747	747	747
41	768	768	746	728	730	747	749	747	729	728	703	700	730	730	0
42	716	716	694	675	676	692	694	693	675	674	655	653	678	678	666
43	797	797	781	763	765	782	785	783	765	764	710	707	738	737	759
44	777	777	766	0	750	768	771	769	752	751	697	695	725	724	734
45	722	722	714	0	697	716	718	717	700	698	647	645	673	673	691
46	729	728	419	0	709	490	467	728	690	644	651	649	676	676	0
47	736	736	735	0	720	731	734	733	718	717	655	653	681	680	716
48	779	779	766	0	753	767	769	768	751	749	689	686	716	716	746
49	797	797	774	0	757	776	779	776	758	757	711	708	740	740	748
50	778	778	756	0	740	757	760	758	740	739	687	684	716	715	733
51	727	723	700	0	683	698	701	699	682	681	636	633	659	659	677
52	727	727	704	0	688	702	705	703	686	685	647	644	672	671	681
53	728	784	711	0	695	713	716	714	696	695	663	660	689	688	689
54	781	780	755	0	739	756	759	757	739	737	701	698	729	729	732

Table 6.2.3. (continued)

Cycle			88.08		88.09	88.10				88.11	89.01		89.02		89.03
Date	28.09	28.09	5.10	18.10	17.11	22.11	28.11	5.12	12.12	16.12	17.01	24.01	16.02	27.02	6.04
Time	16.23	18.25	7.33	10.16	8.48	10.24	9.22	8.18	8.41	8.54	10.47	9.02	8.08	8.09	13.29
FPD	217	234	237	250	278	278	284	291	298	300	321	328	345	356	362
Orient.			F 8 N		F 8 S	F 8 N				F 8 S	F 8 N		F 8 S		F 8 N
VDU	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250
%Ne	0	0	0	0	0	0	20	20	20	0	0	0	0	0	0
MW	45	45	45	45	45	45	45	45	45	45	41.5	41.5	45	45	45
Crtl	61	61	58	59	62	55	62	65	66	61	55	56	62	65	65
TC No.	Temperature (°C)														
37	669	669	672	675	672	824	888	884	877	686	722	717	718	710	678
38	674	675	680	682	675	826	890	887	880	695	728	724	729	722	685
39	720	721	728	730	728	871	925	922	914	735	764	761	777	768	717
40	735	735	741	743	742	884	938	933	925	747	776	773	791	783	727
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	655	655	659	662	659	805	868	864	856	675	706	701	704	697	662
43	745	745	754	753	753	873	926	922	914	757	766	763	804	796	717
44	727	739	738	740	732	851	904	901	897	753	761	748	789	780	703
45	678	679	688	691	687	795	857	854	845	699	698	697	734	727	651
46	622	618	634	550	700	802	866	864	856	709	703	702	0	614	0
47	705	705	709	710	708	804	869	868	860	714	705	705	761	752	658
48	732	731	738	739	740	846	905	903	894	744	744	742	789	782	694
49	734	735	746	750	747	876	930	926	915	750	767	765	795	778	717
50	719	719	728	730	730	847	905	901	893	733	741	739	778	770	690
51	664	664	669	671	670	783	848	846	838	681	684	681	714	706	635
52	671	671	676	679	680	801	867	863	853	686	696	693	723	716	648
53	679	680	687	690	693	819	885	882	874	697	716	712	736	729	670
54	720	720	725	730	728	864	920	915	906	732	757	753	775	767	706

Table 6.2.3. (continued)

Cycle	89.04		89.05											89.06	
Date	1.05	8.05	29.05	5.06	5.06	9.06	14.06	21.06	21.06	29.06	5.07	5.07	7.07	10.07	10.07
Time	8.07	9.02	8.14	8.09	13.11	8.49	14.50	8.31	13.57	9.47	9.01	13.15	8.48	8.44	23.44
FPD	382	390	407	414	414	418	423	426	426	434	440	440	442	442	445
Orient.	F 8 S		F 8 N					F 8 S						F 8 S	
VDU	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250	-250
%Ne	0	0	0	0	0	0	0	0	0	20	20	20	20	20	0
MW	45	45	45	45	45	44	44	42	42	41.5	40.7	40.7	40.4	45	45
Crtl	58	59	58	60	60	63	65	60	60	61	62	62	62	63	63
TC No.	Temperature (°C)														
37	680	681	687	687	688	667	657	634	635	687	667	670	666	707	651
38	688	691	695	696	695	675	665	648	648	700	680	683	679	723	666
39	731	734	729	728	729	708	697	685	685	737	714	716	713	758	700
40	745	748	740	740	740	719	708	696	697	750	725	728	723	770	712
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	665	666	670	669	669	650	641	621	621	672	651	655	650	691	636
43	753	758	729	730	729	709	698	710	709	762	735	739	735	782	723
44	740	741	715	714	715	693	685	696	696	747	724	727	722	769	711
45	689	690	658	658	658	639	629	646	647	697	676	679	675	719	663
46	0	702	0	663	663	0	0	0	0	712	0	0	0	0	0
47	711	713	669	669	670	651	642	671	671	723	701	705	701	748	690
48	742	744	708	707	708	687	677	698	699	750	725	729	724	771	713
49	748	0	729	0	731	663	699	702	701	753	728	731	726	774	718
50	728	731	709	709	709	690	679	689	689	741	717	719	716	761	703
51	668	670	655	654	655	637	627	635	636	685	665	668	663	705	649
52	674	677	665	664	664	647	637	636	636	688	666	670	665	709	651
53	689	691	684	683	683	665	655	645	647	697	675	679	675	717	660
54	728	730	717	716	716	697	686	677	678	730	706	709	705	749	692

6.3 NUCLEAR DATA

The nuclear data consist of (1) post-cycle HIP-TEDDIE volume-averaged data, (2) power and burnup data and graphs, and (3) fast neutron fluence values per cycle, averaged and for two cut-off energies.

The post-cycle HIP-TEDDIE volume-averaged data are presented in Tables 6.3.1 through 6.3.23. In each table, the startup fluence rate (flux), the cycle average fluence rate, and the fluence are given where appropriate for, or corresponding to, the following quantities: (1) the four energy groups used in the HIP-TEDDIE code; (2) the fission, 2200 m/s and the EDN flux; (3) the flux for cutoff energies of 0.1 and 1.0 MeV; and (4) the damage flux graphite. Also given are the nuclear heating, the axial shape factors, and the number of EFPD. For cycle 87.03.1, the change in the value of the EFPD is given by the handwritten entry.

The volume-averaged fluence rates per cycle and the irradiation times are given in Table 6.3.24. The volume-averaged power and burnup, the power and burnup at maximum flux, and the power and burnup for GA and KFA piggyback samples for the uranium and thorium chains (except for KFA piggyback samples with only uranium chains contributing) are presented as a function of the number of EFPD in Figs. 6.3.1 through 6.3.14 and in Tables 6.3.25 through 6.3.31. The power and burnups are given for each fissioning nuclide and for the sum of the contributions in the uranium and thorium chains. The figures follow the table with the corresponding data.

In Tables 6.3.32 through 6.3.34, the fast neutron fluences at the end of each cycle for $E > 0.1$ MeV, the cycle mean fast neutron fluences for $E > 0.1$ MeV but adjusted to the final fluence values, and the cycle mean fast neutron fluences for $E > 0.18$ MeV adjusted to the final fluence values are presented. The latter table applies to the HTGR. The method and data used to convert fluence values from the HFR to the HTGR are described in ref. 29.

Table 6.3.1. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 87.03.1
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle average fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	.561	.0405	.562
Neutron flux 2 1.353MeV>E>.0674MeV	1.003	.0723	1.003
Neutron flux 3 .0674MeV>E>.683 eV	1.326	.0957	1.328
Neutron flux 4 E<.683 eV	.846	.0616	.855
Fission flux	.742	.0535	.743
2200 m/s flux	.772	.056	.777
Neutron flux E>1 MeV	.707	.0509	.706
Neutron flux E>.1 MeV	1.465	.1056	1.465
DAR Graphite (1)	2.219	-	-
Damage flux Graphite	1.741	.1255	1.742
EDN flux (2)	.957	.0689	.956
Nuclear heating W/g	3.199	3.236	-
DPA Graphite (3)	-	.0911	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	8.340 7.52	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom

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Table 6.3.2. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 87.03.2
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle average fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	.563	.071	.559
Neutron flux 2 1.353MeV>E>.0674MeV	1.006	.128	1.008
Neutron flux 3 .0674MeV>E>.683 eV	1.329	.169	1.332
Neutron flux 4 E<.683 eV	.852	.110	.867
Fission flux	.744	.094	.741
2200 m/s flux	.776	.100	.788
Neutron flux E>1 MeV	.709	.090	.709
Neutron flux E>.1 MeV	1.469	.186	1.465
DAR Graphite (1)	2.219	-	-
Damage flux Graphite	1.745	.221	1.741
EDN flux (2)	.959	.122	.961
Nuclear heating W/g	3.204	3.279	-
DPA Graphite (3)	-	.161	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	14.690	-
		13.75	

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

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Table 6.3.3. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 87.05
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle average fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	.508	.105	.514
Neutron flux 2 1.353MeV>E>.0674MeV	.914	.190	.930
Neutron flux 3 .0674MeV>E>.683 eV	1.211	.252	1.233
Neutron flux 4 E<.683 eV	.748	.159	.778
Fission flux	.678	.139	.680
2200 m/s flux	.687	.145	.710
Neutron flux E>1 MeV	.640	.133	.651
Neutron flux E>.1 MeV	1.331	.276	1.351
DAR Graphite (1)	2.23	-	-
Damage flux Graphite	1.582	.328	1.605
EDN flux (2)	.869	.180	.881
Nuclear heating W/g	2.932	3.083	-
DPA Graphite (3)	-	.238	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	23.650	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.4. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 87.09
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E>. 1.353 MeV	.650	.113	.653
Neutron flux 2 1.353MeV>E>.0674MeV	1.190	.207	1.196
Neutron flux 3 .0674MeV>E>.683 eV	1.591	.278	1.606
Neutron flux 4 E<.683 eV	1.072	.193	1.115
Fission flux	.859	.149	.861
2200 m/s flux	.966	.173	1.000
Neutron flux E>1 MeV	.822	.143	.826
Neutron flux E>.1 MeV	1.722	.299	1.728
DAR Graphite (1)	2.255	-	-
Damage flux Graphite	2.048	.356	2.057
EDN flux (2)	1.125	.196	1.133
Nuclear heating W/g	3.83	3.97	-
DPA Graphite (3)	-	.259	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	20.03	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.5. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 87.10.1
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	.633	.087	.631
Neutron flux 2 1.353MeV>E>.0674MeV	1.158	.159	1.153
Neutron flux 3 .0674MeV>E>.683 eV	1.548	.214	1.552
Neutron flux 4 E<.683 eV	1.058	.149	1.081
Fission flux	.837	.115	.834
2200 m/s flux	.950	.134	.972
Neutron flux E>1 MeV	.801	.110	.798
Neutron flux E>.1 MeV	1.677	.231	1.675
DAR Graphite (1)	2.254	-	-
Damage flux Graphite	1.995	.275	1.994
EDN flux (2)	1.096	.151	1.095
Nuclear heating W/g	3.77	3.84	-
DPA Graphite (3)	-	.199	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	15.96	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.6. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 87.10.2
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	.646	.048	.641
Neutron flux 2 1.353MeV>E>.0674MeV	1.181	.088	1.175
Neutron flux 3 .0674MeV>E>.683 eV	1.578	.117	1.562
Neutron flux 4 E<.683 eV	1.098	.083	1.108
Fission flux	.854	.063	.841
2200 m/s flux	.983	.074	.988
Neutron flux E>1 MeV	.817	.061	.814
Neutron flux E>.1 MeV	1.710	.127	1.695
DAR Graphite (1)	2.252	-	-
Damage flux Graphite	2.034	.151	2.016
EDN flux (2)	1.118	.083	1.108
Nuclear heating W/g	3.83	3.82	-
DPA Graphite (3)	-	.1097	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	8.67	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.7. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.01
Position : F 2
Orientation : South

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.511	0.114	0.512
Neutron flux 2 1.353MeV>E>.0674MeV	0.952	0.213	0.957
Neutron flux 3 .0674MeV>E>.683 eV	1.254	0.281	1.263
Neutron flux 4 E<.683 eV	0.768	0.176	0.791
Fission flux	0.676	0.151	0.678
2200 m/s flux	0.707	0.161	0.723
Neutron flux E>1 MeV	0.649	0.145	0.652
Neutron flux E>.1 MeV	1.369	0.306	1.375
DAR Graphite (1)	2.279	-	-
Damage flux Graphite	1.628	0.364	1.635
EDN flux (2)	0.895	0.200	0.899
Nuclear heating W/g	2.91	3.06	-
DPA Graphite (3)	-	0.264	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	25.76	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.8. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.02
Position : F 2
Orientation : North

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.574	0.125	0.569
Neutron flux 2 1.353MeV>E>.0674MeV	1.071	0.233	1.060
Neutron flux 3 .0674MeV>E>.683 eV	1.408	0.308	1.401
Neutron flux 4 E<.683 eV	0.898	0.201	0.915
Fission flux	0.759	0.165	0.751
2200 m/s flux	0.819	0.183	0.833
Neutron flux E>1 MeV	0.729	0.159	0.723
Neutron flux E>.1 MeV	1.540	0.335	1.524
DAR Graphite (1)	2.282	-	-
Damage flux Graphite	1.832	0.399	1.815
EDN flux (2)	1.006	0.219	1.000
Nuclear heating W/g	3.24	3.31	-
DPA Graphite (3)	-	0.290	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	25.44	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.9. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.04
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.596	0.131	0.589
Neutron flux 2 1.353MeV>E>.0674MeV	1.078	0.236	1.061
Neutron flux 3 .0674MeV>E>.683 eV	1.433	0.316	1.420
Neutron flux 4 E<.683 eV	0.937	0.213	0.957
Fission flux	0.788	0.173	0.778
2200 m/s flux	0.850	0.192	0.883
Neutron flux E>1 MeV	0.752	0.165	0.742
Neutron flux E>.1 MeV	1.567	0.344	1.546
DAR Graphite (1)	2.238	-	-
Damage flux Graphite	1.863	0.408	1.834
EDN flux (2)	1.023	0.224	1.007
Nuclear heating W/g	3.48	3.55	-
DPA Graphite (3)	-	0.297	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	25.75	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.10. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.05
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.610	0.132	0.606
Neutron flux 2 1.353MeV>E>.0674MeV	1.103	0.239	1.097
Neutron flux 3 .0674MeV>E>.683 eV	1.461	0.318	1.460
Neutron flux 4 E<.683 eV	0.928	0.208	0.955
Fission flux	0.806	0.175	0.803
2200 m/s flux	0.847	0.189	0.868
Neutron flux E>1 MeV	0.770	0.167	0.767
Neutron flux E>.1 MeV	1.601	0.348	1.598
DAR Graphite (1)	2.238	-	-
Damage flux Graphite	1.906	0.414	1.901
EDN flux (2)	0.883	0.227	1.042
Nuclear heating W/g	3.56	3.66	-
DPA Graphite (3)	-	0.300	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	25.21	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.11. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.06.1
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.541	0.048	0.540
Neutron flux 2 1.353MeV>E>.0674MeV	0.987	0.088	0.984
Neutron flux 3 .0674MeV>E>.683 eV	1.305	0.117	1.304
Neutron flux 4 E<.683 eV	0.872	0.079	0.869
Fission flux	0.716	0.064	0.714
2200 m/s flux	0.787	0.071	0.793
Neutron flux E>1 MeV	0.684	0.062	0.683
Neutron flux E>.1 MeV	1.430	0.128	1.428
DAR Graphite (1)	2.248	-	-
Damage flux Graphite	1.701	0.152	1.697
EDN flux (2)	0.934	0.084	0.933
Nuclear heating W/g	3.03	3.06	-
DPA Graphite (3)	-	0.1103	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	10.36	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.12. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.06.2
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.546	0.049	0.544
Neutron flux 2 1.353MeV>E>.0674MeV	0.994	0.0893	0.991
Neutron flux 3 .0674MeV>E>.683 eV	1.316	0.1184	1.314
Neutron flux 4 E<.683 eV	0.882	0.0802	0.890
Fission flux	0.722	0.0648	0.719
2200 m/s flux	0.796	0.0722	0.801
Neutron flux E>1 MeV	0.690	0.062	0.690
Neutron flux E>.1 MeV	1.442	0.1295	1.437
DAR Graphite (1)	2.247	-	-
Damage flux Graphite	1.714	0.1549	1.719
EDN flux (2)	0.942	0.0846	0.939
Nuclear heating W/g	3.04	3.08	-
DPA Graphite (3)	-	0.1118	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	10.43	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.13. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.07
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.541	0.098	0.539
Neutron flux 2 1.353MeV>E>.0674MeV	0.988	0.179	0.985
Neutron flux 3 .0674MeV>E>.683 eV	1.307	0.237	1.303
Neutron flux 4 E<.683 eV	0.857	0.159	0.875
Fission flux	0.717	0.130	0.715
2200 m/s flux	0.776	0.144	0.792
Neutron flux E>1 MeV	0.685	0.124	0.682
Neutron flux E>.1 MeV	1.432	0.259	1.425
DAR Graphite (1)	2.247	-	-
Damage flux Graphite	1.702	0.308	1.694
EDN flux (2)	0.935	0.169	0.930
Nuclear heating W/g	3.03	3.10	-
DPA Graphite (3)	-	0.224	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	21.04	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.14. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.08
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.549	0.101	0.545
Neutron flux 2 1.353MeV>E>.0674MeV	1.000	0.184	0.993
Neutron flux 3 .0674MeV>E>.683 eV	1.322	0.245	1.323
Neutron flux 4 E<.683 eV	0.871	0.165	0.891
Fission flux	0.726	0.134	0.723
2200 m/s flux	0.788	0.149	0.804
Neutron flux E>1 MeV	0.694	0.128	0.691
Neutron flux E>.1 MeV	1.449	0.267	1.441
DAR Graphite (1)	2.247	-	-
Damage flux Graphite	1.723	0.318	1.717
EDN flux (2)	0.947	0.175	0.945
Nuclear heating W/g	3.06	3.14	-
DPA Graphite (3)	-	0.231	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	21.44	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.15. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.09
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.551	0.101	0.550
Neutron flux 2 1.353MeV>E>.0674MeV	1.000	0.183	0.996
Neutron flux 3 .0674MeV>E>.683 eV	1.325	0.243	1.323
Neutron flux 4 E<.683 eV	0.899	0.169	0.920
Fission flux	0.729	0.133	0.724
2200 m/s flux	0.809	0.151	0.822
Neutron flux E>1 MeV	0.696	0.127	0.691
Neutron flux E>.1 MeV	1.452	0.265	1.442
DAR Graphite (1)	2.247	-	-
Damage flux Graphite	1.727	0.315	1.715
EDN flux (2)	0.949	0.173	0.942
Nuclear heating W/g	3.09	3.15	-
DPA Graphite (3)	-	0.229	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	21.26	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.16. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.10
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.600	0.108	0.598
Neutron flux 2 1.353MeV>E>.0674MeV	1.077	0.194	1.073
Neutron flux 3 .0674MeV>E>.683 eV	1.429	0.258	1.427
Neutron flux 4 E<.683 eV	1.004	0.186	1.029
Fission flux	0.794	0.143	0.791
2200 m/s flux	0.897	0.165	0.913
Neutron flux E>1 MeV	0.756	0.136	0.752
Neutron flux E>.1 MeV	1.570	0.283	1.566
DAR Graphite (1)	2.286	-	-
Damage flux Graphite	1.866	0.336	1.859
EDN flux (2)	1.025	0.185	1.023
Nuclear heating W/g	3.46	3.54	-
DPA Graphite (3)	-	0.244	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	20.92	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.17. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 88.11
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.558	0.103	0.557
Neutron flux 2 1.353MeV>E>.0674MeV	1.011	0.186	1.006
Neutron flux 3 .0674MeV>E>.683 eV	1.352	0.250	1.352
Neutron flux 4 E<.683 eV	0.935	0.177	0.957
Fission flux	0.738	0.136	0.736
2200 m/s flux	0.838	0.157	0.849
Neutron flux E>1 MeV	0.703	0.130	0.703
Neutron flux E>.1 MeV	1.469	0.270	1.466
DAR Graphite (1)	2.239	-	-
Damage flux Graphite	1.747	0.321	1.736
EDN flux (2)	0.960	0.177	0.957
Nuclear heating W/g	3.24	3.30	-
DPA Graphite (3)	-	0.233	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	21.40	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.18. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 89.01
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*10^18	Neutron fluence m^-2*10^25	Cycle averaged fluence rate m^-2 s^-1*10^18
Neutron flux 1 E> 1.353 MeV	0.572	0.103	0.569
Neutron flux 2 1.353MeV>E>.0674MeV	1.019	0.183	1.011
Neutron flux 3 .0674MeV>E>.683 eV	1.363	0.246	1.358
Neutron flux 4 E<.683 eV	0.950	0.177	0.972
Fission flux	0.757	0.136	0.751
2200 m/s flux	0.850	0.157	0.861
Neutron flux E>1 MeV	0.720	0.129	0.712
Neutron flux E>.1 MeV	1.491	0.268	1.481
DAR Graphite (1)	2.216	-	-
Damage flux Graphite	1.771	0.318	1.756
EDN flux (2)	0.960	0.175	0.966
Nuclear heating W/g	3.3	3.36	-
DPA Graphite (3)	-	0.231	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	20.96	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.19. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 89.02
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*E 18	Neutron fluence m^-2*E 25	Cycle averaged fluence rate m^-2 s^-1*E 18
Neutron flux 1 E> 1.353 MeV	0.572	0.101	0.622
Neutron flux 2 1.353MeV>E>.0674MeV	1.127	0.182	1.120
Neutron flux 3 .0674MeV>E>.683 eV	1.513	0.245	1.508
Neutron flux 4 E<.683 eV	1.073	0.178	1.096
Fission flux	0.831	0.134	0.825
2200 m/s flux	0.957	0.158	0.973
Neutron flux E>1 MeV	0.792	0.128	0.788
Neutron flux E>.1 MeV	1.644	0.265	1.631
DAR Graphite (1)	2.225	-	-
Damage flux Graphite	1.955	0.315	1.940
EDN flux (2)	1.074	0.173	1.065
Nuclear heating W/g	3.65	3.70	-
DPA Graphite (3)	-	0.229	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	18.80	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.20. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 89.03
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*E 18	Neutron fluence m^-2*E 25	Cycle averaged fluence rate m^-2 s^-1*E 18
Neutron flux 1 E> 1.353 MeV	0.586	0.099	0.58
Neutron flux 2 1.353MeV>E>.0674MeV	1.038	0.176	1.030
Neutron flux 3 .06[illegible] MeV>E>.683 eV	1.374	0.233	1.365
Neutron flux 4 E<.683 eV	0.958	0.167	0.979
Fission flux	0.775	0.131	0.768
2200 m/s flux	0.857	0.148	0.867
Neutron flux E>1 MeV	0.736	0.125	0.733
Neutron flux E>.1 MeV	1.521	0.258	1.510
DAR Graphite (1)	2.206	-	-
Damage flux Graphite	1.806	0.306	1.800
EDN flux (2)	0.992	0.168	0.985
Nuclear heating W/g	3.37	3.43	-
DPA Graphite (3)	-	0.222	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	19.75	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.21. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 89.04
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*E 18	Neutron fluence m^-2*E 25	Cycle averaged fluence rate m^-2 s^-1*E 18
Neutron flux 1 E> 1.353 MeV	0.588	0.114	0.58
Neutron flux 2 1.353MeV>E>.0674MeV	1.050	0.204	1.040
Neutron flux 3 .0674MeV>E>.683 eV	1.390	0.272	1.380
Neutron flux 4 E<.683 eV	0.963	0.193	0.982
Fission flux	0.778	0.151	0.768
2200 m/s flux	0.862	0.172	0.875
Neutron flux E>1 MeV	0.741	0.144	0.734
Neutron flux E>.1 MeV	1.535	0.299	1.521
DAR Graphite (1)	2.218	-	-
Damage flux Graphite	1.823	0.355	1.806
EDN flux (2)	1.002	0.195	0.992
Nuclear heating W/g	3.34	3.38	-
DPA Graphite (3)	-	0.258	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	22.75	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.22. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 89.05
Position : F 8
Orientation : North

	Start-up fluence rate m^-2 s^-1*E 18	Neutron fluence m^-2*E 25	Cycle averaged fluence rate m^-2 s^-1*E 18
Neutron flux 1 E> 1.353 MeV	0.584	0.106	0.58
Neutron flux 2 1.353MeV>E>.0674MeV	1.050	0.191	1.046
Neutron flux 3 .06 MeV>E>.683 eV	1.399	0.255	1.396
Neutron flux 4 E<.683 eV	0.842	0.156	0.854
Fission flux	0.773	0.140	0.766
2200 m/s flux	0.778	0.144	0.788
Neutron flux E>1 MeV	0.737	0.134	0.734
Neutron flux E>.1 MeV	1.530	0.278	1.522
DAR Graphite (1)	2.218	-	-
Damage flux Graphite	1.819	0.330	1.807
EDN lux (2)	0.999	0.181	0.992
Nuclear heating W/g	3.35	3.342	-
DPA Graphite (3)	-	0.240	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	21.14	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.23. Post-cycle HIP-TEDDIE volume-average data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle : 89.06
Position : F 8
Orientation : South

	Start-up fluence rate m^-2 s^-1*E 18	Neutron fluence m^-2*E 25	Cycle averaged fluence rate m^-2 s^-1*E 18
Neutron flux 1 E> 1.353 MeV	0.581	0.108	0.579
Neutron flux 2 1.353MeV>E>.0674MeV	1.044	0.194	1.04
Neutron flux 3 .06[illegible] MeV>E>.683 eV	1.388	0.259	1.388
Neutron flux 4 E<.683 eV	0.838	0.160	0.857
Fission flux	0.768	0.143	0.766
2200 m/s flux	0.774	0.147	0.788
Neutron flux E>1 MeV	0.732	0.136	0.729
Neutron flux E>.1 MeV	1.521	0.283	1.516
DAR Graphite (1)	2.227	-	-
Damage flux Graphite	1.808	0.336	1.800
EDN [illegible]lux (2)	0.994	0.185	0.991
Nuclear heating W/g	3.35	3.44	-
DPA Graphite (3)	-	0.244	-
Axial shape factors (4)			
- fast fluence	-	1.260	-
- thermal fluence	-	1.230	-
Full power days	-	21.60	-

(1): Damage to activation ratio for graphite
(2): Equivalent DIDO Nickel Fluence
(3): Displacement per Atom
(4): max/average

Table 6.3.24. HFR-TEDDIE volume-average fluence rates $\phi(10^{18} n/m^2 s)$ and irradiation times
Source: JRC-IAM Petten, HFR Unit, The Netherlands

	HFR-TEDDIE broad group number						Time Intervals	
Y·C	1	2	3	4	> 1 MeV	2200 m/s	FPD	ZPD
87.031	0.562	1.003	1.320	0.856	0.706	0.437	7.52	1.90
87.032	0.559	1.008	1.332	0.867	0.709	0.442	14.69	30.58
87.051	0.514	0.930	1.233	0.778	0.651	0.400	0.64	1.94
87.052	0.514	0.930	1.233	0.778	0.651	0.400	23.01	120.02
87.092	0.653	1.196	1.606	1.115	0.826	0.564	20.03	2.47
87.101	0.631	1.153	1.552	1.081	0.798	0.547	15.96	0.88
87.102	0.641	1.171	1.562	1.108	0.814	0.560	8.67	23.28
88.01	0.512	0.957	1.263	0.791	0.652	0.405	25.76	2.77
88.02	0.569	1.060	1.401	0.915	0.723	0.467	25.44	58.40
88.04	0.589	1.061	1.420	0.957	0.742	0.486	25.75	2.80
88.05	0.606	1.097	1.460	0.955	0.767	0.487	25.21	3.00
88.061	0.540	0.984	1.304	0.869	0.683	0.442	10.36	1.55
88.062	0.544	0.991	1.314	0.890	0.690	0.452	10.43	54.06
88.07	0.539	0.985	1.303	0.875	0.682	0.445	21.04	4.61
88.08	0.545	0.993	1.323	0.891	0.691	0.453	21.44	2.78
88.09	0.550	0.996	1.323	0.920	0.691	0.466	21.26	4.09
88.10	0.598	1.073	1.427	1.029	0.752	0.519	20.92	2.67
88.11	0.557	1.060	1.352	0.957	0.703	0.485	21.40	10.57
89.01	0.569	1.011	1.358	0.972	0.712	0.491	20.96	3.34
89.021	0.622	1.120	1.508	1.096	0.788	0.552	2.27	2.00
89.022	0.622	1.120	1.508	1.096	0.788	0.552	14.42	1.89
89.023	0.622	1.120	1.508	1.096	0.788	0.552	2.11	29.73
89.03	0.580	1.030	1.365	0.979	0.733	0.494	19.75	3.34
89.04	0.580	1.040	1.380	0.982	0.734	0.496	22.75	3.69
89.05	0.580	1.046	1.396	0.854	0.734	0.438	21.14	2.95
89.06	0.579	1.040	1.388	0.857	0.729	0.440	21.60	1000.

Y·C = year. cycle number or cycle interval number
FPD = full power days
ZPP = zero power days

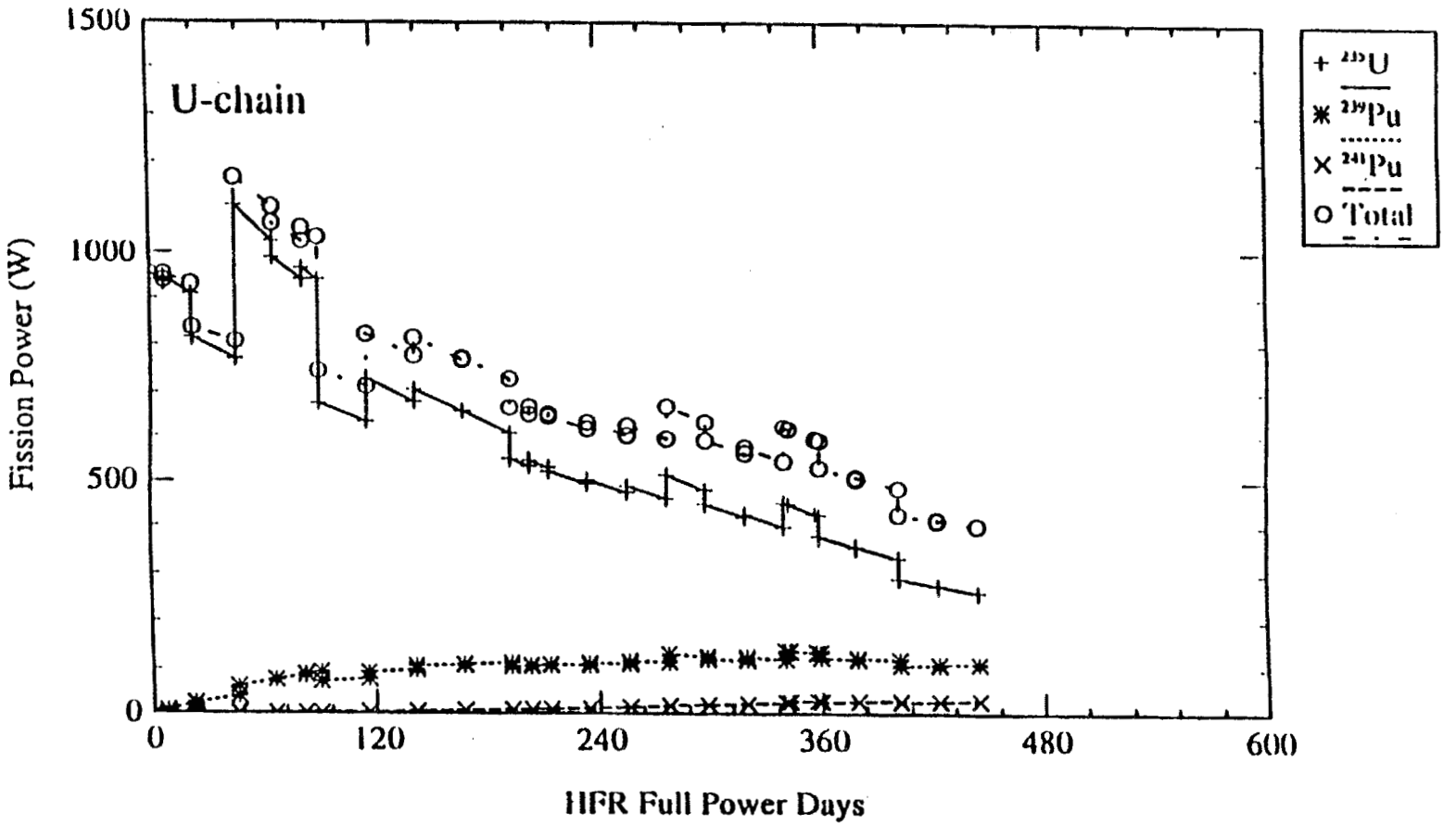

Fig. 6.3.1. Power production in the U-chain nuclides in GA compacts.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

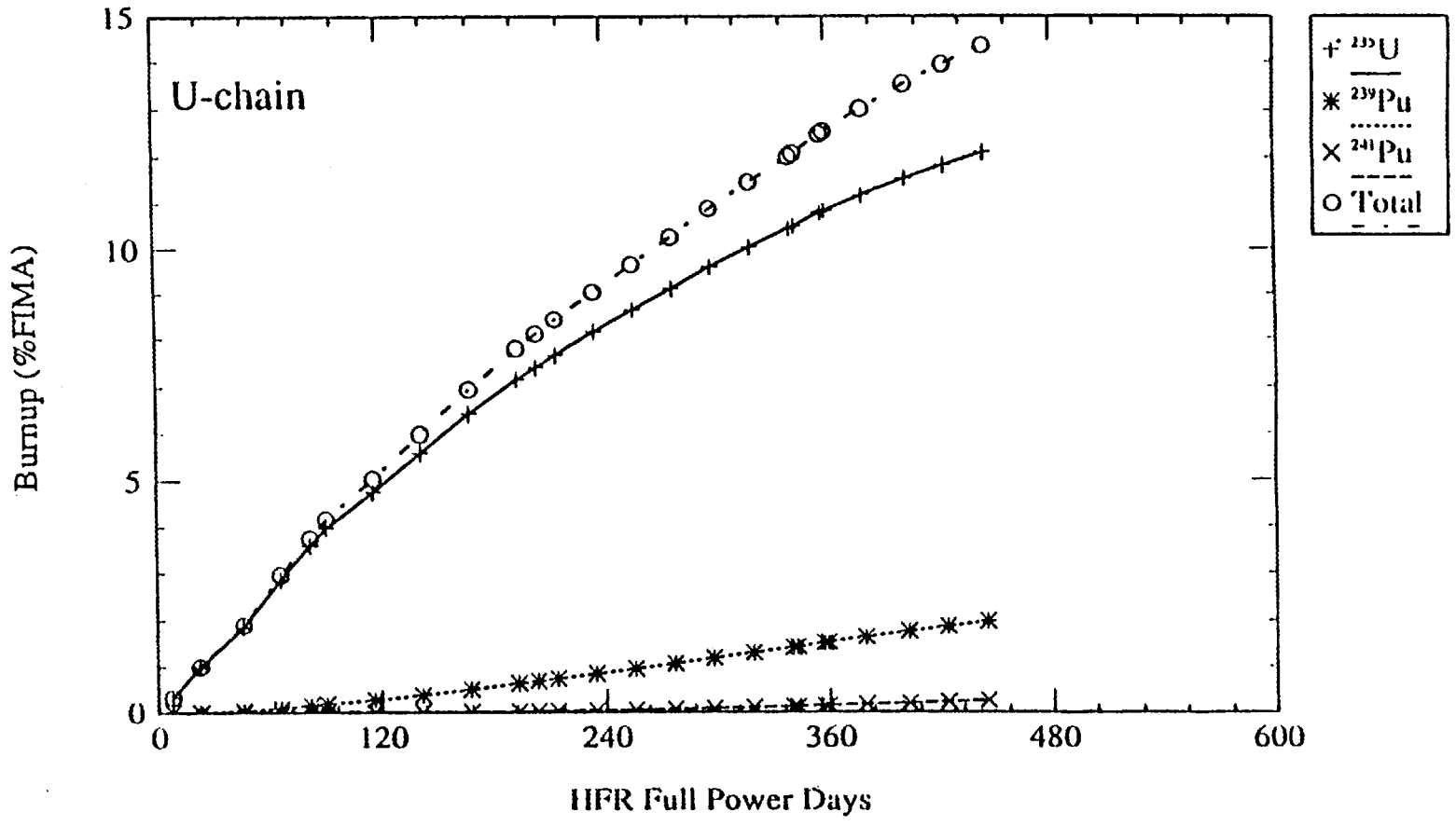

Fig. 6.3.2. Burnup of the U-chain nuclides in GA compacts.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

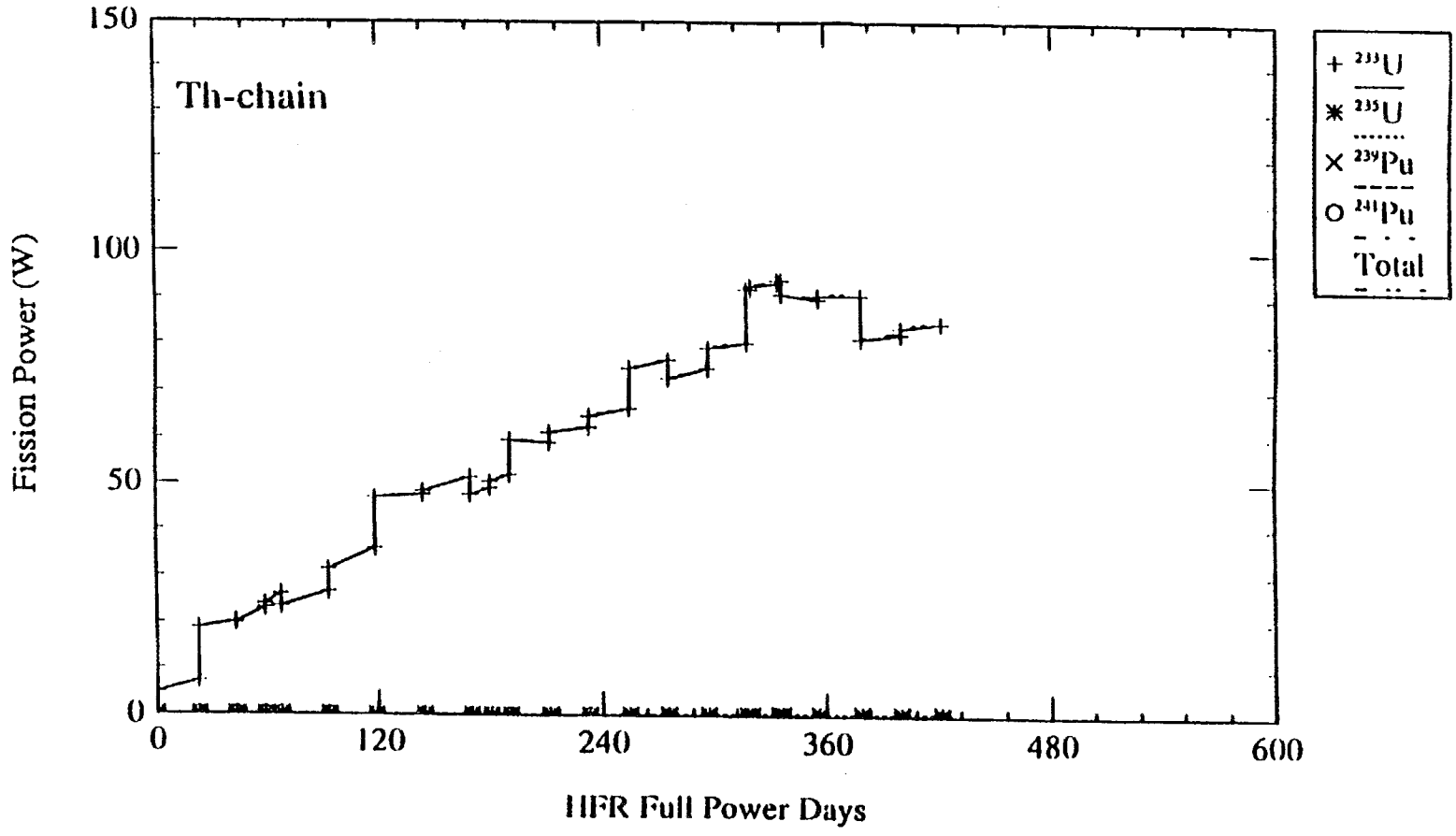

Fig. 6.3.3. Power production in the Th-chain nuclides in GA compacts.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

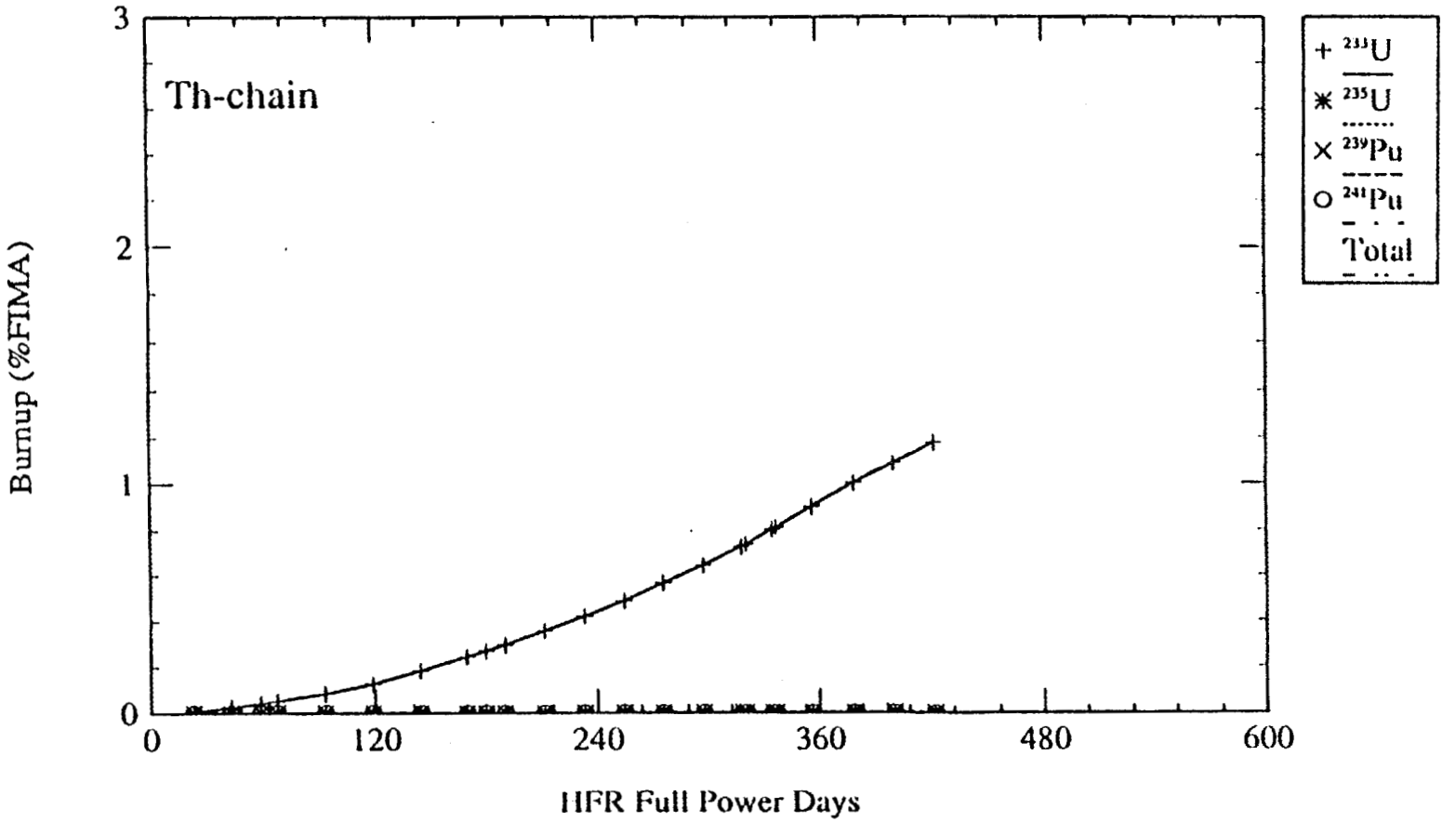

Fig. 6.3.4. Burnup of the Th-chain nuclides in GA compacts.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

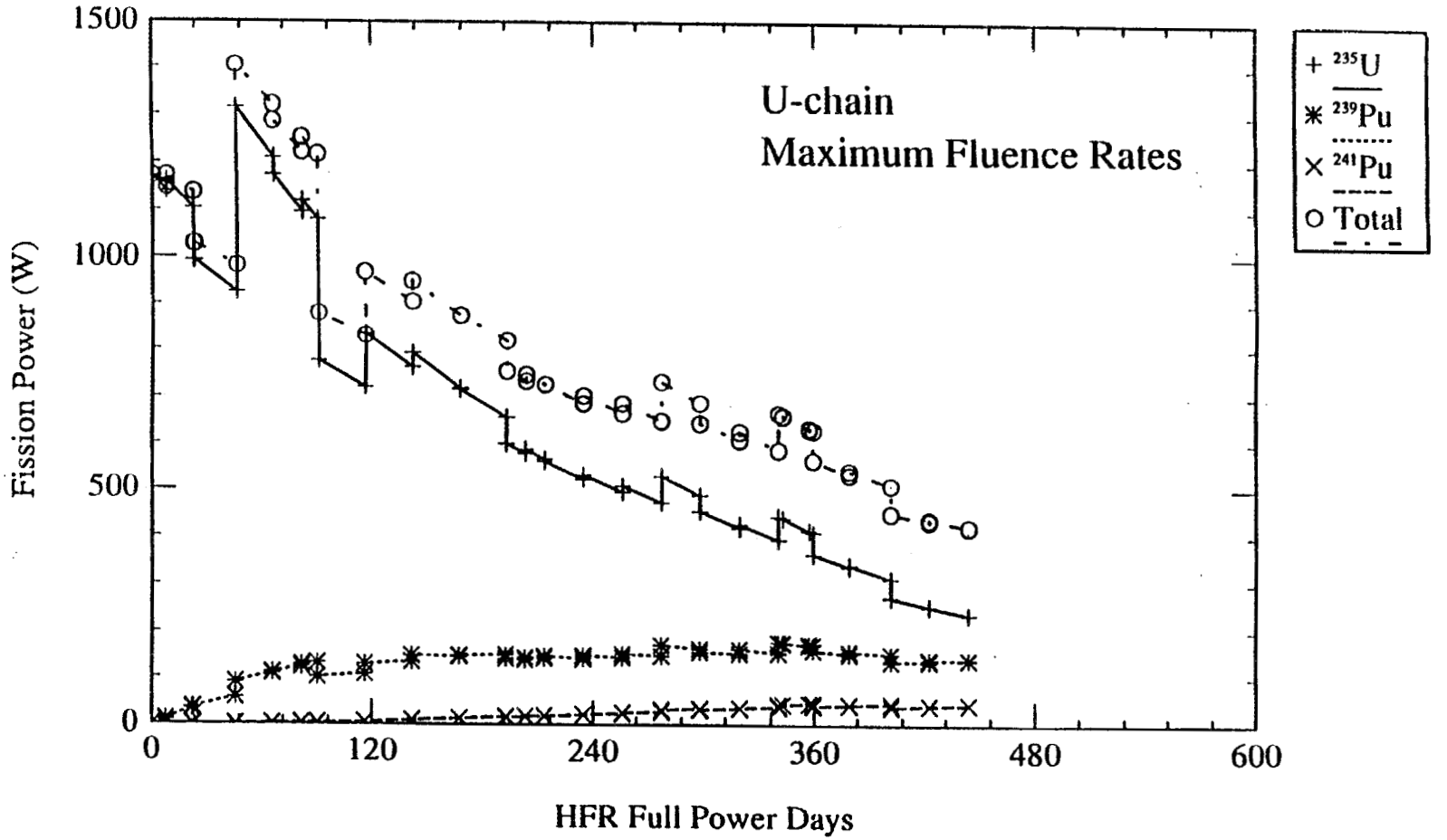

Fig. 6.3.5 Power production in the U-chain nuclides in GA compacts at maximum flux.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

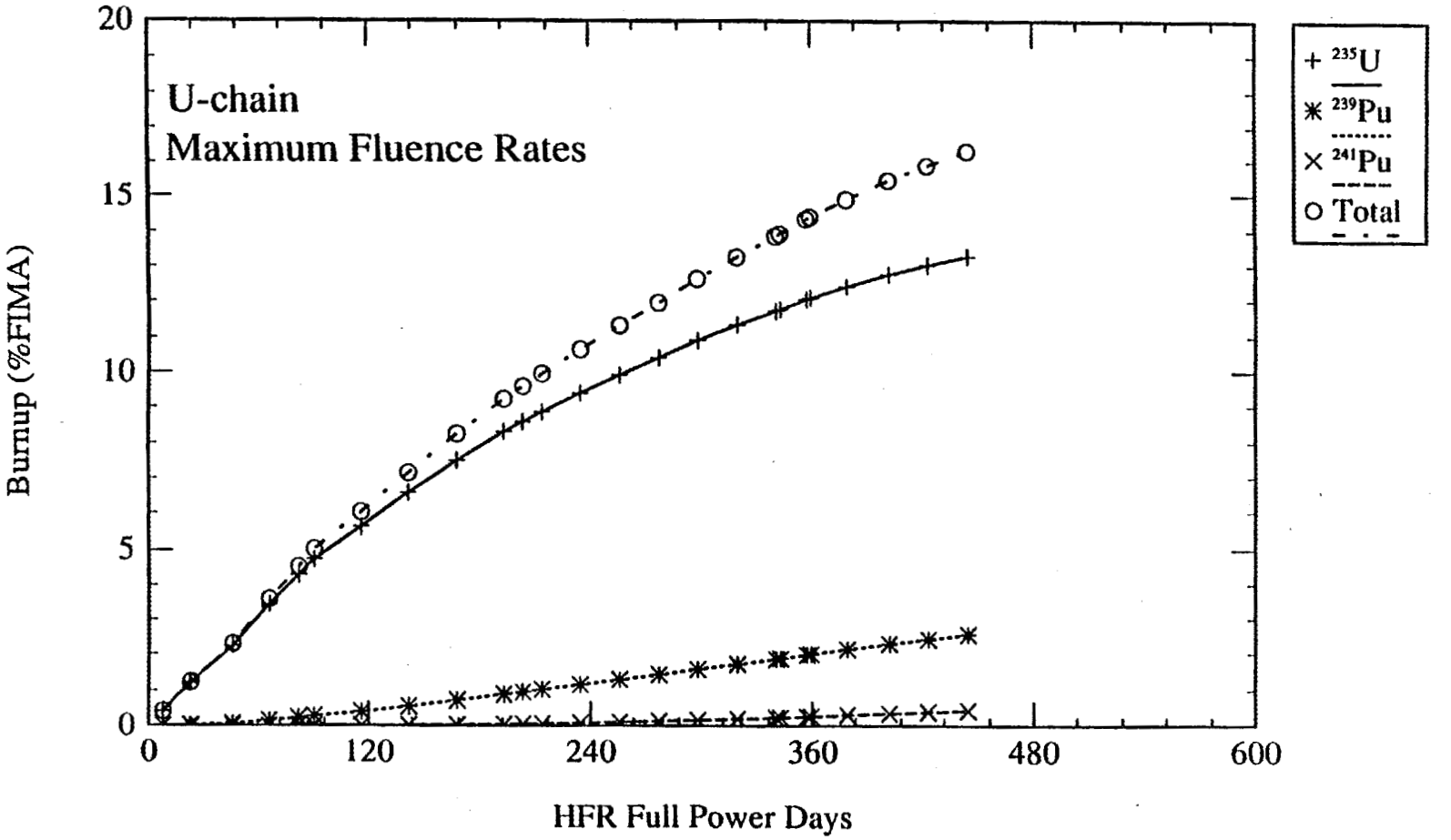

Fig. 6.3.6. Burnup of the U-chain nuclides in GA compacts at maximum flux.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

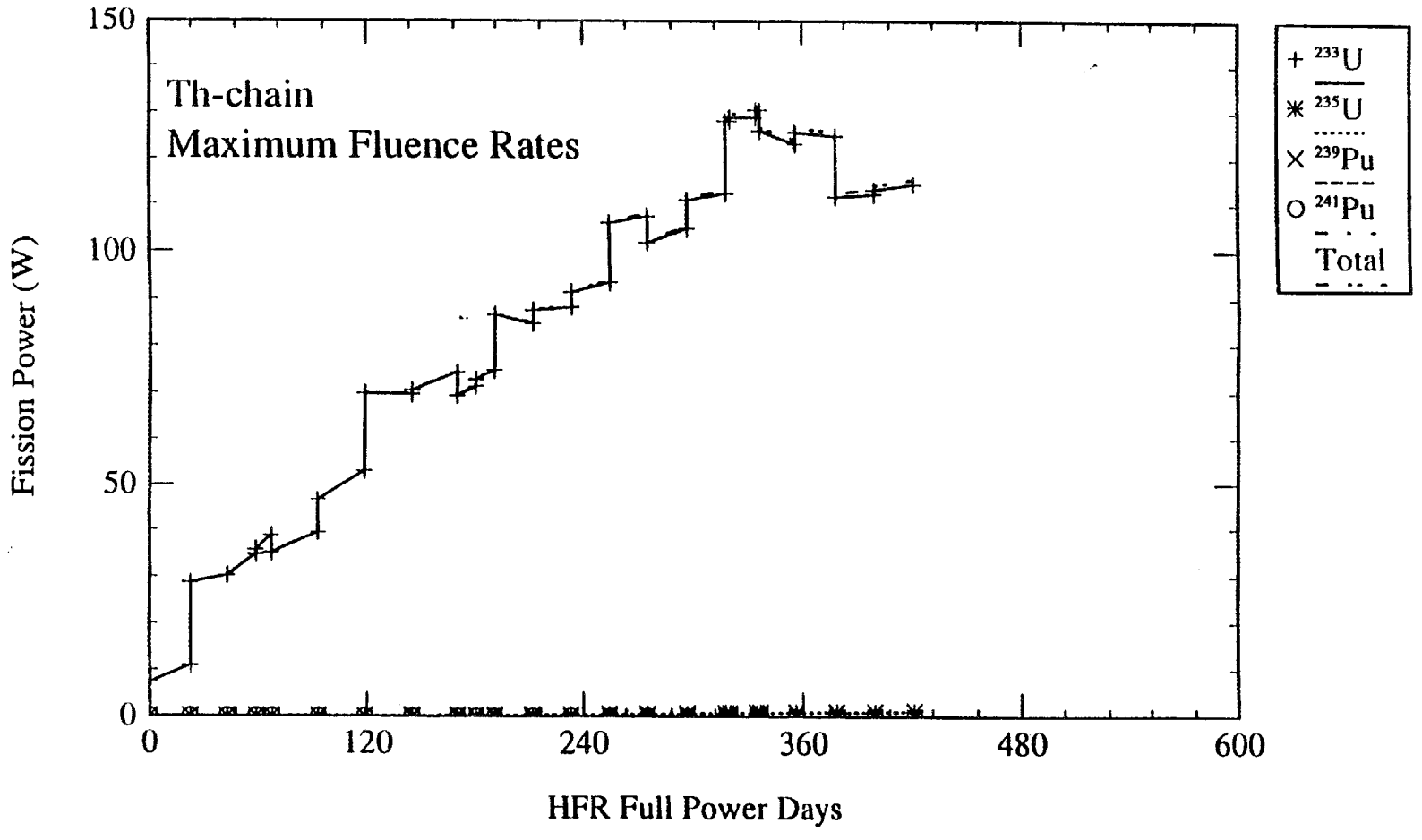

Fig. 6.3.7. Power production in the Th-chain nuclides in GA compacts at maximum flux.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

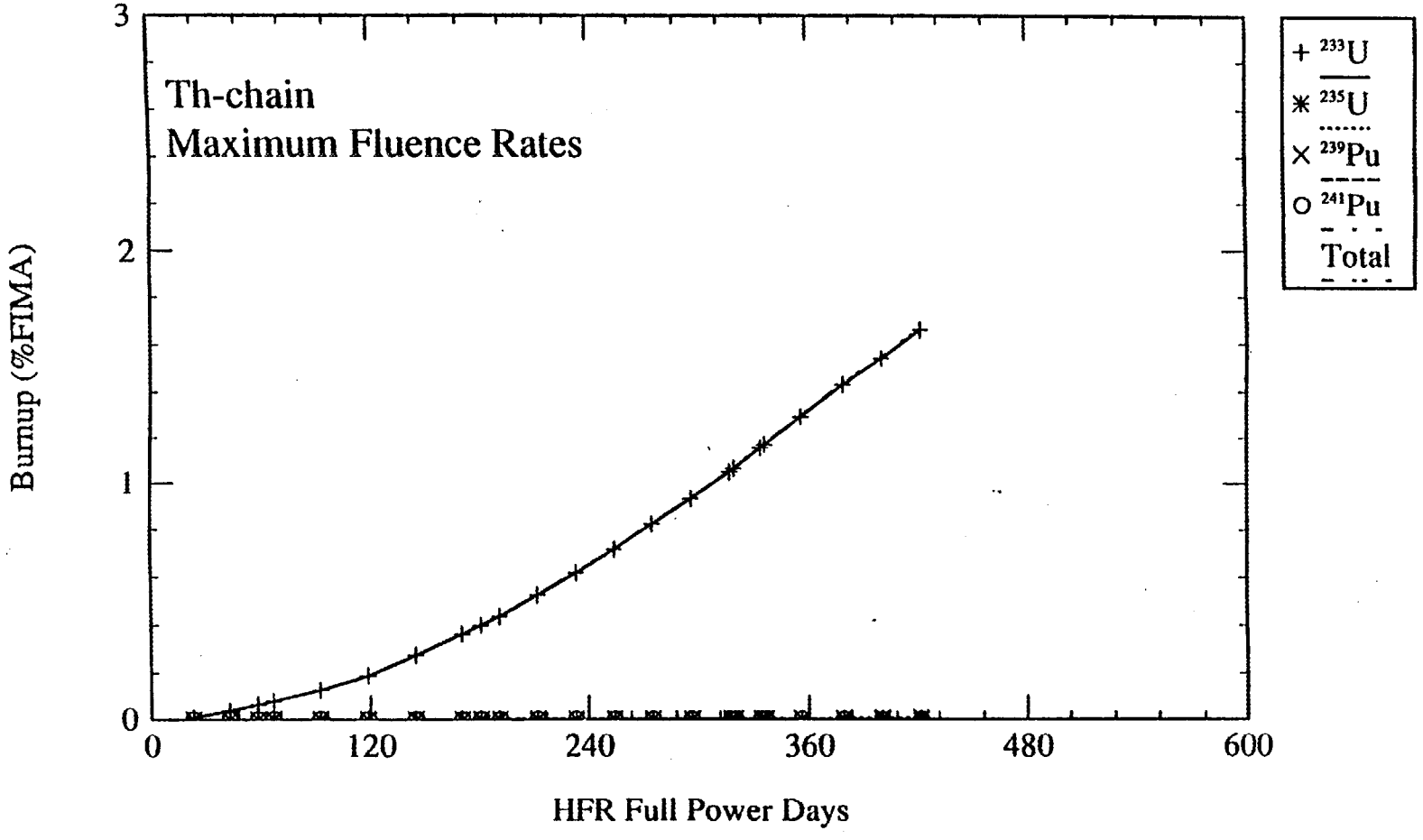

Fig. 6.3.8. Burnup of the Th-chain nuclides in GA compacts at maximum flux.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

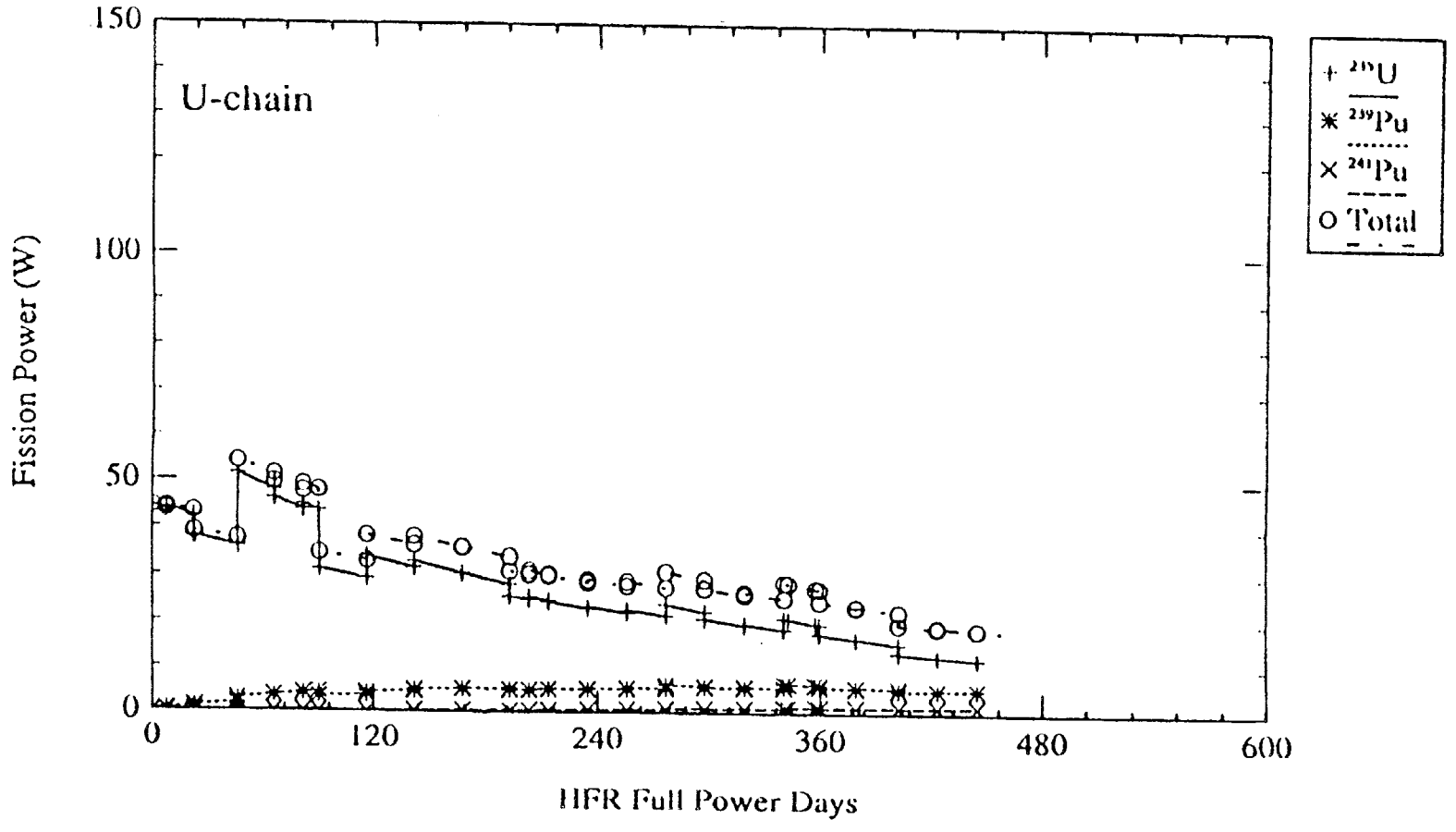

Fig. 6.3.9. Power production in the U-chain nuclides in piggyback samples of GA.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

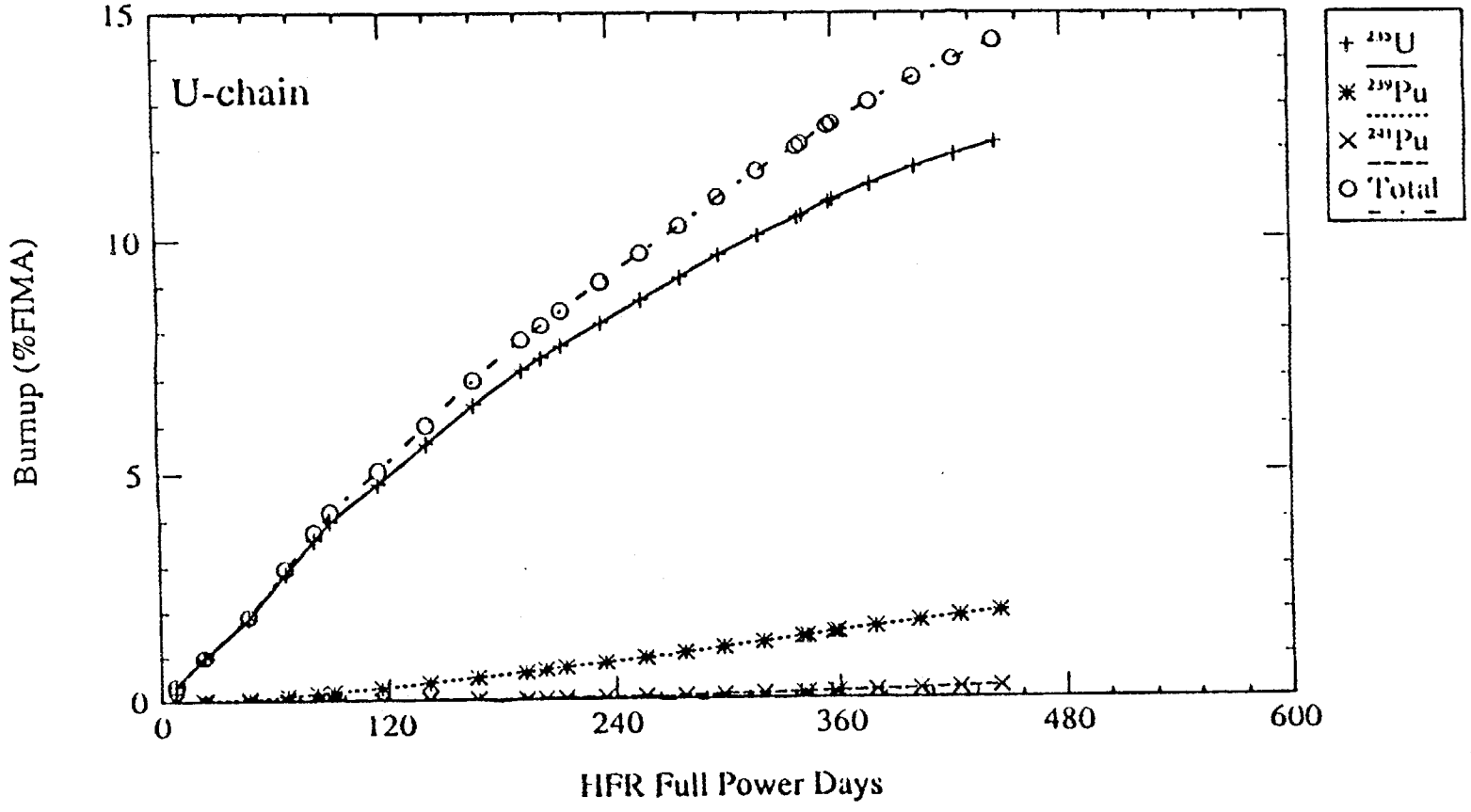

Fig. 6.3.10. Burnup of the U-chain nuclides in piggyback samples of GA.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

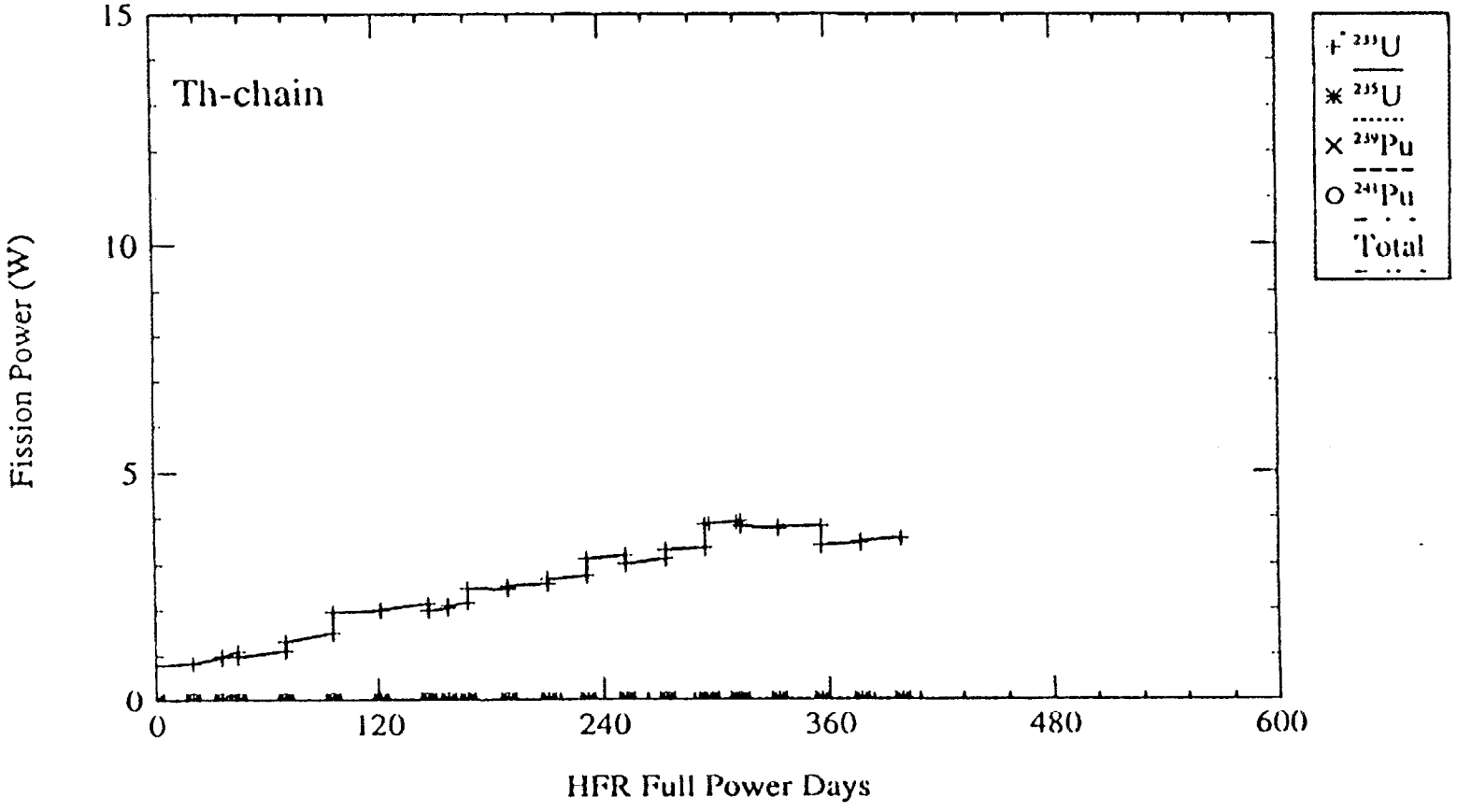

Fig. 6.3.11. Power production in the Th-chain nuclides in piggyback samples of GA.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

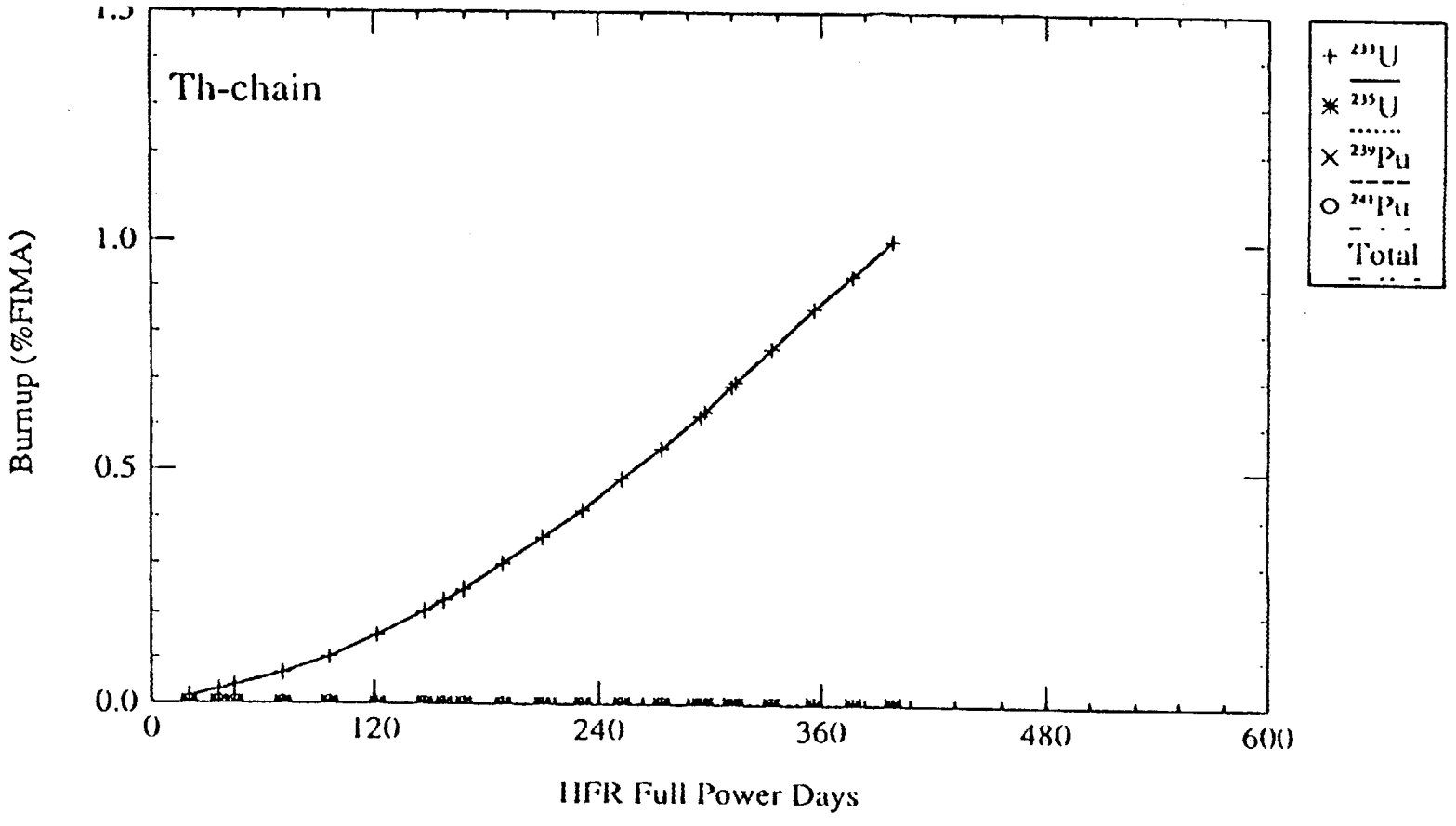

Fig. 6.3.12. Burnup of the Th-chain nuclides in piggyback samples of GA.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

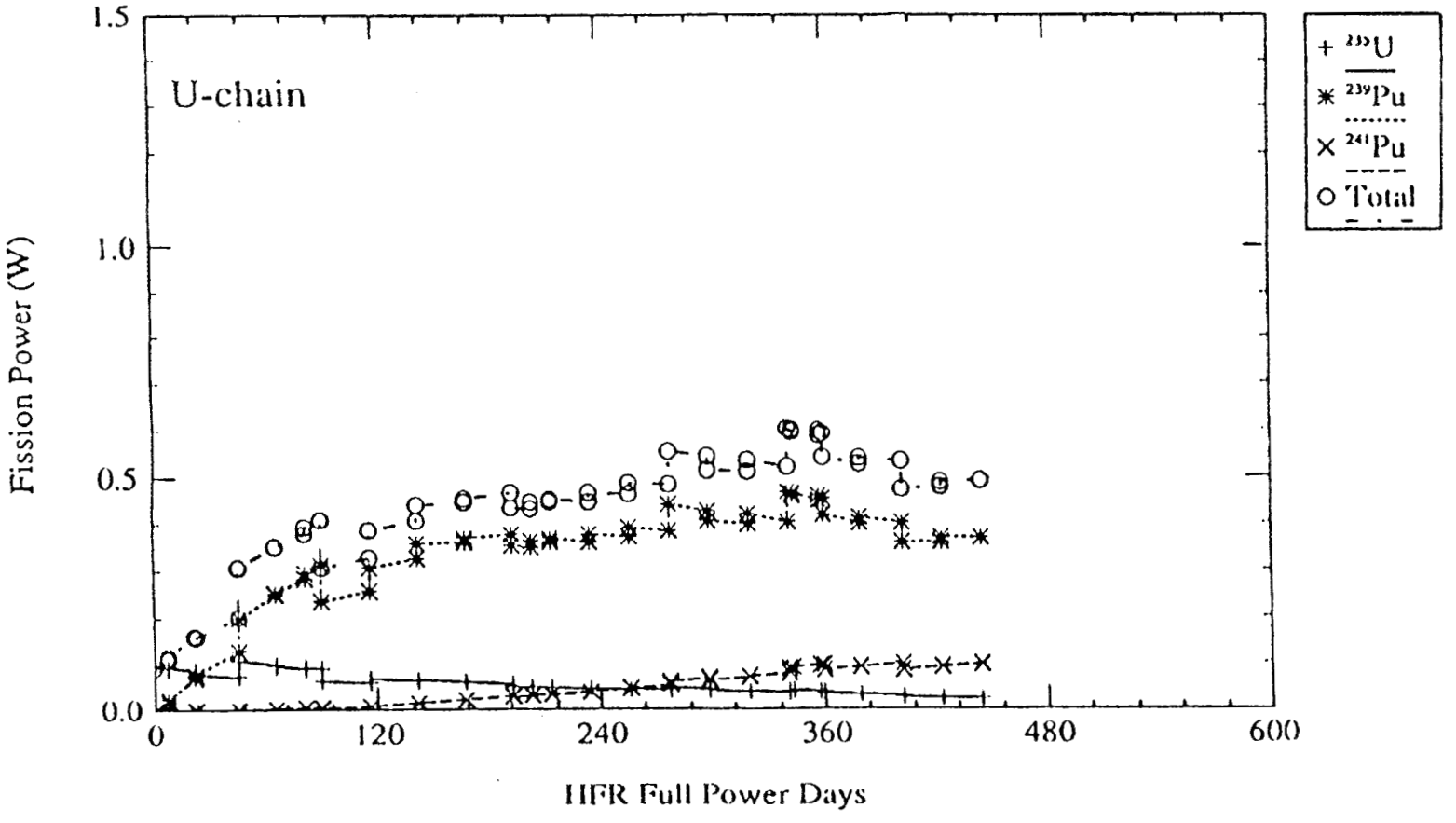

Fig. 6.3.13. Power production in the U-chain nuclides in piggyback samples of KFA.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

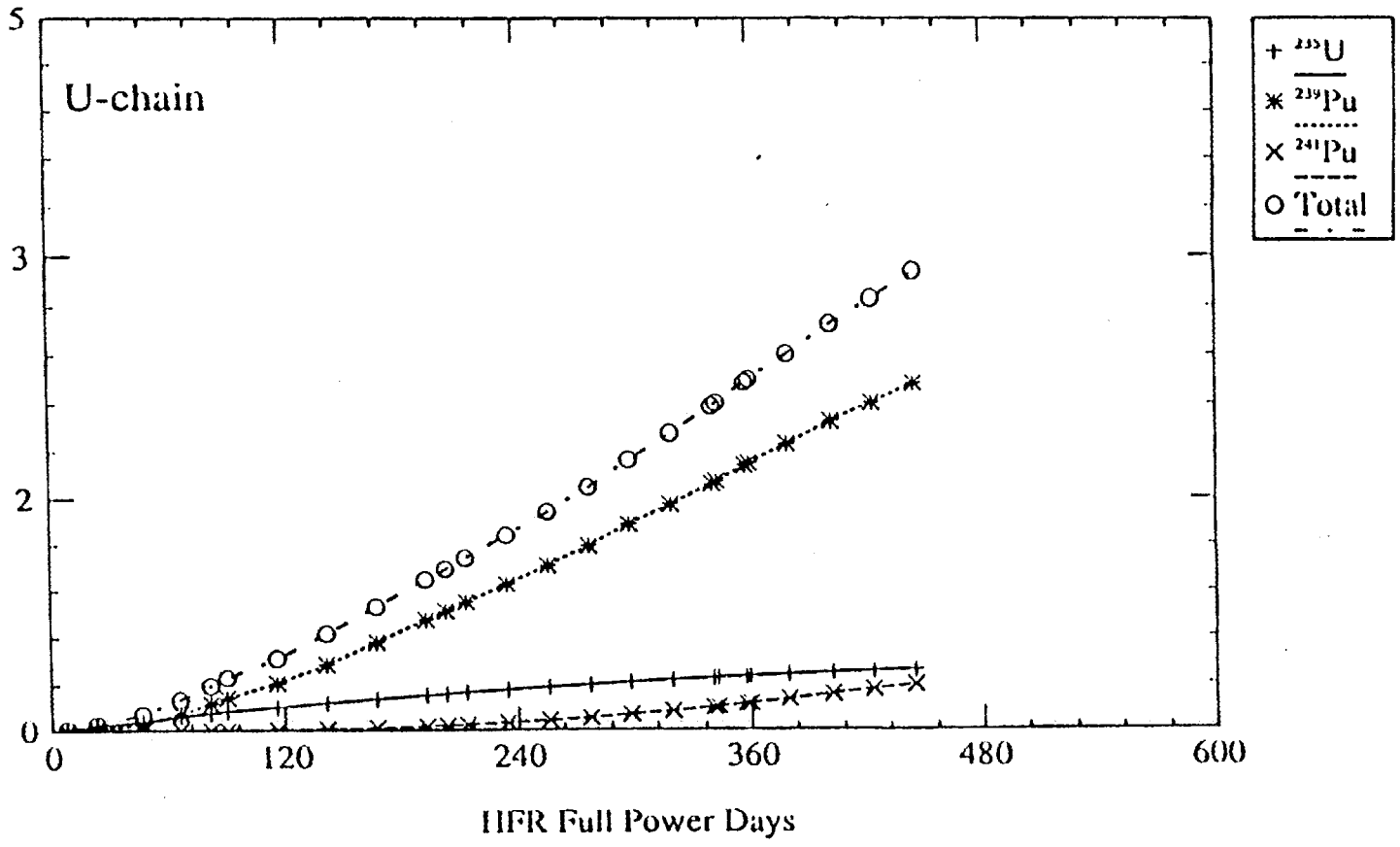

Fig. 6.3.14. Burnup of the U-chain nuclides in piggyback samples of KFA.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Table 6.3.25. Power and burnup volume-averaged data for GA compacts in D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Date: November 29, 1991
Reactor Chain: Uranium Chain

	Power (W)				Burnup (% FIMA)			
FPD	^{235}U	^{239}Pu	^{241}Pu	Total	^{235}U	^{239}Pu	^{241}Pu	Total
7.5800	945.7285	1.8776	0.0001	947.6062	0.3343	0.0006	0.0000	0.3350
14.6900	929.9030	13.4004	0.0070	943.3104	0.6371	0.0089	0.0000	0.6460
0.6400	817.0997	23.3668	0.0211	840.4876	0.0244	0.0007	0.0000	0.0251
23.0100	796.5581	29.2575	0.0718	825.8875	0.8549	0.0305	0.0001	0.8854
20.0300	1072.2058	64.8689	0.4590	1137.5337	1.0017	0.0589	0.0004	1.0609
15.9600	970.7537	79.2378	1.0974	1051.0890	0.7226	0.0573	0.0008	0.7807
8.6700	955.5254	90.8710	1.7946	1048.1909	0.3864	0.0357	0.0007	0.4228
25.7600	652.9997	72.9220	1.9559	727.8776	0.7845	0.0851	0.0023	0.8719
25.4400	705.9749	93.9309	3.7143	803.6200	0.8377	0.1082	0.0043	0.9502
25.7500	682.7838	106.3003	5.8091	794.8932	0.8200	0.1240	0.0068	0.9508
25.2100	633.1757	111.5026	8.1097	752.7880	0.7445	0.1273	0.0093	0.8811
10.3600	544.2778	105.4156	8.9915	658.6849	0.2630	0.0495	0.0042	0.3167
10.4300	541.2960	108.7232	10.0953	660.1144	0.2633	0.0514	0.0048	0.3195
21.0400	510.5790	108.5256	11.1696	630.2742	0.5010	0.1034	0.0106	0.6151
21.4400	490.4754	111.8066	13.2829	615.5649	0.4905	0.1086	0.0129	0.6119
21.2600	476.7943	116.2224	15.7123	608.7289	0.4728	0.1119	0.0151	0.5998
20.9200	499.1407	129.8780	19.8180	648.8367	0.4870	0.1231	0.0188	0.6289
21.4000	435.6944	120.5871	20.6080	576.8895	0.4349	0.1169	0.0200	0.5717
20.9600	413.8684	122.9137	22.9319	559.7141	0.4046	0.1167	0.0218	0.5431
2.2700	450.6094	139.8935	27.2539	617.7567	0.0477	0.0144	0.0028	0.0649
14.4200	438.9402	137.5051	28.1342	604.5795	0.2952	0.0898	0.0184	0.4034
2.1100	425.7322	138.0775	29.1246	592.9343	0.0419	0.0132	0.0028	0.0579
19.7500	368.6486	122.6205	26.7689	518.0380	0.3396	0.1097	0.0239	0.4732
22.7500	346.6348	122.3259	28.7197	497.6804	0.3678	0.1261	0.0296	0.5235
21.1400	283.7571	108.0619	26.8283	418.6473	0.2798	0.1035	0.0257	0.4089
21.6000	268.8645	110.9103	28.6187	408.3934	0.2709	0.1085	0.0280	0.4074

Table 6.3.26. Power and burnup volume-averaged data for GA compacts in D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Date: November 29, 1991
Reactor Chain: Thorium Chain

	Power (W)					Burnup (% FIMA)				
FPD	^{233}U	^{235}U	^{239}Pu	^{241}Pu	Total	^{233}U	^{235}U	^{239}Pu	^{241}Pu	Total
23.0100	5.6448	0.0004	0.0000	0.0000	5.6452	0.0064	0.0000	0.0000	0.0000	0.0064
20.0300	18.9965	0.0025	0.0000	0.0000	18.9991	0.0187	0.0000	0.0000	0.0000	0.0187
15.9600	21.1219	0.0061	0.0000	0.0000	21.1279	0.0166	0.0000	0.0000	0.0000	0.0166
8.6700	24.8022	0.0102	0.0000	0.0000	24.8125	0.0106	0.0000	0.0000	0.0000	0.0106
25.7600	24.5909	0.0116	0.0000	0.0000	24.6026	0.0311	0.0000	0.0000	0.0000	0.0312
25.4400	33.0991	0.0238	0.0000	0.0000	33.1229	0.0414	0.0000	0.0000	0.0000	0.0414
25.7500	46.6794	0.0408	0.0000	0.0000	46.7202	0.0591	0.0000	0.0000	0.0000	0.0592
25.2100	49.4263	0.0621	0.0000	0.0000	49.4884	0.0613	0.0001	0.0000	0.0000	0.0613
10.3600	48.0478	0.0729	0.0000	0.0000	48.1207	0.0245	0.0000	0.0000	0.0000	0.0245
10.4300	50.9982	0.0848	0.0000	0.0000	51.0830	0.0262	0.0000	0.0000	0.0000	0.0262
21.0400	59.0558	0.0993	0.0000	0.0000	59.1551	0.0611	0.0001	0.0000	0.0000	0.0612
21.4400	61.2057	0.1262	0.0000	0.0000	61.3319	0.0645	0.0001	0.0000	0.0000	0.0647
21.2600	65.0980	0.1604	0.0000	0.0000	65.2584	0.0681	0.0002	0.0000	0.0000	0.0682
20.9200	75.5611	0.2179	0.0000	0.0000	75.7789	0.0777	0.0002	0.0000	0.0000	0.0779
21.4000	73.4488	0.2447	0.0000	0.0000	73.6936	0.0773	0.0002	0.0000	0.0000	0.0775
20.9600	79.5760	0.2927	0.0000	0.0000	79.8688	0.0820	0.0003	0.0000	0.0000	0.0823
2.2700	92.2804	0.3639	0.0000	0.0000	92.6443	0.0103	0.0000	0.0000	0.0000	0.0103
14.4200	93.0003	0.3872	0.0000	0.0000	93.3875	0.0659	0.0003	0.0000	0.0000	0.0662
2.1100	94.2438	0.4146	0.0000	0.0000	94.6584	0.0098	0.0000	0.0000	0.0000	0.0098
19.7500	90.3868	0.3968	0.0000	0.0000	90.7835	0.0878	0.0004	0.0000	0.0000	0.0881
22.7500	90.8396	0.4559	0.0000	0.0000	91.2955	0.1016	0.0005	0.0000	0.0000	0.1021
21.1400	81.8148	0.4526	0.0000	0.0000	82.2674	0.0850	0.0004	0.0000	0.0000	0.0855
21.6000	84.1275	0.5089	0.0000	0.0000	84.6364	0.0894	0.0005	0.0000	0.0000	0.0899

Table 6.3.27. Power and burnup at maximum flux for GA compacts in D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Date: December 11, 1991
Reactor Chain: Uranium Chain

	Power (W)				Burnup (%FIMA)			
FPD	^{235}U	^{239}Pu	^{241}Pu	Total	^{235}U	^{239}Pu	^{241}Pu	Total
7.5800	1157.5999	2.8401	0.0002	1160.4402	0.4092	0.0010	0.0000	0.4102
14.6900	1137.5863	20.2366	0.0162	1157.8390	0.7794	0.0135	0.0000	0.7929
0.6400	994.6095	35.3293	0.0486	1029.9874	0.0297	0.0010	0.0000	0.0307
23.0100	964.6581	43.9024	0.1653	1008.7257	1.0353	0.0458	0.0002	1.0812
20.0300	1265.8700	94.7801	1.0214	1361.6715	1.1826	0.0860	0.0009	1.2695
15.9600	1139.4644	114.2574	2.3942	1256.1160	0.8482	0.0826	0.0017	0.9325
8.6700	1102.3350	128.5132	3.8072	1234.6554	0.4457	0.0505	0.0015	0.4977
25.7600	750.8724	101.8526	4.0657	856.7906	0.9021	0.1188	0.0047	1.0257
25.4400	800.2545	129.6183	7.5627	937.4355	0.9495	0.1494	0.0087	1.1076
25.7500	759.7676	143.5139	11.4107	914.6921	0.9125	0.1674	0.0133	1.0932
25.2100	688.1968	146.9160	15.3511	850.4639	0.8092	0.1678	0.0175	0.9945
10.3600	588.4435	138.8236	16.8085	744.0756	0.2843	0.0651	0.0079	0.3574
10.4300	576.7539	141.8104	18.5267	737.0911	0.2806	0.0670	0.0088	0.3563
21.0400	542.7885	141.5583	20.2700	704.6168	0.5326	0.1349	0.0193	0.6869
21.4400	514.3073	143.9217	23.5685	681.7974	0.5143	0.1398	0.0229	0.6769
21.2600	490.5343	147.7047	27.2140	665.4531	0.4864	0.1422	0.0262	0.6548
20.9200	509.6428	165.0233	33.8141	708.4803	0.4973	0.1564	0.0320	0.6857
21.4000	436.6076	152.4384	34.4134	623.4595	0.4358	0.1478	0.0334	0.6169
20.9600	410.3931	155.4102	37.6994	603.5027	0.4012	0.1476	0.0358	0.5845
2.2700	440.2182	175.6853	44.0344	659.9379	0.0466	0.0181	0.0045	0.0692
14.4200	426.1653	171.9746	45.1161	643.2562	0.2866	0.1123	0.0295	0.4284
2.1100	410.5334	172.8477	46.3330	629.7142	0.0404	0.0165	0.0044	0.0613
19.7500	351.3044	152.7585	42.1464	546.2094	0.3236	0.1367	0.0377	0.4980
22.7500	327.2010	152.3577	44.5377	524.0965	0.3472	0.1570	0.0459	0.5501
21.1400	264.2372	134.1863	40.8930	439.3165	0.2605	0.1285	0.0392	0.4282
21.6000	246.1888	137.7782	42.9887	426.9557	0.2480	0.1348	0.0421	0.4249

Table 6.3.28. Power and burnup at maximum flux for GA compacts in D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Date: December 1, 1991
Reactor Chain: Thorium Chain

FPD	Power (W)					Burnup (% FIMA)				
	^{233}U	^{235}U	^{239}Pu	^{241}Pu	Total	^{233}U	^{235}U	^{239}Pu	^{241}Pu	Total
23.0100	8.6153	0.0010	0.0000	0.0000	8.6163	0.0097	0.0000	0.0000	0.0000	0.0097
20.0300	28.8499	0.0059	0.0000	0.0000	28.8559	0.0284	0.0000	0.0000	0.0000	0.0284
15.9600	31.9528	0.0142	0.0000	0.0000	31.9670	0.0251	0.0000	0.0000	0.0000	0.0251
8.6700	36.9059	0.0237	0.0000	0.0000	36.9296	0.0157	0.0000	0.0000	0.0000	0.0157
25.7600	36.6421	0.0269	0.0000	0.0000	36.6690	0.0464	0.0000	0.0000	0.0000	0.0464
25.4400	49.2200	0.0546	0.0000	0.0000	49.2746	0.0616	0.0001	0.0000	0.0000	0.0616
25.7500	69.0694	0.0927	0.0000	0.0000	69.1621	0.0875	0.0001	0.0000	0.0000	0.0876
25.2100	71.7643	0.1387	0.0000	0.0000	71.9031	0.0890	0.0002	0.0000	0.0000	0.0891
10.3600	69.8129	0.1633	0.0000	0.0000	69.9762	0.0356	0.0001	0.0000	0.0000	0.0356
10.4300	73.3048	0.1875	0.0000	0.0000	73.4923	0.0376	0.0001	0.0000	0.0000	0.0377
21.0400	85.6024	0.2197	0.0000	0.0000	85.8221	0.0886	0.0002	0.0000	0.0000	0.0888
21.4400	87.8481	0.2772	0.0000	0.0000	88.1253	0.0926	0.0003	0.0000	0.0000	0.0929
21.2600	92.2796	0.3477	0.0000	0.0000	92.6273	0.0965	0.0003	0.0000	0.0000	0.0968
20.9200	106.8698	0.4727	0.0000	0.0000	107.3424	0.1099	0.0005	0.0000	0.0000	0.1104
21.4000	103.4482	0.5256	0.0000	0.0000	103.9739	0.1089	0.0005	0.0000	0.0000	0.1094
20.9600	111.4353	0.6276	0.0000	0.0000	112.0629	0.1148	0.0006	0.0000	0.0000	0.1155
2.2700	128.1040	0.7719	0.0000	0.0000	128.8759	0.0143	0.0001	0.0000	0.0000	0.0144
14.4200	128.9097	0.8191	0.0000	0.0000	129.7289	0.0914	0.0006	0.0000	0.0000	0.0920
2.1100	130.5211	0.8748	0.0000	0.0000	131.3959	0.0135	0.0001	0.0000	0.0000	0.0136
19.7500	124.7560	0.8295	0.0001	0.0000	125.5855	0.1212	0.0008	0.0000	0.0000	0.1219
22.7500	125.0735	0.9503	0.0001	0.0000	126.0239	0.1399	0.0010	0.0000	0.0000	0.1409
21.1400	111.9364	0.9370	0.0001	0.0000	112.8735	0.1164	0.0009	0.0000	0.0000	0.1173
21.6000	113.8261	1.0434	0.0001	0.0000	114.8696	0.1209	0.0011	0.0000	0.0000	0.1219

Table 6.3.29. Power and burnup data for GA piggyback samples in D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Date: December 02, 1991
Reactor Chain: Uranium Chain

	Power (W)				Burnup (%FIMA)			
FPD	^{235}U	^{239}Pu	^{241}Pu	Total	^{235}U	^{239}Pu	^{241}Pu	Total
7.5800	43.8360	0.0867	0.0000	43.9227	0.3355	0.0006	0.0000	0.3361
14.6900	43.1276	0.6179	0.0003	43.7458	0.6397	0.0089	0.0000	0.6486
0.6400	37.8285	1.0780	0.0010	38.9074	0.0244	0.0007	0.0000	0.0251
23.0100	36.8608	1.3504	0.0033	38.2145	0.8564	0.0305	0.0001	0.8869
20.0300	49.7001	2.9980	0.0212	52.7192	1.0051	0.0589	0.0004	1.0644
15.9600	45.0134	3.6612	0.0507	48.7253	0.7254	0.0573	0.0008	0.7834
8.6700	44.3229	4.1976	0.0828	48.6033	0.3880	0.0357	0.0007	0.4244
25.7600	30.2784	3.3715	0.0903	33.7403	0.7875	0.0852	0.0023	0.8750
25.4400	32.7325	4.3394	0.1715	37.2435	0.8408	0.1083	0.0043	0.9533
25.7500	31.6655	4.9084	0.2682	36.8421	0.8233	0.1239	0.0068	0.9540
25.2100	29.3670	5.1509	0.3749	34.8928	0.7475	0.1273	0.0093	0.8841
10.3600	25.2319	4.8699	0.4152	30.5171	0.2639	0.0495	0.0042	0.3176
10.4300	25.1130	5.0236	0.4663	30.6030	0.2645	0.0514	0.0048	0.3206
21.0400	23.6766	5.0113	0.5161	29.2039	0.5030	0.1034	0.0106	0.6170
21.4400	22.7391	5.1605	0.6135	28.5132	0.4922	0.1085	0.0129	0.6136
21.2600	22.1127	5.3715	0.7249	28.2090	0.4747	0.1120	0.0151	0.6017
20.9200	23.1500	6.0008	0.9157	30.0664	0.4890	0.1231	0.0188	0.6309
21.4000	20.2037	5.5703	0.9510	26.7250	0.4365	0.1169	0.0200	0.5734
20.9600	19.1836	5.6803	1.0592	25.9231	0.4060	0.1167	0.0218	0.5445
2.2700	20.9019	6.4627	1.2600	28.6246	0.0479	0.0144	0.0028	0.0651
14.4200	20.3569	6.3522	1.3000	28.0091	0.2964	0.0898	0.0184	0.4046
2.1100	19.7414	6.3798	1.3456	27.4668	0.0421	0.0132	0.0028	0.0580
19.7500	17.0956	5.6614	1.2363	23.9933	0.3409	0.1096	0.0239	0.4745
22.7500	16.0798	5.6541	1.3266	23.0605	0.3693	0.1261	0.0296	0.5251
21.1400	13.1531	4.9910	1.2394	19.3836	0.2807	0.1035	0.0257	0.4099
21.6000	12.4702	5.1243	1.3221	18.9166	0.2720	0.1085	0.0280	0.4085

Table 6.3.30. Power and burnup data for GA piggyback samples in D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Date: December 02, 1991
Reactor Chain: Thorium Chain

FPD	Power (W)					Burnup (% FIMA)				
	^{233}U	^{235}U	^{239}Pu	^{241}Pu	Total	^{233}U	^{235}U	^{239}Pu	^{241}Pu	Total
20.0300	0.7921	0.0001	0.0000	0.0000	0.7922	0.0160	0.0000	0.0000	0.0000	0.0160
15.9600	0.8805	0.0003	0.0000	0.0000	0.8807	0.0142	0.0000	0.0000	0.0000	0.0142
8.6700	1.0341	0.0004	0.0000	0.0000	1.0345	0.0091	0.0000	0.0000	0.0000	0.0091
25.7600	1.0245	0.0005	0.0000	0.0000	1.0250	0.0267	0.0000	0.0000	0.0000	0.0267
25.4400	1.3800	0.0010	0.0000	0.0000	1.3809	0.0355	0.0000	0.0000	0.0000	0.0355
25.7500	1.9461	0.0017	0.0000	0.0000	1.9478	0.0507	0.0000	0.0000	0.0000	0.0507
25.2100	2.0609	0.0026	0.0000	0.0000	2.0635	0.0525	0.0001	0.0000	0.0000	0.0526
10.3600	2.0032	0.0030	0.0000	0.0000	2.0062	0.0210	0.0000	0.0000	0.0000	0.0210
10.4300	2.1258	0.0035	0.0000	0.0000	2.1293	0.0224	0.0000	0.0000	0.0000	0.0225
21.0400	2.4673	0.0041	0.0000	0.0000	2.4715	0.0525	0.0001	0.0000	0.0000	0.0526
21.4400	2.5531	0.0053	0.0000	0.0000	2.5584	0.0554	0.0001	0.0000	0.0000	0.0555
21.2600	2.7124	0.0067	0.0000	0.0000	2.7191	0.0583	0.0001	0.0000	0.0000	0.0585
20.9200	3.1505	0.0091	0.0000	0.0000	3.1596	0.0667	0.0002	0.0000	0.0000	0.0668
21.4000	3.0602	0.0102	0.0000	0.0000	3.0704	0.0662	0.0002	0.0000	0.0000	0.0664
20.9600	3.3143	0.0122	0.0000	0.0000	3.3265	0.0703	0.0002	0.0000	0.0000	0.0705
2.2700	3.8391	0.0152	0.0000	0.0000	3.8543	0.0088	0.0000	0.0000	0.0000	0.0088
14.4200	3.8784	0.0161	0.0000	0.0000	3.8945	0.0566	0.0002	0.0000	0.0000	0.0568
2.1100	3.9268	0.0173	0.0000	0.0000	3.9441	0.0084	0.0000	0.0000	0.0000	0.0084
19.7500	3.7686	0.0165	0.0000	0.0000	3.7851	0.0753	0.0003	0.0000	0.0000	0.0756
22.7500	3.7883	0.0190	0.0000	0.0000	3.8073	0.0872	0.0004	0.0000	0.0000	0.0876
21.1400	3.4102	0.0189	0.0000	0.0000	3.4291	0.0729	0.0004	0.0000	0.0000	0.0733
21.6000	3.5079	0.0212	0.0000	0.0000	3.5291	0.0766	0.0004	0.0000	0.0000	0.0771

Table 6.3.31. Power and burnup data for KFA piggyback samples in D214.01
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Date: November 29, 1991
Reactor Chain: Uranium Chain

FPD	Power (W)				Burnup (% FIMA)			
	^{235}U	^{239}Pu	^{241}Pu	Total	^{235}U	^{239}Pu	^{241}Pu	Total
7.5800	0.0909	0.0062	0.0000	0.0971	0.0121	0.0008	0.0000	0.0129
14.6900	0.0894	0.0444	0.0000	0.1338	0.0230	0.0111	0.0000	0.0341
0.6400	0.0785	0.0775	0.0001	0.1561	0.0009	0.0008	0.0000	0.0017
23.0100	0.0765	0.0971	0.0002	0.1738	0.0308	0.0380	0.0001	0.0689
20.0300	0.1030	0.2154	0.0015	0.3200	0.0361	0.0734	0.0005	0.1100
15.9600	0.0933	0.2633	0.0036	0.3603	0.0261	0.0714	0.0010	0.0985
8.6700	0.0919	0.3017	0.0060	0.3995	0.0139	0.0445	0.0009	0.0593
25.7600	0.0627	0.2421	0.0065	0.3114	0.0283	0.1060	0.0028	0.1372
25.4400	0.0679	0.3118	0.0123	0.3921	0.0302	0.1349	0.0053	0.1705
25.7500	0.0656	0.3531	0.0193	0.4381	0.0296	0.1546	0.0085	0.1926
25.2100	0.0609	0.3700	0.0269	0.4578	0.0269	0.1586	0.0115	0.1970
10.3600	0.0523	0.3499	0.0299	0.4321	0.0095	0.0616	0.0053	0.0764
10.4300	0.0520	0.3607	0.0335	0.4462	0.0095	0.0640	0.0059	0.0794
21.0400	0.0491	0.3604	0.0371	0.4466	0.0181	0.1289	0.0133	0.1603
21.4400	0.0471	0.3712	0.0441	0.4625	0.0177	0.1353	0.0161	0.1691
21.2600	0.0458	0.3853	0.0521	0.4832	0.0171	0.1393	0.0188	0.1751
20.9200	0.0480	0.4306	0.0658	0.5444	0.0176	0.1531	0.0234	0.1941
21.4000	0.0419	0.4001	0.0684	0.5103	0.0157	0.1456	0.0249	0.1861
20.9600	0.0398	0.4072	0.0762	0.5231	0.0146	0.1451	0.0271	0.1868
2.2700	0.0433	0.4633	0.0905	0.5971	0.0017	0.0179	0.0035	0.0231
14.4200	0.0422	0.4554	0.0934	0.5910	0.0106	0.1116	0.0229	0.1452
2.1100	0.0409	0.4572	0.0967	0.5948	0.0015	0.0164	0.0035	0.0214
19.7500	0.0354	0.4057	0.0889	0.5300	0.0122	0.1362	0.0298	0.1783
22.7500	0.0333	0.4045	0.0952	0.5331	0.0133	0.1565	0.0368	0.2066
21.1400	0.0273	0.3572	0.0890	0.4735	0.0101	0.1284	0.0320	0.1705
21.6000	0.0258	0.3662	0.0949	0.4869	0.0098	0.1345	0.0349	0.1791

Table 6.3.32. Fast neutron fluence for E > 0.1 MeV at the end of each cycle in the HFR
Source: JRC-IAM Petten, HFR Unit, The Netherlands

		Fast Neutron Fluence, f,[a] E > 0.1 MeV		
Index	Cycle	Capsule 1	Capsule 2	Capsule 3
1	87.03	0.26	0.34	0.30
2	87.05	0.39	0.60	0.62
3	87.09	0.67	0.95	0.92
4	87.10	1.0	1.4	1.3
5	88.01	1.32	1.8	1.6
6	88.02	1.67	2.2	1.87
7	88.04	2.04	2.5	2.17
8	88.05	2.4	2.9	2.46
9	88.06	2.7	3.2	2.7
10	88.07	3.0	3.5	2.9
11	88.08	3.3	3.8	3.1
12	88.09	3.6	4.1	3.3
13	88.10	3.9	4.4	3.4
14	88.11	4.2	4.7	3.6
15	89.01	4.5	5.0	3.8
16	89.02	4.8	5.3	4.1
17	89.03	5.1	5.6	4.3
18	89.04	5.4	6.0	4.6
19	89.05	5.7	6.3	4.9
20	89.06	6.0	6.6	5.1
Final Data (after gamma scan)		6.3	6.8	5.0

[a] f = the fast neutron fluence in units of 10^{25}n/m^2.

Table 6.3.33. The cycle mean fast neutron fluences in the HFR for E > 0.10 MeV adjusted to final fluence values

		Mean Fast Neutron Fluence,[a] f (10^{25}n/m^2), E > 0.10 MeV		
Index	Cycle	Capsule 1	Capsule 2	Capsule 3
1	87.03	0.14	0.18	0.15
2	87.05	0.34	0.48	0.45
3	87.09	0.56	0.80	0.75
4	87.10	0.88	1.21	1.09
5	88.01	1.22	1.65	1.42
6	88.02	1.57	2.06	1.70
7	88.04	1.95	2.42	1.98
8	88.05	2.33	2.78	2.27
9	88.06	2.68	3.14	2.53
10	88.07	2.99	3.45	2.74
11	88.08	3.31	3.76	2.94
12	88.09	3.62	4.07	3.14
13	88.10	3.94	4.38	3.28
14	88.11	4.25	4.68	3.43
15	89.01	4.57	5.00	3.63
16	89.02	4.88	5.30	3.87
17	89.03	5.20	5.61	4.12
18	89.04	5.51	5.97	4.36
19	89.05	5.83	6.33	4.66
20	89.06	6.14	6.64	4.90

[a] $f \equiv \langle F/(10^{25}\text{n/m}^2)\rangle = \{(f_i + f_{i+1})/2\}C$

where f_j is the normalized fast fluence for index numbers j = i and j = i+1 given in Table 6.3.32. The index number i ranges from 0 to 20.

C = final data/last index values
= 1.05 for Capsule 1
= 1.03 for Capsule 2
= 0.98 for Capsule 3

Table 6.3.34. The cycle mean fast neutron fluences in the HTGR for E > 0.18 MeV adjusted to final fluence values

		Mean Fast Neutron Fluence[a] f (10^{25}n/m^2), E > 0.18 MeV		
Index	Cycle	Capsule 1	Capsule 2	Capsule 3
1	87.03	0.11	0.14	0.12
2	87.05	0.27	0.39	0.36
3	87.09	0.45	0.64	0.60
4	87.10	0.71	0.97	0.88
5	88.01	0.98	1.32	1.14
6	88.02	1.26	1.65	1.37
7	88.04	1.57	1.94	1.59
8	88.05	1.87	2.23	1.82
9	88.06	2.15	2.52	2.03
10	88.07	2.40	2.77	2.20
11	88.08	2.66	3.02	2.36
12	88.09	2.91	3.27	2.52
13	88.10	3.16	3.52	2.63
14	88.11	3.41	3.76	2.75
15	89.01	3.67	4.02	2.91
16	89.02	3.92	4.26	3.11
17	89.03	4.18	4.50	3.31
18	89.04	4.42	4.79	3.50
19	89.05	4.68	5.08	3.74
20	89.06	4.93	5.33	3.93

[a]These values were calculated by applying the following equation from ref. 29 to the data of Table 6.3.33:

$$f\ (\text{HTGR, E} > 0.18\ \text{MeV}) = 0.803\ f\ (\text{HFR, E} > 0.1\ \text{MeV})$$

where f = fast neutron fluence in units of 10^{25}n/m^2.

6.4 FISSION GAS RELEASE DATA

The steady-state, fractional fission gas release, R/B, values are presented for the case that:

1. fission gas is released only from dtf particles whose kernels are exposed shortly after the beginning of irradiation (see Sect. 4.4.1.3),

2. the fission gas is generated from the fissioning of ^{235}U only,

3. the yield of fission products are those corresponding to the fissioning of ^{235}U, and

4. the power in the particles with exposed kernels is constant at the initial irradiation value.

Further discussion on these restrictions and their removal is presented in Sect. 4.4.1.3. The R/B values in the following tables and figures are based on 8.9% of the power in the fissile particles; the number of dtf particles is 8.9% of the total number of fissile particles (see footnote on page 4-21).

The R/B values for capsule A (No. 1) are given in Tables 6.4.1 through 6.4.20 and Figs. 6.4.1 through 6.4.20; for capsule B (No. 2) in Tables 6.4.21 through 6.4.40 and Figs. 6.4.21 through 6.4.40; and for capsule C (No. 3), in Tables 6.4.41 through 6.4.60 and Figs. 6.4.41 through 6.4.60. The figures follow the corresponding tables in presentation. In addition to the R/B values, the tables contain the date, time, general relative activity level (GM), the groups of isotopes measured simultaneously (SV) as shown in the table below; the temperature; and the EFPD. The figures show the time profiles of the isotopes ^{85m}Kr, ^{87}Kr, ^{88}Kr, ^{89}Kr, ^{90}Kr, ^{133}Xe, ^{135}Xe, ^{135m}Xe, ^{137}Xe, and ^{138}Xe as well as a representative temperature profile of a TC response specific to each capsule. The SV values and the corresponding isotopes measured simultaneously are as follows:

Isotope	SV				
^{85m}Kr	00			30	40
^{87}Kr	00			30	40
^{88}Kr	00			30	40
^{89}Kr	00	10			
^{90}Kr	00	10			
^{133}Xe			20		40
^{135}Xe	00		20		40
^{135m}Xe	00	10			
^{137}Xe	00	10			
^{138}Xe	00	10			

Water-vapor injection data are provided in Table 6.4.61. In the table, cycle number, injection number, the start and ending times, the duration, inlet and outlet water-vapor pressures, the delay in the appearance of water-vapor in the outlet, and the corresponding amount of water-vapor are given.

Table 6.4.1. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 87.03		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
10. 4.87	12						884
0. 0	10						0
10. 4.87	12		1.144E-05				796
10.1	10			1.774E-05	6.554E-06	1.256E-05	1.4
11. 4.87	12		1.240E-05	5.099E-05	4.172E-05	5.446E-05	816
13.4	0		2.020E-05	2.333E-05	6.782E-06	1.200E-05	3.4
11. 4.87	14	4.034E-05	4.422E-05	3.926E-05	4.313E-05	3.880E-05	816
15.24	0		1.574E-05	3.335E-05	2.302E-05	1.498E-05	3.5
11. 4.87	14			5.267E-05	3.978E-05	5.909E-05	816
15.24	0		2.383E-05			1.283E-05	3.5
11. 4.87	14						816
15.24	0						3.5
13. 4.87	21	1.758E-06	1.289E-05				822
9. 3	0			2.172E-05	6.032E-06	1.126E-05	6.1
13. 4.87	14			5.053E-05	3.804E-05	7.587E-05	822
9. 3	0		2.492E-05				6.1
14. 4.87	14		3.646E-05				826
9.3	10			5.588E-05	1.787E-05	2.641E-05	7.9
14. 4.87	14			1.413E-04	1.043E-04	1.570E-04	826
9.3	40	3.133E-04	6.770E-05				7.9
14. 4.87	24	2.360E-06	2.445E-05				826
11.39	10			4.833E-05	1.106E-05	2.432E-05	8
14. 4.87	24			1.387E-04	1.002E-04	1.526E-04	826
11.39	40	3.203E-04	7.063E-05				8
21. 4.87	24						804
11.14	10			4.572E-04	4.541E-05	2.237E-04	12.4
21. 4.87	24			1.412E-03	9.913E-04	1.476E-03	804
11.14	30						12.4
21. 4.87	24			1.690E-03	1.195E-03	1.728E-03	804
11.14	40	2.452E-03	9.489E-04				12.4
23. 4.87	25			3.001E-03	2.227E-03	3.212E-03	803
9.21	40	5.262E-03	1.797E-03				14.1
26. 4.87	25			3.523E-03	2.613E-03	3.739E-03	808
12.5	40	6.572E-03	2.186E-03				16.7
2. 5.87	25			5.751E-03	4.334E-03	6.168E-03	819
9.25	40	1.029E-02	3.687E-03				21.4
3. 5.87	25			5.616E-03	4.076E-03	6.016E-03	820
10.1	40	9.824E-03	3.618E-03				22.2
4. 5.87	15			2.251E-03		2.560E-03	822
13.3	40	3.864E-03	2.440E-03				22.9
4. 5.87	15						241
16.4	40						23.03

Table 6.4.2. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 87.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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4. 6.87	35						476
13.4	10						23.03
4. 6.87	35		4.297E-04				476
13.56	10			1.399E-03	3.164E-04	6.438E-04	23.3
4. 6.87	35						476
13.56	10			1.543E-03	2.655E-04	7.212E-04	23.3
4. 6.87	35			2.322E-03	1.862E-03	2.492E-03	476
13.56	30						23.3
4. 6.87	35			2.427E-03	1.702E-03	2.483E-03	476
13.56	40	1.029E-03	1.958E-03				23.3
6. 6.87	32		3.510E-04				456
17.19	10			3.578E-04	2.374E-04	4.455E-04	23.8
6. 6.87	35		4.171E-04				456
17.19	10			4.518E-04	2.956E-04	5.534E-04	23.8
6. 6.87	35		5.195E-04				456
17.23	10			5.172E-04	3.521E-04	6.606E-04	23.8
7. 6.87	35		3.057E-04				518
19.13	10			1.444E-03	2.369E-04	6.819E-04	24.8
7. 6.87	35		4.257E-04				518
19.13	10			1.628E-03	2.919E-04	7.749E-04	24.8
7. 6.87	35			2.875E-03	2.036E-03	3.131E-03	518
19.13	40	1.911E-03	2.067E-03				24.8
7. 6.87	35			3.287E-03	2.458E-03	3.301E-03	518
19.13	40	2.433E-03	2.327E-03				24.8
8. 6.87	35						776
19.45	10						25.8
8. 6.87	35						776
19.45	10			2.167E-03		9.987E-04	25.8
8. 6.87	35			5.444E-03	4.071E-03	5.749E-03	776
19.45	40	6.614E-03	3.577E-03				25.8
8. 6.87	35			5.818E-03	4.410E-03	6.209E-03	776
19.45	40	7.080E-03	3.840E-03				25.8
8. 6.87	35						776
19.45	20	6.675E-03	4.237E-03				25.8
9. 6.87	35		5.647E-04				777
13.41	10			2.153E-03	4.494E-04	8.978E-04	26.65
9. 6.87	35			4.027E-03	3.325E-03	4.385E-03	777
13.41	30						26.65
9. 6.87	35			5.067E-03	3.935E-03	5.025E-03	777
13.41	40	5.101E-03	3.477E-03				26.65
10. 6.87	35						780
11. 7	30		-				27.65
10. 6.87	35			6.214E-03	4.833E-03	6.611E-03	780
11. 7	40	7.773E-03	4.328E-03				27.65
18. 6.87	35		3.109E-04				780
0.49	10			1.645E-03	2.123E-04		35.3
18. 6.87	35						780
0.49	10			2.281E-03	1.765E-04	9.136E-04	35.3
18. 6.87	35			6.557E-03	4.647E-03	7.089E-03	780
0.49	40	1.015E-02	4.529E-03				35.3
18. 6.87	35		4.125E-04				781
19.39	10			1.698E-03	2.610E-04	6.842E-04	35.85

Table 6.4.2. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 87.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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18. 6.87	35			4.924E-03	3.574E-03	5.368E-03	781
19.39	40	7.718E-03	3.408E-03				35.85
19. 6.87	35			8.014E-03	1.142E-02	7.201E-03	777
17.18	40	6.165E-03	3.751E-03				36.8
22. 6.87	35			5.414E-03	3.078E-03	6.374E-03	780
17.28	40	9.322E-03	1.716E-03				39.7
26. 6.87	35			3.954E-03	2.360E-03	4.525E-03	780
16. 5	40	7.033E-03	1.425E-03				43.65
27. 6.87	35			4.785E-03	3.656E-03	5.113E-03	785
20. 3	40	7.786E-03	3.023E-03				44.8
28. 6.87	35			4.819E-03	3.646E-03	5.159E-03	785
16.16	40	7.692E-03	3.037E-03				45.65
29. 6.87	35		4.014E-04				554
12.54	10			1.724E-03	3.095E-04	6.252E-04	46.5
29. 6.87	35		6.232E-04				554
12.54	10			2.008E-03	3.670E-04	7.221E-04	46.5
29. 6.87	35		1.159E-03				556
15.12	10			1.794E-03		6.966E-04	46.6
29. 6.87	35						47
17. 0	10						46.68
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Table 6.4.3. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 87.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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28.10.87	35						828
15. 5	10			1.367E-03	2.547E-04	5.363E-04	47.8
28.10.87	35			3.957E-03	2.988E-03	4.212E-03	828
15. 5	30						47.8
28.10.87	35						828
15. 5	20	1.578E-03	2.483E-03				47.8
29.10.87	35						832
8.3	10			1.906E-03		7.342E-04	48.5
29.10.87	35			3.286E-03	2.025E-03	3.896E-03	832
8.3	30						48.5
29.10.87	35						832
8.3	20	3.747E-03	2.910E-03				48.5
30.10.87	35						835
8.27	10			1.254E-03	2.124E-04	4.958E-04	49.5
30.10.87	35			3.525E-03	2.743E-03	3.792E-03	835
8.27	30						49.5
30.10.87	35						835
8.27	20	4.275E-03	2.531E-03				49.5
3.11.87	35						841
20.12	10			1.289E-03	3.042E-04	4.760E-04	53.8
3.11.87	35			3.210E-03	2.505E-03	3.482E-03	841
20.12	30						53.8
3.11.87	35						841
20.12	20	5.150E-03	2.361E-03				53.8
6.11.87	35						842
17.57	10			1.166E-03	2.176E-04	4.330E-04	56.8
6.11.87	35			3.227E-03	2.426E-03	3.463E-03	842
17.57	30						56.8
6.11.87	35						842
17.57	20	5.945E-03	2.227E-03				56.8
7.11.87	35						843
16.49	10			1.189E-03		4.694E-04	57.8
7.11.87	35			3.197E-03	2.407E-03	3.427E-03	843
16.49	30						57.8
7.11.87	35						843
16.49	20	5.331E-03	2.209E-03				57.8
8.11.87	35						844
16.43	10			1.191E-03	1.980E-04	4.547E-04	58.8
8.11.87	35			3.287E-03	2.500E-03	3.583E-03	844
16.43	30						58.8
8.11.87	35						844
16.43	20	6.166E-03	2.277E-03				58.8
13.11.87	35						853
16.26	10			1.209E-03	2.261E-04	4.398E-04	63.8
13.11.87	35			3.280E-03	2.495E-03	3.527E-03	853
16.26	30						63.8
13.11.87	35						853
16.26	20	6.091E-03	2.162E-03				63.8
14.11.87	35						853
16.5	10			1.134E-03	1.333E-04	4.364E-04	64.8
14.11.87	35			3.228E-03	2.404E-03	3.502E-03	853
16.5	30						64.8

Table 6.4.3. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 87.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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14.11.87	35						853
16.5	20	5.697E-03	2.075E-03				64.8
15.11.87	35						853
16.28	10			1.194E-03	2.265E-04	4.306E-04	65.8
15.11.87	35			3.106E-03	2.367E-03	3.388E-03	853
16.28	30						65.8
15.11.87	35						853
16.28	20	5.815E-03	1.988E-03				65.8
16.11.87	35						66
17. 0	20						66.71
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Table 6.4.4. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 87.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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25.11.87	35						827
0. 0	10						66.71
25.11.87	35						828
16.25	10			1.227E-03	2.464E-04	4.631E-04	72.6
25.11.87	35			2.686E-03	2.053E-03	2.742E-03	828
16.25	30						72.6
25.11.87	35						828
16.25	20	4.602E-03	1.817E-03				72.6
26.11.87	35						829
16. 6	10			1.200E-03	1.933E-04		73.6
26.11.87	35			2.653E-03	1.997E-03	2.730E-03	829
16. 6	30						73.6
26.11.87	35						829
16. 6	20	4.637E-03	1.796E-03				73.6
30.11.87	35						839
16. 9	10			1.177E-03	1.872E-04		78.6
30.11.87	35			2.638E-03	1.980E-03	2.718E-03	839
16. 9	30						78.6
30.11.87	35						839
16. 9	20	5.022E-03	1.720E-03				78.6
2.12.87	35						841
16. 3	10			1.159E-03	1.942E-04	4.411E-04	80.6
2.12.87	35			2.648E-03	2.006E-03	2.704E-03	841
16. 3	30						80.6
2.12.87	35						841
16. 3	20	4.742E-03	1.718E-03				80.6
3.12.87	35						839
16. 5	10			1.122E-03	1.929E-04	4.194E-04	81.6
3.12.87	35			2.573E-03	1.947E-03	2.625E-03	839
16. 5	30						81.6
3.12.87	35						839
16. 5	20	4.757E-03	1.674E-03				81.6
4.12.87	35						840
15.59	10			1.187E-03	1.543E-04	4.350E-04	82.6
4.12.87	35			2.849E-03	2.112E-03	2.927E-03	840
15.59	30						82.6
4.12.87	35						840
15.59	20	5.415E-03	1.827E-03				82.6
10.12.87	35						836
16.38	10			1.096E-03	1.844E-04	3.984E-04	87.6
10.12.87	35			2.375E-03	1.774E-03	2.469E-03	836
16.38	30						87.6
10.12.87	35						836
16.38	20	4.226E-03	1.515E-03				87.6
11.12.87	35						837
16.21	10			1.065E-03	1.935E-04	3.949E-04	88.6
11.12.87	35			2.363E-03	1.749E-03	2.455E-03	837
16.21	30						88.6
11.12.87	35						837
16.21	20	4.350E-03	1.490E-03				88.6
12.12.87	35						840
16.4	10			1.092E-03	1.782E-04	3.911E-04	89.6

Table 6.4.4. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 87.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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12.12.87	35			2.367E-03	1.773E-03	2.582E-03	840
16.4	30						89.6
12.12.87	35						840
16.4	20	4.314E-03	1.503E-03				89.6
13.12.87	35						840
16.26	10			1.078E-03	1.756E-04	3.989E-04	90.6
13.12.87	35			2.400E-03	1.783E-03	2.498E-03	840
16.26	30						90.6
13.12.87	35						840
16.26	20	4.421E-03	1.500E-03				90.6
14.12.87	35						60
17. 0	20						91.34
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Table 6.4.5. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	A	CYCLE NO.	88.01	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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8. 1.88	35						805
0. 0	10						91.34
8. 1.88	35		5.442E-04				807
15.56	10			1.687E-03		6.152E-04	93.1
8. 1.88	35			3.324E-03	2.526E-03	3.411E-03	807
15.56	30						93.1
8. 1.88	35						807
15.56	20	2.580E-03	2.394E-03				93.1
9. 1.88	35						811
16. 7	10			1.668E-03		5.981E-04	94.1
9. 1.88	35			3.288E-03	2.495E-03	3.351E-03	811
16. 7	30						94.1
9. 1.88	35						811
16. 7	20	3.520E-03	2.410E-03				94.1
10. 1.88	35						813
16.1	10			1.679E-03		6.075E-04	95.1
10. 1.88	35			3.259E-03	2.497E-03	3.531E-03	813
16.1	30						95.1
10. 1.88	35						813
16.1	20	4.605E-03	2.378E-03				95.1
12. 1.88	35						816
15.53	10			1.643E-03		5.738E-04	97.1
12. 1.88	35			3.364E-03	2.478E-03	3.382E-03	816
15.53	30						97.1
12. 1.88	35						816
15.53	20	4.865E-03	2.304E-03				97.1
20. 1.88	35						823
18.34	10			1.642E-03		5.698E-04	105.2
20. 1.88	35			3.360E-03	2.501E-03	3.462E-03	823
18.34	30						105.2
20. 1.88	35						823
18.34	20	6.802E-03	2.376E-03				105.2
21. 1.88	35						826
15.55	10			1.608E-03		5.625E-04	106.1
21. 1.88	35			3.316E-03	2.468E-03	3.447E-03	826
15.55	30						106.1
21. 1.88	35						826
15.55	20	5.964E-03	2.359E-03				106.1
22. 1.88	35						830
16. 0	10			1.524E-03		5.612E-04	107.1
22. 1.88	35			3.606E-03	2.542E-03	3.670E-03	830
16. 0	30						107.1
22. 1.88	35						830
16. 0	20	6.167E-03	2.307E-03				107.1
23. 1.88	35						828
16.32	10			1.596E-03		5.641E-04	108.1
23. 1.88	35			3.369E-03	2.441E-03	3.569E-03	828
16.32	30						108.1
23. 1.88	35						828
16.32	20	5.520E-03	2.302E-03				108.1
29. 1.88	35						834
17.14	10			1.577E-03		5.545E-04	114.1

Table 6.4.5. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29. 1.88	35			3.221E-03	2.397E-03	3.304E-03	834
17.14	30						114.1
29. 1.88	35						834
17.14	20	6.346E-03	2.214E-03				114.1
30. 1.88	35						836
16.52	10			1.583E-03		5.662E-04	115.1
30. 1.88	35			3.230E-03	2.408E-03	3.351E-03	836
16.52	30						115.1
30. 1.88	35						836
16.52	20	5.783E-03	2.248E-03				115.1
31. 1.88	35						838
16.25	10			1.551E-03		5.506E-04	116.1
31. 1.88	35			3.234E-03	2.446E-03	3.386E-03	838
16.25	30						116.1
31. 1.88	35						838
16.25	20	6.385E-03	2.226E-03				116.1
1. 2.88	35						32
20. 0	20						117.1
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Table 6.4.6. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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9. 2.88	35						832
0. 0	10						117.1
9. 2.88	35						832
13. 4	10			1.385E-03		4.763E-04	122.7
9. 2.88	35			2.604E-03	1.944E-03	2.744E-03	832
13. 4	30						122.7
9. 2.88	35						832
13. 4	20	4.649E-03	1.324E-03				122.7
10. 2.88	35						832
9.3	10			1.366E-03		4.736E-04	123.5
10. 2.88	35			2.604E-03	1.966E-03	2.718E-03	832
9.3	30						123.5
10. 2.88	35						832
9.3	20	4.548E-03	1.831E-03				123.5
11. 2.88	35						837
8.32	10			1.395E-03		4.946E-04	124.4
11. 2.88	35			2.583E-03	1.935E-03	2.688E-03	837
8.32	30						124.4
11. 2.88	35						837
8.32	20	4.486E-03	1.795E-03				124.4
12. 2.88	35						835
8.29	10			1.339E-03		4.657E-04	125.4
12. 2.88	35			2.610E-03	1.903E-03	2.669E-03	835
8.29	30						125.4
12. 2.88	35						835
8.29	20	5.585E-03	1.772E-03				125.4
17. 2.88	35						844
17. 9	10			1.234E-03		4.377E-04	130.9
17. 2.88	35			2.412E-03	1.789E-03	2.532E-03	844
17. 9	30						130.9
17. 2.88	35						844
17. 9	20	4.742E-03	1.545E-03				130.9
18. 2.88	35						842
17. 1	10			1.239E-03		4.383E-04	132
18. 2.88	35			2.363E-03	1.767E-03	2.591E-03	842
17. 1	30						132
18. 2.88	35						842
17. 1	20	4.206E-03	1.557E-03				132
19. 2.88	35						844
16.31	10			1.214E-03		4.349E-04	133
19. 2.88	35			2.391E-03	1.726E-03	2.575E-03	844
16.31	30						133
19. 2.88	35						844
16.31	20	4.927E-03	1.504E-03				133
26. 2.88	35						838
16.36	10			1.314E-03		4.604E-04	140
26. 2.88	35			2.550E-03	1.869E-03	2.677E-03	838
16.36	30						140
26. 2.88	35						838
16.36	20	6.120E-03	1.733E-03				140
27. 2.88	35						838
16.37	10			1.240E-03		4.359E-04	141

Table 6.4.6. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
27. 2.88	35			2.520E-03	1.831E-03	2.596E-03	838
16.37	30						141
27. 2.88	35						838
16.37	20	5.641E-03	1.699E-03				141
28. 2.88	35						838
16.38	10			1.362E-03		4.709E-04	142
28. 2.88	35			2.590E-03	1.920E-03	2.821E-03	838
16.38	30						142
28. 2.88	35						838
16.38	20	5.826E-03	1.784E-03				142
29. 2.88	35						62
18. 0	20						142.54
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Table 6.4.7. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29. 4.88	45						886
0. 0	10						142.54
29. 4.88	45		4.274E-04				896
16.55	10			1.489E-03		5.254E-04	143.7
29. 4.88	45						896
16.55	20	1.945E-03					143.7
30. 4.88	45						896
16.38	10			1.552E-03	2.670E-04	5.297E-04	144.8
30. 4.88	45			4.349E-03	3.245E-03	5.039E-03	896
16.38	30						144.8
30. 4.88	45						896
16.38	20	2.822E-03	1.653E-03				144.8
1. 5.88	45		4.270E-04				897
16.48	10			1.488E-03	2.417E-04	5.131E-04	145.8
1. 5.88	45			2.620E-03	1.998E-03	3.097E-03	897
16.48	30						145.8
1. 5.88	45						897
16.48	20	2.939E-03	1.594E-03				145.8
3. 5.88	45		2.923E-04				899
16.25	10			1.166E-03	1.722E-04	4.060E-04	147.8
3. 5.88	45			2.093E-03	1.447E-03	2.392E-03	899
16.25	30						147.8
3. 5.88	45						899
16.25	20	3.114E-03	1.256E-03				147.8
10. 5.88	45			5.426E-03	3.248E-03	6.198E-03	899
8.32	30						155
10. 5.88	45						899
8.32	20	1.474E-02	2.944E-03				155
11. 5.88	45			5.018E-03	2.981E-03	5.756E-03	902
8.54	30						156
11. 5.88	45						902
8.54	20	1.066E-02	2.458E-03				156
13. 5.88	45			4.512E-03	2.766E-03	5.233E-03	897
9. 5	30						158
13. 5.88	45						897
9. 5	20	8.791E-03	2.169E-03				158
16. 5.88	45			4.518E-03	2.719E-03	5.234E-03	899
8.41	30						161
17. 5.88	45			4.392E-03	2.698E-03	5.213E-03	897
8.36	30						162
17. 5.88	45						897
8.36	20	8.476E-03	1.915E-03				162
18. 5.88	45			4.510E-03	2.678E-03	5.204E-03	900
8.36	30						163
18. 5.88	45						900
8.36	20	6.657E-03	1.670E-03				163
19. 5.88	45			4.391E-03	2.690E-03	5.232E-03	901
8.42	30						164
19. 5.88	45						901
8.42	20	8.255E-03	1.815E-03				164
23. 5.88	45						84
17. 0	20						168.29

Table 6.4.8. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	A	CYCLE NO.	88.05	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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27. 5.88	45						885
0. 0	10						168.29
27. 5.88	45			4.885E-03	3.622E-03	5.020E-03	894
16.28	30						169
27. 5.88	45						894
16.28	20	6.037E-03	2.678E-03				169
28. 5.88	45		5.864E-04				895
16.14	10			2.156E-03	3.326E-04	7.031E-04	170
28. 5.88	45			4.824E-03	3.559E-03	4.904E-03	895
16.14	30						170
28. 5.88	45						895
16.14	20	6.266E-03	2.857E-03				170
29. 5.88	45		7.215E-04				898
16.26	10			2.123E-03	3.291E-04	6.121E-04	171
29. 5.88	45			4.377E-03	3.499E-03	4.863E-03	898
16.26	30						171
29. 5.88	45						898
16.26	20	7.072E-03	2.806E-03				171
30. 5.88	45		5.610E-04				896
18.3	10			1.910E-03	3.464E-04	6.354E-04	172.1
31. 5.88	45			3.715E-03	2.520E-03	3.797E-03	898
16.55	30						173
31. 5.88	45						898
16.55	20	6.955E-03	2.145E-03				173
1. 6.88	45		4.823E-04				894
17. 5	10			1.651E-03	2.828E-04	6.252E-04	174
1. 6.88	45			3.403E-03	2.592E-03	3.797E-03	894
17. 5	30						174
1. 6.88	45						894
17. 5	20	6.448E-03	2.077E-03				174
3. 6.88	45		3.759E-04				897
17.19	10			1.358E-03	2.168E-04	4.835E-04	176
3. 6.88	45			3.136E-03	2.296E-03	3.598E-03	897
17.19	30						176
3. 6.88	45						897
17.19	20	6.324E-03	1.937E-03				176
4. 6.88	45		3.998E-04				890
16.15	10			1.316E-03	2.287E-04	4.961E-04	177
4. 6.88	45			3.065E-03	2.285E-03	3.589E-03	890
16.15	30						177
4. 6.88	45						890
16.15	20	6.585E-03	1.851E-03				177
5. 6.88	45		3.948E-04				897
16.29	10			1.366E-03	2.359E-04	4.803E-04	178
5. 6.88	45			2.856E-03	2.054E-03	2.814E-03	897
16.29	30						178
5. 6.88	45						897
16.29	20	5.989E-03	1.813E-03				178
6. 6.88	45						898
17. 1	10			1.674E-03	2.530E-04	6.008E-04	179
6. 6.88	45			3.443E-03	2.558E-03	4.036E-03	898
17. 1	30						179

Table 6.4.8. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
6. 6.88	45						898
17. 1	20	7.246E-03	2.036E-03				179
7. 6.88	45		3.583E-04				899
16.29	10			1.230E-03	2.073E-04	4.308E-04	180
7. 6.88	45			2.677E-03	1.903E-03	3.101E-03	899
16.29	30						180
7. 6.88	45						899
16.29	20	5.339E-03	1.587E-03				180
8. 6.88	45			2.667E-03	1.922E-03	3.130E-03	898
16.19	30						181
8. 6.88	45						898
16.19	20	5.490E-03	1.654E-03				181
10. 6.88	45		3.612E-04				904
16.33	10			1.238E-03	2.187E-04	4.465E-04	183
10. 6.88	45			2.869E-03	2.106E-03	3.375E-03	904
17.33	30						183
11. 6.88	45		3.667E-04				901
16.49	10			1.298E-03	2.266E-04	4.227E-04	184
12. 6.88	45			2.536E-03	1.900E-03	2.846E-03	902
16.45	30						185
12. 6.88	45						902
16.45	20	5.121E-03	1.544E-03				185
13. 6.88	45		3.241E-04				903
16.36	10			1.189E-03	1.919E-04	4.195E-04	186
13. 6.88	45			2.556E-03	1.910E-03	2.884E-03	902
17.4	30						186
13. 6.88	45						902
18.36	20	7.383E-03	1.540E-03				186
14. 6.88	45		3.841E-04				904
16.19	10			1.257E-03	2.128E-04	4.275E-04	187
14. 6.88	45			2.794E-03	1.959E-03	3.171E-03	904
16.19	30						187
14. 6.88	45						904
16.19	20	6.564E-03	1.596E-03				187
16. 6.88	45		3.293E-04				906
8.27	10			1.102E-03	1.921E-04	3.799E-04	189
16. 6.88	45			2.763E-03	1.936E-03	2.907E-03	906
8.27	30						189
16. 6.88	45		3.330E-04				906
14.21	10			1.274E-03	1.972E-04	4.209E-04	189
17. 6.88	45		3.466E-04				902
8.59	10			1.286E-03	2.063E-04	4.327E-04	189.8
17. 6.88	45			2.819E-03	2.031E-03	3.239E-03	902
8.59	30						189.8
17. 6.88	45						902
8.59	20	5.515E-03	1.661E-03				189.8
18. 6.88	45						902
9. 1	20	4.989E-03					190.8
19. 6.88	45						902
9. 2	20	5.392E-03					191.8
20. 6.88	45						903
8.36	10			8.394E-04	9.476E-05	3.174E-04	192.7

Table 6.4.8. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
20. 6.88	45			2.201E-03	1.486E-03	3.327E-03	903
8.36	30						192.7
20. 6.88	45						903
8.36	20	5.316E-03					192.7
20. 6.88	45						0
18. 0	20						193.5
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Table 6.4.9. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
24. 6.88	42						809
0. 0	10						193.5
24. 6.88	42		2.887E-04				817
9.22	10			1.276E-03	1.977E-04	5.358E-04	194.5
24. 6.88	45			3.392E-03	2.497E-03	3.597E-03	817
9.22	30						194.5
24. 6.88	45						817
9.22	20	5.005E-03	1.880E-03				194.5
25. 6.88	45		4.004E-04				824
8.25	10			1.658E-03	2.468E-04	5.468E-04	195.4
25. 6.88	45				2.420E-03	3.999E-03	824
8.25	30						195.4
25. 6.88	45						824
8.25	20	6.283E-03	2.491E-03				195.4
26. 6.88	42		2.487E-04				827
9. 0	10			1.380E-03	1.598E-04	4.448E-04	196.5
26. 6.88	45			3.436E-03	2.549E-03	4.060E-03	827
9. 0	30						196.5
26. 6.88	45						827
9. 0	20	6.810E-03	2.561E-03				196.5
30. 6.88	45			2.814E-03	1.643E-03	3.427E-03	832
18.16	30						200.8
30. 6.88	45						831
20.16	20	6.241E-03	1.215E-03				200.8
1. 7.88	45			2.845E-03	1.680E-03	3.472E-03	834
16.38	30						201.7
1. 7.88	45						834
16.38	20	6.276E-03	1.154E-03				201.7
2. 7.88	45			2.821E-03	1.660E-03	3.488E-03	836
16.21	30						202.7
2. 7.88	45						836
16.21	20	6.098E-03	1.115E-03				202.7
3. 7.88	45			2.703E-03	1.607E-03	3.392E-03	836
16.12	30						203.7
3. 7.88	45						836
16.12	20	6.132E-03	1.067E-03				203.7
7. 7.88	45		3.205E-04				839
10.13	10			1.560E-03	2.091E-04	4.874E-04	205.9
7. 7.88	45			2.985E-03	2.045E-03	3.228E-03	839
10.13	30						205.9
7. 7.88	45						839
10.13	20	6.473E-03	2.084E-03				205.9
8. 7.88	45		3.868E-04				839
9. 5	10			1.525E-03	2.550E-04	4.816E-04	206.9
8. 7.88	45			3.031E-03	2.113E-03	3.582E-03	839
9. 5	30						206.9
8. 7.88	45						839
9. 5	20	5.352E-03	1.998E-03				206.9
9. 7.88	45		4.054E-04				840
8.14	10			1.541E-03	2.383E-04	4.912E-04	207.8
9. 7.88	45			2.907E-03	2.202E-03	3.396E-03	840
8.14	30						207.8

Table 6.4.9. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
9. 7.88	45						840
8.14	20	5.559E-03	1.902E-03				207.8
10. 7.88	45		4.086E-04				841
8.37	10			1.504E-03	2.585E-04	4.938E-04	208.8
10. 7.88	45			2.944E-03	2.133E-03	3.315E-03	841
8.37	30						208.8
10. 7.88	45						841
8.37	20	6.035E-03	1.955E-03				208.8
11. 7.88	45		3.154E-04				837
9. 5	10			1.192E-03	1.973E-04	3.926E-04	209.9
11. 7.88	45			2.931E-03	1.983E-03	3.281E-03	837
9. 5	30						209.9
11. 7.88	45						837
9. 5	20	5.474E-03	1.800E-03				209.9
12. 7.88	45		3.883E-04				838
8.16	10			1.372E-03	2.331E-04	4.740E-04	210.8
12. 7.88	45			2.325E-03	1.339E-03	2.918E-03	838
8.16	30						210.8
12. 7.88	45						838
8.16	20	7.962E-03	1.832E-03				210.8
13. 7.88	45		3.896E-04				838
8.18	10			1.388E-03	2.324E-04	4.630E-04	211.8
13. 7.88	45			2.702E-03	1.930E-03	3.055E-03	838
8.18	30						211.8
13. 7.88	45						838
8.18	20	5.803E-03	1.700E-03				211.8
14. 7.88	45		3.512E-04				838
9.21	10			1.346E-03	2.155E-04	4.208E-04	212.8
14. 7.88	45			2.639E-03	1.950E-03	2.995E-03	838
9.21	30						212.8
14. 7.88	45						838
9.21	20	5.649E-03	1.671E-03				212.8
15. 7.88	45		3.889E-04				838
8.17	10			1.360E-03	2.307E-04	4.749E-04	213.8
15. 7.88	45			2.666E-03	1.906E-03	2.849E-03	838
8.17	30						213.8
15. 7.88	45						838
8.17	20	5.814E-03	1.670E-03				213.8
18. 7.88	45						27
5. 0	20						214.29
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Table 6.4.10. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	A	CYCLE NO.	88.07	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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8. 9.88	42						364
0. 0	10						214.3
8. 9.88	42		4.259E-04				835
11. 5	10			9.525E-04		4.514E-04	214.7
8. 9.88	45		5.535E-04				835
11.13	10			1.099E-03	3.058E-04	5.831E-04	214.7
8. 9.88	45			3.218E-03	2.379E-03	3.681E-03	835
11.13	40		1.486E-03				214.7
9. 9.88	42		4.153E-04				849
8.42	10			1.302E-03	2.620E-04	4.181E-04	215.6
9. 9.88	45		4.851E-04				849
8.52	10			1.398E-03	2.541E-04	4.874E-04	215.6
9. 9.88	45			2.624E-03	2.001E-03	3.151E-03	849
8.52	30						215.6
9. 9.88	45						849
8.52	20	1.742E-03	1.956E-03				215.6
10. 9.88	42		3.725E-04				853
11.2	10			1.327E-03	2.130E-04	4.375E-04	216.7
10. 9.88	45		3.364E-04				853
11.31	10			1.352E-03	1.997E-04	5.135E-04	216.7
10. 9.88	45			2.523E-03	1.767E-03	2.745E-03	853
11.31	30						216.7
10. 9.88	45						853
11.31	20	3.057E-03	1.872E-03				216.7
11. 9.88	42		3.691E-04				853
9. 1	10			1.310E-03	2.228E-04	4.010E-04	217.6
11. 9.88	45		4.372E-04				853
9.12	10			1.437E-03	2.828E-04	4.514E-04	217.6
11. 9.88	45			2.772E-03	2.061E-03	3.201E-03	853
9.12	30						217.6
11. 9.88	45						853
9.12	20	3.822E-03	2.064E-03				217.6
12. 9.88	42		3.275E-04				856
8.45	10			1.131E-03	2.112E-04	3.962E-04	218.6
12. 9.88	45		4.646E-04				856
8.53	10			1.554E-03		4.999E-04	218.6
12. 9.88	45			2.901E-03	2.038E-03	3.444E-03	856
8.53	30						218.6
12. 9.88	45						856
8.53	20	4.683E-03	2.173E-03				218.6
13. 9.88	42		3.773E-04				856
8.45	10			1.378E-03	2.391E-04	4.626E-04	219.7
13. 9.88	45		3.905E-04				856
8.57	10			1.469E-03	1.984E-04	4.716E-04	219.7
13. 9.88	45			2.753E-03	2.074E-03	3.327E-03	856
8.57	30						219.7
13. 9.88	45						856
8.57	20	4.894E-03	2.142E-03				219.7
16. 9.88	42		1.412E-04				857
16.32	10						222.9
16. 9.88	45						857
16.38	10			1.251E-03		4.410E-04	222.9

Table 6.4.10. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.07		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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16. 9.88	45			2.556E-03	1.760E-03	3.023E-03	857
16.38	30						222.9
16. 9.88	45						857
16.38	20	6.292E-03	2.210E-03				222.9
16. 9.88	42		2.914E-04				857
19.2	10			1.293E-03	1.875E-04	3.922E-04	223
16. 9.88	45						857
19.25	10			1.717E-03	2.917E-04	5.564E-04	223
16. 9.88	45			2.924E-03	2.028E-03	3.495E-03	857
19.25	30						223
16. 9.88	45						857
19.25	20	6.223E-03	2.256E-03				223
17. 9.88	42		3.115E-04				860
16.33	10			1.482E-03	1.957E-04	4.628E-04	223.9
17. 9.88	45						860
16.38	10			1.884E-03	2.778E-04	6.481E-04	223.9
17. 9.88	45						860
16.38	20	7.480E-03	2.531E-03				223.9
17. 9.88	42		3.431E-04				858
19.3	10			1.407E-03	2.093E-04	4.740E-04	224
17. 9.88	45						858
19.35	10			1.900E-03	2.253E-04	6.062E-04	224
17. 9.88	45			3.259E-03	2.300E-03	3.709E-03	858
19.35	30						224
17. 9.88	45						858
19.35	20	7.246E-03	2.482E-03				224
18. 9.88	42		2.296E-04				857
16.35	10			1.512E-03	2.276E-04	4.752E-04	224.9
18. 9.88	45						857
16.4	10			2.004E-03		6.964E-04	224.9
18. 9.88	45			3.358E-03	2.211E-03	3.845E-03	857
16.4	30						224.9
18. 9.88	45						857
16.4	20	7.597E-03	2.649E-03				224.9
18. 9.88	42		2.116E-04				858
20.43	10			1.222E-03	1.878E-04	3.596E-04	225.05
18. 9.88	45						858
20.49	10			1.980E-03		6.333E-04	225.05
18. 9.88	45			3.139E-03	2.382E-03	3.588E-03	858
20.49	30						225.05
18. 9.88	45						858
20.49	20	7.473E-03	2.533E-03				225.05
19. 9.88	45		3.349E-04				856
16.51	10			1.833E-03	2.787E-04	6.040E-04	225.91
19. 9.88	45			3.391E-03	2.517E-03	3.951E-03	856
16.51	30						225.91
19. 9.88	45						856
16.51	20	7.798E-03	2.560E-03				225.91
20. 9.88	45		4.166E-04				858
16.39	10			2.160E-03	3.101E-04	6.918E-04	226.9
20. 9.88	45			3.530E-03	2.577E-03	4.058E-03	858
16.39	30						226.9

Table 6.4.10. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.07		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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20. 9.88	45						858
16.39	20	1.153E-02	2.676E-03				226.9
22. 9.88	45		3.954E-04				861
0.35	10			1.994E-03	3.022E-04	6.437E-04	228.25
22. 9.88	45			3.406E-03	2.399E-03	3.805E-03	861
0.35	30						228.25
22. 9.88	45						861
0.35	20	7.429E-03	2.483E-03				228.25
23. 9.88	45		4.070E-04				859
0.4	10			1.843E-03	3.071E-04	5.769E-04	229.25
23. 9.88	45			3.121E-03	2.361E-03	3.765E-03	859
0.4	30						229.25
23. 9.88	45						859
0.4	20	8.518E-03	2.319E-03				229.25
24. 9.88	45		6.569E-04				861
1. 0	10			1.958E-03	4.552E-04	6.647E-04	230.28
24. 9.88	45			3.087E-03	2.301E-03	3.501E-03	861
1. 0	30						230.28
24. 9.88	45						861
1. 0	20	7.400E-03	2.258E-03				230.28
25. 9.88	45		3.892E-04				861
0.43	10			1.744E-03	3.211E-04	6.091E-04	231.25
25. 9.88	45			2.875E-03	2.155E-03	3.495E-03	861
0.43	30						231.25
25. 9.88	45						861
0.43	20	6.495E-03	2.154E-03				231.25
26. 9.88	45		3.917E-04				860
1.55	10			1.749E-03	2.700E-04	5.663E-04	232.32
26. 9.88	45			2.950E-03	2.165E-03	3.445E-03	860
1.55	30						232.32
26. 9.88	45						860
1.55	20	9.623E-03	2.211E-03				232.32
27. 9.88	45		2.803E-04				859
1.15	10			1.405E-03	1.864E-04	4.546E-04	233.29
27. 9.88	45			2.893E-03	2.078E-03	3.429E-03	859
1.15	30						233.29
27. 9.88	45						859
1.15	20	8.196E-03	2.147E-03				233.29
28. 9.88	45		2.608E-04				861
1.5	10			1.621E-03	1.998E-04	5.377E-04	234.32
28. 9.88	45			2.921E-03	2.108E-03	3.482E-03	861
1.5	30						234.32
28. 9.88	45						861
1.5	20	6.825E-03	2.173E-03				234.32
29. 9.88	45						62
3. 0	20						235.33
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Table 6.4.11. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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4.10.88	45						831
0. 0	10						235.33
4.10.88	45						839
17.15	10			1.866E-03	1.445E-04	6.289E-04	236.4
4.10.88	45			3.864E-03	2.910E-03	4.660E-03	839
17.15	40	8.580E-03	2.645E-03				236.4
4.10.88	45			4.208E-03	2.588E-03	4.757E-03	839
17.15	40	7.206E-03	2.863E-03				236.4
5.10.88	42		2.593E-04				843
18.25	10			1.892E-03	2.131E-04	5.696E-04	237.6
5.10.88	45		2.154E-04				843
18.25	10			2.039E-03	1.850E-04	6.290E-04	237.6
5.10.88	45			3.706E-03	2.754E-03	4.484E-03	843
18.25	40	6.290E-03	2.720E-03				237.6
5.10.88	45			4.263E-03	2.906E-03	4.748E-03	843
18.25	40	6.748E-03	3.066E-03				237.6
6.10.88	42		3.421E-04				843
16.56	10			1.588E-03	2.391E-04	5.259E-04	238.6
6.10.88	45						843
17. 0	10			2.146E-03	4.057E-04	6.808E-04	238.6
6.10.88	45			3.034E-03	2.303E-03	3.640E-03	843
17. 0	30						238.6
6.10.88	45						843
17. 0	20	5.861E-03	2.442E-03				238.6
7.10.88	42		2.636E-04				845
16.5	10			1.460E-03	1.745E-04	4.844E-04	239.6
7.10.88	45		2.979E-04				845
16.55	10			1.729E-03	2.135E-04	5.434E-04	239.6
7.10.88	45			2.766E-03	2.095E-03	3.491E-03	845
16.55	30						239.6
7.10.88	45						845
16.55	20	6.286E-03	2.313E-03				239.6
8.10.88	42		2.589E-04				846
16.34	10			1.509E-03	2.021E-04	5.016E-04	240.6
8.10.88	45		3.004E-04				846
16.4	10			1.692E-03	2.026E-04	5.570E-04	240.6
8.10.88	45			2.927E-03	2.096E-03	3.589E-03	846
16.4	30						240.6
8.10.88	45						846
16.4	20	6.709E-03	2.361E-03				240.6
9.10.88	42		3.349E-04				849
16.4	10			1.454E-03	2.141E-04	4.865E-04	241.6
9.10.88	45		3.200E-04				849
16.45	10			1.828E-03	2.415E-04	5.685E-04	241.6
9.10.88	45			2.939E-03	2.103E-03	3.561E-03	849
16.45	30						241.6
9.10.88	45						849
16.45	20	7.470E-03	2.355E-03				241.6
12.10.88	42		2.619E-04				849
20. 3	10			1.470E-03	1.769E-04	4.224E-04	244.8
12.10.88	45						849
20. 4	10			1.806E-03	2.381E-04	5.510E-04	244.8

Table 6.4.11. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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12.10.88	45			2.851E-03	1.996E-03	3.385E-03	849
20. 4	30						244.8
12.10.88	45						849
20. 4	20	6.598E-03	2.255E-03				244.8
13.10.88	42		3.124E-04				850
18.16	10			1.481E-03	2.198E-04	4.607E-04	245.7
13.10.88	45						850
18.18	10			1.814E-03	2.153E-04	5.941E-04	245.7
13.10.88	45			2.866E-03	2.162E-03	3.477E-03	850
18.18	30						245.7
13.10.88	45						850
18.18	20	7.111E-03	2.370E-03				245.7
14.10.88	42		2.541E-04				850
16.4	10			1.471E-03	1.754E-04	4.400E-04	246.7
14.10.88	45						850
16.41	10			2.063E-03	2.765E-04	6.115E-04	246.7
14.10.88	45			3.053E-03	2.246E-03	3.691E-03	850
16.41	30						246.7
14.10.88	45						850
16.41	20	8.591E-03	2.488E-03				246.7
15.10.88	42		2.681E-04				849
16.43	10			1.410E-03	1.521E-04	4.681E-04	247.7
15.10.88	45						849
16.45	10			1.842E-03	2.199E-04	5.760E-04	247.7
15.10.88	45			2.763E-03	2.121E-03	3.405E-03	849
16.45	30						247.7
15.10.88	45						849
16.45	20	6.727E-03	2.311E-03				247.7
16.10.88	42		2.512E-04				849
16.43	10			1.363E-03	1.859E-04	4.433E-04	248.7
16.10.88	45						849
16.46	10			1.819E-03	2.466E-04	5.536E-04	248.7
16.10.88	45			2.644E-03	2.035E-03	3.187E-03	849
16.46	30						248.7
16.10.88	45						849
16.46	20	7.630E-03	2.149E-03				248.7
17.10.88	42		2.400E-04				851
17.27	10			1.498E-03	1.551E-04	4.177E-04	249.7
17.10.88	45						851
17.3	10			1.691E-03	2.377E-04	5.514E-04	249.7
17.10.88	45			2.838E-03	2.177E-03	3.564E-03	851
17.3	30						249.7
17.10.88	45						851
17.3	20	7.210E-03	2.395E-03				249.7
19.10.88	42		2.882E-04				850
1. 0	10			1.313E-03	1.788E-04	4.125E-04	250.9
19.10.88	45						850
1. 3	10			1.739E-03	2.539E-04	5.264E-04	250.9
19.10.88	45			2.643E-03	1.935E-03	3.015E-03	850
1. 3	30						250.9
19.10.88	45						850
1. 3	20	1.340E-02	2.066E-03				250.9

Table 6.4.11. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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21.10.88	42		2.135E-04				852
18.42	10			1.500E-03	1.673E-04	4.486E-04	253.7
21.10.88	45						852
18.46	10			1.727E-03	1.647E-04	5.154E-04	253.7
21.10.88	45			2.890E-03	2.036E-03	3.063E-03	852
18.46	30						253.7
21.10.88	45						852
18.46	20	7.065E-03	2.398E-03				253.7
22.10.88	42		1.824E-04				851
17. 0	10			1.506E-03	1.285E-04	4.632E-04	254.6
22.10.88	45						851
17. 2	10			1.740E-03	1.248E-04	5.339E-04	254.6
22.10.88	45			2.834E-03	2.117E-03	3.597E-03	851
17. 2	30						254.6
22.10.88	45						851
17. 2	20	6.393E-03	2.267E-03				254.6
23.10.88	42		2.502E-04				853
16.25	10			1.247E-03	1.753E-04	3.921E-04	255.6
23.10.88	45						853
16.3	10			1.481E-03		4.448E-04	255.6
23.10.88	45			2.471E-03	1.794E-03	2.958E-03	853
16.3	30						255.6
23.10.88	45						853
16.3	20	5.560E-03	1.872E-03				255.6
25.10.88	45						78
1.3	20						256.77
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Table 6.4.12. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	A	CYCLE NO.	88.09	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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28.10.88	45						836
0. 0	10						256.77
28.10.88	52		5.900E-04				851
16.52	10			2.412E-03	4.008E-04	8.656E-04	257.8
28.10.88	55						851
16.58	10			2.507E-03	4.499E-04	8.952E-04	257.8
28.10.88	55			3.745E-03	2.908E-03	4.120E-03	851
16.58	30						257.8
28.10.88	55						851
16.58	20	6.839E-03	2.424E-03				257.8
29.10.88	52		4.016E-04				854
18. 0	10			2.435E-03	3.009E-04	7.756E-04	258.9
29.10.88	55						854
18. 2	10			2.576E-03	3.538E-04	8.121E-04	258.9
29.10.88	55			3.847E-03	2.794E-03	4.154E-03	854
18. 2	30						258.9
29.10.88	55						854
18. 2	20	6.985E-03	2.652E-03				258.9
30.10.88	52		4.540E-04				854
17.1	10			2.350E-03	3.172E-04	7.331E-04	259.8
30.10.88	55						854
17.12	10			2.442E-03	3.442E-04	7.803E-04	259.8
30.10.88	55			3.431E-03	2.653E-03	3.856E-03	854
17.12	30						259.8
30.10.88	55						854
17.12	20	6.658E-03	2.405E-03				259.8
31.10.88	52		5.918E-04				851
17. 2	10			2.219E-03	3.799E-04	7.273E-04	260.8
31.10.88	55						851
17. 5	10			2.380E-03	3.904E-04	7.571E-04	260.8
31.10.88	55			3.203E-03	2.523E-03	3.644E-03	851
17. 5	30						260.8
31.10.88	55						851
17. 5	20	6.517E-03	2.259E-03				260.8
1.11.88	52		5.258E-04				854
16.24	10			2.083E-03	3.402E-04	7.368E-04	261.8
1.11.88	55						854
16.26	10			2.382E-03	5.824E-04	7.239E-04	261.8
1.11.88	55			3.217E-03	2.518E-03	3.589E-03	854
16.26	30						261.8
1.11.88	55						854
16.26	20	6.656E-03	2.228E-03				261.8
2.11.88	52		5.668E-04				854
16.43	10			1.995E-03	3.535E-04	6.494E-04	262.8
2.11.88	55						854
16.46	10			2.115E-03	5.020E-04	7.359E-04	262.8
2.11.88	55			3.090E-03	2.400E-03	3.396E-03	854
16.46	30						262.8
2.11.88	55						854
16.46	20	9.540E-03	2.098E-03				262.8
3.11.88	52		5.658E-04				858
17.47	10			2.092E-03	3.598E-04	7.001E-04	263.8

Table 6.4.12. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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3.11.88	55						858
17.49	10			2.397E-03	5.464E-04	8.130E-04	263.8
3.11.88	55			3.377E-03	2.456E-03	3.745E-03	858
17.49	30						263.8
3.11.88	55						858
17.49	20	7.109E-03	2.272E-03				263.8
4.11.88	52		5.236E-04				858
16.35	10			1.997E-03	3.247E-04	6.333E-04	264.8
4.11.88	55						858
16.38	10			2.165E-03	6.294E-04	7.217E-04	264.8
4.11.88	55			3.095E-03	2.333E-03	3.471E-03	858
16.38	30						264.8
4.11.88	55						858
16.38	20	9.795E-03	1.925E-03				264.8
5.11.88	52		5.056E-04				857
16.4	10			1.812E-03	3.406E-04	6.101E-04	265.8
5.11.88	55						857
16.45	10			2.065E-03	5.450E-04	6.307E-04	265.8
5.11.88	55			2.869E-03	2.222E-03	3.219E-03	857
16.45	30						265.8
5.11.88	55						857
16.45	20	6.408E-03	1.845E-03				265.8
6.11.88	52		6.577E-04				859
16.42	10			1.881E-03	3.950E-04	6.440E-04	266.8
6.11.88	55						859
16.45	10			2.077E-03	5.379E-04	7.124E-04	266.8
6.11.88	55			2.855E-03	2.219E-03	3.254E-03	859
16.45	30						266.8
6.11.88	55						859
16.45	20	5.797E-03	1.865E-03				266.8
7.11.88	52		5.361E-04				859
16.35	10			1.753E-03	3.489E-04	6.148E-04	267.8
7.11.88	55						859
16.38	10			2.093E-03	5.303E-04	6.938E-04	267.8
7.11.88	55			2.835E-03	2.193E-03	3.229E-03	859
16.38	30						267.8
7.11.88	55						859
16.38	20	6.257E-03	1.800E-03				267.8
8.11.88	52		3.526E-04				857
16.33	10			1.712E-03	2.486E-04	5.924E-04	268.8
8.11.88	55						857
16.36	10			1.863E-03	4.982E-04	6.307E-04	268.8
8.11.88	55			2.871E-03	2.225E-03	3.308E-03	857
16.36	30						268.8
8.11.88	55						857
16.36	20	6.414E-03	1.835E-03				268.8
10.11.88	52		4.642E-04				858
16.58	10			1.754E-03	3.074E-04	5.765E-04	270.8
10.11.88	55						859
17. 0	10			2.022E-03	2.909E-04	7.318E-04	270.8
10.11.88	55			3.303E-03	2.468E-03	3.592E-03	859
17. 0	30						270.8

Table 6.4.12. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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10.11.88	55						859
17. 0	20	7.434E-03	1.981E-03				270.8
11.11.88	52		3.139E-04				859
19. 7	10			1.688E-03	2.432E-04	6.063E-04	271.9
11.11.88	55						859
19.1	10			1.699E-03	3.242E-04	6.304E-04	271.9
11.11.88	55			2.983E-03	2.258E-03	3.443E-03	859
19.1	30						271.9
11.11.88	55						859
19.1	20	6.683E-03	1.867E-03				271.9
12.11.88	52		4.290E-04				859
17.25	10			1.764E-03	2.820E-04	6.407E-04	272.8
12.11.88	55						859
17.31	10			1.671E-03	2.403E-04	6.009E-04	272.8
12.11.88	55			2.826E-03	2.244E-03	3.344E-03	859
17.31	30						272.8
12.11.88	55						859
17.31	20	7.032E-03	1.768E-03				272.8
14.11.88	52		4.279E-04				859
17. 1	10			1.736E-03	2.716E-04	5.948E-04	274.8
14.11.88	55						859
17. 3	10			1.808E-03	2.193E-04	6.162E-04	274.8
14.11.88	55			2.733E-03	2.153E-03	3.107E-03	859
17. 3	30						274.8
14.11.88	55						859
17. 3	20	7.272E-03	1.739E-03				274.8
15.11.88	52		4.257E-04				860
16.48	10			1.748E-03	2.856E-04	6.045E-04	275.8
15.11.88	55						860
16.5	10			1.857E-03	2.414E-04	6.316E-04	275.8
15.11.88	55			2.873E-03	2.216E-03	3.307E-03	860
16.5	30						275.8
15.11.88	55						860
16.5	20	7.566E-03	1.843E-03				275.8
16.11.88	52		4.003E-04				859
16.29	10			1.724E-03	2.712E-04	5.480E-04	276.8
16.11.88	55						859
16.32	10			1.807E-03	2.953E-04	5.961E-04	276.8
16.11.88	55			2.819E-03	2.138E-03	3.222E-03	859
16.32	30						276.8
16.11.88	55						859
16.32	20	8.326E-03	1.749E-03				276.8
17.11.88	52		4.083E-04				859
16.38	10			1.673E-03	1.304E-04	5.760E-04	277.8
17.11.88	55						859
16.4	10			1.767E-03	2.779E-04	5.917E-04	277.8
17.11.88	55			2.927E-03	2.231E-03	3.366E-03	859
16.4	30						277.8
17.11.88	55						859
16.4	20	7.715E-03	1.862E-03				277.8
18.11.88	55						25
7. 0	20						278.03

Table 6.4.13. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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23.11.88	52						848
1.28	10						278.03
23.11.88	52		4.268E-04				848
1.28	10			1.952E-03	3.061E-04	6.687E-04	279.09
23.11.88	55						848
1.33	10						279.09
23.11.88	55						848
1.33	10						279.09
23.11.88	55						848
1.33	20	6.773E-03	1.926E-03				279.09
24.11.88	52		2.910E-04				850
2.36	10			1.920E-03	2.245E-04	5.642E-04	281.14
24.11.88	55						850
2.41	10			1.932E-03		5.991E-04	281.14
24.11.88	55			2.999E-03	2.267E-03	3.455E-03	850
2.41	30						281.14
24.11.88	55						850
2.41	20	6.893E-03	2.099E-03				281.14
25.11.88	52		3.148E-04				850
0.51	10			2.043E-03	2.643E-04	6.341E-04	282.07
25.11.88	55						850
0.54	10			2.119E-03	2.991E-04	6.590E-04	282.07
25.11.88	55			3.130E-03	2.424E-03	3.751E-03	850
0.54	30						282.07
25.11.88	55						850
0.54	20	6.569E-03	2.140E-03				282.07
26.11.88	52		3.274E-04				854
0. 0	10			1.790E-03	2.222E-04	5.547E-04	282.47
26.11.88	55						854
0. 5	10			1.779E-03		5.750E-04	282.47
26.11.88	55						854
0. 5	30						282.47
26.11.88	55						854
0. 5	20	5.968E-03	1.760E-03				282.47
26.11.88	52		4.630E-04				853
1. 0	10			2.088E-03	3.154E-04	6.832E-04	283.07
26.11.88	55						853
1. 1	10			2.255E-03	3.707E-04	7.079E-04	283.07
26.11.88	55			3.217E-03	2.406E-03	3.626E-03	853
1. 1	30						283.07
26.11.88	55						853
1. 1	20	7.398E-03	2.130E-03				283.07
28.11.88	52		3.725E-04				855
17.15	10			2.124E-03	2.688E-04	6.444E-04	284.75
28.11.88	55						855
17.18	10			2.181E-03	2.613E-04	6.845E-04	284.75
28.11.88	55			3.198E-03	2.419E-03	3.690E-03	855
17.18	30						284.75
28.11.88	55						855
17.18	20	8.328E-03	2.227E-03				284.75
29.11.88	52		3.811E-04				858
16.15	10			2.103E-03	2.929E-04	6.701E-04	285.7

Table 6.4.13. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29.11.88	55						858
16.18	10			2.137E-03	3.308E-04	6.967E-04	285.7
29.11.88	55			3.239E-03	2.447E-03	3.696E-03	858
16.18	30						285.7
29.11.88	55						858
16.18	20	8.849E-03	2.262E-03				285.7
30.11.88	52		3.733E-04				857
16.22	10			2.142E-03	2.902E-04	6.993E-04	286.71
30.11.88	55						857
16.27	10			2.224E-03	2.446E-04	6.919E-04	286.71
30.11.88	55			3.248E-03	2.378E-03	3.738E-03	857
16.27	30						286.71
30.11.88	55						857
16.27	20	8.083E-03	2.238E-03				286.71
1.12.88	52		3.777E-04				862
17.46	10			2.029E-03	2.693E-04	5.971E-04	287.76
1.12.88	55						862
17.49	10			2.163E-03	3.287E-04	6.992E-04	287.76
1.12.88	55			3.304E-03	2.534E-03	3.748E-03	862
17.49	30						287.76
1.12.88	55						862
17.49	20	8.800E-03	2.382E-03				287.76
2.12.88	52						858
17.13	10			2.216E-03	3.061E-04	7.010E-04	288.74
2.12.88	55						858
17.18	10			2.336E-03	2.734E-04	7.154E-04	288.74
2.12.88	55			3.502E-03	2.673E-03	4.020E-03	858
17.18	30						288.74
2.12.88	55						858
17.18	20	8.690E-03	2.346E-03				288.74
3.12.88	52		4.225E-04				861
16.17	10			2.227E-03	3.066E-04	6.693E-04	289.7
3.12.88	55						861
16.24	10			1.962E-03	2.638E-04	6.356E-04	289.7
3.12.88	55						861
16.24	10						289.7
3.12.88	55						861
16.24	20	8.381E-03	2.274E-03				289.7
4.12.88	52		4.029E-04				862
17. 0	10			2.180E-03	2.731E-04	6.810E-04	290.7
4.12.88	55						862
17. 2	10			2.270E-03	3.098E-04	7.202E-04	290.7
4.12.88	55			3.374E-03	2.581E-03	3.998E-03	862
17. 2	30						290.7
4.12.88	55						862
17. 2	20	9.142E-03	2.383E-03				290.7
5.12.88	52		3.905E-04				860
17.46	10			2.134E-03	2.949E-04	6.756E-04	291.76
5.12.88	55						860
17.52	10			2.278E-03		7.378E-04	291.76
5.12.88	55			3.497E-03	2.607E-03	3.639E-03	860
17.52	30						291.76

Table 6.4.13. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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5.12.88	55						860
17.52	20	8.870E-03	2.304E-03				291.76
6.12.88	52						862
16.27	10			2.136E-03	2.777E-04	6.712E-04	292.71
6.12.88	55						862
16.3	10					7.042E-04	292.71
6.12.88	55			3.355E-03	2.489E-03	3.782E-03	862
16.2	30						292.71
6.12.88	55						863
17.3	20	8.261E-03	2.306E-03				292.71
7.12.88	52		4.441E-04				862
16.42	10			2.133E-03	2.952E-04	6.230E-04	293.7
7.12.88	55						862
16.45	10			2.241E-03	2.333E-04	6.623E-04	293.7
7.12.88	55						862
16.45	30						293.7
7.12.88	55						862
16.45	20						293.7
8.12.88	52		5.726E-04				863
17. 0	10			2.038E-03	3.853E-04	6.081E-04	294.73
8.12.88	55						863
17. 3	10			2.392E-03		7.679E-04	294.73
8.12.88	55			3.240E-03	2.394E-03	3.737E-03	863
17. 3	30						294.73
8.12.88	55						863
17. 3	20	9.130E-03	1.672E-03				294.73
9.12.88	52		5.081E-04				863
16.54	10			2.180E-03	3.390E-04	6.865E-04	295.9
9.12.88	55						863
16.58	10			2.387E-03		7.436E-04	295.9
9.12.88	55			3.250E-03	2.541E-03	3.812E-03	863
16.58	30						295.9
9.12.88	55						863
16.58	20	9.078E-03	2.270E-03				295.9
10.12.88	52		4.978E-04				865
17. 4	10			2.192E-03	3.380E-04	6.754E-04	296.73
10.12.88	55						865
17. 5	10						296.73
10.12.88	55						865
17. 5	30						296.73
10.12.88	55						865
17. 5	20	1.042E-02	3.094E-03				296.73
11.12.88	52		5.169E-04				864
17. 8	10			2.090E-03	3.210E-04	6.710E-04	297.73
11.12.88	55						864
17.1	10			2.232E-03	3.133E-04	7.122E-04	297.3
11.12.88	55			3.050E-03	2.432E-03	3.499E-03	864
17.1	30						297.73
11.12.88	55						864
17.1	20	1.036E-02	2.141E-03				297.73
12.12.88	52		6.199E-04				865
16.34	10			2.250E-03	4.031E-04	6.715E-04	298.75

Table 6.4.13. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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12.12.88	55						865
16.34	10			2.586E-03	4.726E-04	7.671E-04	298.75
12.12.88	55			3.100E-03	2.471E-03	3.524E-03	865
16.34	30						298.75
12.12.88	55						865
16.34	20	8.354E-03	2.218E-03				298.75
13.12.88	55						21
5. 0	20						298.95
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Table 6.4.14. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.11		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
16.12.88	52						831
0. 0	10						298.95
16.12.88	52		2.530E-04				832
1.3	10			1.326E-03	2.118E-04	6.862E-04	299.45
16.12.88	55						832
1.35	10			1.386E-03	2.540E-04	6.586E-04	299.45
16.12.88	55						832
1.35	30						299.45
16.12.88	55						832
1.35	20	7.095E-03	1.487E-03				299.45
17.12.88	52		3.588E-04				853
0.32	10			1.932E-03	2.822E-04	6.634E-04	300.46
17.12.88	55						853
0.32	10			2.068E-03	3.478E-04	6.994E-04	300.46
17.12.88	55			2.765E-03	2.168E-03	3.114E-03	853
0.32	30						300.46
17.12.88	55						853
0.32	20	7.477E-03	2.098E-03				300.46
18.12.88	52		2.782E-04				853
0.38	10			2.780E-03	2.261E-04	6.873E-04	301.47
18.12.88	55						853
0.38	10			2.373E-03	2.252E-04	7.289E-04	301.47
18.12.88	55			3.191E-03	2.428E-03	3.673E-03	853
0.38	30						301.47
18.12.88	55						853
0.38	20	7.650E-03	2.518E-03				301.47
19.12.88	52		3.252E-04				855
0.33	10			2.210E-03	2.598E-04	7.070E-04	302.48
19.12.88	55						855
0.33	10			2.340E-03	2.828E-04	7.546E-04	302.48
19.12.88	55			3.323E-03	2.427E-03	3.600E-03	855
0.33	30						302.48
19.12.88	55						855
0.33	20	7.672E-03	2.485E-03				302.48
20.12.88	52		3.523E-04				857
1.35	10			2.072E-03	2.598E-04	6.492E-04	303.48
20.12.88	55						857
1.39	10			2.149E-03	2.502E-04	6.785E-04	303.48
20.12.88	55			2.821E-03	2.236E-03	3.220E-03	857
1.39	30						303.48
20.12.88	55						857
1.39	20	7.386E-03	2.226E-03				303.48
21.12.88	52		3.654E-04				856
0.57	10			2.186E-03	2.969E-04	7.249E-04	304.5
21.12.88	55						856
1. 0	10			2.306E-03	2.598E-04	7.211E-04	304.5
21.12.88	55			2.959E-03	2.344E-03	3.355E-03	856
1. 0	30						304.5
21.12.88	55						856
1. 0	20	7.612E-03	2.329E-03				304.5
22.12.88	52		4.117E-04				855
1. 0	10			2.128E-03	3.204E-04	6.571E-04	305.51

Table 6.4.14. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.11		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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22.12.88	55						855
1. 5	10			2.207E-03	3.470E-04	6.947E-04	305.51
22.12.88	55			2.756E-03	2.113E-03	3.187E-03	855
1. 5	30						305.51
22.12.88	55						855
1. 5	20	7.129E-03	2.168E-03				305.51
23.12.88	52		3.151E-04				855
1.3	10			2.070E-03	2.680E-04	6.375E-04	306.52
23.12.88	55						855
1.34	10			2.161E-03	2.302E-04	6.864E-04	306.52
23.12.88	55			2.865E-03	2.114E-03	3.296E-03	855
1.34	30						306.52
23.12.88	55						855
1.34	20		2.260E-03				306.52
24.12.88	52		4.259E-04				854
0.25	10			2.139E-03	3.279E-04	6.739E-04	307.53
24.12.88	55						854
0.29	10			2.248E-03	2.840E-04	7.401E-04	307.53
24.12.88	55			2.873E-03	2.142E-03	3.098E-03	854
0.29	30						307.53
24.12.88	55						854
0.29	20	7.790E-03	2.202E-03				307.53
25.12.88	52		3.788E-04				856
1.59	10			2.120E-03	2.993E-04	6.815E-04	308.6
25.12.88	55						856
2. 1	10			2.167E-03	3.157E-04	7.177E-04	308.6
25.12.88	55			2.729E-03	2.262E-03	3.170E-03	856
2. 1	30						308.6
25.12.88	55						856
2. 1	20	7.808E-03	2.261E-03				308.6
26.12.88	52		3.736E-04				855
1.15	10			2.238E-03	2.927E-04	6.800E-04	309.61
26.12.88	55						855
1.18	10			2.290E-03	3.382E-04	7.196E-04	309.61
26.12.88	55			2.832E-03	2.259E-03	3.229E-03	855
1.18	30						309.61
26.12.88	55						855
1.18	20	7.462E-03	2.270E-03				309.61
27.12.88	52		3.637E-04				856
1.12	10			2.230E-03	2.819E-04	6.912E-04	310.62
27.12.88	55						856
1.12	10			2.168E-03	2.762E-04	7.196E-04	310.62
27.12.88	55			2.808E-03	2.235E-03	3.170E-03	856
1.12	30						310.61
27.12.88	55						856
1.12	20	7.734E-03	2.303E-03				310.61
29.12.88	52		3.381E-04				857
0.1	10			2.176E-03	2.618E-04	6.419E-04	312.64
29.12.88	55						857
0.13	10			2.193E-03	3.314E-04	6.976E-04	312.64
29.12.88	55			2.779E-03	2.174E-03	3.074E-03	857
0.13	30						312.64

Table 6.4.14. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.11		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29.12.88	55						857
0.13	20	7.409E-03	2.210E-03				312.64
30.12.88	52		2.637E-04				858
0.25	10			2.331E-03	2.459E-04	7.478E-04	313.65
30.12.88	55						858
0.27	10			2.342E-03	2.769E-04	7.320E-04	313.65
30.12.88	55			3.301E-03	2.547E-03	3.607E-03	858
0.27	30						313.65
30.12.88	55						858
0.27	20	9.155E-03	2.544E-03				313.65
31.12.88	52		4.033E-04				858
0. 7	10			2.110E-03	2.507E-04	6.699E-04	314.66
31.12.88	55						858
0.1	10			2.177E-03	2.514E-04	6.753E-04	314.66
31.12.88	55			2.807E-03	2.177E-03	3.225E-03	858
0.1	30						314.66
31.12.88	55						858
0.1	20	7.894E-03	2.301E-03				314.66
1. 1.89	52		3.697E-04				858
0.39	10			2.324E-03	3.268E-04	7.660E-04	315.67
1. 1.89	55						858
0.42	10			2.623E-03	2.986E-04	8.285E-04	315.67
1. 1.89	55			3.414E-03	2.401E-03	3.507E-03	858
0.42	30						315.67
1. 1.89	55						858
0.42	20	8.636E-03	2.638E-03				315.67
2. 1.89	52		3.691E-04				858
0.41	10			2.441E-03	3.015E-04	7.503E-04	316.7
2. 1.89	55						858
0.43	10			2.536E-03	3.847E-04	8.189E-04	316.7
2. 1.89	55			3.139E-03	2.540E-03	3.613E-03	858
0.43	30						316.7
2. 1.89	55						858
0.43	20	9.389E-03	2.613E-03				316.7
3. 1.89	52		2.991E-04				859
0.49	10			1.680E-03	2.416E-04	5.329E-04	317.8
3. 1.89	55						859
0.51	10			1.838E-03	2.564E-04	5.690E-04	317.8
3. 1.89	55			2.139E-03	1.686E-03	2.408E-03	859
0.51	30						317.8
3. 1.89	55						859
0.51	20	5.910E-03	1.753E-03				317.8
4. 1.89	52		2.907E-04				860
0.35	10			1.795E-03	2.440E-04	5.403E-04	318.99
4. 1.89	55						860
0.37	10			1.830E-03	2.892E-04	5.639E-04	318.99
4. 1.89	55			2.194E-03	1.665E-03	2.428E-03	860
0.37	30						318.99
4. 1.89	55						860
0.37	20	5.696E-03	1.781E-03				318.99
5. 1.89	52		3.033E-04				858
0.29	10			1.660E-03	2.328E-04	5.393E-04	319.99

Table 6.4.14. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 88.11		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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5. 1.89	55						858
0.31	10			1.784E-03	2.665E-04	5.710E-04	319.99
5. 1.89	55			2.147E-03	1.709E-03	2.394E-03	858
0.31	30						319.99
5. 1.89	55						858
0.31	20	5.451E-03	1.754E-03				319.99
6. 1.89	55						37
4. 0	20						320.35
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Table 6.4.15. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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17. 1.89	52						807
0. 0	10						321.25
17. 1.89	52		5.795E-04				809
10.51	10			2.604E-03	4.734E-04	8.730E-04	321.25
17. 1.89	55						809
10.55	10			2.851E-03	5.961E-04	9.687E-04	321.25
17. 1.89	55			3.206E-03	2.477E-03	3.412E-03	809
10.55	30						321.25
17. 1.89	55						809
10.55	20	4.162E-03	2.621E-03				321.25
18. 1.89	52		5.143E-04				809
9.56	10			2.629E-03	4.170E-04	8.177E-04	322.2
18. 1.89	55						809
9.59	10			2.746E-03	4.552E-04	5.210E-04	322.2
18. 1.89	55			2.650E-03	2.183E-03	3.139E-03	809
9.59	30						322.2
18. 1.89	55						809
9.59	20	4.369E-03	2.552E-03				322.2
20. 1.89	52		4.029E-04				808
8.52	10			2.743E-03	3.401E-04	8.263E-04	324.16
20. 1.89	55						808
8.52	10			2.873E-03	4.768E-04	9.184E-04	324.16
20. 1.89	55			3.062E-03	2.475E-03	3.556E-03	808
8.52	30						324.16
20. 1.89	55						808
8.52	20	6.574E-03	2.854E-03				324.16
21. 1.89	52		3.906E-04				809
9.19	10			2.709E-03	3.206E-04	8.228E-04	325.16
21. 1.89	55						809
9.19	10			2.701E-03	3.760E-04	8.439E-04	325.16
21. 1.89	55			3.040E-03	2.360E-03	3.430E-03	809
9.19	30						325.16
21. 1.89	55						809
9.19	20	7.723E-03	2.835E-03				325.16
22. 1.89	52		3.791E-04				810
9.29	10			2.707E-03	3.343E-04	8.107E-04	326.16
22. 1.89	55						810
9.35	10			2.802E-03	2.582E-04	8.366E-04	326.16
22. 1.89	55			2.988E-03	2.450E-03	3.441E-03	810
9.35	30						326.16
22. 1.89	55						810
9.35	20	8.002E-03	2.500E-03				326.16
24. 1.89	52		5.063E-04				815
16.35	10			2.961E-03	3.903E-04	8.596E-04	328.48
24. 1.89	55						815
16.38	10			3.016E-03	4.702E-04	9.116E-04	328.48
24. 1.89	55			3.167E-03	2.561E-03	3.676E-03	815
16.38	30						328.48
24. 1.89	55						815
16.38	20	7.981E-03	3.035E-03				328.48
25. 1.89	52		4.312E-04				812
20. 3	10			2.754E-03	3.683E-04	7.882E-04	329.48

Table 6.4.15. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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25. 1.89	55						812
20. 3	10			2.643E-03	4.141E-04	8.252E-04	329.48
25. 1.89	55			2.899E-03	2.302E-03	3.393E-03	812
20. 3	30						329.48
25. 1.89	55						812
20. 3	20	7.894E-03	2.702E-03				329.48
26. 1.89	52		4.154E-04				815
16.1	10			2.790E-03	3.455E-04	8.205E-04	330.32
26. 1.89	55						815
16.12	10			2.874E-03	3.598E-04	9.028E-04	330.32
26. 1.89	55			3.213E-03	2.570E-03	3.604E-03	815
16.12	30						330.32
26. 1.89	55						815
16.12	20	1.023E-02	3.151E-03				330.32
28. 1.89	52		3.494E-04				815
16. 0	10			2.688E-03	3.221E-04	8.069E-04	332.32
28. 1.89	55						815
16. 2	10			2.966E-03	5.469E-04	8.952E-04	332.32
28. 1.89	55			3.114E-03	2.522E-03	3.488E-03	815
16. 2	30						332.32
28. 1.89	55						815
16. 2	20	1.157E-02	3.019E-03				332.32
29. 1.89	52		4.089E-04				816
16.4	10			2.746E-03	3.484E-04	8.296E-04	333.32
29. 1.89	55						816
16.42	10			2.871E-03	6.182E-04	9.172E-04	333.32
29. 1.89	55			3.140E-03	2.560E-03	3.429E-03	816
16.42	30						333.32
29. 1.89	55						816
16.42	20	9.693E-03	2.919E-03				333.32
30. 1.89	52		4.175E-04				816
16.15	10			2.749E-03	3.479E-04	8.156E-04	334.82
30. 1.89	55						816
16.17	10			2.966E-03	3.648E-04	8.627E-04	334.82
30. 1.89	55			3.216E-03	2.442E-03	3.684E-03	816
16.17	30						334.82
30. 1.89	55						816
16.17	20	1.641E-02	2.902E-03				334.82
1. 2.89	52		4.060E-04				813
16.42	10			2.898E-03	3.553E-04	8.359E-04	336.8
1. 2.89	55						813
16.44	10			2.985E-03	4.087E-04	9.316E-04	336.8
1. 2.89	55			3.195E-03	2.489E-03	3.654E-03	813
16.44	30						336.8
1. 2.89	55						813
16.44	20	9.751E-03	3.009E-03				336.8
2. 2.89	52		2.791E-04				813
16.15	10			2.525E-03	2.793E-04	7.626E-04	336.8
2. 2.89	55						813
16.2	10			2.943E-03	4.278E-04	8.777E-04	336.8
2. 2.89	55			2.940E-03	2.312E-03	3.413E-03	813
16.2	30						336.8

Table 6.4.15. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	A	CYCLE NO.	89.01	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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2. 2.89	55						813
16.2	20	9.528E-03	2.860E-03				336.8
3. 2.89	52						815
16.31	10			2.001E-03		5.855E-04	338.41
3. 2.89	55						815
16.35	10			2.406E-03		7.256E-04	338.41
3. 2.89	55			2.879E-03	2.270E-03	3.328E-03	815
16.35	30						338.41
3. 2.89	55						815
16.35	20	9.411E-03	2.806E-03				338.41
4. 2.89	52		3.689E-04				813
16.35	10			2.143E-03	2.937E-04	6.466E-04	339.42
4. 2.89	55						813
16.38	10			2.230E-03	3.036E-04	6.713E-04	339.42
4. 2.89	55			2.377E-03	1.955E-03	2.582E-03	813
16.38	30						339.42
4. 2.89	55						813
16.38	20	6.862E-03	2.086E-03				339.42
5. 2.89	52		4.282E-04				815
16.4	10			2.866E-03	3.659E-04	8.341E-04	340.42
5. 2.89	55						815
16.43	10			2.958E-03	3.994E-04	9.153E-04	340.42
5. 2.89	55			3.183E-03	2.524E-03	3.552E-03	815
16.43	30						340.42
5. 2.89	55						815
16.43	20	9.431E-03	3.030E-03				340.42
6. 2.89	52		4.588E-04				815
16.4	10			2.843E-03	3.755E-04	8.696E-04	341
6. 2.89	55						815
16.42	10			3.096E-03	3.279E-04	6.369E-04	341
6. 2.89	55			3.441E-03	2.603E-03	3.875E-03	815
16.42	30						341
6. 2.89	55						815
16.42	20	1.043E-02	3.149E-03				341
7. 2.89	55						34
3. 0	20						341.31
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Table 6.4.16. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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10. 2.89	52						865
10. 0	10						341.84
10. 2.89	52		4.822E-04				882
18.56	10			2.140E-03	4.066E-04	9.098E-04	341.84
10. 2.89	55						886
19. 6	10			2.311E-03	3.484E-04	9.978E-04	341.84
10. 2.89	55			3.817E-03	2.977E-03	4.175E-03	886
19. 6	30						341.84
10. 2.89	55						886
19. 6	20	8.605E-03	2.254E-03				341.84
11. 2.89	52		4.005E-04				890
16.26	10			2.915E-03	3.620E-04	8.352E-04	342.96
11. 2.89	55						890
16.3	10			3.148E-03	2.929E-04	9.005E-04	342.96
11. 2.89	55			3.624E-03	2.856E-03	4.235E-03	890
16.3	30						342.96
11. 2.89	55						890
16.3	20	9.293E-03	3.228E-03				342.96
15. 2.89	52		3.902E-04				897
16.36	10			2.649E-03	3.303E-04	7.999E-04	343.96
15. 2.89	55						897
16.38	10			2.853E-03	3.713E-04	8.866E-04	343.96
15. 2.89	55			3.438E-03	2.717E-03	3.914E-03	897
16.38	30						343.96
15. 2.89	55						897
16.38	20	7.292E-03	2.845E-03				343.96
16. 2.89	52		4.907E-04				902
16.41	10			3.152E-03	3.801E-04	8.528E-04	345.96
16. 2.89	55						902
16.43	10			3.451E-03	3.887E-04	9.496E-04	345.96
16. 2.89	55			3.904E-03	3.060E-03	4.593E-03	902
16.43	30						345.96
16. 2.89	55						902
16.43	20	8.723E-03	3.535E-03				345.96
17. 2.89	52		4.411E-04				901
16.44	10			3.022E-03	3.617E-04	8.302E-04	346.96
17. 2.89	55						901
16.47	10			3.409E-03	3.924E-04	9.234E-04	346.96
17. 2.89	55			3.868E-03	3.082E-03	4.758E-03	901
16.47	30						346.96
17. 2.89	55						901
16.47	20	9.081E-03	3.431E-03				346.96
18. 2.89	52		4.302E-04				902
17.24	10			2.998E-03	3.445E-04	8.026E-04	347.98
18. 2.89	55						902
17.26	10			3.296E-03	3.180E-04	9.082E-04	347.98
18. 2.89	55			4.019E-03	2.951E-03	4.045E-03	902
17.26	30						347.98
18. 2.89	55						902
17.26	20		3.361E-03				347.98
19. 2.89	52		4.229E-04				902
17.1	10			3.089E-03	3.617E-04	8.123E-04	348.97

Table 6.4.16. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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19. 2.89	55						902
17.13	10			3.302E-03	3.501E-04	9.111E-04	348.97
19. 2.89	55			3.793E-03	2.963E-03	4.365E-03	902
17.13	30						348.97
19. 2.89	55						902
17.13	20	1.021E-02	3.379E-03				348.07
25. 2.89	52						905
16.43	10			2.874E-03	3.424E-04	7.789E-04	354.79
25. 2.89	55						905
16.47	10			3.005E-03	4.652E-04	8.314E-04	354.79
25. 2.89	55			3.591E-03	2.628E-03	4.236E-03	905
16.47	30						354.79
25. 2.89	55						905
16.47	20	1.255E-02	3.063E-03				354.79
27. 2.89	52		4.375E-04				908
16.29	10			3.001E-03	3.488E-04	7.453E-04	356.8
27. 2.89	55						908
16.31	10			3.068E-03	4.025E-04	8.304E-04	356.8
27. 2.89	55			3.537E-03	2.690E-03	4.025E-03	908
16.31	30						356.8
27. 2.89	55						908
16.31	20	1.070E-02	3.018E-03				356.8
28. 2.89	52		3.718E-04				909
6.2	10			2.961E-03	3.394E-04	7.622E-04	357.78
28. 2.89	55						908
16.2	10			3.039E-03	3.524E-04	8.250E-04	357.78
28. 2.89	55			3.464E-03	2.629E-03	4.025E-03	908
16.2	30						357.78
28. 2.89	55						908
16.2	20	9.763E-03	2.965E-03				357.78
3. 3.89	52		4.203E-04				901
18. 0	10			2.513E-03	3.362E-04	7.738E-04	358.86
3. 3.89	55						901
18. 0	10			2.595E-03	3.980E-04	8.403E-04	358.86
3. 3.89	55			3.392E-03	2.671E-03	3.972E-03	901
18. 0	30						358.86
3. 3.89	55						901
18. 0	20	8.552E-03	2.538E-03				358.86
4. 3.89	52		3.472E-04				904
16. 0	10			2.649E-03	3.071E-04	7.423E-04	359.78
4. 3.89	55						904
16. 0	10			2.852E-03	2.958E-04	7.694E-04	359.78
4. 3.89	55			3.489E-03	2.651E-03	3.997E-03	904
16. 0	30						359.78
4. 3.89	55						904
16. 0	20	8.765E-03	2.943E-03				359.78
5. 3.89	55						73
2. 0	20						359.78
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Table 6.4.17. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	A	CYCLE NO.	89.03	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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6. 4.89	52						805
0. 0	10						361.28
6. 4.89	52		5.064E-04				815
16.4	10			2.958E-03	4.218E-04	8.599E-04	361.28
6. 4.89	55						815
16.4	10			3.094E-03	4.976E-04	9.114E-04	361.28
6. 4.89	55			2.906E-03	2.345E-03	3.349E-03	815
16.4	30						361.28
6. 4.89	55						815
16.4	20	3.710E-03	1.500E-03				361.28
7. 4.89	52		6.328E-04				820
18.15	10			3.157E-03	5.110E-04	9.025E-04	362.54
7. 4.89	55						820
18.15	10			3.331E-03	5.522E-04	9.652E-04	362.54
7. 4.89	55			2.972E-03	2.402E-03	3.509E-03	820
18.15	30						362.54
7. 4.89	55						820
18.15	20	4.851E-03	3.110E-03				362.54
8. 4.89	52		4.843E-04				820
16. 0	10			3.065E-03	4.149E-04	8.672E-04	363.46
8. 4.89	55						820
16. 0	10			3.214E-03	3.662E-04	9.274E-04	363.46
8. 4.89	55			2.961E-03	2.399E-03	3.471E-03	820
16. 0	30						363.46
8. 4.89	55						820
16. 0	20	5.831E-03	3.033E-03				363.46
9. 4.89	52		4.471E-04				822
16.4	10			3.032E-03	4.293E-04	8.877E-04	364.5
9. 4.89	55						822
16.4	10			3.233E-03	5.063E-04	9.380E-04	364.5
9. 4.89	55			3.080E-03	2.442E-03	3.445E-03	822
16.4	30						364.5
9. 4.89	55						822
16.4	20	7.341E-03	3.115E-03				364.5
10. 4.89	52		2.802E-04				824
17.4	10			2.889E-03	2.719E-04	8.407E-04	365.46
10. 4.89	55						824
17.4	10			2.978E-03		8.656E-04	365.46
10. 4.89	55			3.273E-03	2.519E-03	3.654E-03	824
17.4	30						365.46
10. 4.89	55						824
17.4	20	8.172E-03	3.274E-03				365.46
11. 4.89	52		3.938E-04				826
16.2	10			3.210E-03	4.203E-04	7.438E-04	366.44
11. 4.89	55						826
16.2	10			3.561E-03	4.047E-04	1.014E-03	366.44
11. 4.89	55			3.305E-03	2.674E-03	3.769E-03	826
16.2	30						366.44
11. 4.89	55						826
16.2	20	8.328E-03	3.433E-03				366.44
12. 4.89	52		6.234E-04				833
17. 0	10			3.223E-03	5.077E-04	9.211E-04	367.49

Table 6.4.17. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.03		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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12. 4.89	55						833
17. 0	10			3.401E-03	6.740E-04	9.783E-04	367.49
12. 4.89	55			3.213E-03	2.494E-03	3.753E-03	833
17. 0	30						367.49
12. 4.89	55						833
17. 0	20	8.705E-03	3.178E-03				367.49
13. 4.89	52		6.842E-04				813
16.5	10			3.254E-03	5.206E-04	8.614E-04	368.49
13. 4.89	55						813
16.5	10			3.409E-03	6.091E-04	9.580E-04	368.49
13. 4.89	55			3.017E-03	2.524E-03	3.545E-03	813
16.5	30						368.49
13. 4.89	55						813
16.5	20	8.421E-03	1.568E-03				368.49
14. 4.89	52		6.806E-04				829
16.45	10			3.218E-03	5.377E-04	9.136E-04	369.49
14. 4.89	55						829
16.45	10			3.694E-03	6.895E-04	1.067E-03	369.49
14. 4.89	55			3.119E-03	2.443E-03	3.654E-03	829
16.45	30						369.49
14. 4.89	55						829
16.45	20	8.849E-03	3.188E-03				369.49
15. 4.89	52		6.813E-04				830
16.45	10			3.261E-03	5.355E-04	8.821E-04	370.49
15. 4.89	55						830
16.45	10			3.439E-03	5.838E-04	1.014E-03	370.49
15. 4.89	55			3.151E-03	2.417E-03	3.542E-03	830
16.45	30						370.49
15. 4.89	55						830
16.45	20	1.079E-02	3.107E-03				370.49
16. 4.89	52		6.947E-04				832
16.3	10			3.235E-03	5.447E-04	8.875E-04	371.49
16. 4.89	55						832
16.3	10			3.369E-03	6.005E-04	9.798E-04	371.49
16. 4.89	55			3.085E-03	2.472E-03	3.573E-03	832
16.3	30						371.49
16. 4.89	55						832
16.3	20	9.491E-03	3.182E-03				371.49
17. 4.89	52		6.734E-04				831
16.2	10			3.205E-03	5.517E-04	8.970E-04	372.49
17. 4.89	55						831
16.2	10			3.404E-03	6.490E-04	9.322E-04	372.49
17. 4.89	55			3.184E-03	2.464E-03	3.677E-03	831
16.2	30						372.49
17. 4.89	55						831
16.2	20	9.337E-03	3.190E-03				372.49
19. 4.89	52		6.847E-04				832
16.41	10			3.071E-03	5.199E-04	8.383E-04	374.56
19. 4.89	55						832
16.41	10			3.384E-03	4.489E-04	9.546E-04	374.56
19. 4.89	55			3.006E-03	2.382E-03	3.516E-03	832
16.41	30						374.56

Table 6.4.17. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.03		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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19. 4.89	55						832
16.41	20	9.309E-03	3.031E-03				374.56
20. 4.89	52		6.671E-04				831
16.32	10			3.100E-03	5.528E-04	9.433E-04	375.5
20. 4.89	55						831
16.32	10			3.332E-03	6.598E-04	9.689E-04	375.5
20. 4.89	55			3.106E-03	2.409E-03	3.648E-03	831
16.32	30						375.5
20. 4.89	55						831
16.32	20	1.107E-02	3.077E-03				375.5
21. 4.89	52		6.741E-04				831
16.25	10			3.138E-03	5.261E-04	8.873E-04	376.5
21. 4.89	55						831
16.25	10			3.368E-03	5.962E-04	9.559E-04	376.5
21. 4.89	55						831
16.25	30						376.5
21. 4.89	55						831
16.25	20	9.453E-03	3.015E-03				376.5
22. 4.89	52		6.352E-04				831
17.1	10			3.087E-03	5.299E-04	8.617E-04	377.54
22. 4.89	55						831
17.1	10			3.418E-03	5.893E-04	9.292E-04	377.54
22. 4.89	55			2.991E-03	2.393E-03	3.381E-03	831
17.1	30						377.54
22. 4.89	55						831
17.1	20	9.075E-03	3.040E-03				377.54
23. 4.89	52		6.771E-04				829
16.38	10			3.115E-03	5.309E-04	9.117E-04	378.52
23. 4.89	55						829
16.38	10			3.274E-03	5.841E-04	9.625E-04	378.52
23. 4.89	55			3.042E-03	2.380E-03	3.444E-03	829
16.38	30						378.52
23. 4.89	55						829
16.38	20	1.111E-02	2.990E-03				378.52
24. 4.89	52		6.914E-04				832
16.35	10			3.130E-03	5.152E-04	8.952E-04	379.52
24. 4.89	55						832
16.35	10			3.325E-03	5.850E-04	9.617E-04	379.52
24. 4.89	55			3.217E-03	2.453E-03	3.525E-03	832
16.35	30						379.52
24. 4.89	55						832
16.35	20	9.060E-03	3.133E-03				379.52
25. 4.89	55						30
5. 0	20						379.86
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Table 6.4.18. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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28. 4.89	52						816
18.25	10						379.86
28. 4.89	52		7.388E-04				816
18.25	10			1.934E-03	5.825E-04	7.978E-04	380.36
28. 4.89	55						816
18.25	10			2.055E-03	6.605E-04	8.894E-04	380.36
28. 4.89	55			2.382E-03	1.984E-03	2.726E-03	816
18.25	30						380.36
28. 4.89	55						816
18.25	20	6.452E-03	1.706E-03				380.36
29. 4.89	52		6.844E-04				830
16.32	10			3.008E-03	5.776E-04	8.776E-04	381.3
29. 4.89	55						830
16.32	10			3.266E-03	5.509E-04	9.695E-04	381.3
29. 4.89	55			2.639E-03	2.095E-03	3.096E-03	830
16.32	30						381.3
29. 4.89	55						830
16.32	20	6.230E-03	2.721E-03				381.3
30. 4.89	52		7.318E-04				834
16.28	10			3.080E-03	5.914E-04	8.238E-04	382.3
30. 4.89	55						834
16.28	10			3.294E-03	5.320E-04	9.827E-04	382.3
30. 4.89	55			2.699E-03	2.203E-03	3.205E-03	834
16.28	30						382.3
30. 4.89	55						834
16.28	20	7.443E-03	2.862E-03				382.3
1. 5.89	52		6.694E-04				834
16.48	10			3.176E-03	5.550E-04	9.685E-04	383.3
1. 5.89	55						834
16.48	10			3.511E-03	6.022E-04	1.013E-03	383.3
1. 5.89	55			2.902E-03	2.356E-03	3.038E-03	834
16.48	30						383.3
1. 5.89	55						834
16.48	20	9.142E-03	3.207E-03				383.3
4. 5.89	52		6.804E-04				837
0.38	10			3.245E-03	5.255E-04	8.782E-04	385.64
4. 5.89	55						837
0.38	10			3.410E-03	6.293E-04	9.759E-04	385.64
4. 5.89	55			3.061E-03	2.320E-03	3.325E-03	837
0.38	30						385.64
4. 5.89	55						837
0.38	20	9.290E-03	3.030E-03				385.64
5. 5.89	52		6.576E-04				838
0.38	10			3.224E-03	5.651E-04	8.720E-04	386.64
5. 5.89	55						838
0.38	10			3.239E-03	4.464E-04	9.223E-04	386.64
5. 5.89	55			2.784E-03	2.248E-03	3.319E-03	838
0.38	30						386.64
5. 5.89	55						838
0.38	20	8.761E-03	2.916E-03				386.64
6. 5.89	52		6.782E-04				837
0.38	10			3.116E-03	5.486E-04	8.878E-04	387.64

Table 6.4.18. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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6. 5.89	55						837
0.38	10			3.290E-03	5.816E-04	9.511E-04	387.64
6. 5.89	55			2.865E-03	2.239E-03	3.295E-03	837
0.38	30						387.64
6. 5.89	55						837
0.38	20	8.991E-03	2.945E-03				387.64
7. 5.89	52		6.491E-04				839
0.43	10			3.234E-03	5.483E-04	9.111E-04	388.64
7. 5.89	55						839
0.43	10			3.352E-03	6.355E-04	9.604E-04	388.64
7. 5.89	55			2.868E-03	2.295E-03	3.242E-03	839
0.43	30						388.64
7. 5.89	55						839
0.43	20	8.979E-03	2.973E-03				388.64
8. 5.89	52		6.909E-04				843
1. 0	10			3.297E-03	5.681E-04	9.226E-04	389.64
8. 5.89	55						843
1. 0	10			3.391E-03	5.973E-04	1.024E-03	389.64
8. 5.89	55			3.131E-03	2.412E-03	3.469E-03	843
1. 0	30						389.64
8. 5.89	55						843
1. 0	20	9.305E-03	3.045E-03				389.64
9. 5.89	52		6.349E-04				842
16.52	10			3.190E-03	5.471E-04	9.002E-04	391.3
9. 5.89	55						842
16.52	10			3.444E-03	6.130E-04	9.781E-04	391.3
9. 5.89	55			3.020E-03	2.395E-03	3.440E-03	842
16.52	30						391.3
9. 5.89	55						842
16.52	20	1.214E-02	3.195E-03				391.3
10. 5.89	52		6.544E-04				841
16.13	10			3.243E-03	5.608E-04	8.830E-04	392.26
10. 5.89	55						841
16.13	10			3.364E-03	6.180E-04	9.867E-04	392.26
10. 5.89	55			2.977E-03	2.339E-03	3.363E-03	841
16.13	30						392.26
10. 5.89	55						841
16.13	20	1.081E-02	3.068E-03				392.26
15. 5.89	52		6.302E-04				845
1.26	10			3.122E-03	5.082E-04	9.146E-04	396.64
15. 5.89	55						845
1.26	10						396.64
15. 5.89	55			3.130E-03	2.341E-03	3.468E-03	845
1.26	30						396.64
15. 5.89	55						845
1.26	20	9.621E-03	3.115E-03				396.64
16. 5.89	52		6.332E-04				843
0.55	10			3.266E-03	5.306E-04	9.062E-04	397.64
16. 5.89	55						843
0.55	10			3.303E-03	5.187E-04	9.714E-04	397.64
16. 5.89	55			2.875E-03	2.267E-03	3.327E-03	843
0.55	30						397.64

Table 6.4.18. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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16. 5.89	55						843
0.55	20	9.758E-03	3.042E-03				397.64
17. 5.89	52		6.385E-04				844
1. 0	10			3.235E-03	5.427E-04	9.252E-04	398.64
17. 5.89	55						844
1. 0	10			3.242E-03	4.498E-04	9.317E-04	398.64
17. 5.89	55			2.929E-03	2.308E-03	3.396E-03	844
1. 0	30						398.64
17. 5.89	55						844
1. 0	20	1.186E-02	3.033E-03				398.64
18. 5.89	52		6.566E-04				845
1.38	10			3.191E-03	5.417E-04	9.218E-04	399.66
18. 5.89	55						845
1.38	10			3.364E-03	6.106E-04	9.654E-04	399.66
18. 5.89	55			2.829E-03	2.267E-03	3.286E-03	845
1.38	30						399.66
18. 5.89	55						845
1.38	20	9.700E-03	2.979E-03				399.66
19. 5.89	52		6.601E-04				845
0.5	10			3.171E-03	5.446E-04	9.313E-04	400.64
19. 5.89	55						845
0.5	10			3.550E-03	4.891E-04	1.012E-03	400.64
19. 5.89	55			2.994E-03	2.413E-03	3.441E-03	845
0.5	30						400.64
19. 5.89	55						845
0.5	20	1.098E-02	3.131E-03				400.64
20. 5.89	52		6.679E-04				847
0.4	10			3.383E-03	5.561E-04	9.264E-04	401.64
20. 5.89	55						847
0.4	10			3.473E-03	5.199E-04	1.003E-03	401.64
20. 5.89	55				2.324E-03	3.472E-03	847
0.4	30						401.64
20. 5.89	55						847
0.4	20	1.016E-02	3.125E-03				401.64
21. 5.89	55						17
12. 0	20						402.59
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Table 6.4.19. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
25. 5.89	52						788
13.2	10						402.61
25. 5.89	52		7.240E-04				788
13.2	10			3.184E-03	6.431E-04	1.054E-03	404.45
25. 5.89	55						788
13.2	10			3.354E-03	6.754E-04	1.134E-03	404.45
25. 5.89	55			2.857E-03	2.341E-03	3.371E-03	788
13.2	30						404.45
25. 5.89	55						788
13.2	20	7.445E-03	2.991E-03				404.45
26. 5.89	52		7.342E-04				793
8.2	10			3.570E-03	6.277E-04	1.054E-03	405.25
26. 5.89	55						793
8.2	10			3.739E-03	7.267E-04	1.112E-03	405.25
26. 5.89	55			2.873E-03	2.379E-03	3.356E-03	793
8.2	30						405.25
26. 5.89	55						793
8.2	20	8.631E-03	3.439E-03				405.25
27. 5.89	52		7.280E-04				794
9.3	10						406.22
27. 5.89	55						794
9.3	10						406.22
27. 5.89	55			2.901E-03	2.282E-03	3.198E-03	794
9.3	30						406.22
27. 5.89	55						794
9.3	20	9.101E-03	3.442E-03				406.22
28. 5.89	52		7.101E-04				794
8.55	10			3.475E-03	6.100E-04	1.012E-03	407.17
28. 5.89	55						794
8.55	10			3.700E-03	6.504E-04	9.940E-04	407.17
28. 5.89	55			2.931E-03	2.325E-03	3.360E-03	794
8.55	30						407.17
28. 5.89	55						794
8.55	20	9.139E-03	3.410E-03				407.17
29. 5.89	52		7.213E-04				797
8.25	10			3.616E-03	6.392E-04	1.015E-03	408.12
29. 5.89	55						797
8.25	10			3.665E-03	6.100E-04	1.049E-03	408.12
29. 5.89	55			2.840E-03	2.349E-03	3.207E-03	797
8.25	30						408.12
29. 5.89	55						797
8.25	20	8.703E-03	3.350E-03				408.12
31. 5.89	52		6.876E-04				801
8.32	10			3.662E-03	6.228E-04	1.024E-03	409.75
31. 5.89	55						801
8.32	10			3.799E-03	6.761E-04	1.117E-03	409.75
31. 5.89	55			2.958E-03	2.432E-03	3.520E-03	801
8.32	30						409.75
31. 5.89	55						801
8.32	20	9.139E-03	3.476E-03				409.75
1. 6.89	52		6.794E-04				801
8.45	10						411

Table 6.4.19. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
1. 6.89	55						801
8.45	10			3.807E-03	7.038E-04	1.104E-03	411
1. 6.89	55			2.964E-03	2.373E-03	3.426E-03	801
8.45	30						411
1. 6.89	55						801
8.45	20	1.007E-02	3.471E-03				411
2. 6.89	52		7.114E-04				801
0.5	10			3.580E-03	6.183E-04	1.004E-03	411.7
2. 6.89	55						801
0.5	10			3.941E-03	6.626E-04	1.106E-03	411.7
2. 6.89	55			3.007E-03	2.348E-03	3.523E-03	801
0.5	30						411.7
2. 6.89	55						801
0.5	20	1.101E-02	3.615E-03				411.7
3. 6.89	52		6.757E-04				802
0.4	10			3.605E-03	6.080E-04	1.020E-03	412.65
3. 6.89	55						802
0.4	10			3.841E-03	5.484E-04	1.102E-03	412.65
3. 6.89	55			3.071E-03	2.438E-03	3.681E-03	802
0.4	30						412.65
3. 6.89	55						802
0.4	20	1.064E-02	3.786E-03				412.65
4. 6.89	52		6.695E-04				804
0.32	10			3.674E-03	6.249E-04	1.013E-03	413.6
4. 6.89	55						804
0.32	10			3.874E-03	6.418E-04	1.143E-03	413.6
4. 6.89	55			2.975E-03	2.371E-03	3.537E-03	804
0.32	30						413.6
4. 6.89	55						804
0.32	20		3.798E-03				413.6
5. 6.89	52						805
0.51	10						414.5
5. 6.89	55						805
0.51	10						414.5
5. 6.89	55						805
0.51	30						414.5
5. 6.89	55						805
0.51	20		3.247E-03				414.5
7. 6.89	52		6.822E-04				788
8.46	10			3.431E-03	5.856E-04	9.885E-04	416.75
7. 6.89	55						788
8.46	10			3.492E-03	6.986E-04	9.357E-04	416.75
7. 6.89	55			2.669E-03	2.192E-03	3.227E-03	788
8.46	30						416.75
7. 6.89	55						788
8.46	20	8.712E-03	3.185E-03				416.75
8. 6.89	52		6.351E-04				788
8.39	10			3.400E-03	5.814E-04	1.041E-03	417.7
8. 6.89	55						788
8.39	10			3.565E-03	5.985E-04	1.005E-03	417.7
8. 6.89	55			2.619E-03	2.262E-03	2.836E-03	788
8.39	30						417.7

Table 6.4.19. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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8. 6.89	55						788
8.39	20	9.193E-03	3.216E-03				417.7
11. 6.89	52		7.245E-04				792
8.42	10						420.55
11. 6.89	55						792
8.42	10			3.692E-03	6.774E-04	1.044E-03	420.55
11. 6.89	55			2.899E-03	2.214E-03	3.252E-03	792
8.42	30						420.55
11. 6.89	55						792
8.42	20	1.088E-02	3.291E-03				420.55
12. 6.89	52		6.560E-04				791
8.2	10			3.438E-03	6.150E-04	1.004E-03	421.5
12. 6.89	55						791
8.2	10			3.594E-03	6.288E-04	1.073E-03	421.5
12. 6.89	55			2.941E-03	2.264E-03	3.414E-03	791
8.2	30						421.5
12. 6.89	55						791
8.2	20	1.091E-02	3.352E-03				421.5
13. 6.89	52		6.715E-04				790
8.3	10			3.524E-03	6.070E-04	9.820E-04	422.45
13. 6.89	55						790
8.3	10			3.661E-03	7.838E-04	1.056E-03	422.45
13. 6.89	55			2.760E-03	2.215E-03	3.046E-03	790
8.3	30						422.45
13. 6.89	55						790
8.3	20	1.202E-02	3.234E-03				422.45
14. 6.89	52		6.714E-04				789
8.4	10			3.547E-03	6.123E-04	9.587E-04	423.45
14. 6.89	55						789
8.4	10			3.828E-03	6.055E-04	1.123E-03	423.45
14. 6.89	55			2.698E-03	2.237E-03	3.191E-03	789
8.4	30						423.45
14. 6.89	55						789
8.4	20	1.063E-02	3.333E-03				423.45
15. 6.89	55						24
7. 0	20						423.75
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Table 6.4.20. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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18. 6.89	52						814
17.17	10						423.75
18. 6.89	52		7.342E-04				814
17.17	10			3.089E-03	6.636E-04	1.115E-03	424.51
18. 6.89	55						814
17.17	10			3.380E-03	8.350E-04	1.180E-03	424.51
18. 6.89	55			3.074E-03	2.333E-03	3.410E-03	814
17.17	30						424.51
18. 6.89	55						814
17.17	20	7.421E-03	2.909E-03				424.51
19. 6.89	52		7.652E-04				820
16.54	10			3.812E-03	6.790E-04	1.106E-03	425.51
19. 6.89	55						820
16.54	10			4.001E-03	7.293E-04	1.178E-03	425.51
19. 6.89	55			2.955E-03	2.433E-03	3.175E-03	820
16.54	30						425.51
19. 6.89	55						820
16.54	20	7.821E-03	3.543E-03				425.51
20. 6.89	52		7.784E-04				822
16.13	10			3.975E-03	6.488E-04	1.139E-03	426.75
20. 6.89	55						822
16.13	10			4.077E-03	7.196E-04	1.213E-03	426.75
20. 6.89	55			3.100E-03	2.384E-03	3.456E-03	822
16.13	30						426.75
20. 6.89	55						822
16.13	20	7.955E-03	3.651E-03				426.75
22. 6.89	52		6.471E-04				789
8.5	10			3.515E-03	6.553E-04	1.042E-03	428.05
22. 6.89	55						789
8.5	10			3.590E-03	8.138E-04	1.070E-03	428.05
22. 6.89	55			2.713E-03	2.096E-03	2.918E-03	789
8.5	30						428.05
22. 6.89	55						789
8.5	20	9.160E-03	3.261E-03				428.05
23. 6.89	52		7.298E-04				788
8.52	10			3.648E-03	6.518E-04	1.081E-03	428.93
23. 6.89	55						788
8.52	10			3.841E-03	7.362E-04	1.160E-03	428.93
23. 6.89	55			2.663E-03	2.228E-03	3.021E-03	788
8.52	30						428.93
23. 6.89	55						788
8.52	20	8.960E-03	3.384E-03				428.93
24. 6.89	52		6.960E-04				789
8.32	10			3.754E-03	6.560E-04	1.090E-03	429.86
24. 6.89	55						789
8.32	10			3.938E-03	8.047E-04	1.164E-03	429.86
24. 6.89	55			2.768E-03	2.190E-03	2.858E-03	789
8.32	30						429.86
24. 6.89	55						789
8.32	20	9.466E-03	3.468E-03				429.86
25. 6.89	52		7.332E-04				789
8.28	10			3.673E-03	6.857E-04	1.097E-03	430.79

Table 6.4.20. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
25. 6.89	55						789
8.28	10			3.932E-03	8.332E-04	1.180E-03	430.79
25. 6.89	55			2.600E-03	2.211E-03	3.158E-03	789
8.28	30						430.79
25. 6.89	55						789
8.28	20	9.051E-03	3.486E-03				430.79
1. 7.89	52		7.154E-04				792
9. 0	10			3.710E-03	6.958E-04	1.104E-03	436.38
1. 7.89	55						792
9. 0	10			3.994E-03	6.490E-04	1.166E-03	436.38
1. 7.89	55			2.690E-03	2.166E-03	2.885E-03	792
9. 0	30						436.38
1. 7.89	55						792
9. 0	20	1.004E-02	3.481E-03				436.38
2. 7.89	52		7.023E-04				792
8.15	10			3.664E-03	6.481E-04	1.038E-03	437.27
2. 7.89	55						792
8.15	10			3.802E-03	7.949E-04	1.167E-03	437.27
2. 7.89	55			2.617E-03	2.299E-03	2.812E-03	792
8.15	30						437.27
2. 7.89	55						792
8.15	20	8.750E-03	3.239E-03				437.27
4. 7.89	52		7.124E-04				786
16.28	10			3.644E-03	6.786E-04	1.129E-03	439.53
4. 7.89	55						786
16.28	10			4.085E-03	7.660E-04	1.166E-03	439.53
4. 7.89	55			2.581E-03	2.185E-03	2.899E-03	786
16.28	30						439.53
4. 7.89	55						786
16.28	20	8.960E-03	3.454E-03				439.53
6. 7.89	52		7.385E-04				781
9.35	10			3.709E-03	6.912E-04	1.106E-03	441.15
6. 7.89	55						781
9.35	10			3.837E-03	8.149E-04	1.179E-03	441.15
6. 7.89	55			2.582E-03	2.120E-03	2.931E-03	781
9.35	30						441.15
6. 7.89	55						781
9.35	20	1.127E-02	3.522E-03				441.15
7. 7.89	52		6.992E-04				781
9.37	10			3.721E-03	6.938E-04	1.114E-03	442.08
7. 7.89	55						781
9.37	10			3.861E-03	7.561E-04	1.177E-03	442.08
7. 7.89	55			2.712E-03	2.128E-03	2.630E-03	781
9.37	30						442.08
7. 7.89	52						781
9.37	10						442.08
7. 7.89	52						781
9.37	10						442.08
8. 7.89	52		8.664E-04				833
8.59	10			4.534E-03	8.095E-04	1.323E-03	442.98
8. 7.89	55						833
8.59	10			4.777E-03	8.699E-04	1.434E-03	442.98

Table 6.4.20. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. A		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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8. 7.89	55			3.330E-03	2.794E-03	3.893E-03	833
8.59	30						442.98
8. 7.89	55						833
8.59	20	1.248E-02	4.140E-03				442.98
9. 7.89	52		9.259E-04				836
8.45	10			4.511E-03	8.231E-04	1.306E-03	443.91
9. 7.89	55						836
8.45	10				8.646E-04	1.381E-03	443.91
9. 7.89	55			3.342E-03	2.706E-03	3.901E-03	836
8.45	30						443.91
9. 7.89	55						836
8.45	20	1.220E-02	4.228E-03				443.91
10. 7.89	52		8.611E-04				834
19.37	10			4.514E-03	8.035E-04	1.330E-03	445.11
10. 7.89	55						834
19.37	10			9.340E-04		2.857E-04	445.11
10. 7.89	55			3.489E-03	2.812E-03	4.050E-03	834
19.37	30						445.11
10. 7.89	55						834
19.37	20	1.197E-02	4.421E-03				445.11
11. 7.89	55						60
3. 0	20						445.35
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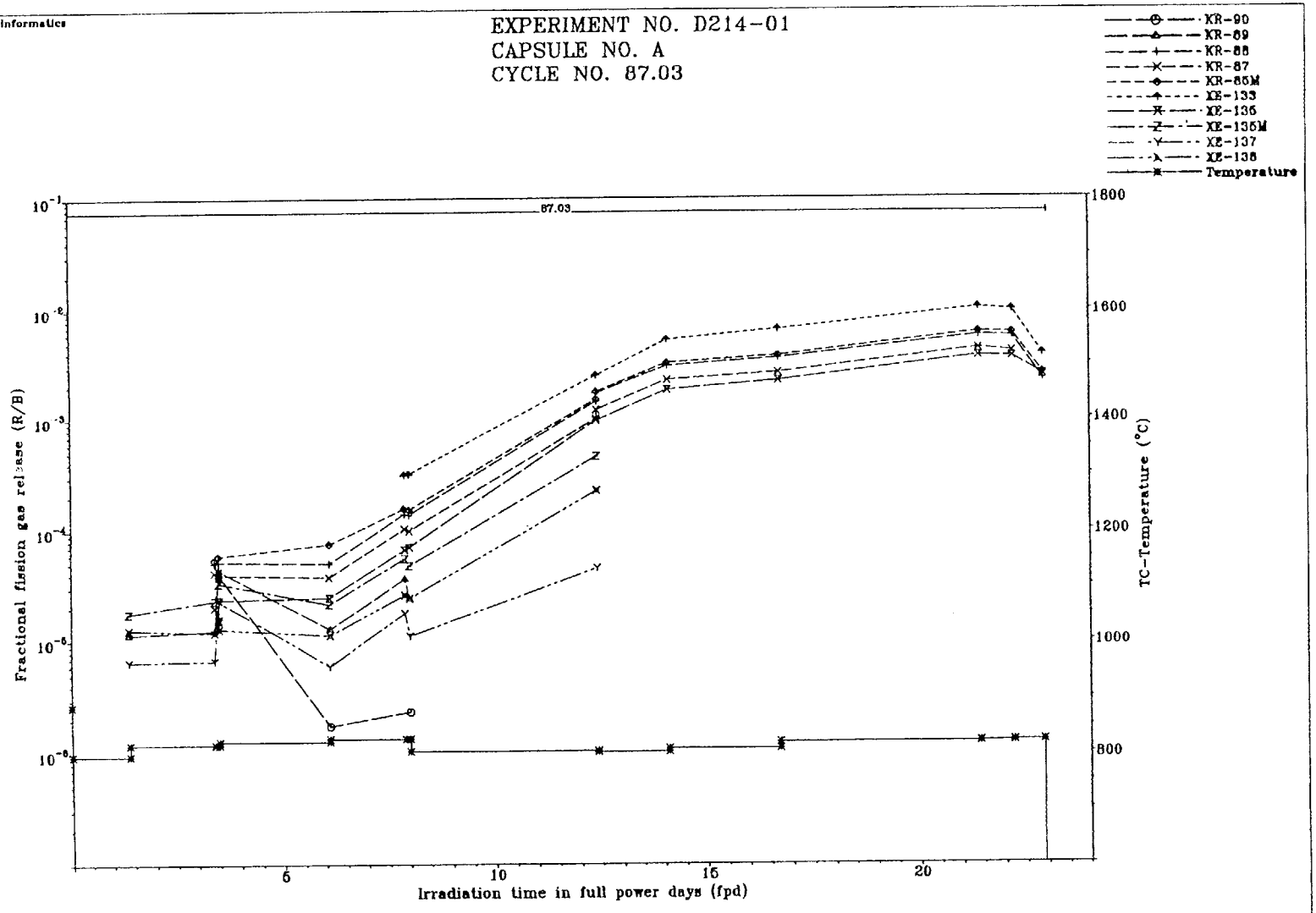

Fig. 6.4.1. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

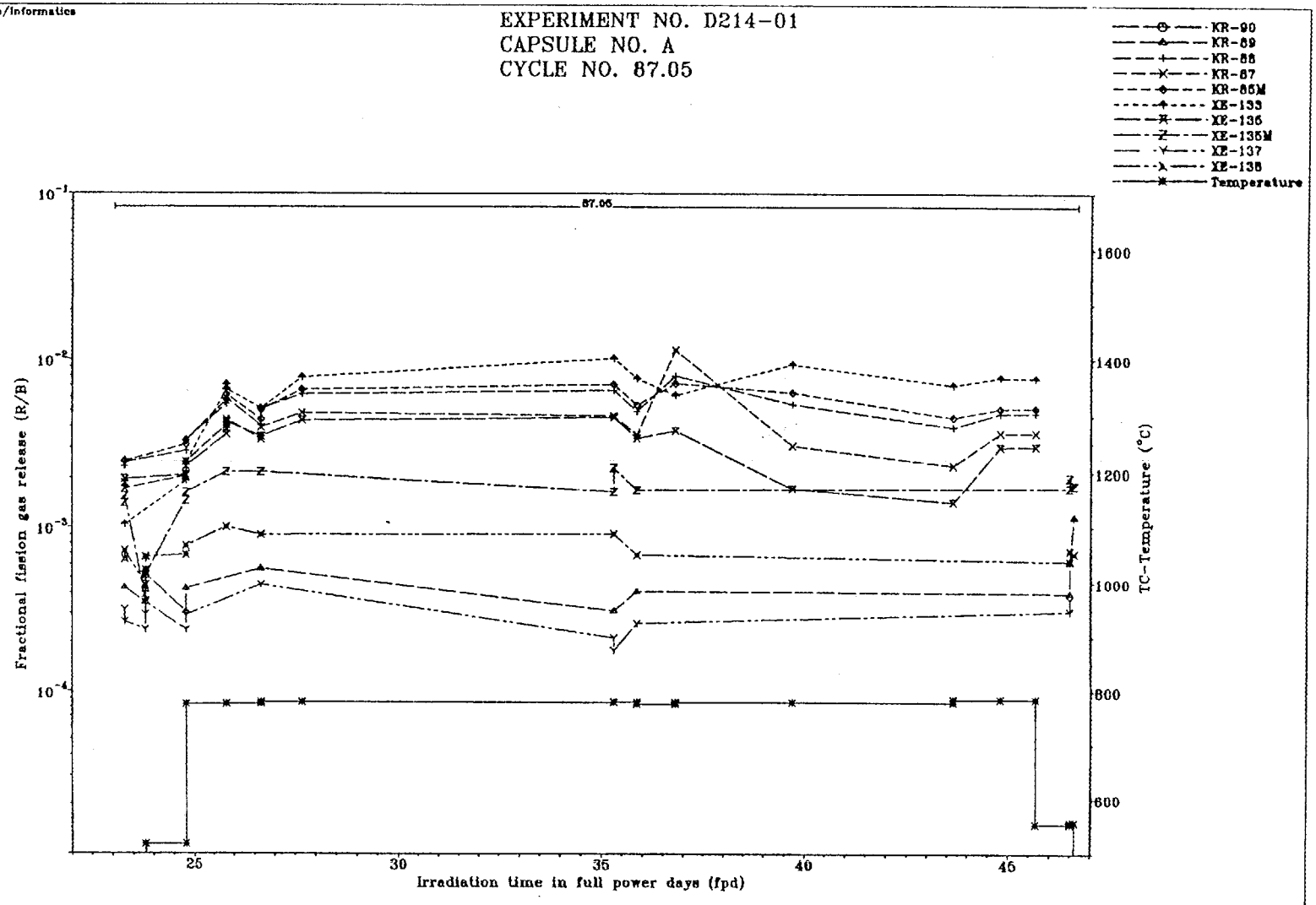

Fig. 6.4.2. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

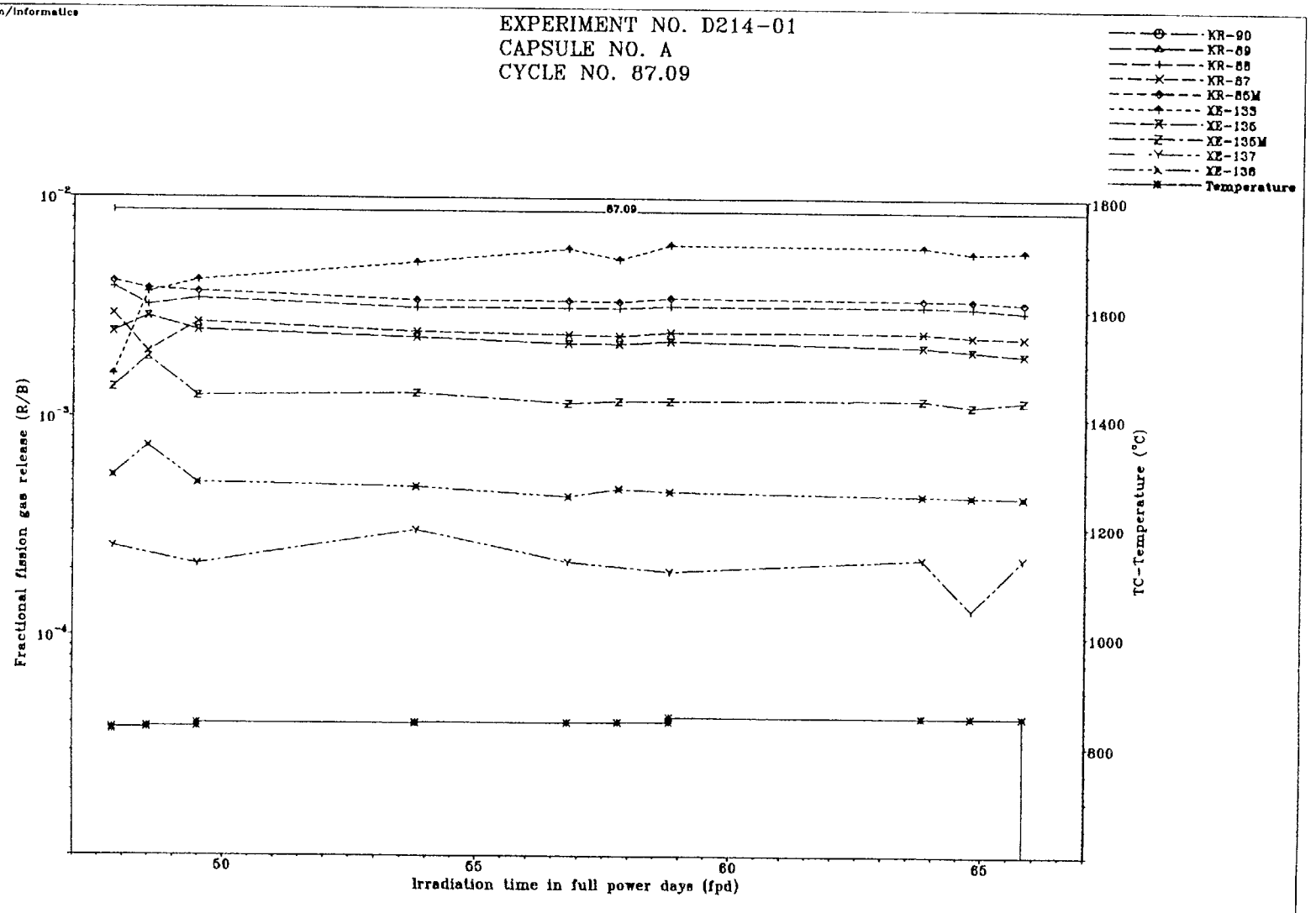

Fig. 6.4.3. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

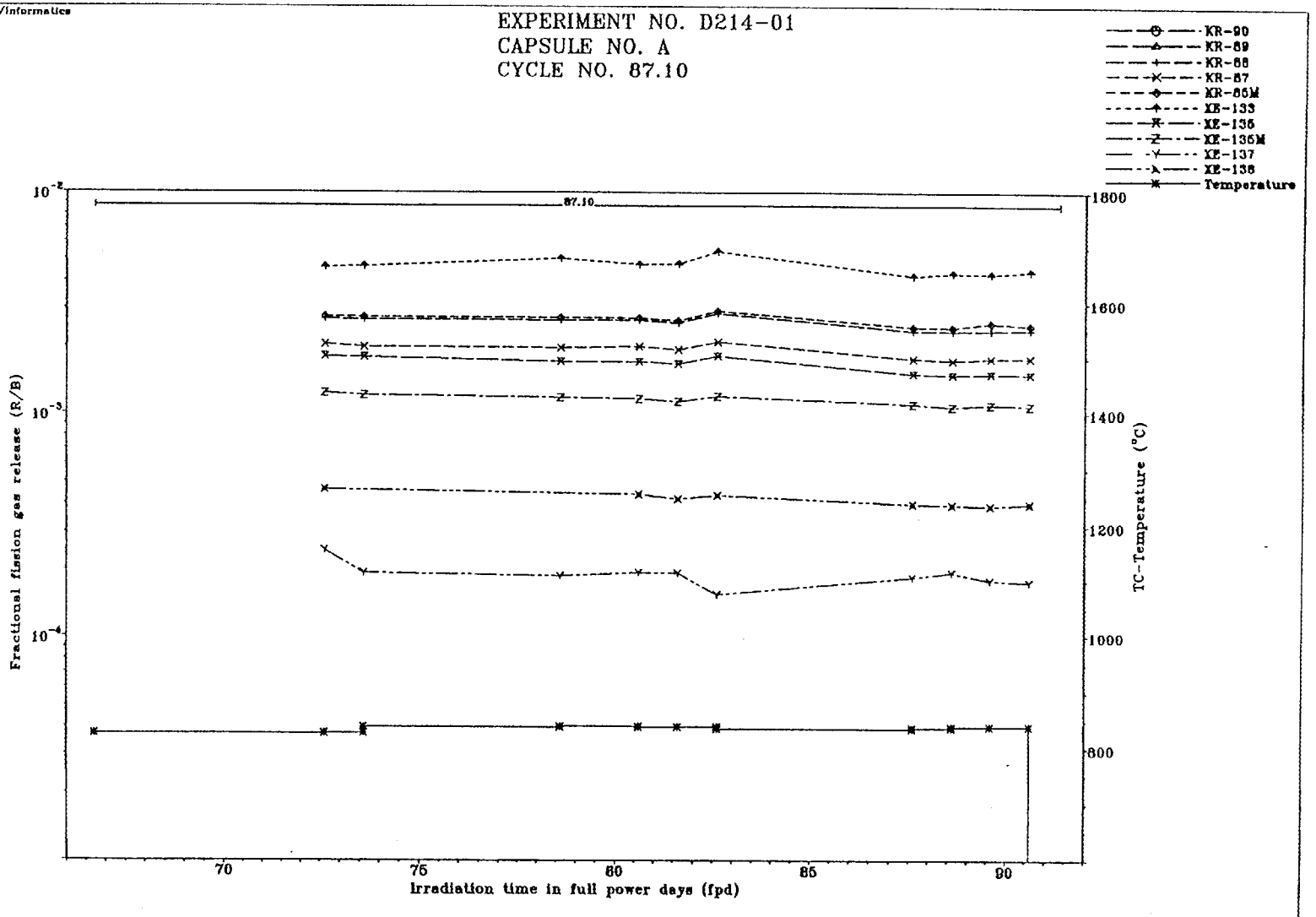

Fig. 6.4.4. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

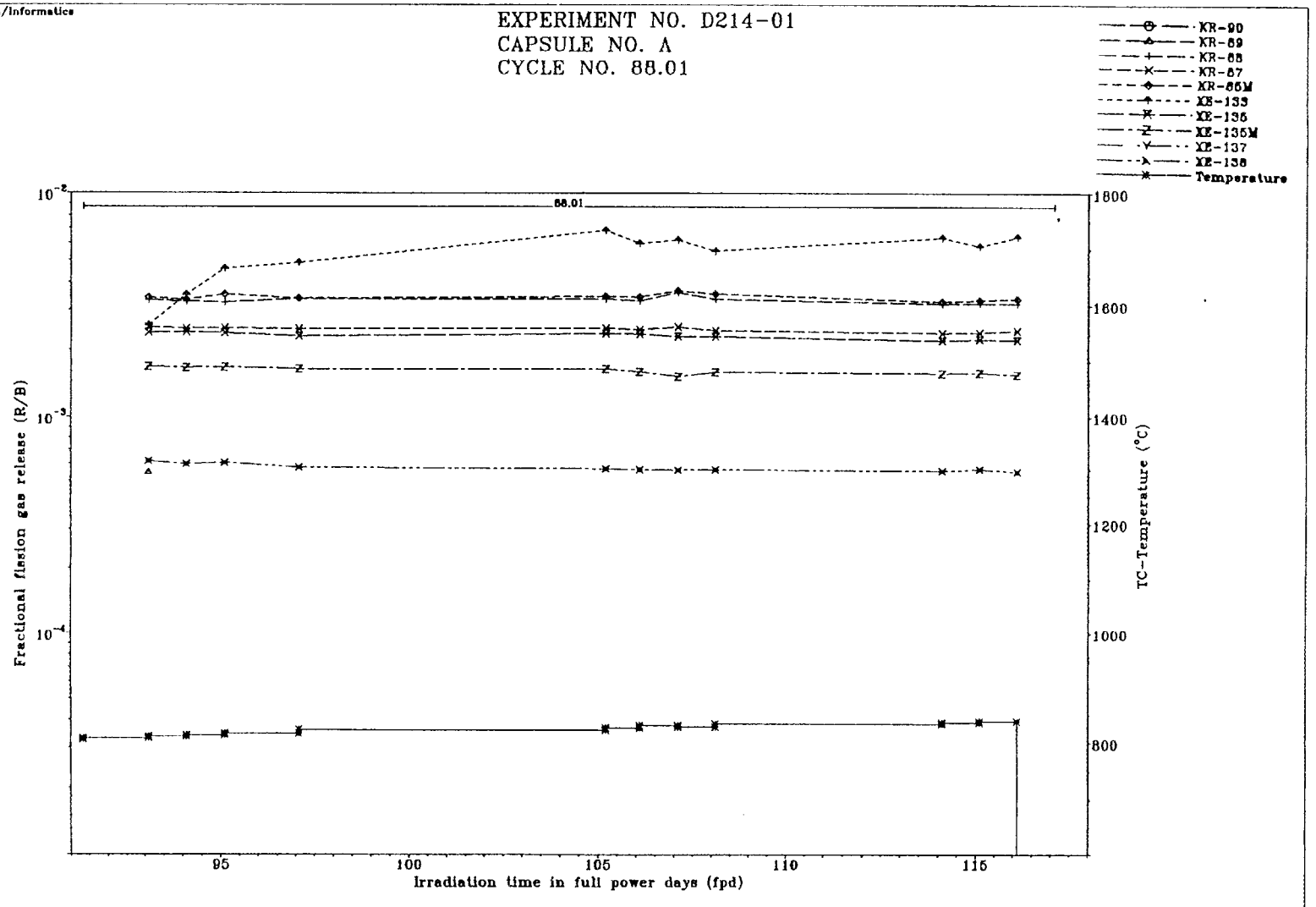

Fig. 6.4.5. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

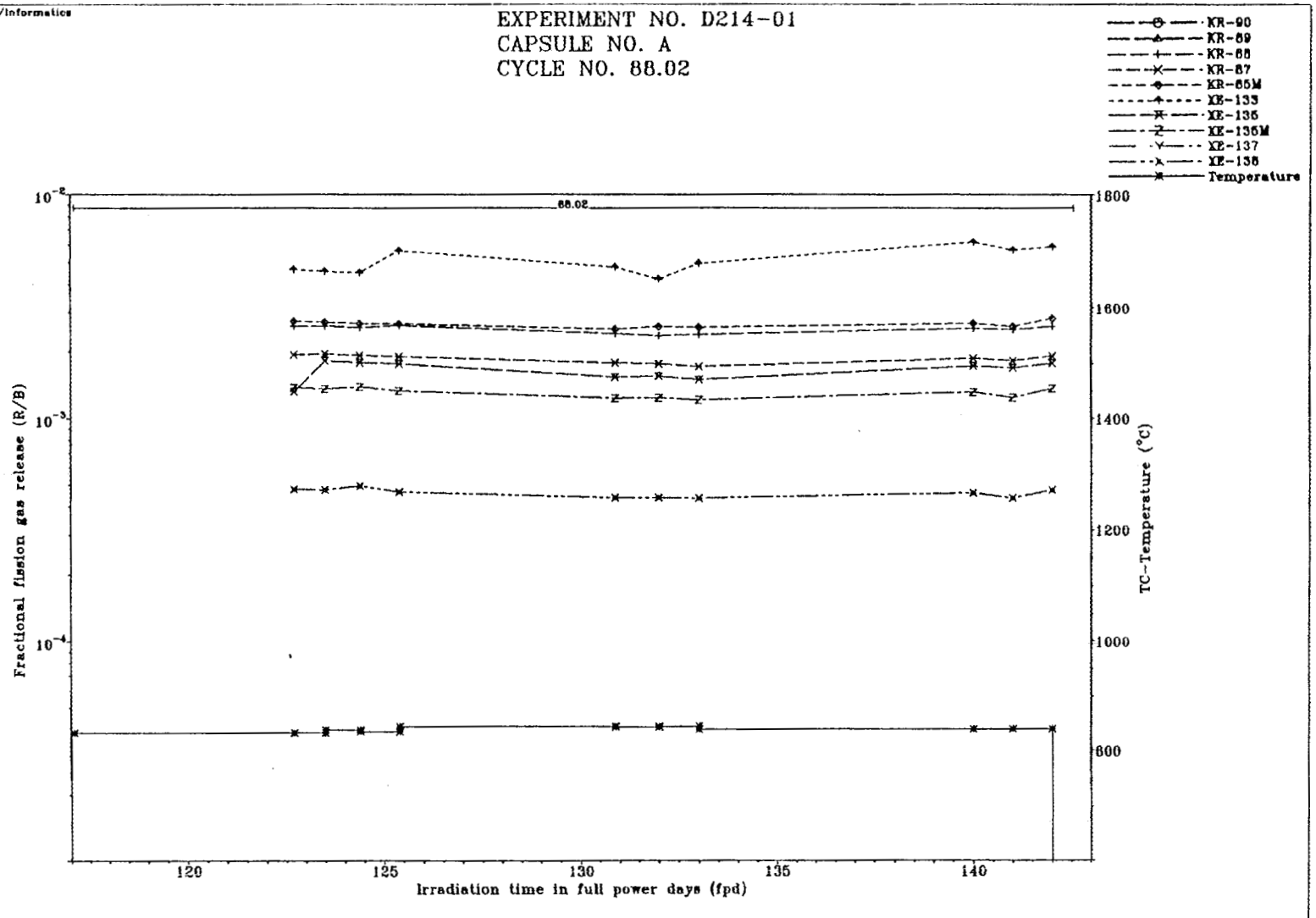

Fig. 6.4.6. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

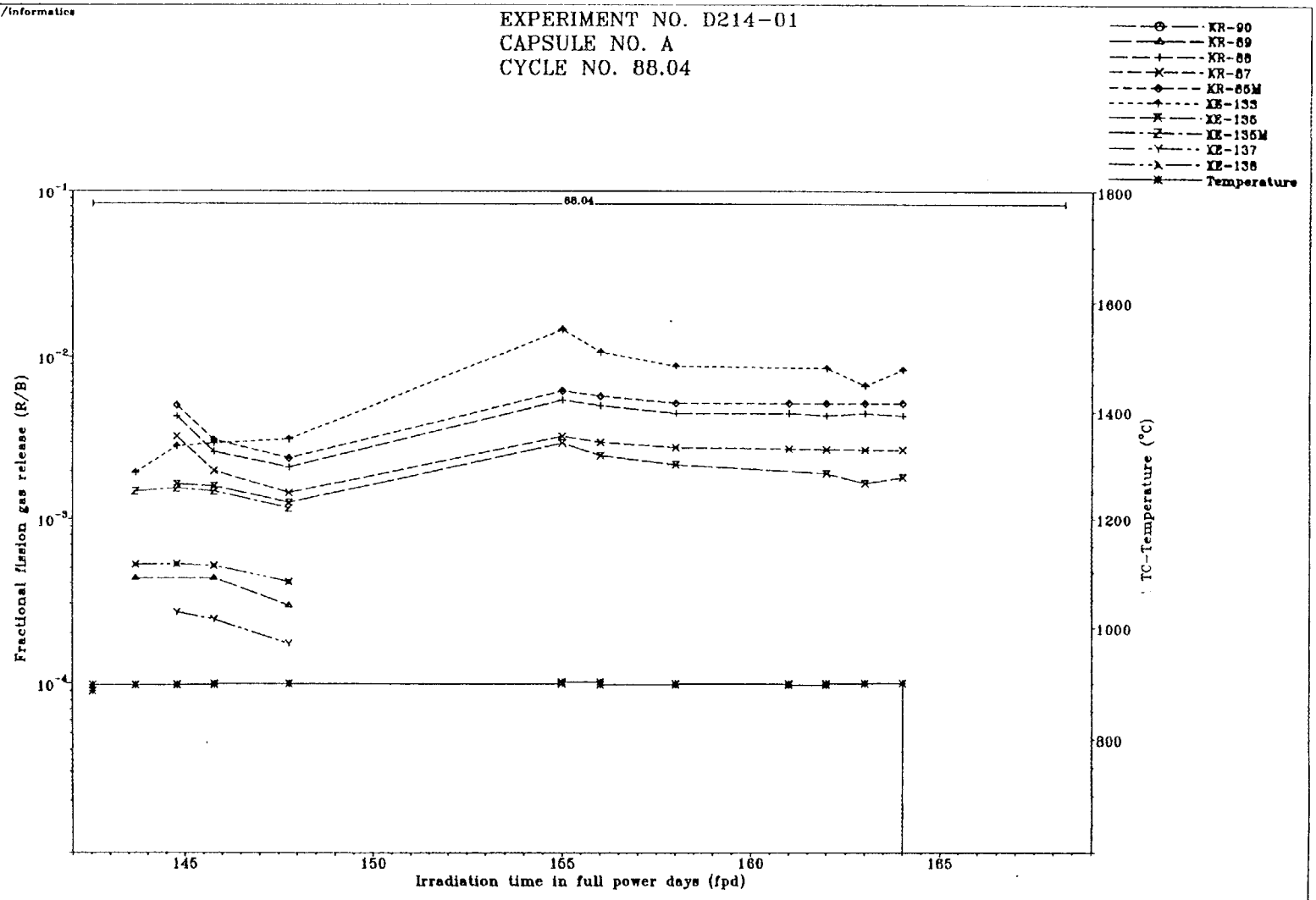

Fig. 6.4.7. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

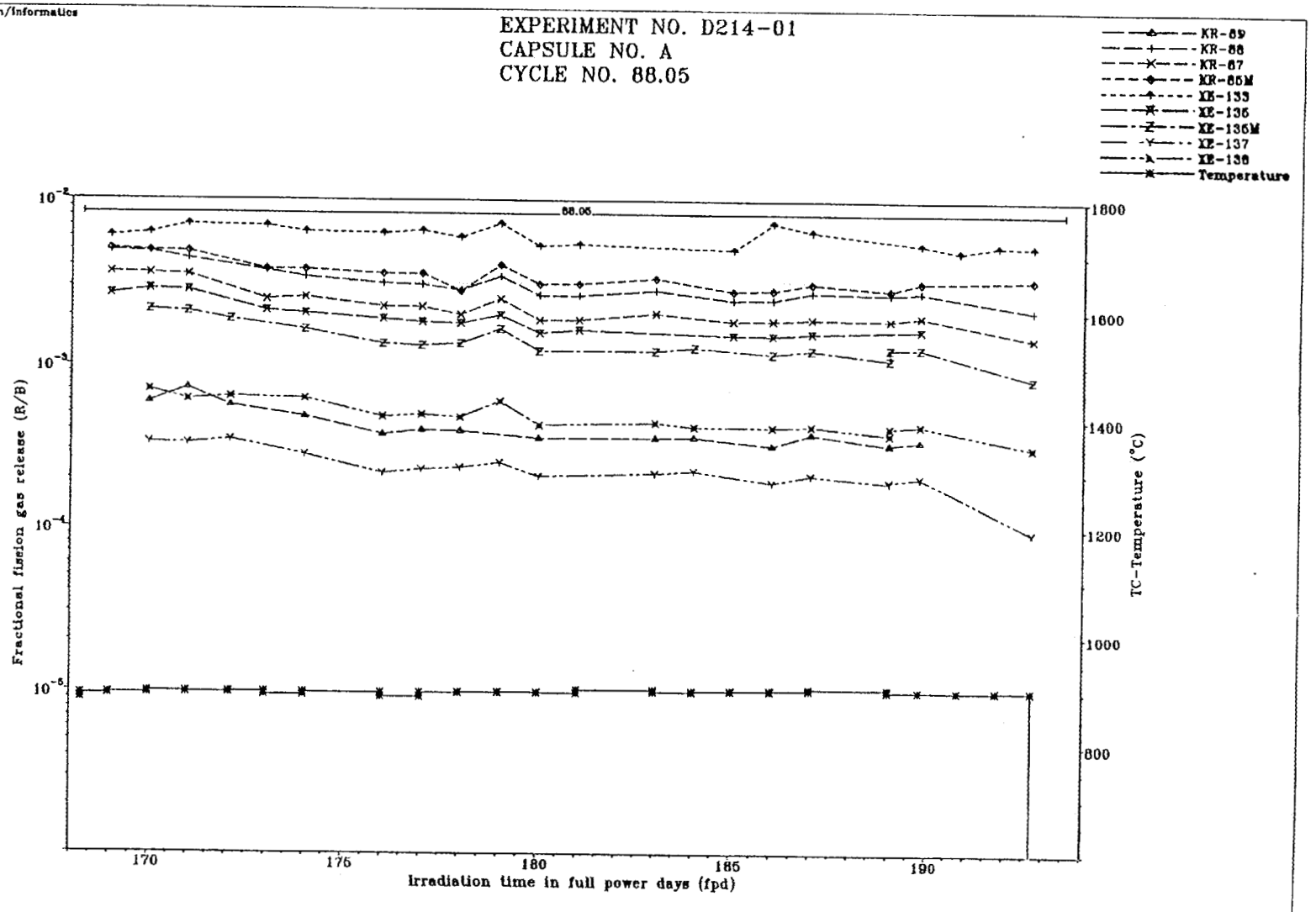

Fig. 6.4.8. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

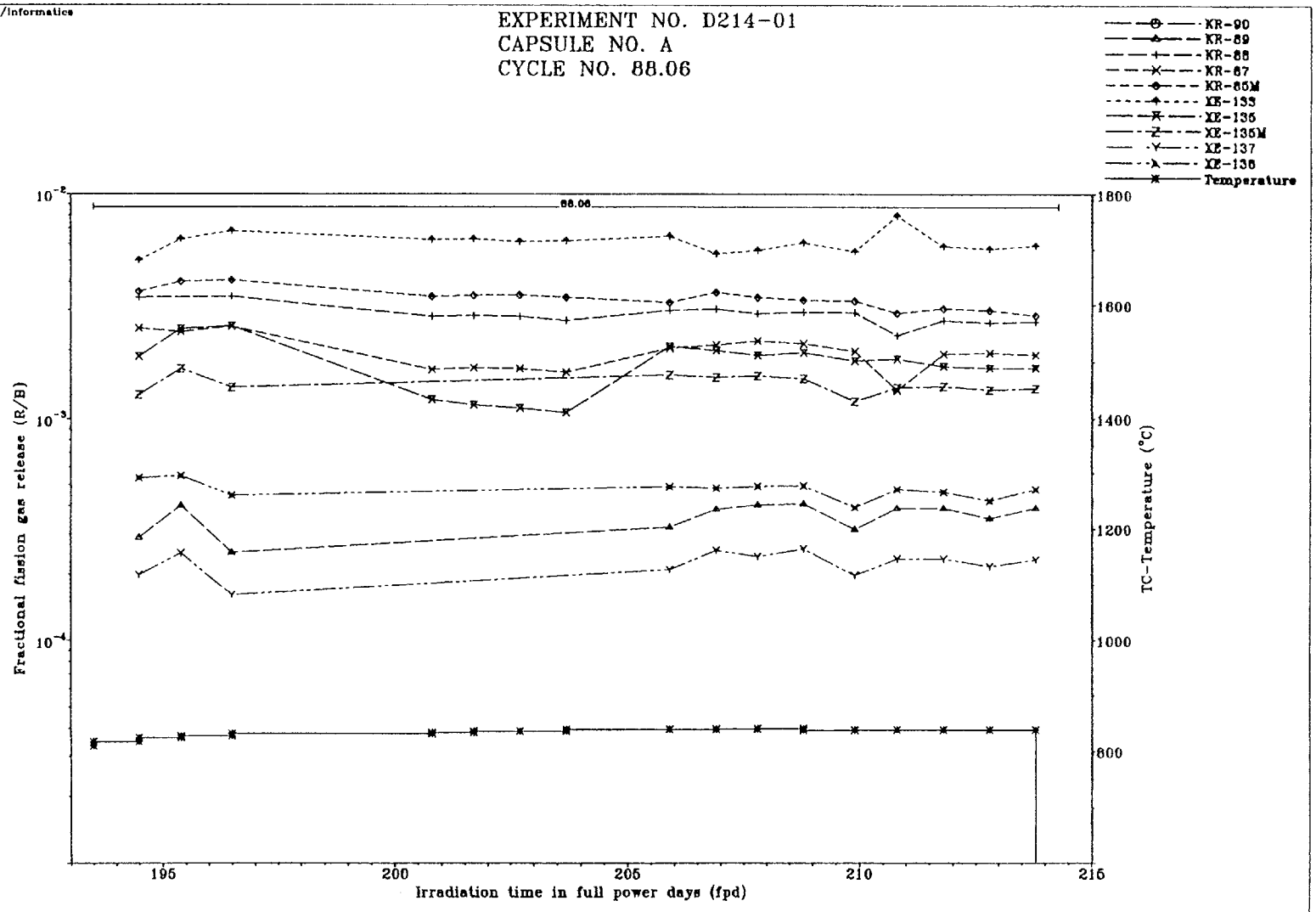

Fig. 6.4.9. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

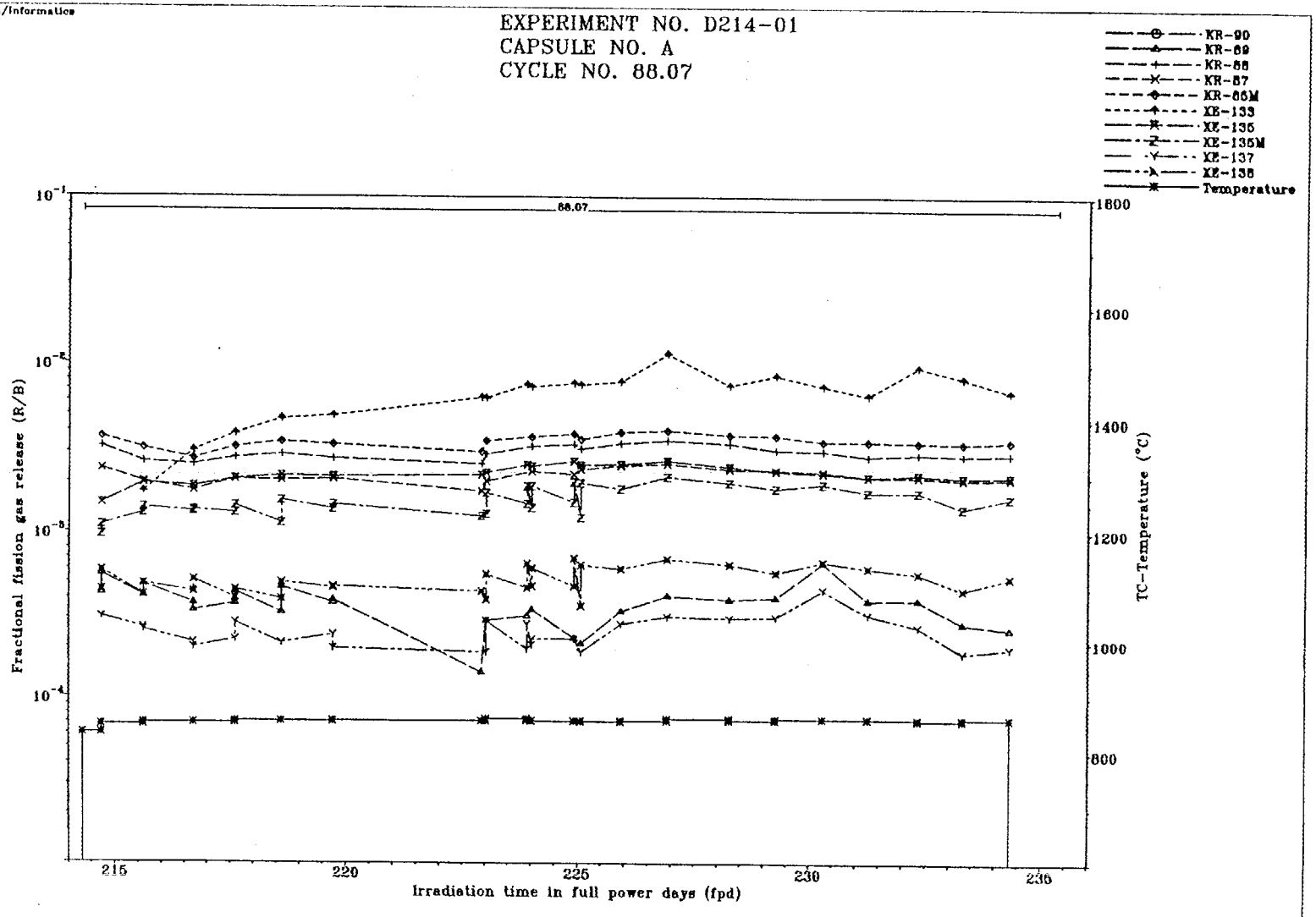

Fig. 6.4.10. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

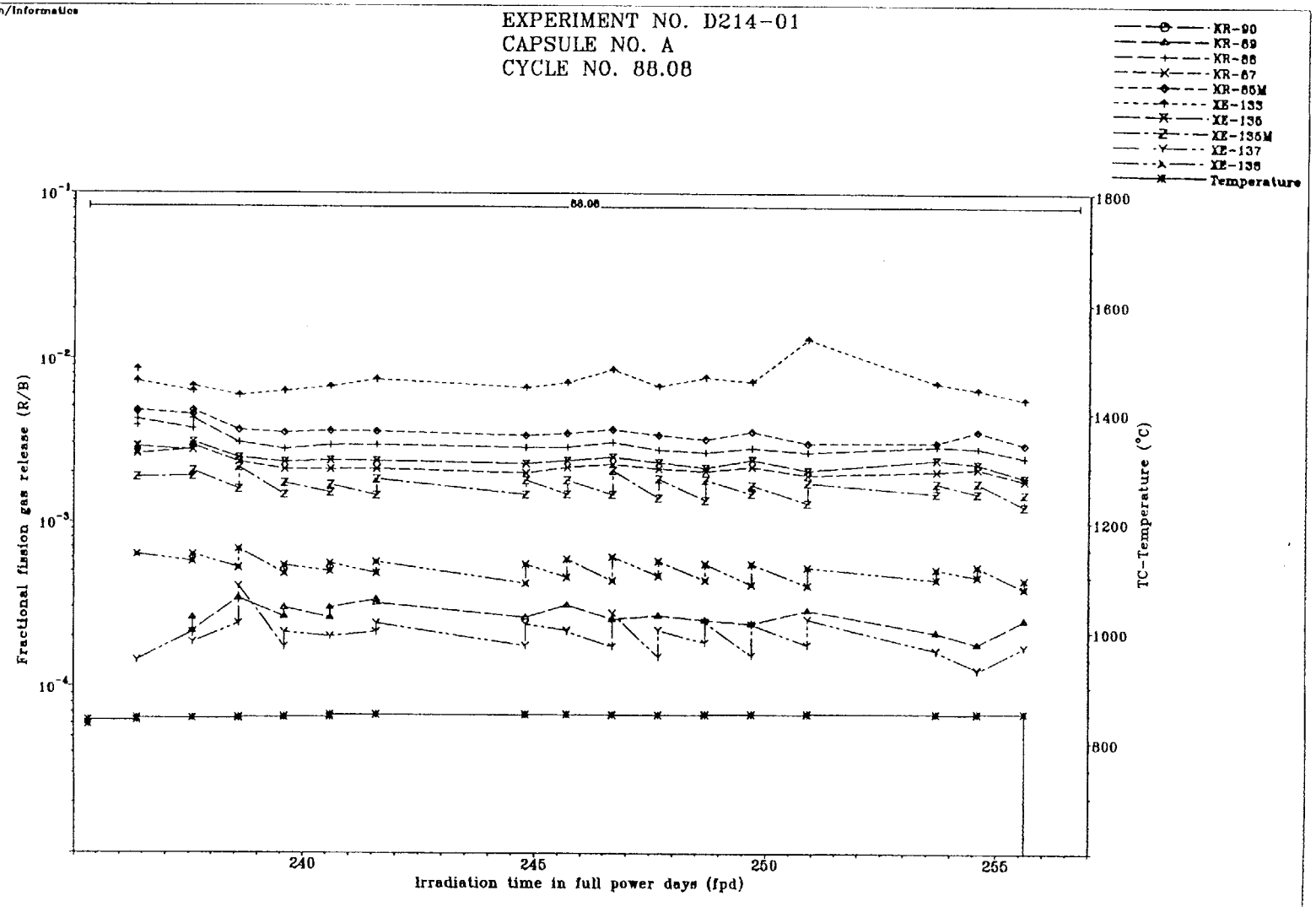

Fig. 6.4.11. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

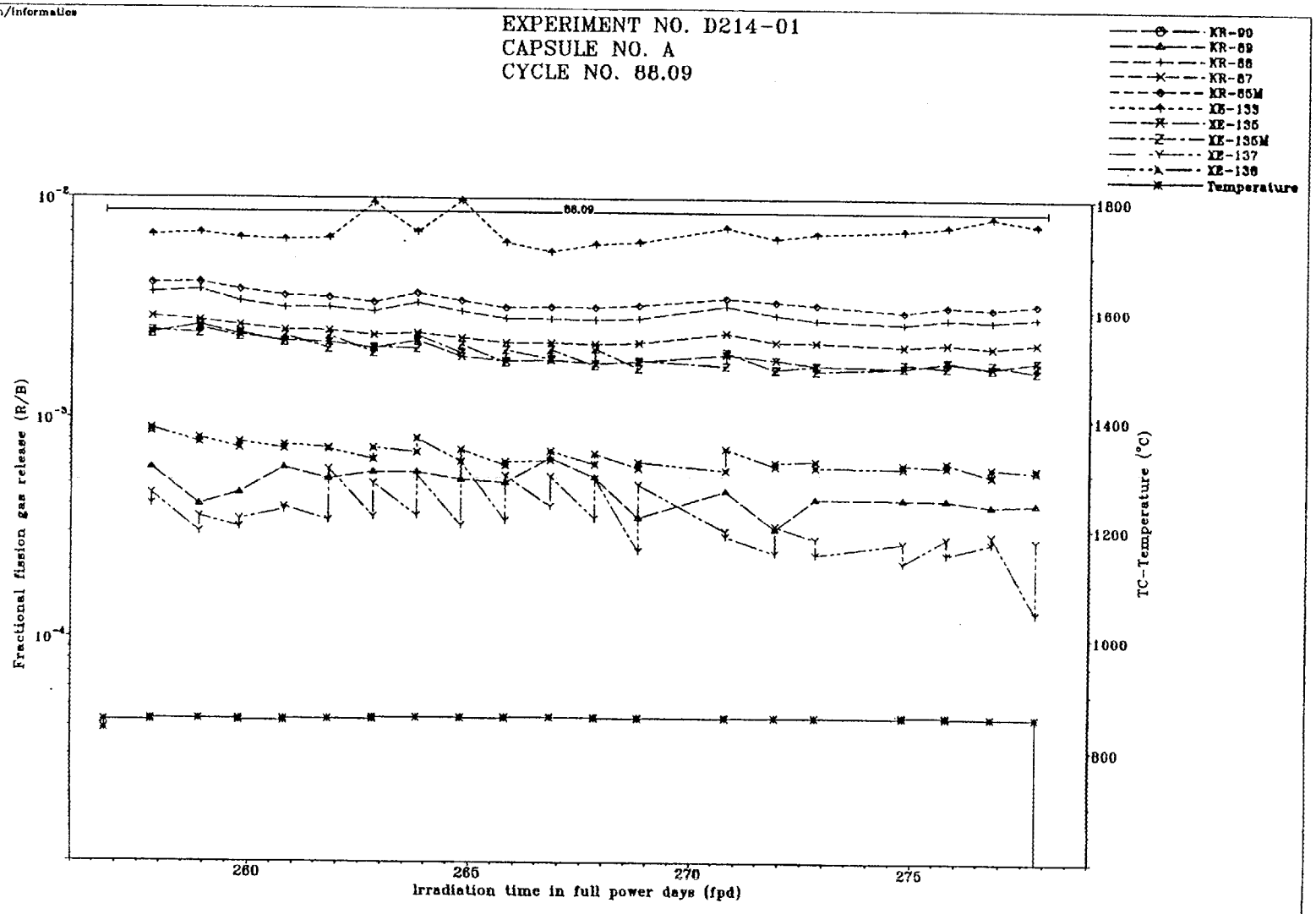

Fig. 6.4.12. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

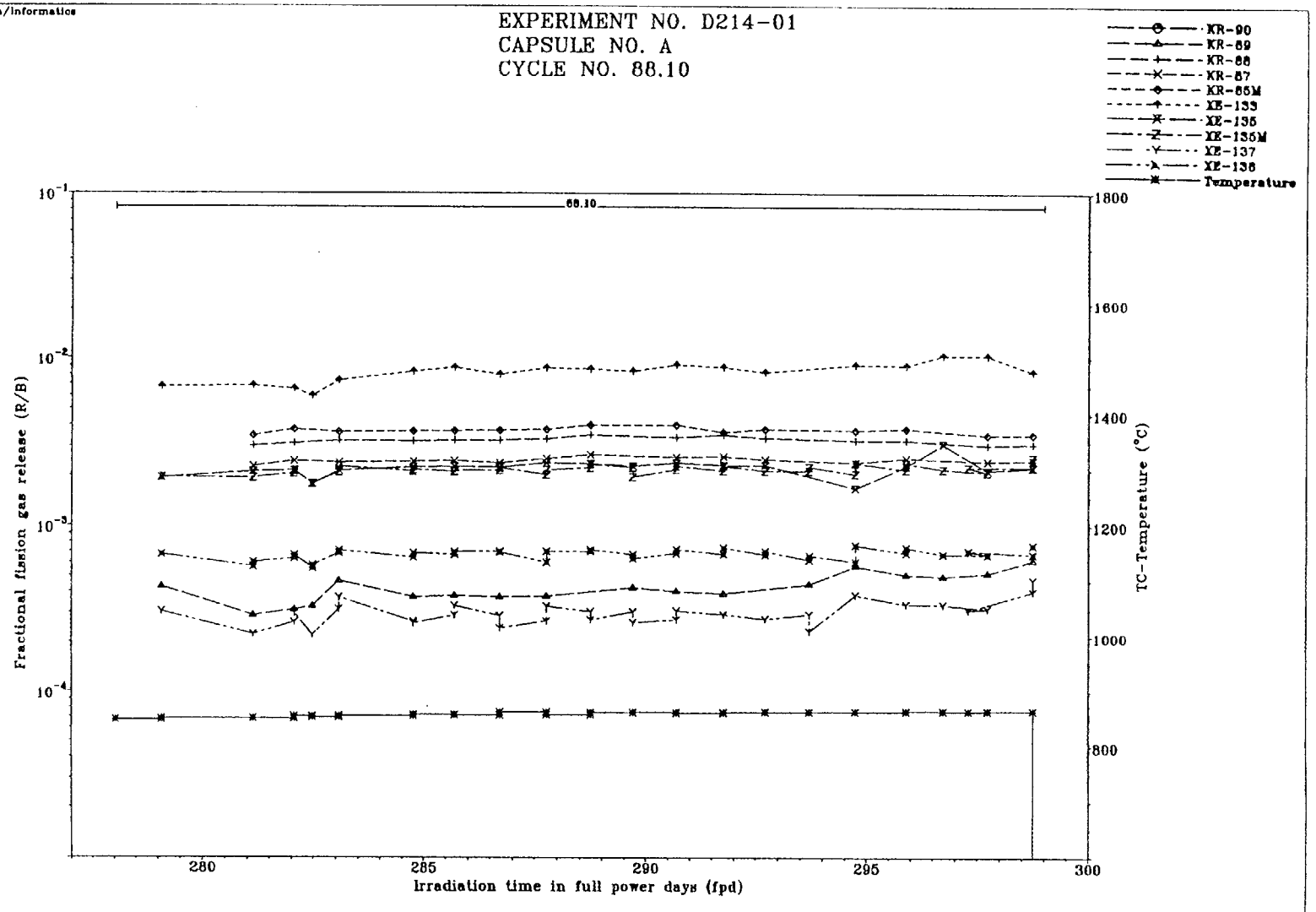

Fig. 6.4.13. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

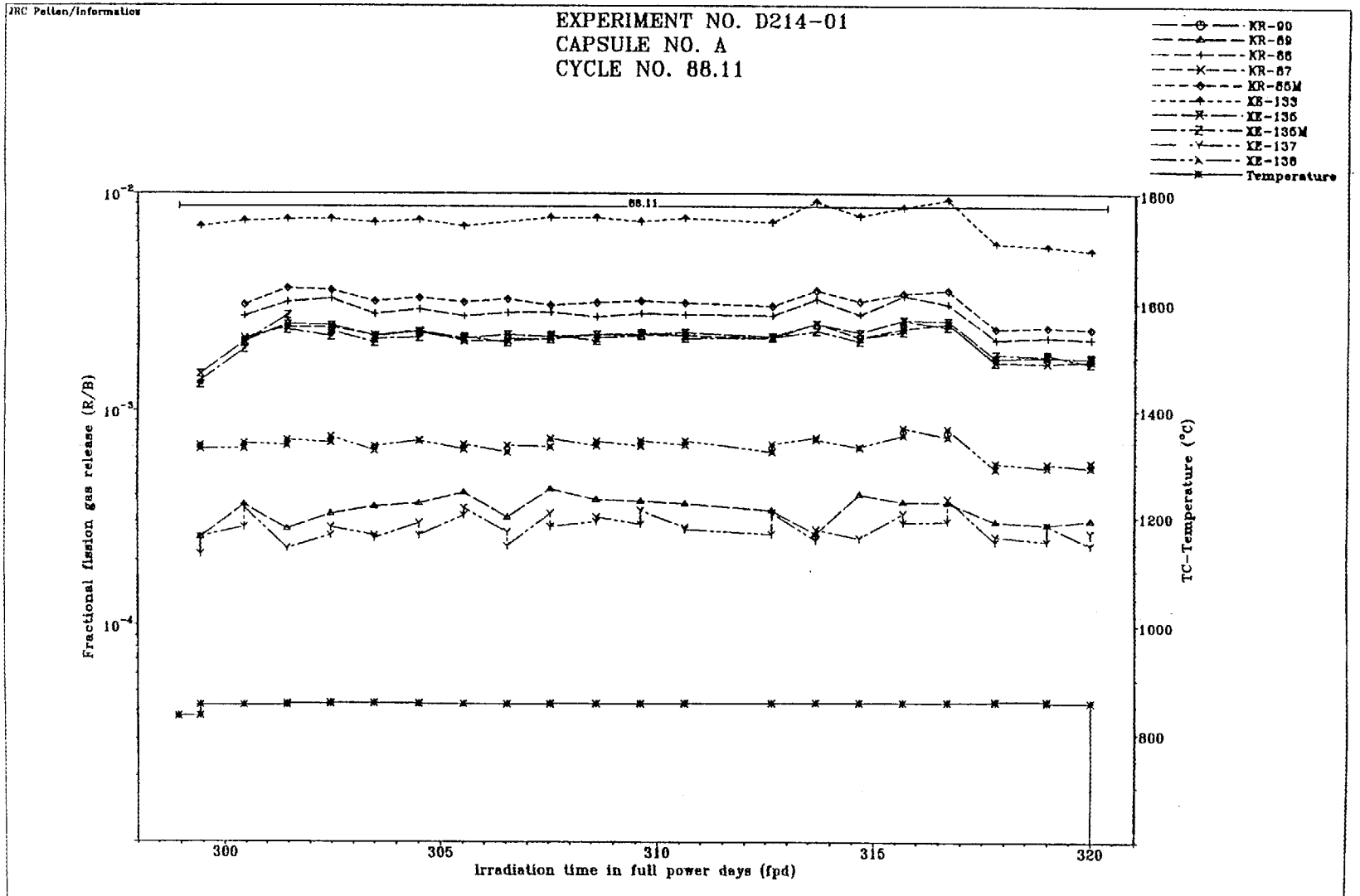

Fig. 6.4.14. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

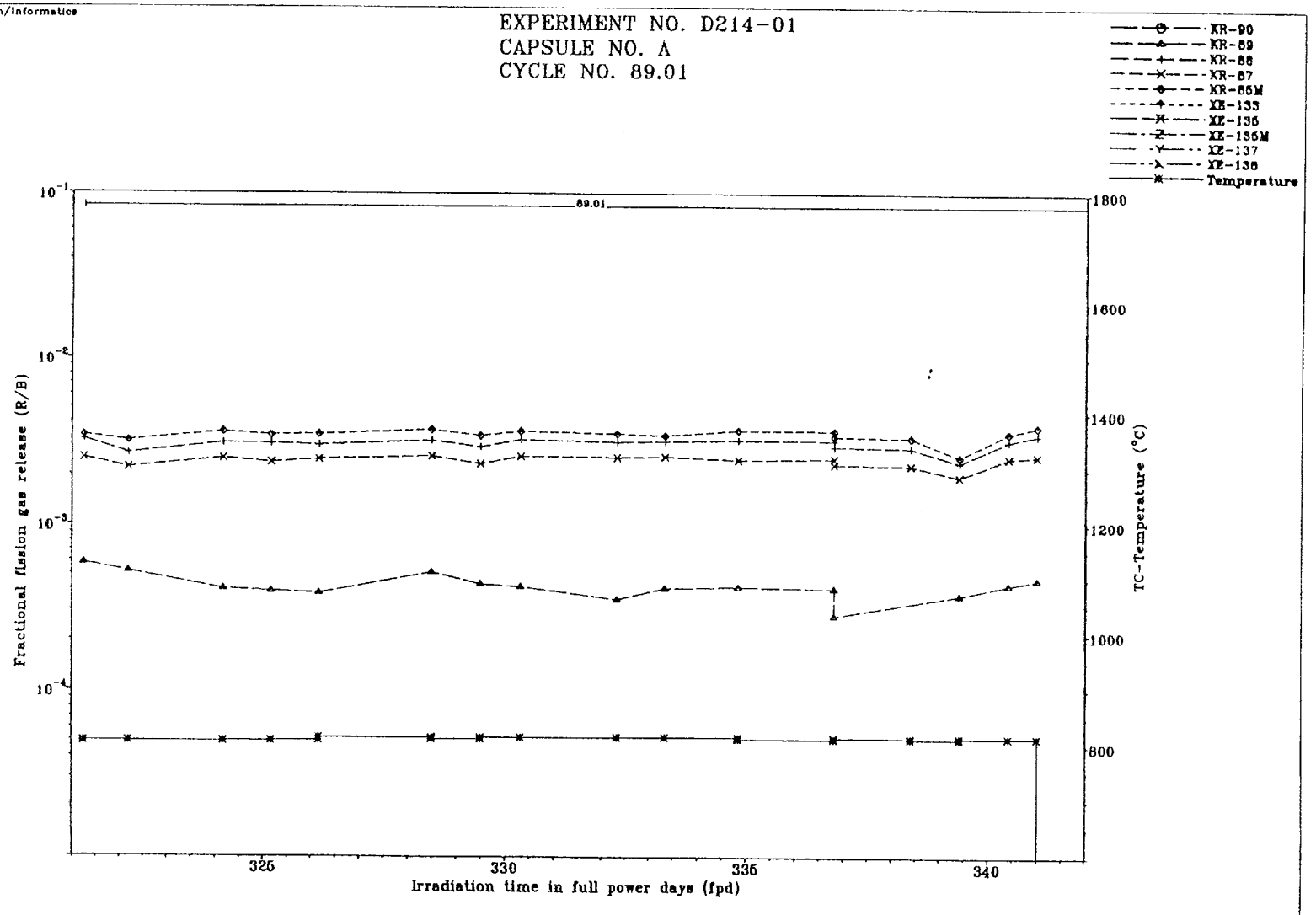

Fig. 6.4.15. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

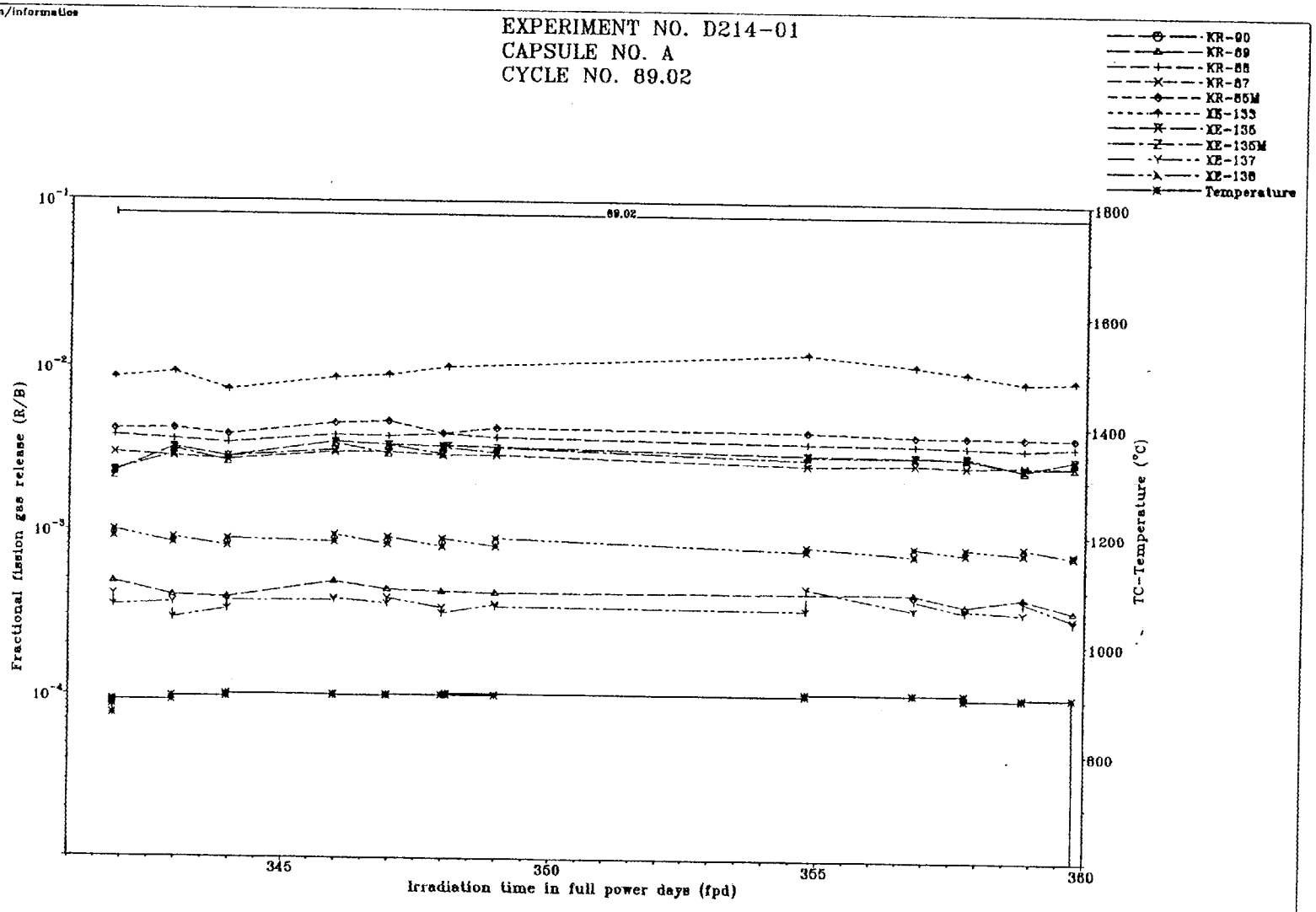

Fig. 6.4.16. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

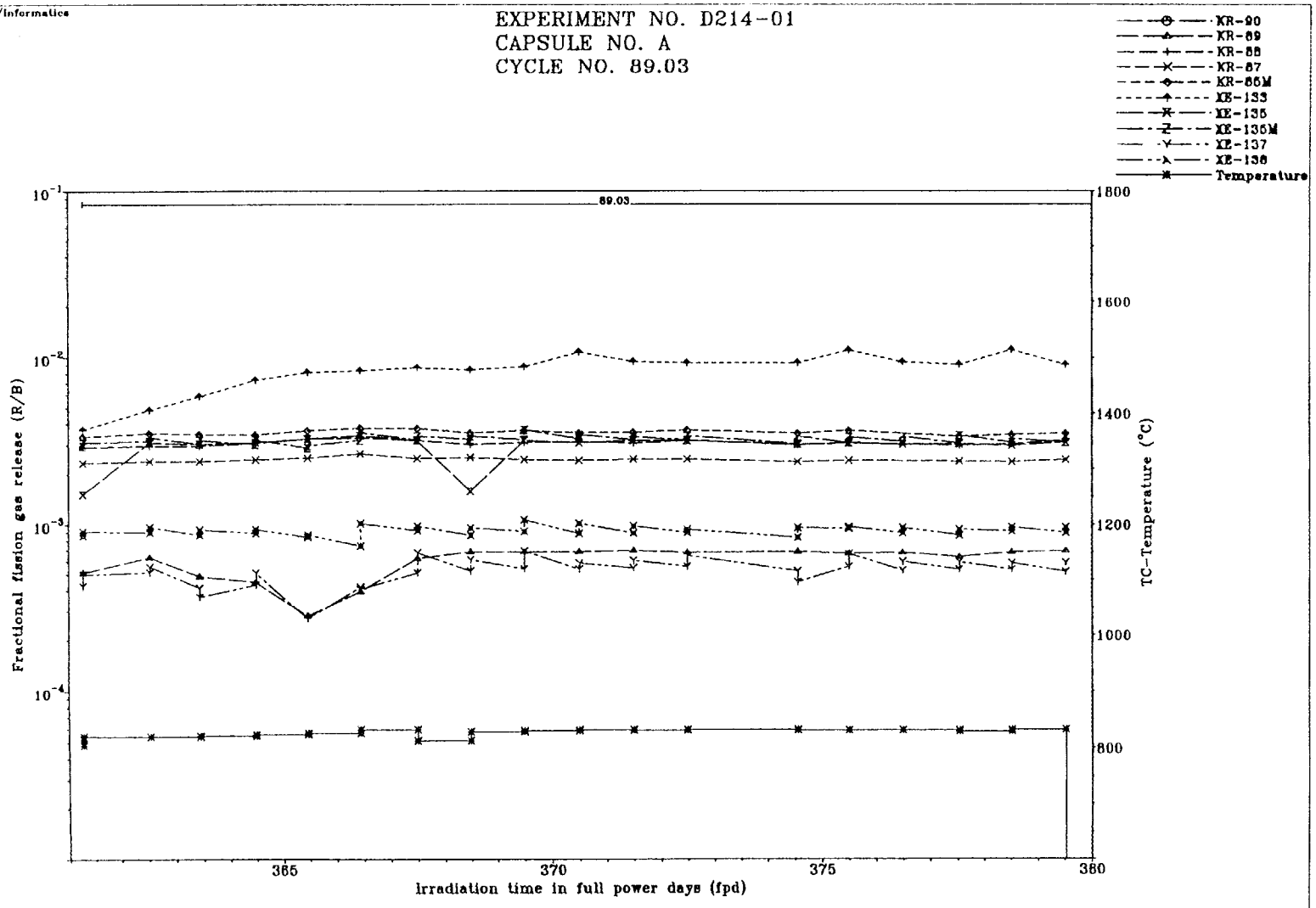

Fig. 6.4.17. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

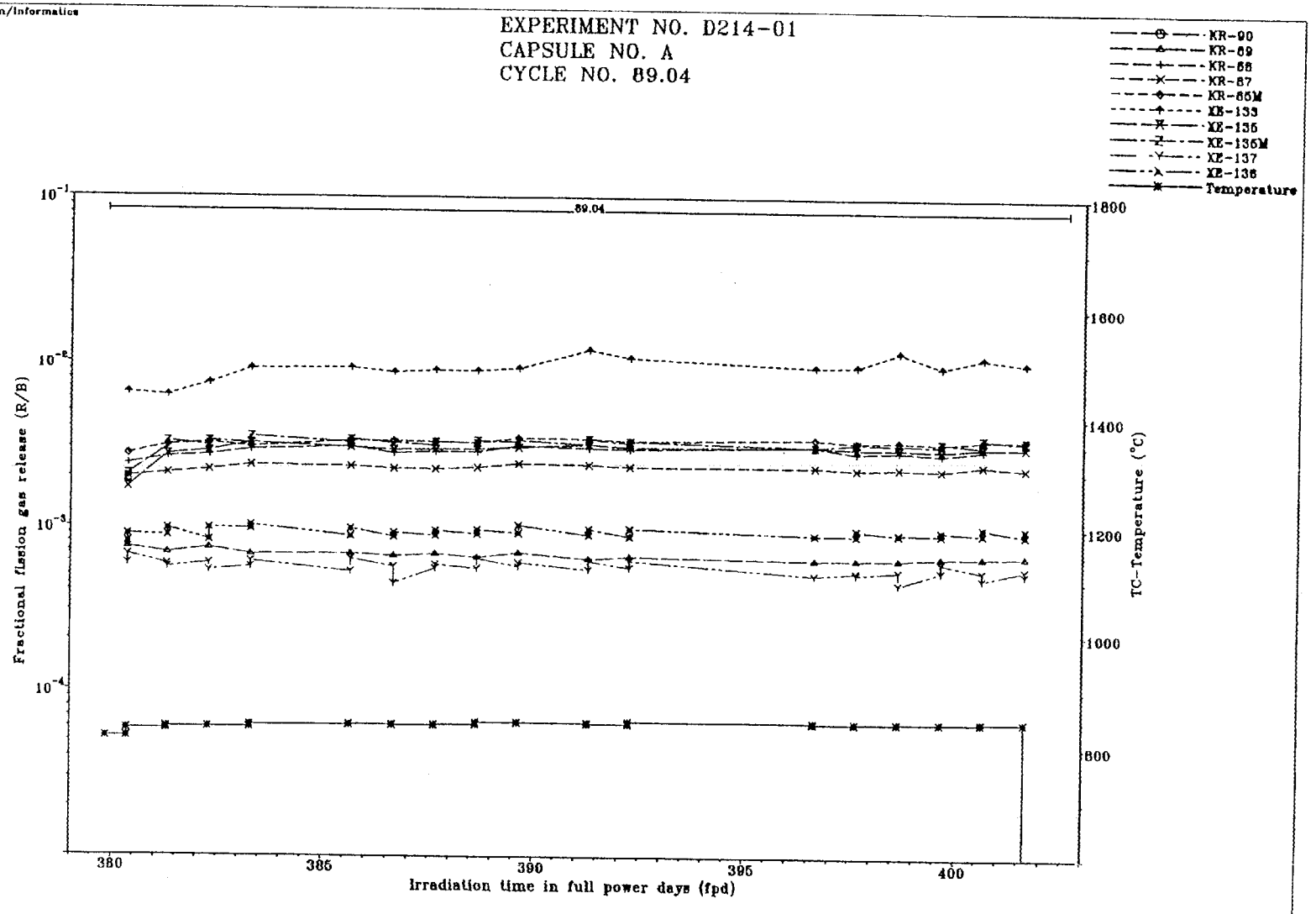

Fig. 6.4.18. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

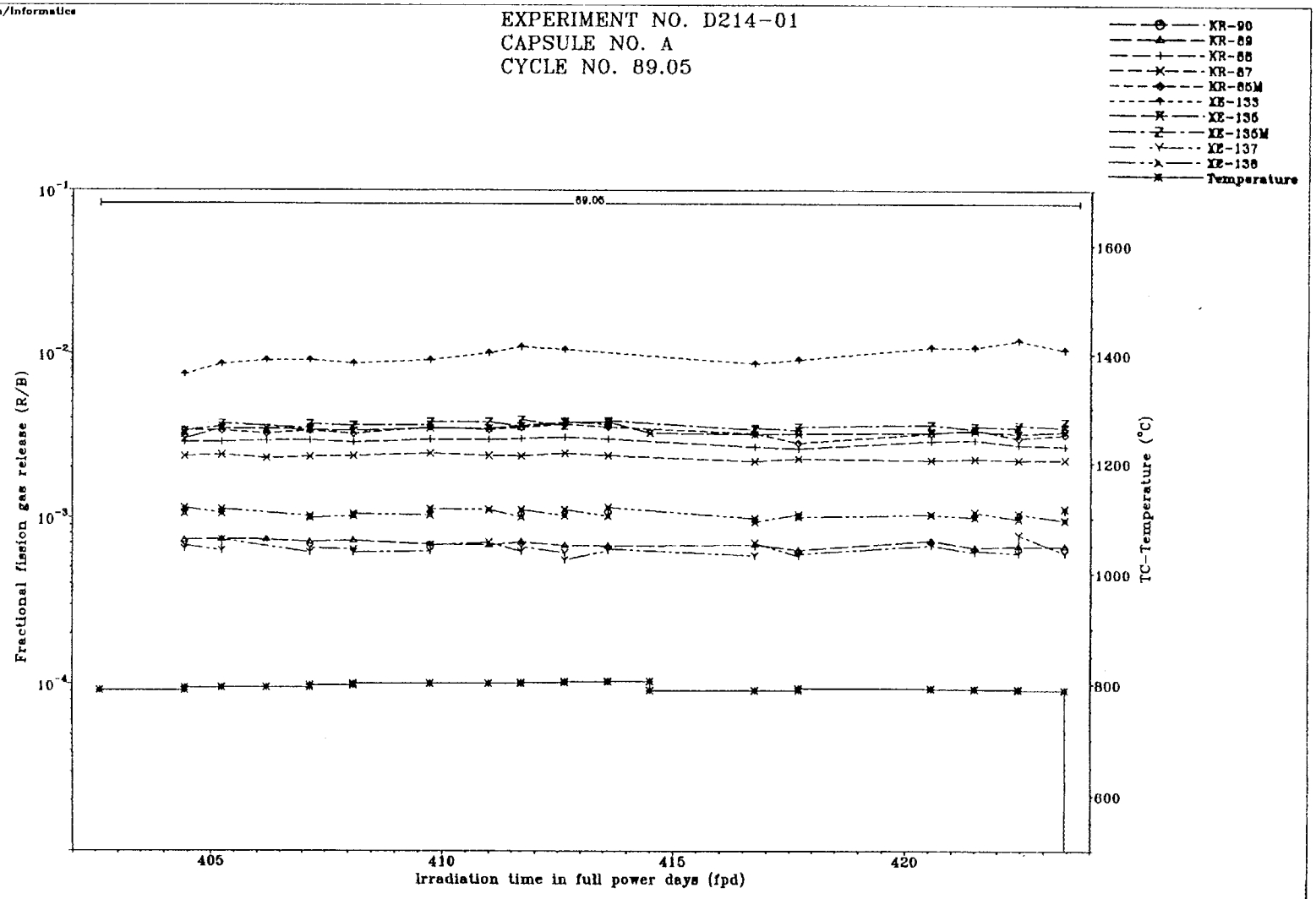

Fig. 6.4.19. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

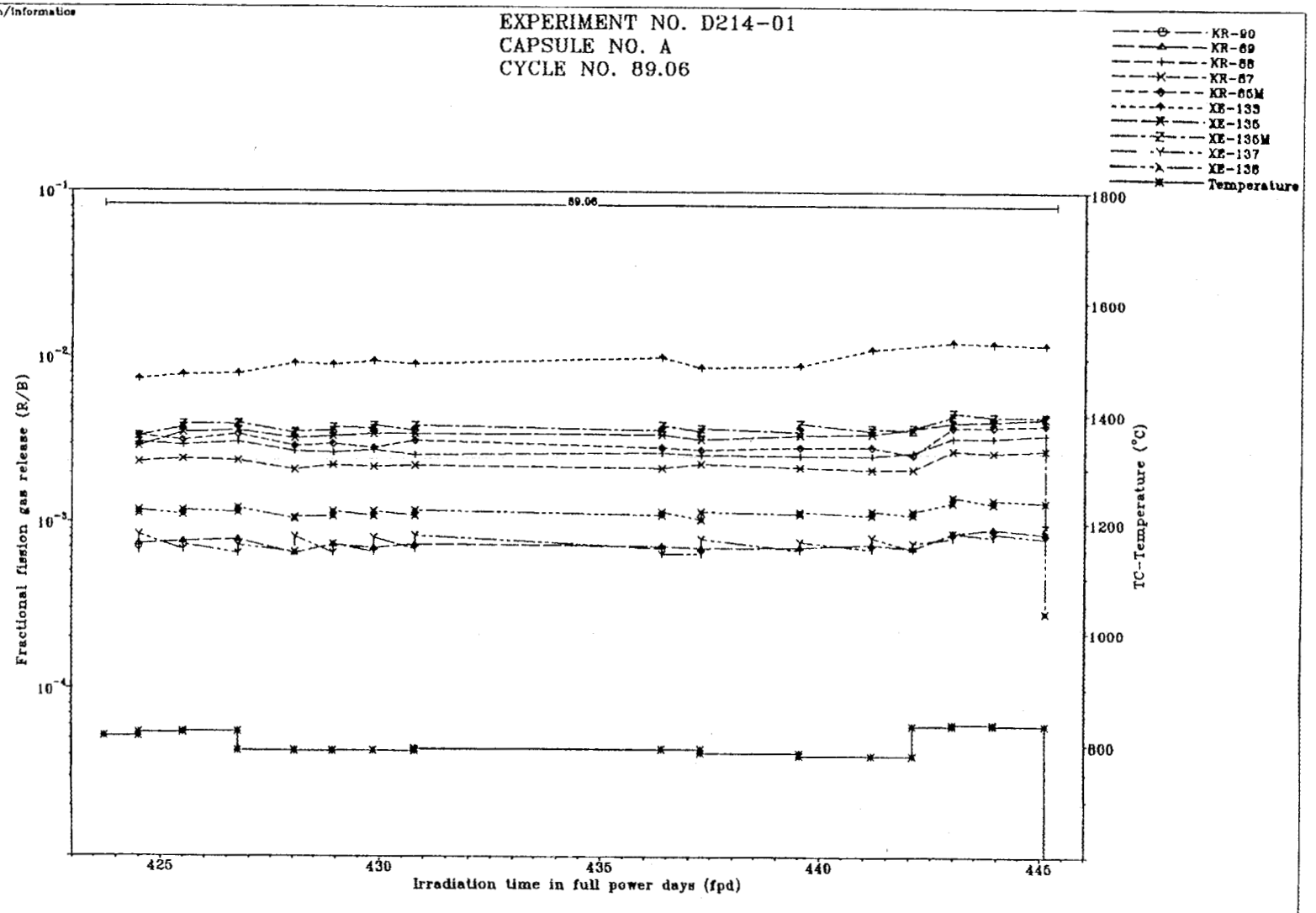

Fig. 6.4.20. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Table 6.4.21. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 87.03		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
10. 4.87	12						794
14. 0	0						0
10. 4.87	12		9.343E-06	5.134E-05	4.106E-05	5.734E-05	794
14. 0	0		1.122E-05	1.412E-05	4.593E-06	9.686E-06	1.7
11. 4.87	11	5.251E-07	8.497E-06	4.602E-05	3.428E-05	4.634E-05	792
16.46	0		1.127E-05	1.353E-05	2.132E-07	7.838E-06	3.5
13. 4.87	11	4.310E-07	1.267E-05	1.250E-04	6.733E-05	1.643E-04	791
12.45	0	5.920E-04	2.816E-05	2.799E-05	4.471E-06	1.315E-05	6.7
13. 4.87	14			1.463E-04	9.278E-05	1.753E-04	791
13.31	0	3.303E-04	5.589E-05				6.75
16. 4.87	25		1.201E-04	5.624E-04	4.339E-04	6.102E-04	774
23.14	0	8.209E-04	1.789E-04	1.756E-04	6.106E-05	1.368E-04	8.8
16. 4.87	25			7.062E-04	5.145E-04	7.411E-04	774
23.14	40	1.323E-03	2.363E-04				8.8
17. 4.87	25		1.405E-04				785
14.32	10			2.664E-04	6.670E-04	1.578E-04	9.2
17. 4.87	25			1.089E-03	8.258E-04	1.067E-03	785
14.32	40	1.916E-03	4.712E-04				9.2
22. 4.87	25			4.115E-03	3.160E-03	4.302E-03	773
10.45	40	5.952E-03	2.475E-03				13.2
24. 4.87	15						770
16.58	40	5.838E-03					15.2
27. 4.87	25			4.681E-03	3.811E-03	4.875E-03	768
11.45	40	7.644E-03	2.673E-03				17.5
29. 4.87	25			5.177E-03	3.666E-03	5.829E-03	769
10.45	40		2.691E-03				19
1. 5.87	25			5.549E-03	4.222E-03	5.883E-03	766
9.19	40	9.033E-03	3.192E-03				20.6
2. 5.87	25			7.113E-03	5.255E-03	7.715E-03	763
20.11	40	1.137E-02	4.095E-03				21.7
3. 5.87	25			5.413E-03	4.072E-03	5.759E-03	762
18.3	40	8.721E-03	3.094E-03				22.4
4. 5.87	15			4.143E-03		4.956E-03	762
12.3	40	6.755E-03	2.409E-03				22.95
4. 5.87	12						253
16. 0	0						23.03
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Table 6.4.22. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 87.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
6. 6.87	35						43
0. 0	10						23.03
6. 6.87	35		3.359E-04				607
18.1	10			3.716E-04	2.138E-04	3.939E-04	23.8
6. 6.87	35			2.077E-03	1.756E-03	2.215E-03	607
18.1	30						23.8
7. 6.87	35						644
20.52	10			1.496E-03	2.168E-04	7.238E-04	24.85
7. 6.87	35						644
20.52	10			1.726E-03		8.087E-04	24.85
7. 6.87	35			4.103E-03	2.854E-03	4.313E-03	644
20.52	40	3.436E-03	2.391E-03				24.85
9. 6.87	35						688
1.57	10			2.134E-03		9.342E-04	26
9. 6.87	35			5.068E-03	3.981E-03	5.339E-03	688
1.57	30						26
9. 6.87	35						688
1.57	20	6.210E-03	3.544E-03				26
9. 6.87	35			4.786E-03	3.638E-03	5.061E-03	690
16.38	40	5.568E-03	2.842E-03				26.7
11. 6.87	35		3.475E-04				694
2.52	10			1.440E-03	2.525E-04	5.949E-04	28.2
11. 6.87	35			3.314E-03	2.608E-03	2.670E-03	694
2.52	30						28.2
11. 6.87	35			4.597E-03	3.576E-03	4.921E-03	694
2.52	30						28.2
11. 6.87	35						694
2.52	20	6.344E-03	3.292E-03				28.2
17. 6.87	35		4.325E-04				690
9.25	10			1.596E-03	2.613E-04	6.814E-04	34.5
17. 6.87	35			4.699E-03	3.529E-03	5.035E-03	690
9.25	30						34.5
17. 6.87	35						690
9.25	20	8.141E-03	3.139E-03				34.5
19. 6.87	35		3.991E-04				694
3. 4	10			2.035E-03	2.561E-04	6.591E-04	36.4
19. 6.87	35			4.780E-03	3.672E-03	5.179E-03	694
3. 4	30						36.4
19. 6.87	35						694
3. 4	20	8.505E-03	3.218E-03				36.4
20. 6.87	35			4.384E-03	3.347E-03	4.679E-03	696
0.48	40	5.785E-03	2.461E-03				37.35
23. 6.87	35			4.243E-03	3.247E-03	4.573E-03	696
1. 1	40	6.756E-03	2.373E-03				40.1
27. 6.87	35			3.986E-03	3.070E-03	4.304E-03	697
0.29	40	6.303E-03	2.218E-03				44.1
28. 6.87	35			4.015E-03	3.048E-03	4.327E-03	700
2.11	40	6.535E-03	2.202E-03				45.1
29. 6.87	35			3.914E-03	2.964E-03	4.264E-03	699
0.18	40	6.756E-03	2.172E-03				46.1
29. 6.87	35		3.980E-04				659
13.41	10			1.218E-03	2.567E-04	4.955E-04	46.5

Table 6.4.22. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 87.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
29. 6.87	35			2.810E-03	2.163E-03	2.608E-03	659
13.41	30						46.5
29. 6.87	35						81
17. 0	20						46.68
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Table 6.4.23. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	B	CYCLE NO.	87.09	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
28.10.87	35						862
0. 0	10						46.68
28.10.87	35						858
18.26	10			1.288E-03		5.149E-04	47.9
28.10.87	35			5.252E-03	5.431E-03	5.222E-03	858
18.26	30						47.9
28.10.87	35						858
18.26	20	1.497E-03	2.098E-03				47.9
29.10.87	35						860
16.42	10			1.309E-03		5.147E-04	48.9
29.10.87	35			4.476E-03	3.342E-03	4.782E-03	860
16.42	30						48.9
29.10.87	35						860
16.42	20	4.418E-03	2.589E-03				48.9
30.10.87	35						860
16.23	10			1.093E-03		4.478E-04	49.9
30.10.87	35			4.017E-03	2.925E-03	4.245E-03	860
16.23	30						49.9
30.10.87	35						860
16.23	20	5.092E-03	2.372E-03				49.9
31.10.87	35						857
16.14	13			1.121E-03		4.503E-04	50.9
31.10.87	35			3.928E-03	2.962E-03	4.208E-03	857
16.14	30						50.9
31.10.87	35						857
16.14	20	5.385E-03	1.974E-03				50.9
5.11.87	35			3.029E-03	2.330E-03	3.482E-03	859
16.58	30						55.8
5.11.87	35						859
16.58	20	5.921E-03	1.893E-03				55.8
7.11.87	35						858
0.5	10			1.124E-03		4.093E-04	57
7.11.87	35			3.224E-03	2.423E-03	3.540E-03	858
0.5	30						57
7.11.87	35						858
0.5	20	5.911E-03	1.871E-03				57
9.11.87	35						857
0.47	10			1.093E-03		3.948E-04	58.9
9.11.87	35			3.233E-03	2.381E-03	3.465E-03	857
0.47	30						58.9
9.11.87	35						857
0.47	20	6.285E-03	1.834E-03				58.9
13.11.87	35						858
0.37	10			1.039E-03		3.855E-04	62.9
13.11.87	35			3.194E-03	2.430E-03	3.436E-03	858
0.37	30						62.9
13.11.87	35						858
0.37	30						62.9
14.11.87	35			3.094E-03	2.343E-03	3.391E-03	858
0.37	30						63.9
14.11.87	35						858
0.23	20	5.873E-03	1.741E-03				63.9

Table 6.4.23. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 87.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
15.11.87	35			3.084E-03	2.300E-03	3.435E-03	857
0.21	30						64.9
15.11.87	35						857
0.21	20	5.804E-03	1.725E-03				64.9
16.11.87	35						856
0.3	10			1.049E-03		3.751E-04	65.9
16.11.87	35			3.051E-03	2.237E-03	3.358E-03	856
0.3	30						65.9
16.11.87	35						856
0.3	20	6.000E-03	1.700E-03				65.9
16.11.87	35						87
17. 0	20						66.71
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Table 6.4.24. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	B	CYCLE NO.	87.10	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
26.11.87	35						851
0. 0	10						66.71
26.11.87	35						851
1.5	10			1.011E-03		3.827E-04	75.8
26.11.87	35			2.768E-03	2.052E-03	2.817E-03	851
1.5	30						75.8
26.11.87	35						851
1.5	20	5.305E-03	1.515E-03				75.8
27.11.87	35						858
3. 2	10			9.790E-04		3.870E-04	76.9
27.11.87	35			2.801E-03	2.075E-03	2.943E-03	858
3. 2	30						76.9
27.11.87	35						858
3. 2	20	5.476E-03	1.450E-03				76.9
1.12.87	35						858
1.12	10			9.876E-04		3.960E-04	78.9
1.12.87	35			2.858E-03	2.058E-03	3.089E-03	858
1.12	30						78.9
1.12.87	35						858
1.12	20	5.399E-03	1.404E-03				78.9
2.12.87	35						857
1.35	10			9.913E-04		3.804E-04	79.9
2.12.87	35			2.756E-03	1.999E-03	3.012E-03	857
1.35	30						79.9
2.12.87	35						857
1.35	20	4.630E-03	1.409E-03				79.9
7.12.87	35						843
0.39	10			8.801E-04		3.747E-04	83.9
7.12.87	35			2.611E-03	1.824E-03	2.580E-03	843
0.39	30						83.9
7.12.87	35						843
0.39	20	4.106E-03	1.178E-03				83.9
8.12.87	35						843
0.46	10			9.427E-04		3.715E-04	84.9
8.12.87	35			2.617E-03	1.850E-03	2.775E-03	843
0.46	30						84.9
8.12.87	35						843
0.46	20	4.403E-03	1.288E-03				84.9
9.12.87	35						843
0.17	10			9.492E-04		3.730E-04	85.9
9.12.87	35			2.543E-03	1.885E-03	2.632E-03	843
0.17	30						85.9
9.12.87	35						843
0.17	20	4.223E-03	1.280E-03				85.9
12.12.87	35						844
0.44	10			9.062E-04		3.552E-04	88.9
12.12.87	35			2.443E-03	1.775E-03	2.539E-03	844
0.44	30						88.9
12.12.87	35						844
0.44	20	4.341E-03	1.223E-03				88.9
13.12.87	35						844
0.36	10			9.663E-04		3.739E-04	89.9

Table 6.4.24. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 87.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
13.12.87	35			2.468E-03	1.788E-03	2.546E-03	844
0.36	30						89.9
13.12.87	35						844
0.36	20	4.336E-03	1.216E-03				89.9
14.12.87	35						843
0.35	10			9.203E-04		3.514E-04	90.9
14.12.87	35			2.517E-03	2.238E-03	2.571E-03	843
0.35	30						90.9
14.12.87	35						843
0.35	20	4.785E-03	1.219E-03				90.9
14.12.87	35						78
17. 0	20						91.34
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Table 6.4.25. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
8. 1.88	35						782
0. 0	10						91.34
8. 1.88	35						782
0.34	10			1.283E-03		5.536E-04	92.4
8. 1.88	35			3.073E-03	2.203E-03	3.273E-03	782
0.34	30						92.4
8. 1.88	35						782
0.34	20	1.507E-03	1.637E-03				92.4
9. 1.88	35						784
1.27	10			1.369E-03		5.444E-04	93.5
9. 1.88	35			2.969E-03	2.205E-03	3.084E-03	784
1.27	30						93.5
9. 1.88	35						784
1.27	20	3.028E-03	1.747E-03				93.5
10. 1.88	35						785
1.26	10			1.341E-03		5.419E-04	94.5
10. 1.88	35			2.908E-03	2.175E-03	3.210E-03	785
1.26	30						93.5
10. 1.88	35						785
1.26	20	3.474E-03	1.729E-03				94.5
11. 1.88	35						786
1.21	10			1.373E-03		5.366E-04	95.5
11. 1.88	35			2.858E-03	2.167E-03	3.200E-03	786
1.21	30						95.5
11. 1.88	35						786
1.21	20	4.122E-03	1.671E-03				95.5
18. 1.88	35						784
0.38	10			1.321E-03		5.083E-04	102.5
18. 1.88	35			2.997E-03	2.156E-03	3.063E-03	784
0.38	30						102.5
18. 1.88	35						784
0.38	20	5.214E-03	1.646E-03				102.5
19. 1.88	35						786
0.17	10			1.309E-03		5.225E-04	103.5
19. 1.88	35			3.104E-03	2.252E-03	3.147E-03	786
0.17	30						103.5
19. 1.88	35						786
0.17	20	5.528E-03	1.728E-03				103.5
20. 1.88	35						783
0.24	10			1.287E-03		5.136E-04	104.5
20. 1.88	35			2.584E-03	1.612E-03	2.914E-03	783
0.24	30						104.5
20. 1.88	35						783
0.24	20	4.707E-03	1.651E-03				104.5
21. 1.88	35						784
0.15	10			1.343E-03		5.233E-04	105.5
21. 1.88	35			2.798E-03	2.119E-03	3.199E-03	784
0.15	30						105.5
21. 1.88	35						784
0.15	20	4.721E-03	1.637E-03				105.5
28. 1.88	35						784
0.37	10			1.246E-03		4.875E-04	112.5

Table 6.4.25. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
28. 1.88	35			2.771E-03	2.090E-03	2.972E-03	784
0.37	30						112.5
28. 1.88	35						784
0.37	20	5.526E-03	1.594E-03				112.5
29. 1.88	35						784
0.16	10			1.094E-03		4.157E-04	113.5
29. 1.88	35			2.869E-03	2.049E-03	3.029E-03	784
0.16	30						113.5
29. 1.88	35						784
0.16	20	5.289E-03	1.607E-03				113.5
30. 1.88	35						783
0.58	10			1.265E-03		4.863E-04	114.5
30. 1.88	35			2.852E-03	2.070E-03	3.120E-03	783
0.58	30						114.5
30. 1.88	35						783
0.58	20	4.799E-03	1.595E-03				114.5
31. 1.88	35						783
0.42	10			1.282E-03		4.972E-04	115.5
31. 1.88	35			2.789E-03	2.040E-03	3.095E-03	783
0.42	30						115.5
31. 1.88	35						783
0.42	20	5.177E-03	1.590E-03				115.5
1. 2.88	35						46
20. 0	20						117.1
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Table 6.4.26. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
12. 2.88	35						940
0. 0	10						117.1
12. 2.88	35						940
0.3	10			1.051E-03		4.016E-04	125.2
12. 2.88	35			3.225E-03	2.392E-03	3.557E-03	940
0.3	30						125.2
12. 2.88	35						940
0.3	20	4.666E-03	1.346E-03				125.2
13. 2.88	35						948
1.15	10			1.033E-03		3.846E-04	126.3
13. 2.88	35			3.270E-03	2.379E-03	3.474E-03	948
1.15	30						126.3
13. 2.88	35						948
1.15	20	4.875E-03	1.351E-03				126.3
14. 2.88	35						950
0.28	10			1.030E-03		3.853E-04	127.2
14. 2.88	35			3.290E-03	2.343E-03	3.569E-03	950
0.28	30						127.2
14. 2.88	35						950
0.28	20	4.774E-03	1.336E-03				127.2
15. 2.88	35						950
3. 7	10			9.209E-04		3.659E-04	128.3
15. 2.88	35			3.139E-03	2.334E-03	3.435E-03	950
3. 7	30						128.3
15. 2.88	35						950
3. 7	20	4.000E-03	1.209E-03				128.3
19. 2.88	35						969
0.46	10			9.992E-04		3.816E-04	131.2
19. 2.88	35			3.294E-03	2.399E-03	3.577E-03	969
0.46	30						131.2
19. 2.88	35						969
0.46	20	4.756E-03	1.225E-03				131.2
20. 2.88	35						968
0.33	10			9.878E-04		3.699E-04	132.2
20. 2.88	35			3.295E-03	2.373E-03	3.579E-03	968
0.33	30						132.2
20. 2.88	35						968
0.33	20	4.799E-03	1.214E-03				132.2
21. 2.88	35						969
0.22	10			9.697E-04		3.688E-04	133.2
21. 2.88	35			3.360E-03	2.400E-03	3.657E-03	969
0.22	30						133.2
21. 2.88	35						969
0.22	20	4.857E-03	1.232E-03				133.2
24. 2.88	35						964
0.2	10			6.263E-04		2.266E-04	136.2
24. 2.88	35			3.179E-03	2.350E-03	3.399E-03	964
0.2	30						136.2
24. 2.88	35						964
0.2	20	4.805E-03	1.198E-03				136.2
28. 2.88	35						952
0.23	10			1.104E-03		4.072E-04	138.2

Table 6.4.26. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
28. 2.88	35			4.616E-03	3.265E-03	4.756E-03	952
0.23	30						138.2
28. 2.88	35						952
0.23	20	4.823E-03	1.305E-03				138.2
29. 2.88	35						952
0.3	10			1.006E-03		3.919E-04	139.2
29. 2.88	35			3.046E-03	2.295E-03	3.348E-03	952
0.3	30						139.2
29. 2.88	35						952
0.3	20	4.780E-03	1.219E-03				139.2
29. 2.88	35						79
18. 0	20						142.54
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Table 6.4.27. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
29. 4.88	45		3.031E-04				806
8.36	10			7.711E-04	1.756E-04	3.324E-04	143.7
29. 4.88	45			1.644E-03	1.106E-03	1.826E-03	806
8.36	30						143.7
29. 4.88	45						806
8.36	20	9.012E-04	8.074E-04				143.7
29. 4.88	45						806
8.36	20	7.719E-04	8.223E-04				143.7
29. 4.88	45						806
8.36	20	9.127E-04	8.298E-04				143.8
30. 4.88	45						989
0.51	10						144.7
30. 4.88	45		4.034E-04				989
0.51	10			1.101E-03	1.676E-04	3.946E-04	144.7
30. 4.88	45			3.653E-03	2.681E-03	4.055E-03	989
0.51	30						144.7
30. 4.88	45						989
0.51	20	1.834E-03	1.249E-03				144.7
1. 5.88	45		4.060E-04				987
0.48	10			1.148E-03	1.705E-04	4.247E-04	145.7
2. 5.88	45		4.196E-04				990
1. 0	10			1.227E-03	1.792E-04	4.393E-04	146.7
2. 5.88	45			4.138E-03	2.921E-03	4.414E-03	990
1. 0	30						146.7
9. 5.88	45		3.838E-04				993
16.39	10			1.003E-03	1.574E-04	3.675E-04	154.5
9. 5.88	45			3.225E-03	2.145E-03	3.689E-03	993
16.39	30						154.5
9. 5.88	45						993
16.39	20	4.054E-03	1.122E-03				154.5
10. 5.88	45		4.009E-04				995
16.22	10			1.029E-03	1.642E-04	3.725E-04	155.5
10. 5.88	45						995
16.22	20	4.239E-03	1.150E-03				155.5
11. 5.88	45		3.812E-04				992
16.52	10			1.018E-03	1.590E-04	3.555E-04	156.5
11. 5.88	45			3.158E-03	2.107E-03	3.515E-03	992
16.52	30						156.5
11. 5.88	45						992
16.52	20	3.985E-03	1.111E-03				156.5
13. 5.88	45		3.285E-04				992
16.27	10			1.076E-03	1.400E-04	3.743E-04	158.5
13. 5.88	45						992
16.27	20	4.535E-03	1.187E-03				158.5
18. 5.88	45			3.230E-03	1.826E-03	3.973E-03	995
16.28	30						163.5
18. 5.88	45						995
16.28	20	3.903E-03	6.460E-04				163.5
19. 5.88	45			3.208E-03	1.793E-03	4.008E-03	993
16. 8	30						164.5
19. 5.88	45						993
16. 8	20	4.831E-03	6.041E-04				164.5

Table 6.4.27. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
20. 5.88	45			3.288E-03	1.823E-03	4.125E-03	992
16.26	30						165.5
20. 5.88	45						992
16.26	20	7.266E-03	7.300E-04				165.5
21. 5.88	45			3.237E-03	1.791E-03	4.025E-03	993
16.35	30						166.5
21. 5.88	45						993
16.35	20	7.342E-03	7.400E-04				166.5
21. 5.88	45						992
17. 0	20						168.29
23. 5.88	45						100
17. 0	20						168.29
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Table 6.4.28. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
28. 5.88	45						942
0. 0	10						168.29
28. 5.88	45		3.304E-04				942
2. 2	10			1.015E-03	1.586E-04	3.770E-04	169.6
28. 5.88	45			2.748E-03	2.007E-03	3.329E-03	942
2. 2	30						169.6
28. 5.88	45						942
2. 2	20	3.193E-03	1.161E-03				169.6
29. 5.88	45						941
0. 0	20						169.99
29. 5.88	45		3.145E-04				941
1.47	10			1.015E-03	1.390E-04	3.708E-04	170.5
29. 5.88	45			2.723E-03	1.981E-03	3.108E-03	941
1.47	30						170.5
29. 5.88	45						941
1.47	20	3.546E-03	1.166E-03				170.5
30. 5.88	45		3.309E-04				941
2.11	10			1.034E-03	1.575E-04	3.747E-04	171.5
30. 5.88	45			2.885E-03	1.859E-03	3.133E-03	941
2.11	30						171.5
30. 5.88	45						941
2.11	20	3.883E-03	1.184E-03				171.5
31. 5.88	45						994
0.32	10						172.5
31. 5.88	45		4.019E-04				994
0.32	10			1.058E-03	1.782E-04	3.821E-04	172.5
31. 5.88	45						994
0.32	20	4.567E-03	1.231E-03				172.5
1. 6.88	45		3.511E-04				993
0.25	10			9.227E-04	1.494E-04	3.237E-04	173.5
1. 6.88	45			2.369E-03	2.295E-03		993
0.25	30						173.5
1. 6.88	45						993
0.25	20	3.579E-03	9.882E-04				173.5
2. 6.88	45		3.377E-04				996
0.3	10			9.117E-04	1.446E-04	3.157E-04	174.5
2. 6.88	45						996
0.3	20	3.337E-03	9.360E-04				174.5
4. 6.88	45		3.270E-04				1012
0.42	10			9.314E-04	1.322E-04	3.071E-04	176.5
4. 6.88	45			2.836E-03	2.055E-03	3.252E-03	1012
0.42	30						176.5
4. 6.88	45						1012
0.42	20	4.385E-03	1.089E-03				176.5
5. 6.88	45		3.156E-04				1013
0.46	10			9.931E-04	1.331E-04	3.085E-04	177.5
5. 6.88	45			3.032E-03	2.068E-03	3.299E-03	1013
0.46	30						177.5
5. 6.88	45						1013
0.46	20	7.701E-03	1.160E-03				177.5
6. 6.88	45		2.887E-04				1015
0.54	10			9.130E-04	1.245E-04	2.965E-04	178.5

Table 6.4.28. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
6. 6.88	45			2.888E-03	1.972E-03	3.140E-03	1015
0.54	30						178.5
6. 6.88	45						1015
0.54	20	6.071E-03	1.141E-03				178.5
7. 6.88	45		2.563E-04				1014
0.54	10			9.412E-04	1.087E-04	2.781E-04	179.5
7. 6.88	45			2.762E-03	1.897E-03	3.064E-03	1014
0.54	30						179.5
7. 6.88	45						1014
0.54	20	5.959E-03	1.177E-03				179.5
8. 6.88	45		2.721E-04				1015
0.57	10			9.380E-04	1.144E-04	2.842E-04	180.5
8. 6.88	45			2.603E-03	1.766E-03	2.864E-03	1015
0.57	30						180.5
8. 6.88	45						1015
0.57	20	1.124E-02	1.040E-03				180.5
9. 6.88	45		2.872E-04				1014
0.28	10			9.421E-04	1.204E-04	2.801E-04	181.5
9. 6.88	45			2.515E-03	1.706E-03	2.905E-03	1014
0.28	30						181.5
9. 6.88	45						1014
0.28	20	4.725E-03	1.089E-03				181.5
11. 6.88	45		3.943E-04				1013
1. 5	10			1.089E-03	1.736E-04	2.872E-04	183.5
11. 6.88	45			2.826E-03	1.902E-03	3.167E-03	1012
2. 5	30						183.5
12. 6.88	45		2.088E-04				1015
1.1	10			9.314E-04	1.017E-04	2.469E-04	184.5
13. 6.88	45		4.576E-05				1015
0.3	10			8.222E-04	2.797E-05	2.169E-04	185.5
13. 6.88	45			2.557E-03	1.715E-03	3.078E-03	1015
0.3	30						185.5
14. 6.88	45		9.513E-05				1013
0.44	10			8.821E-04	5.258E-05	2.331E-04	186.5
14. 6.88	45			2.397E-03	1.726E-03	2.775E-03	1013
0.44	30						186.5
14. 6.88	45						1013
0.44	20	7.814E-03	1.186E-03				186.5
15. 6.88	45		1.926E-04				1019
0.43	10			1.058E-03	9.625E-05	2.898E-04	187.5
15. 6.88	45			2.600E-03	1.871E-03	3.025E-03	1019
0.43	30						187.5
15. 6.88	45						1019
0.43	20	1.041E-02	1.305E-03				187.5
15. 6.88	45		3.774E-04				1018
16.5	10			1.132E-03	1.582E-04	2.893E-04	187.5
15. 6.88	45			2.961E-03	1.980E-03	3.336E-03	1018
16.5	30						187.5
17. 6.88	45		6.814E-05				1012
16.5	10			8.419E-04	4.180E-05	2.268E-04	190.1
17. 6.88	45			2.238E-03	1.483E-03	2.665E-03	1012
16.5	30						190.1

Table 6.4.28. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
17. 6.88	45						1012
16.5	20	9.733E-03	1.179E-03				190.1
19. 6.88	45		8.033E-05				1015
16.32	10			9.538E-04	4.619E-05	2.566E-04	192
19. 6.88	45			2.658E-03	1.846E-03	3.109E-03	1015
16.32	30						192
19. 6.88	45						1015
16.32	20	9.335E-03	1.310E-03				192
19. 6.88	45						1012
18. 0	20						193.5
20. 6.88	45						0
18. 0	10						193.5
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Table 6.4.29. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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24. 6.88	45						930
12. 0	20						193.99
24. 6.88	45		1.867E-04				949
17.3	10			1.070E-03	1.155E-04	4.002E-04	194.7
24. 6.88	45			3.093E-03	2.090E-03	3.674E-03	949
17.3	30						194.7
24. 6.88	45						949
17.3	20	4.760E-03	1.423E-03				194.7
25. 6.88	45						952
12. 0	20						194.99
25. 6.88	45		1.825E-04				950
18.16	10			1.205E-03	1.063E-04	4.017E-04	195.8
25. 6.88	45			3.058E-03	2.183E-03	3.568E-03	950
18.16	30						195.8
25. 6.88	45						950
18.16	20	5.210E-03	1.523E-03				195.8
26. 6.88	45		2.304E-04				953
16.2	10			1.178E-03	1.365E-04	3.911E-04	196.7
26. 6.88	45			3.134E-03	2.234E-03	3.558E-03	953
16.2	30						196.7
26. 6.88	45						953
16.2	20	4.234E-03	1.402E-03				196.7
27. 6.88	45		2.868E-04				951
16.2	10			1.223E-03	1.490E-04	4.173E-04	197.7
27. 6.88	45			3.724E-03	2.507E-03	4.012E-03	951
16.2	30						197.7
27. 6.88	45						951
16.2	20	4.822E-03	1.495E-03				197.7
1. 7.88	45		2.248E-04				950
1. 9	10			9.214E-04	1.192E-04	3.099E-04	201.3
1. 7.88	45			2.637E-03	1.894E-03	3.076E-03	950
1. 9	30						201.3
1. 7.88	45						950
1. 9	20	4.195E-03	1.084E-03				201.3
2. 7.88	45		2.364E-04				948
2.53	10			8.704E-04	1.194E-04	3.336E-04	202.3
2. 7.88	45			2.591E-03	1.849E-03	3.040E-03	948
2.53	30						202.3
2. 7.88	45						948
2.53	20	3.844E-03	1.081E-03				202.3
3. 7.88	45		2.393E-04				948
2. 6	10			9.468E-04	1.242E-04	3.051E-04	203.3
3. 7.88	45						948
2. 6	20	3.785E-03	1.068E-03				203.3
7. 7.88	45		2.853E-04				940
16.43	10			1.028E-03	1.554E-04	3.673E-04	206.2
7. 7.88	45						940
16.43	20	3.736E-03	1.145E-03				206.2
8. 7.88	45		3.038E-04				940
16.28	10			9.403E-04	1.386E-04	3.392E-04	207.2
8. 7.88	45			2.561E-03	1.820E-03	2.971E-03	940
16.28	30						207.2

Table 6.4.29. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
8. 7.88	45						940
16.28	20	3.406E-03	1.062E-03				207.2
9. 7.88	45		2.686E-04				942
16.32	10			9.672E-04	1.463E-04	3.368E-04	208.2
9. 7.88	45			2.522E-03	1.782E-03	2.929E-03	942
16.32	30						208.2
9. 7.88	45						942
16.32	20	3.568E-03	1.059E-03				208.2
10. 7.88	45		2.514E-04				943
16.41	10			9.551E-04	1.403E-04	3.359E-04	209.2
10. 7.88	45			2.503E-03	1.773E-03	2.979E-03	943
16.41	30						209.2
10. 7.88	45						943
16.41	20	4.152E-03	1.053E-03				209.2
11. 7.88	45		2.200E-04				936
16. 5	10			8.350E-04	1.179E-04	2.961E-04	210.2
11. 7.88	45			2.295E-03	1.698E-03	2.690E-03	936
16. 5	30						210.2
11. 7.88	45						936
16. 5	20	3.586E-03	9.842E-04				210.2
12. 7.88	45		2.646E-04				936
16.39	10			8.833E-04	1.372E-04	3.194E-04	211.2
12. 7.88	45			2.293E-03	1.606E-03	2.740E-03	936
16.39	30						211.2
12. 7.88	45						936
16.39	20	4.180E-03	9.792E-04				211.2
13. 7.88	42		1.415E-04				946
16. 6	10			7.999E-04	7.757E-05	2.674E-04	212.2
13. 7.88	45			2.474E-03	1.785E-03	2.829E-03	946
16. 6	30						212.2
13. 7.88	45						946
16. 6	20	3.618E-03	9.965E-04				212.2
14. 7.88	45			2.411E-03	1.791E-03	2.758E-03	944
16.23	30						213.2
14. 7.88	45						944
16.23	20	3.548E-03	9.814E-04				213.2
15. 7.88	45		2.840E-04				945
11.41	10			9.232E-04	1.455E-04	3.182E-04	214.1
15. 7.88	45			2.338E-03	1.655E-03	2.777E-03	945
11.41	30						214.1
15. 7.88	45		1.485E-04				753
17. 1	10			8.160E-04	1.035E-04	2.287E-04	214.2
15. 7.88	45			7.983E-04	6.096E-04	8.974E-04	753
17. 1	30						214.2
15. 7.88	45		1.570E-04				753
17.14	10			8.035E-04	1.117E-04	2.473E-04	214.2
15. 7.88	45			9.665E-04	7.085E-04	1.129E-03	753
17.14	30						214.2
15. 7.88	45		1.585E-04				753
18.2	10			7.358E-04	1.147E-04	2.518E-04	214.2
15. 7.88	45			1.015E-03	7.387E-04	1.198E-03	753
18.2	30						214.2

Table 6.4.30. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.07		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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8. 9.88	42						364
0. 0	10						214.3
8. 9.88	42		1.230E-04				776
18.15	10			1.338E-03	1.000E-04	3.298E-04	215
8. 9.88	45		2.071E-04				776
18.23	10			1.494E-03	1.630E-04	4.518E-04	215
8. 9.88	45			1.511E-03	1.208E-03	1.800E-03	776
18.23	30						215
8. 9.88	45						776
18.23	20	8.923E-04	1.794E-03				215
9. 9.88	42		3.285E-04				961
16.2	10			1.526E-03	1.727E-04	4.020E-04	215.9
9. 9.88	45		3.179E-04				961
16.3	10			1.524E-03	1.634E-04	4.135E-04	215.9
9. 9.88	45			2.942E-03	2.128E-03	3.451E-03	961
16.3	30						215.9
10. 9.88	42		2.538E-04				944
16.2	10			1.234E-03	1.337E-04	3.581E-04	216.9
10. 9.88	45		2.744E-04				944
16.3	10			1.211E-03	1.539E-04	3.579E-04	216.9
10. 9.88	45			2.862E-03	1.950E-03	3.155E-03	944
16.3	30						216.9
10. 9.88	45						944
16.3	20	2.842E-03	1.515E-03				216.9
11. 9.88	45						964
12. 0	20						216.99
11. 9.88	42		2.891E-04				964
16.3	10			1.217E-03	1.451E-04	3.663E-04	217.9
11. 9.88	45		2.855E-04				964
16.4	10			1.226E-03	1.496E-04	3.733E-04	217.9
11. 9.88	45			3.127E-03	2.145E-03	3.435E-03	964
16.4	30						217.9
11. 9.88	45						964
16.4	20	3.463E-03	1.557E-03				217.9
11. 9.88	45						963
20. 0	20						217.99
12. 9.88	42		2.480E-04				963
16.4	10			9.624E-04	1.224E-04	3.224E-04	218.9
12. 9.88	45		2.540E-04				963
16.49	10			1.051E-03	1.413E-04	3.171E-04	218.9
12. 9.88	45			2.946E-03	2.218E-03	3.451E-03	963
16.49	30						218.9
12. 9.88	45						963
16.49	20	3.658E-03	1.439E-03				218.9
13. 9.88	42		2.828E-04				950
16.2	10			1.037E-03	1.494E-04	3.228E-04	219.9
13. 9.88	45		2.976E-04				950
16.3	10			1.053E-03	1.570E-04	3.240E-04	219.9
13. 9.88	45			2.637E-03	1.872E-03	2.871E-03	950
16.3	30						219.9
13. 9.88	45						950
16.3	20	3.484E-03	1.314E-03				219.9

Table 6.4.30. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.07		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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17. 9.88	42		2.700E-04				942
0.45	10			9.562E-04	1.485E-04	3.323E-04	223.25
17. 9.88	45		2.827E-04				942
0.54	10			1.024E-03	1.478E-04	3.530E-04	223.25
17. 9.88	45			2.653E-03	1.901E-03	3.183E-03	942
0.54	30						223.25
17. 9.88	45						942
0.54	20	4.060E-03	1.371E-03				223.25
17. 9.88	42		2.743E-04				937
3.45	10			9.757E-04	1.512E-04	3.393E-04	223.4
17. 9.88	45		2.963E-04				937
3.53	10			9.462E-04	1.620E-04	3.470E-04	223.4
17. 9.88	45			2.595E-03	1.836E-03	3.022E-03	937
3.53	30						223.4
17. 9.88	45						937
3.53	20	3.966E-03	1.304E-03				223.4
18. 9.88	42		3.364E-04				971
0.45	10			1.019E-03	1.610E-04	3.531E-04	224.25
18. 9.88	45		3.350E-04				971
0.55	10			1.094E-03	1.606E-04	3.718E-04	224.25
18. 9.88	45			3.259E-03	2.321E-03	3.776E-03	971
0.55	30						224.25
18. 9.88	45						971
0.55	20	4.895E-03	1.565E-03				224.25
18. 9.88	42		2.482E-04				937
3.46	10			9.263E-04	1.297E-04	3.523E-04	224.4
18. 9.88	45		2.538E-04				937
3.57	10			1.074E-03	1.443E-04	3.567E-04	224.4
18. 9.88	45			2.784E-03	2.016E-03	3.191E-03	937
3.57	30						224.4
18. 9.88	45						937
3.57	20	4.407E-03	1.488E-03				224.4
19. 9.88	42		2.224E-04				949
0.33	10			8.429E-04	1.193E-04	3.192E-04	225.25
19. 9.88	45		2.477E-04				949
0.41	10			1.022E-03	1.329E-04	3.360E-04	225.25
19. 9.88	45			2.879E-03	2.044E-03	3.384E-03	949
0.41	30						225.25
19. 9.88	45						949
0.41	20	4.885E-03	1.457E-03				225.25
19. 9.88	42		1.734E-04				949
3.38	10			1.039E-03	1.074E-04	3.846E-04	225.4
19. 9.88	45		1.776E-04				949
3.47	10			1.059E-03	9.929E-05	3.582E-04	225.4
19. 9.88	45			3.322E-03	2.297E-03	3.916E-03	949
3.47	30						225.4
19. 9.88	45						949
3.47	20	5.214E-03	1.548E-03				225.4
20. 9.88	45		4.216E-04				962
1.1	10			1.406E-03	2.465E-04	4.674E-04	226.3
21. 9.88	45		2.523E-04				960
0.42	10			1.401E-03	1.720E-04	4.745E-04	227.28

Table 6.4.30. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.07		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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21. 9.88	45		2.732E-04				959
16. 3	10			1.236E-03	1.538E-04	4.354E-04	227.88
21. 9.88	45			3.471E-03	2.319E-03	3.892E-03	959
16. 3	30						227.88
21. 9.88	45						959
16. 3	20	5.775E-03	1.646E-03				227.88
22. 9.88	45		2.579E-04				959
16. 2	10			1.174E-03	1.330E-04	4.174E-04	228.88
22. 9.88	45			3.304E-03	2.220E-03	3.790E-03	959
16. 2	30						228.88
22. 9.88	45						959
16. 2	20	5.271E-03	1.543E-03				228.88
23. 9.88	45		2.545E-04				959
16. 3	10			1.112E-03	1.402E-04	3.730E-04	229.88
23. 9.88	45			3.141E-03	2.095E-03	3.502E-03	959
16. 3	30						229.88
23. 9.88	45						959
16. 3	20	5.277E-03	1.419E-03				229.88
24. 9.88	45		1.848E-04				892
9.2	10			9.926E-04	1.164E-04	3.312E-04	230.65
24. 9.88	45			2.385E-03	1.931E-03	2.826E-03	892
9.2	30						230.65
24. 9.88	45						892
9.2	20	2.249E-03	7.342E-04				230.65
25. 9.88	45		3.016E-04				958
9.45	10			1.140E-03	1.905E-04	3.938E-04	231.67
25. 9.88	45			2.868E-03	2.056E-03	3.166E-03	958
9.45	30						231.67
25. 9.88	45						958
9.45	20	4.803E-03	1.307E-03				231.67
27. 9.88	45		4.127E-04				925
9.45	10			1.219E-03	1.674E-04	4.224E-04	233.67
27. 9.88	45			2.729E-03	1.844E-03	3.047E-03	925
9.45	30						233.67
27. 9.88	45						925
9.45	20	4.820E-03	1.360E-03				233.67
28. 9.88	45		2.947E-04				944
9.53	10			1.079E-03	1.599E-04	3.969E-04	234.67
28. 9.88	45			2.790E-03	1.957E-03	3.072E-03	944
9.53	30						234.67
28. 9.88	45						944
9.53	20	4.711E-03	1.289E-03				234.67
29. 9.88	45						76
3. 0	20						235.33
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Table 6.4.31. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
7.10.88	42						1001
0. 0	10						235.33
7.10.88	42						1001
0.25	10						238.9
7.10.88	42		2.791E-04				1001
0.25	10			1.103E-03	1.441E-04	3.673E-04	238.9
7.10.88	45		3.061E-04				1001
0.3	10			1.304E-03	1.562E-04	4.167E-04	238.9
7.10.88	45			3.658E-03	2.400E-03	4.237E-03	1001
0.3	30						238.9
7.10.88	45						1001
0.3	20	5.269E-03	1.583E-03				238.9
8.10.88	42		2.826E-04				996
0.23	10			1.129E-03	1.398E-04	3.687E-04	239.9
8.10.88	45		3.007E-04				996
0.28	10			1.328E-03	1.621E-04	4.147E-04	239.9
8.10.88	45			3.581E-03	2.583E-03	4.213E-03	996
0.28	30						239.9
8.10.88	45						996
0.28	20	5.974E-03	1.601E-03				239.9
9.10.88	42		2.197E-04				994
0.19	10			1.224E-03	1.240E-04	3.583E-04	240.9
9.10.88	45		1.508E-04				994
0.24	10			1.222E-03	1.047E-04	3.975E-04	240.9
9.10.88	45			3.612E-03	2.548E-03	4.286E-03	994
0.24	30						240.9
9.10.88	45						994
0.24	20	9.490E-03	1.685E-03				240.9
10.10.88	42		2.806E-04				996
0. 9	10			1.215E-03	1.472E-04	3.710E-04	241.9
10.10.88	45		3.158E-04				996
0.14	10			1.439E-03	1.270E-04	4.167E-04	241.9
10.10.88	45			3.622E-03	2.600E-03	4.211E-03	996
0.14	30						241.9
10.10.88	45						996
0.14	20	7.058E-03	1.729E-03				241.9
14.10.88	42		1.746E-04				786
1.13	10			9.644E-04	1.255E-04	3.054E-04	246
14.10.88	45						786
1.15	10			1.044E-03	1.165E-04	3.281E-04	246
14.10.88	45			1.412E-03	8.326E-04	1.685E-03	786
1.15	40	3.650E-03	1.094E-03				246
15.10.88	42		1.766E-04				790
0.5	10			8.617E-04	1.427E-04	3.217E-04	247
15.10.88	45						790
0.55	10			9.968E-04	2.111E-04	3.823E-04	247
15.10.88	45			1.437E-03	1.027E-03	1.740E-03	790
0.55	30						247
15.10.88	45						790
0.55	20	3.751E-03	1.084E-03				247
16.10.88	42		1.627E-04				791
3.32	10			7.847E-04	1.226E-04	3.064E-04	248.1

Table 6.4.31. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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16.10.88	45						791
3.34	10			9.244E-04	1.354E-04	3.352E-04	248.1
16.10.88	45			1.465E-03	1.077E-03	1.636E-03	791
3.34	30						248.1
16.10.88	45						791
3.34	20	3.297E-03	1.060E-03				248.1
17.10.88	42		1.893E-04				792
0.5	10			8.756E-04	1.378E-04	3.248E-04	249
17.10.88	45						792
0.51	10			8.829E-04	1.550E-04	3.524E-04	249
17.10.88	45			1.352E-03	1.026E-03	1.656E-03	792
0.51	30						249
17.10.88	45						792
0.51	20	2.913E-03	1.002E-03				249
18.10.88	42		1.174E-04				793
0.5	10			7.608E-04	9.635E-05	3.063E-04	250
18.10.88	45						793
0.51	10			8.744E-04	1.604E-04	3.360E-04	250
18.10.88	45			1.347E-03	1.011E-03	1.667E-03	793
0.51	30						250
18.10.88	45						793
0.51	20	2.822E-03	9.972E-04				250
22.10.88	42		1.888E-04				790
0.37	10			8.609E-04	1.414E-04	2.920E-04	254
22.10.88	45						790
0.4	10			9.516E-04	1.636E-04	3.605E-04	254
22.10.88	45			1.343E-03	1.015E-03	1.628E-03	790
0.4	30						254
22.10.88	45						790
0.4	20	3.287E-03	1.060E-03				254
23.10.88	42		9.486E-05				788
3.56	10			7.550E-04	7.645E-05	2.690E-04	255.1
23.10.88	45						788
3.57	10			8.182E-04	1.100E-04	2.832E-04	255.1
23.10.88	45			1.321E-03	9.399E-04	1.481E-03	788
3.57	30						255.1
23.10.88	45						788
3.57	20	2.852E-03	1.012E-03				255.1
24.10.88	42		1.583E-04				790
0.54	10			8.316E-04	1.202E-04	2.965E-04	256
24.10.88	45						790
0.55	10			1.084E-03	2.527E-04	3.875E-04	256
24.10.88	45			1.303E-03	9.464E-04	1.524E-03	790
0.55	30						256
24.10.88	45						790
0.55	20	2.949E-03	9.495E-04				256
24.10.88	42		1.699E-04				789
16.25	10			8.945E-04	1.247E-04	3.060E-04	256.5
24.10.88	45						789
16.27	10			9.497E-04	8.988E-05	3.612E-04	256.5
24.10.88	45			1.453E-03	1.072E-03	1.751E-03	789
16.27	30						256.5

Table 6.4.31. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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24.10.88	45						789
16.27	20	3.433E-03	1.100E-03				256.5
25.10.88	45						90
1. 0	20						256.77
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Table 6.4.32. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29.10.88	55						793
0. 0	10						256.77
29.10.88	55						793
0.41	10			1.337E-03	2.293E-04	4.934E-04	258.1
29.10.88	55			1.839E-03	1.474E-03	2.177E-03	793
0.41	30						258.1
29.10.88	55						793
0.41	20	3.340E-03	1.241E-03				258.1
30.10.88	52		3.084E-04				794
0.55	10			1.349E-03	2.234E-04	4.514E-04	259.1
30.10.88	55						794
1. 0	10			1.448E-03	2.094E-04	4.940E-04	259.1
30.10.88	55			1.955E-03	1.533E-03	2.249E-03	794
1. 0	30						259.1
30.10.88	55						794
1. 0	20	3.238E-03	1.347E-03				259.1
31.10.88	52		2.509E-04				794
0.42	10			1.231E-03	1.920E-04	4.129E-04	260.1
31.10.88	55						794
0.45	10			1.249E-03	1.899E-04	4.356E-04	260.1
31.10.88	55			1.811E-03	1.373E-03	2.057E-03	794
0.45	30						260.1
31.10.88	55						794
0.45	20	3.839E-03	1.183E-03				260.1
1.11.88	52		3.016E-04				791
1. 0	10			1.243E-03	2.031E-04	4.408E-04	261.1
1.11.88	55						791
1. 2	10			1.210E-03	2.310E-04	4.396E-04	261.1
1.11.88	55			1.838E-03	1.434E-03	2.073E-03	791
1. 2	30						261.1
1.11.88	55						791
1. 2	20	3.969E-03	1.211E-03				261.1
2.11.88	52		3.224E-04				790
1. 8	10			1.286E-03	2.235E-04	4.526E-04	262.1
2.11.88	52		3.182E-04				790
1.15	10			1.292E-03	2.069E-04	4.582E-04	262.1
2.11.88	55						790
1.21	10			1.314E-03	2.615E-04	4.457E-04	262.1
2.11.88	55			1.840E-03	1.454E-03	2.144E-03	790
1.21	30						262.1
2.11.88	55						790
1.21	20	3.457E-03	1.273E-03				262.1
3.11.88	52		3.283E-04				793
1.1	10			1.253E-03	2.243E-04	4.314E-04	263.1
3.11.88	55			1.846E-03	1.422E-03	2.135E-03	793
1.13	30						263.1
3.11.88	55						793
1.13	20	3.767E-03	1.189E-03				263.1
4.11.88	52		2.954E-04				792
0.43	10			1.189E-03	2.122E-04	4.078E-04	264.1
4.11.88	55						792
0.45	10						264.1

Table 6.4.32. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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4.11.88	55						792
0.45	20	3.912E-03	1.143E-03				264.1
5.11.88	52		3.373E-04				791
1. 0	10			1.137E-03	2.273E-04	4.262E-04	265.1
5.11.88	55						791
1. 3	10			1.174E-03	3.220E-04	4.023E-04	265.1
5.11.88	55			1.717E-03	1.326E-03	1.879E-03	791
1. 3	30						265.1
5.11.88	55						791
1. 3	20	3.884E-03	1.112E-03				265.1
6.11.88	52		3.088E-04				792
2. 0	10			1.400E-03	2.185E-04	4.537E-04	266.2
6.11.88	55						792
2. 4	10			1.194E-03	2.901E-04	4.354E-04	266.2
6.11.88	55			1.892E-03	1.398E-03	2.154E-03	792
2. 4	30						266.2
6.11.88	55						792
2. 4	20	5.416E-03	1.383E-03				266.2
7.11.88	52		3.157E-04				791
0.44	10			1.165E-03	2.185E-04	4.329E-04	267.1
7.11.88	55						791
0.46	10			1.291E-03	3.611E-04	4.508E-04	267.1
7.11.88	55			1.724E-03	1.399E-03	2.011E-03	791
0.46	30						267.1
7.11.88	55						791
0.46	20	4.014E-03	1.115E-03				267.1
8.11.88	52		1.331E-04				789
0.55	10			8.389E-04	1.012E-04	3.047E-04	268.1
8.11.88	55						789
0.59	10			7.567E-04		2.612E-04	268.1
8.11.88	55			1.152E-03	8.451E-04	1.287E-03	789
0.59	30						268.1
8.11.88	55						789
0.59	20	2.345E-03	7.174E-04				268.1
11.11.88	52		2.053E-04				789
0.51	10			9.145E-04	1.529E-04	3.403E-04	271.1
11.11.88	55						789
0.55	10			8.997E-04		3.340E-04	271.1
11.11.88	55			1.449E-03	1.081E-03	1.693E-03	789
0.55	30						271.1
11.11.88	55						789
0.55	20	3.149E-03	9.246E-04				271.1
12.11.88	52		1.575E-04				790
0.42	10			1.049E-03	1.266E-04	3.607E-04	272.1
12.11.88	55						790
0.45	10			1.049E-03		3.686E-04	272.1
12.11.88	55			1.718E-03	1.259E-03	1.808E-03	790
0.45	30						272.1
12.11.88	55						790
0.45	20	3.934E-03	1.034E-03				272.1
13.11.88	52		1.717E-04				789
0.35	10			1.066E-03	1.325E-04	3.884E-04	273.1

Table 6.4.32. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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13.11.88	55						789
0.4	10			1.038E-03	2.632E-04	3.671E-04	273.1
13.11.88	55			1.684E-03	1.243E-03	1.927E-03	789
0.4	30						273.1
13.11.88	55						789
0.4	20	4.213E-03	1.092E-03				273.1
15.11.88	52		1.629E-04				788
0.55	10			9.938E-04	1.438E-04	3.644E-04	275.1
15.11.88	55						787
1. 0	10			9.914E-04	1.632E-04	3.652E-04	275.1
15.11.88	55			1.602E-03	1.201E-03	1.714E-03	787
1. 0	30						275.1
15.11.88	55						787
1. 0	20	5.470E-03	1.026E-03				275.1
16.11.88	52		1.426E-04				788
1.21	10			9.858E-04	1.115E-04	3.383E-04	276.1
16.11.88	55						788
1.25	10			9.588E-04	2.132E-04	3.600E-04	276.1
16.11.88	55			1.505E-03	1.212E-03	1.771E-03	788
1.25	30						276.1
16.11.88	55						788
1.25	20	3.798E-03	1.029E-03				276.1
17.11.88	52		1.682E-04				786
1. 0	10			1.026E-03	1.344E-04	3.487E-04	277.1
17.11.88	55						786
1. 5	10			1.018E-03	2.255E-04	3.724E-04	277.1
17.11.88	55			1.496E-03	1.170E-03	1.657E-03	786
1. 5	30						277.1
17.11.88	55						786
1. 5	20	3.651E-03	1.014E-03				277.1
18.11.88	55						39
7. 0	20						278.03
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Table 6.4.33. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	B	CYCLE NO.	88.10	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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23.11.88	52						784
8.5	10						278.03
23.11.88	52		2.536E-04				784
8.5	10			1.299E-03	1.928E-04	4.509E-04	279.39
23.11.88	55						784
8.52	10			1.317E-03	2.015E-04	4.641E-04	279.39
23.11.88	55			1.829E-03	1.432E-03	2.016E-03	784
8.52	30						279.39
23.11.88	55						784
8.52	20	3.097E-03	1.234E-03				279.39
24.11.88	55		3.602E-04				787
9.47	10			1.376E-03	1.988E-04	4.649E-04	280.43
24.11.88	55						787
9.49	10			1.330E-03	2.142E-04	4.487E-04	280.43
24.11.88	55			1.771E-03	1.346E-03	2.052E-03	787
9.49	30						280.43
24.11.88	55						787
9.49	20	3.618E-03	1.271E-03				280.43
25.11.88	52		2.153E-04				788
9.43	10			1.334E-03	1.762E-04	4.279E-04	281.38
25.11.88	55						788
9.47	10			1.282E-03	2.070E-04	4.397E-04	281.38
25.11.88	55			1.820E-03	1.482E-03	2.109E-03	788
9.47	30						281.38
25.11.88	55						788
9.47	20	4.672E-03	1.330E-03				281.38
26.11.88	52		2.344E-04				788
8.41	10			1.327E-03	1.801E-04	4.300E-04	282.32
26.11.88	55						788
8.43	10			1.344E-03	1.948E-04	4.433E-04	282.32
26.11.88	55			1.798E-03	1.386E-03	1.982E-03	788
8.43	30						282.32
26.11.88	55						788
8.43	20	4.747E-03	1.295E-03				282.32
27.11.88	52		1.949E-04				787
8.4	10			1.124E-03	1.468E-04	3.530E-04	283.39
27.11.88	55						787
8.42	10			1.212E-03	1.882E-04	3.949E-04	283.39
27.11.88	55			1.563E-03	1.201E-03	1.854E-03	787
8.42	30						283.39
27.11.88	55						787
8.42	20	3.743E-03	1.163E-03				283.39
27.11.88	52		1.143E-04				789
17.2	10			1.090E-03	9.662E-05	3.506E-04	283.75
27.11.88	55						789
17.25	10			1.026E-03		3.333E-04	283.75
27.11.88	55			1.593E-03	1.210E-03	1.841E-03	789
17.25	30						283.75
27.11.88	55						789
17.25	20	4.295E-03	1.158E-03				283.75
27.11.88	55						789
17.25	20						283.75

Table 6.4.33. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29.11.88	52		2.647E-04				889
0.48	10			1.864E-03	1.688E-04	4.763E-04	285.06
29.11.88	55						889
0.51	10			1.873E-03		5.012E-04	285.06
29.11.88	55			2.343E-03	1.949E-03	2.680E-03	889
0.51	30						285.06
29.11.88	55						889
0.51	20	5.517E-03	1.805E-03				285.06
30.11.88	52		1.545E-04				896
0.46	10			1.733E-03	1.331E-04	5.031E-04	286.06
30.11.88	55						896
0.51	10			1.524E-03		4.087E-04	286.06
30.11.88	55			1.433E-03	1.159E-03	1.586E-03	896
0.51	30						286.06
30.11.88	55						896
0.51	20	4.956E-03	1.766E-03				286.06
1.12.88	52		2.698E-04				890
0.55	10				1.595E-04	4.588E-04	287.07
1.12.88	55						890
0.57	10			1.452E-03		4.887E-04	287.07
1.12.88	55			2.748E-03	2.030E-03	3.021E-03	890
0.57	30						287.07
1.12.88	55						890
0.57	20		1.542E-03				287.07
2.12.88	52		2.408E-04				894
0.55	10			1.570E-03	1.719E-04	4.836E-04	288.07
2.12.88	55						894
0.57	10			1.576E-03		5.321E-04	288.07
2.12.88	55			2.989E-03	2.249E-03	3.567E-03	894
0.57	30						288.07
2.12.88	55						894
0.57	20	5.822E-03					288.07
3.12.88	52		1.641E-04				895
1.16	10			1.478E-03	1.329E-04	4.604E-04	289.08
3.12.88	55						895
1.18	10			1.535E-03		4.769E-04	289.08
3.12.88	55			2.716E-03	2.781E-03	2.977E-03	895
1.18	30						289.08
3.12.88	55						895
1.18	20	5.573E-03	1.638E-03				289.08
4.12.88	52		2.241E-04				904
0.58	10			1.385E-03	1.504E-04	4.408E-04	290.07
4.12.88	55						905
1. 0	10			1.376E-03	1.804E-04	4.652E-04	290.07
4.12.88	55			2.866E-03	2.092E-03	3.278E-03	905
1. 0	0						290.07
4.12.88	55						905
1. 0	20	6.028E-03	1.441E-03				290.07
5.12.88	52		2.508E-04				893
1.46	10			1.411E-03	1.664E-04	4.165E-04	291.1
5.12.88	55						893
1.48	10			1.391E-03		4.842E-04	291.1

Table 6.4.33. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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5.12.88	55			2.685E-03	2.094E-03	3.030E-03	893
1.48	30						291.1
5.12.88	55						893
1.48	20	5.340E-02	1.447E-03				291.1
5.12.88	55						893
1.48	20						291.1
5.12.88	52		3.684E-04				889
9.41	10			1.332E-03	2.162E-04	4.370E-04	291.43
5.12.88	55						889
9.44	10			1.580E-03	3.216E-04	4.985E-04	291.43
5.12.88	55			2.948E-03	2.076E-03	3.022E-03	889
9.44	30						291.43
5.12.88	55						889
9.44	20		1.513E-03				291.43
6.12.88	52		4.374E-04				1016
1.13	10			2.585E-03	2.493E-04	6.336E-04	292.08
6.12.88	55						1016
1.15	10			2.837E-03	3.634E-04	7.381E-04	292.08
6.12.88	55			5.953E-03	4.409E-03	6.957E-03	1016
1.15	30						292.08
6.12.88	55						1016
1.15	20	6.502E-02	3.052E-03				292.08
7.12.88	52		5.360E-04				1016
0.57	10			4.427E-03	2.839E-04	7.540E-04	293.07
7.12.88	55						1015
1. 0	10			5.117E-03	3.278E-04	8.315E-04	293.07
7.12.88	55			6.424E-03	4.605E-03	7.604E-03	1015
1. 0	30						293.07
7.12.88	55						1015
1. 0	20	1.293E-01	5.419E-03				293.07
8.12.88	52		4.995E-04				1016
0.59	10			8.710E-03	3.011E-04	7.644E-04	294.07
8.12.88	55						1016
1. 2	10			6.579E-03	3.495E-04	8.765E-04	294.07
8.12.88	55						1016
1. 2	20						294.07
8.12.88	55						1016
1. 2	20	3.218E-01	7.281E-03				294.07
9.12.88	52		6.850E-04				981
1.28	10				3.417E-04	7.302E-04	295.09
9.12.88	55						981
1.28	10			6.583E-03	3.782E-04	8.796E-04	295.09
9.12.88	55			6.826E-03	4.781E-03	8.051E-03	981
1.28	30						295.09
9.12.88	55						981
1.28	20	1.816E-01	7.039E-03				295.09
10.12.88	52		6.096E-04				1013
0.58	10			5.319E-03	3.206E-04	7.979E-04	296.07
10.12.88	55						1013
0.58	10			6.069E-03	3.606E-04	8.698E-04	296.07
10.12.88	55			6.570E-03	4.864E-03	7.855E-03	1013
0.58	30						296.07

Table 6.4.33. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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10.12.88	55						1013
0.58	20	1.659E-01	6.556E-03				296.07
11.12.88	52		5.865E-04				1012
0.59	10			5.718E-03	3.308E-04		297.05
11.12.88	55						1012
1. 2	10			6.180E-03	3.325E-04	9.041E-04	297.05
11.12.88	55			7.127E-03	4.673E-03	8.439E-03	1012
1. 2	30						297.05
11.12.88	55						1012
1. 2	20	2.013E-01	7.016E-03				297.05
12.12.88	52		6.355E-04				1011
0.54	10			5.518E-03	3.393E-04	8.051E-04	297.95
12.12.88	55						1011
0.56	10			6.267E-03	3.629E-04	9.003E-04	297.97
12.12.88	55			6.405E-03	4.668E-03	7.827E-03	1011
0.56	30						297.95
12.12.88	55						1011
0.56	20	1.512E-01	7.721E-03				297.95
13.12.88	55						36
5. 0	20						298.95
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Table 6.4.34. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	B	CYCLE NO.	88.11	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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16.12.88	52		4.647E-04				784
8.45	10			3.099E-03	3.991E-04	1.045E-03	299.7
16.12.88	55						784
8.47	10			3.438E-03	4.586E-04	1.179E-03	299.7
16.12.88	55			3.815E-03	3.183E-03	4.387E-03	784
8.47	30						299.7
16.12.88	55						784
8.47	20	9.359E-03	3.641E-03				299.7
17.12.88	52		3.244E-04				794
8.5	10			2.836E-03	2.821E-04	8.615E-04	300.71
17.12.88	55						794
8.51	10			3.043E-03		9.058E-04	300.71
17.12.88	55			3.377E-03	2.611E-03	3.852E-03	794
8.51	30						300.71
17.12.88	55						794
8.51	20	7.617E-03	3.288E-03				300.71
18.12.88	52		2.601E-04				799
9. 5	10			2.379E-03	2.276E-04	9.975E-04	301.75
18.12.88	55						799
9. 8	10			2.453E-03	2.898E-04	7.597E-04	301.75
18.12.88	55			3.022E-03	2.332E-03	3.476E-03	799
9. 8	30						301.75
18.12.88	55						799
9. 8	20	6.914E-03	2.747E-03				301.75
19.12.88	52						801
8.52	10			1.600E-03		4.976E-04	302.76
19.12.88	55						801
8.55	10			1.614E-03		4.961E-04	302.76
19.12.88	55			2.586E-03	1.925E-03	3.042E-03	801
8.55	30						302.76
19.12.88	55						801
8.55	20	6.095E-03	2.256E-03				302.76
20.12.88	52		2.247E-04				802
9.46	10			1.801E-03	1.982E-04	5.765E-04	303.77
20.12.88	55						802
9.48	10			1.797E-03		6.029E-04	303.77
20.12.88	55			2.353E-03	1.757E-03	2.718E-03	802
9.48	30						303.77
20.12.88	55						802
9.48	20	5.648E-03	1.934E-03				303.77
21.12.88	52		2.760E-04				799
8.42	10			1.786E-03	2.169E-04	5.845E-04	304.78
21.12.88	55						799
8.44	10			1.861E-03	2.556E-04	5.977E-04	304.78
21.12.88	55			2.162E-03	1.702E-03	2.606E-03	799
8.44	30						304.78
21.12.88	55						799
8.44	20	5.897E-03	1.818E-03				304.78
22.12.88	52		2.722E-04				799
8.4	10			1.622E-03	2.214E-04	5.656E-04	305.79
22.12.88	55						799
8.44	10			1.716E-03		5.723E-04	305.79

Table 6.4.34. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.11		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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22.12.88	55			2.111E-03	1.643E-03	2.422E-03	799
8.44	30						305.79
22.12.88	55						799
8.44	20	5.071E-03	1.658E-03				305.79
23.12.88	52		3.042E-04				798
8.37	10			1.454E-03	2.404E-04	4.899E-04	306.81
23.12.88	55						798
8.39	10			1.543E-03	2.743E-04	5.334E-04	306.81
23.12.88	55			1.803E-03	1.420E-03	1.935E-03	798
8.39	30						306.81
23.12.88	55						798
8.39	20	4.247E-03	1.442E-03				306.81
24.12.88	52		3.030E-04				797
9. 7	10			1.354E-03		4.413E-04	307.82
24.12.88	55						797
9. 7	10			1.325E-03			307.82
24.12.88	55			1.949E-03	1.503E-03	2.333E-03	797
9. 7	30						307.82
24.12.88	55						797
9. 7	20	5.066E-03	1.549E-03				307.82
25.12.88	52		2.759E-04				800
9.22	10			1.487E-03	2.240E-04	5.084E-04	308.83
25.12.88	55						800
9.24	10			1.489E-03	2.303E-04	5.212E-04	308.83
25.12.88	55			1.841E-03	1.457E-03	2.113E-03	800
9.24	30						308.83
25.12.88	55						800
9.24	20	6.820E-03	1.422E-03				308.83
26.12.88	52		2.917E-04				798
9.15	10			1.434E-03	2.205E-04	5.164E-04	309.84
26.12.88	55						798
9.15	10			1.481E-03		5.182E-04	309.84
26.12.88	55			1.897E-03	1.460E-03	2.076E-03	798
9.15	30						309.84
26.12.88	55						798
9.15	20	4.672E-03	1.471E-03				309.84
27.12.88	52		2.644E-04				797
9.11	10			1.512E-03	2.140E-04	5.164E-04	310.85
27.12.88	55						797
9.13	10			1.555E-03	2.088E-04	5.234E-04	310.85
27.12.88	55			1.906E-03	1.510E-03	2.178E-03	797
9.13	30						310.85
27.12.88	55						797
9.13	20	4.393E-03	1.502E-03				310.84
29.12.88	52		2.529E-04				798
8.45	10			1.403E-03	2.014E-04	4.847E-04	312.87
29.12.88	55						798
8.5	10			1.394E-03	1.821E-04	4.919E-04	312.87
29.12.88	55			1.854E-03	1.453E-03	2.100E-03	798
8.5	30						312.87
29.12.88	55						798
8.5	20	4.524E-03	1.424E-03				312.87

Table 6.4.34. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.11		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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30.12.88	52		2.502E-04				798
8.37	10			1.445E-03	2.069E-04	4.889E-04	313.88
30.12.88	55						798
8.39	10			1.409E-03		4.895E-04	313.88
30.12.88	55			1.803E-03	1.390E-03	1.961E-03	798
8.39	30						313.88
30.12.88	55						798
8.39	20	4.383E-03	1.412E-03				313.88
31.12.88	52		2.445E-04				798
8.15	10			1.489E-03	2.003E-04	4.990E-04	314.89
31.12.88	55						798
8.15	10			1.451E-03	2.174E-04	5.179E-04	314.89
31.12.88	55			1.915E-03	1.436E-03	2.080E-03	798
8.15	30						314.89
31.12.88	55						798
8.15	20	5.094E-03	1.474E-03				314.89
1. 1.89	52		2.396E-04				797
8.32	10			1.553E-03	2.060E-04	5.573E-04	315.9
1. 1.89	55						797
8.34	10			1.659E-03	2.900E-04	5.535E-04	315.9
1. 1.89	55			2.064E-03	1.567E-03	2.370E-03	797
8.34	30						315.9
1. 1.89	55						797
8.34	20	5.103E-03	1.580E-03				315.9
2. 1.89	52		2.489E-04				797
8.46	10			1.548E-03	2.067E-04	5.408E-04	316.01
2. 1.89	55						797
8.49	10			1.579E-03	2.298E-04	5.333E-04	316.01
2. 1.89	55			2.009E-03	1.599E-03	2.300E-03	797
8.49	30						316.01
2. 1.89	55						797
8.49	20	5.554E-03	1.585E-03				316.01
3. 1.89	52		2.529E-04				797
8.39	10			1.553E-03	2.210E-04	5.572E-04	317.93
3. 1.89	55						797
8.41	10			1.631E-03	2.027E-04	5.668E-04	317.98
3. 1.89	55			2.112E-03	1.667E-03	2.397E-03	797
8.41	30						317.93
3. 1.89	55						797
8.41	20	5.138E-03					317.93
4. 1.89	52		2.053E-04				796
8.37	10			1.670E-03	1.874E-04	5.921E-04	318.94
4. 1.89	55						796
8.39	10			1.603E-03	1.973E-04	5.667E-04	318.94
4. 1.89	55			2.238E-03	1.789E-03	2.534E-03	796
8.39	30						318.94
4. 1.89	55						796
8.39	20	7.789E-03	1.774E-03				318.94
5. 1.89	52		2.148E-04				796
8.4	10			1.706E-03	1.844E-04	5.736E-04	319.95
5. 1.89	55						796
8.44	10			1.719E-03	1.915E-04	5.580E-04	319.95

Table 6.4.34. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 88.11		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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5. 1.89	55			2.169E-03	1.733E-03	2.532E-03	796
8.44	30						319.95
5. 1.89	55						796
8.44	20	5.903E-03	1.770E-03				319.95
6. 1.89	55						54
4. 0	20						319.99
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Table 6.4.35. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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17. 1.89	55						782
0. 0	20						320.35
17. 1.89	52		6.037E-04				1002
17.41	10			1.947E-03	3.018E-04	5.933E-04	321.6
17. 1.89	55						1002
17.43	10			1.831E-03	3.035E-04	5.808E-04	321.6
17. 1.89	55			3.580E-03	2.750E-03	3.917E-03	1002
17.43	30						321.6
17. 1.89	55						1002
17.43	20	3.836E-03	1.657E-03				321.6
18. 1.89	52		5.770E-04				1018
17. 0	10			2.521E-03	3.076E-04	7.298E-04	322.5
18. 1.89	55						1018
17. 3	10			2.666E-03	2.670E-04	7.882E-04	322.5
18. 1.89	55			3.790E-03	3.705E-03	3.954E-03	1018
17. 3	30						322.5
18. 1.89	55						1018
17. 3	20	8.784E-03	2.752E-03				322.5
20. 1.89	52		5.040E-04				1016
16.45	10			3.533E-03	1.556E-04	8.358E-04	324.5
20. 1.89	55						1016
16.48	10			3.695E-03	2.221E-04	8.332E-04	324.5
20. 1.89	55			6.310E-03	4.524E-03	7.276E-03	1016
16.48	30						324.5
20. 1.89	55						1016
16.48	20	2.252E-02	4.012E-03				324.5
21. 1.89	52		6.750E-04				1016
16.55	10			4.604E-03	3.738E-04	8.942E-04	325.5
21. 1.89	55						1016
17. 0	10			5.017E-03	3.833E-04	1.039E-03	325.5
21. 1.89	55			8.356E-03	5.655E-03	1.149E-02	1016
17. 0	30						325.5
21. 1.89	55						1016
17. 0	20	2.360E-02	6.113E-03				325.5
22. 1.89	52		3.785E-04				1017
16.45	10			4.888E-03	2.342E-04	7.688E-04	326.5
22. 1.89	55						1017
16.5	10			5.003E-03		8.706E-04	326.5
22. 1.89	55			6.984E-03	5.092E-03	8.156E-03	1017
16.5	30						326.5
22. 1.89	55						1017
16.5	20	7.115E-02	5.943E-03				326.5
25. 1.89	52		4.841E-04				1017
0.35	10			6.387E-03	3.082E-04	9.392E-04	329.14
25. 1.89	55						1017
0.38	10			6.833E-03		1.010E-03	329.14
25. 1.89	55			7.279E-03	5.348E-03	8.721E-03	1017
0.38	30						329.14
25. 1.89	55						1017
0.38	20	1.007E-01	7.619E-03				329.14
26. 1.89	52		4.551E-04				1016
1.18	10			6.134E-03	2.864E-04	9.165E-04	330.14

Table 6.4.35. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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26. 1.89	55						1016
1.2	10			6.301E-03	3.254E-04	9.543E-04	330.14
26. 1.89	55			6.911E-03	5.098E-03	8.145E-03	1016
1.2	30						330.14
26. 1.89	55						1016
1.2	20	1.040E-01	7.143E-03				330.14
29. 1.89	52		3.608E-04				1014
0.45	10			6.540E-03	2.594E-04	9.623E-04	333.14
29. 1.89	55						1014
0.5	10			6.697E-03		9.749E-04	333.14
29. 1.89	55			7.419E-03	5.887E-03	8.894E-03	1014
0.5	30						333.14
29. 1.89	55						1014
0.5	20	1.194E-01	8.480E-03				333.14
30. 1.89	52		2.179E-04				1014
1.1	10			7.009E-03	2.033E-04	7.931E-04	334.14
30. 1.89	55						1014
1.15	10			7.052E-03		8.516E-04	334.14
30. 1.89	55			4.887E-03	3.431E-03	6.382E-03	1014
1.15	30						334.14
30. 1.89	55						1014
1.15	20	1.601E-01	8.608E-03				334.14
31. 1.89	52		4.574E-04				1019
1. 2	10			6.831E-03	3.022E-04	1.090E-03	335.14
31. 1.89	55						1019
1. 5	10			7.713E-03		1.191E-03	335.14
31. 1.89	55			8.278E-03	6.177E-03	1.009E-02	1019
1. 5	30						335.14
31. 1.89	55						1019
1. 5	20	1.613E-01	8.864E-03				335.14
2. 2.89	52		4.783E-04				1016
0.41	10			7.030E-03	3.462E-04	1.036E-03	337.04
2. 2.89	55						1016
0.43	10			7.575E-03	3.029E-04	1.132E-03	337.04
2. 2.89	55			8.467E-03	6.071E-03	1.029E-02	1016
0.43	30						337.04
2. 2.89	55						1016
0.43	20	1.550E-01	8.966E-03				337.04
3. 2.89	52		4.310E-04				1015
0.37	10			6.940E-03	3.233E-04	1.094E-03	338.03
3. 2.89	55						1015
0.43	10			7.623E-03	3.250E-04	1.171E-03	338.03
3. 2.89	55			7.871E-03	5.579E-03	9.768E-03	1015
0.43	30						338.03
3. 2.89	55						1015
0.43	20	1.312E-01	9.089E-03				338.03
4. 2.89	52		5.690E-04				1013
1.15	10			6.832E-03	4.002E-04	1.079E-03	339.01
4. 2.89	55						1013
1.18	10			7.379E-03	5.072E-04	1.187E-03	339.01
4. 2.89	55			7.275E-03	5.441E-03	9.004E-03	1013
1.18	30						339.01

Table 6.4.35. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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4. 2.89	55						1013
1.18	20	1.496E-01	8.169E-03				339.01
5. 2.89	52		5.963E-04				1019
1.41	10			6.705E-03	3.994E-04	1.057E-03	340
5. 2.89	55						1019
1.47	10			7.411E-03	3.898E-04	1.193E-03	340
5. 2.89	55			7.276E-03	5.520E-03		1019
1.47	30						340
5. 2.89	55						1019
1.47	20	1.110E-01	8.129E-03				340
6. 2.89	52		6.069E-04				1018
0.48	10			7.438E-03	4.124E-04	1.249E-03	341
6. 2.89	55						1018
0.5	10			8.045E-03	3.603E-04	1.282E-03	341
6. 2.89	55			7.363E-03	5.603E-03	8.787E-03	1018
0.5	30						341
6. 2.89	55						1018
0.5	20	7.828E-02	8.415E-03				341
7. 2.89	55						49
3. 0	20						341.31
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Table 6.4.36. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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11. 2.89	52						821
1.14	10						341.31
11. 2.89	52		6.338E-04				821
1.14	10			5.057E-03	6.046E-04	1.454E-03	342.11
11. 2.89	55						821
1.17	10			5.397E-03	5.961E-04	1.710E-03	342.11
11. 2.89	55			5.038E-03	3.516E-03	5.485E-03	821
1.17	30						342.11
11. 2.89	55						821
1.17	20	1.035E-02	5.825E-03				342.11
12. 2.89	52		4.022E-04				828
1.35	10			4.233E-03	4.708E-04	1.182E-03	343.11
12. 2.89	55						828
1.37	10			4.771E-03	5.290E-04	1.317E-03	343.11
12. 2.89	55			4.175E-03	3.192E-03	4.498E-03	828
1.37	30						343.11
12. 2.89	55						828
1.37	20	9.465E-03	5.047E-03				343.11
16. 2.89	52		4.107E-04				842
1. 0	10			3.526E-03	3.911E-04	9.770E-04	345.19
16. 2.89	55						842
1. 0	10			3.630E-03	4.082E-04	1.072E-03	345.19
16. 2.89	55			3.694E-03	4.274E-03	3.995E-03	842
1. 0	30						345.19
16. 2.89	55						842
1. 0	20	7.679E-03	3.881E-03				345.19
17. 2.89	52		3.848E-04				842
0.51	10			3.429E-03	3.628E-04	9.513E-04	346.19
17. 2.89	55						842
0.55	10			3.806E-03	4.166E-04	1.064E-03	346.19
17. 2.89	55			3.501E-03	2.730E-03	4.009E-03	842
0.55	30						346.19
17. 2.89	55						842
0.55	20	8.579E-03	3.844E-03				346.19
18. 2.89	52		3.748E-04				842
0.45	10			3.018E-03	3.501E-04	8.505E-04	347.19
18. 2.89	55						842
0.48	10			3.106E-03	3.518E-04	9.261E-04	347.19
18. 2.89	55			3.123E-03	2.517E-03	3.663E-03	842
0.48	30						347.19
18. 2.89	55						842
0.48	20	8.144E-03	3.295E-03				347.19
19. 2.89	52		3.218E-04				841
0.55	10			2.891E-03	3.070E-04	8.348E-04	348.19
19. 2.89	55						841
0.57	10			2.920E-03	2.875E-04	8.451E-04	348.19
19. 2.89	55			3.074E-03	2.416E-03	3.498E-03	841
0.57	30						348.19
19. 2.89	55						841
0.57	20	9.003E-03	3.156E-03				348.19
20. 2.89	52		2.895E-04				799
1.56	10			2.619E-03	2.572E-04	7.706E-04	349.19

Table 6.4.36. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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20. 2.89	55						836
2. 0	10			2.631E-03	1.618E-04	8.085E-04	349.19
20. 2.89	55			3.318E-03	2.524E-03	3.754E-03	836
2. 0	30						349.19
20. 2.89	55						836
2. 0	20	9.390E-03	3.067E-03				349.19
20. 2.89	55						836
2. 0	20						349.19
20. 2.89	52		4.584E-04				975
11.25	10			2.774E-03	3.415E-04	8.462E-04	349.59
20. 2.89	55						975
11.29	10			2.797E-03	4.000E-04	9.378E-04	349.59
20. 2.89	55			4.875E-03	3.531E-03	6.197E-03	975
11.29	30						349.59
20. 2.89	55						975
11.29	20	1.561E-02	3.027E-03				349.59
20. 2.89	52		4.900E-04				986
14.33	10			3.654E-03	3.783E-04	9.540E-04	349.71
20. 2.89	55						986
14.4	10			4.026E-03	4.077E-04	1.051E-03	349.71
20. 2.89	55			5.091E-03	4.071E-03	6.158E-03	986
14.4	30						349.71
20. 2.89	55						986
14.4	20	1.691E-02	4.206E-03				349.71
21. 2.89	52		5.219E-04				984
0.35	10			4.407E-03	3.786E-04	9.907E-04	350.1
21. 2.89	55						984
0.37	10			4.999E-03	4.263E-04	1.092E-03	350.1
21. 2.89	55			5.583E-03	4.325E-03	6.494E-03	984
0.37	30						350.1
21. 2.89	55						984
0.37	20	1.757E-02	5.131E-03				350.1
21. 2.89	52		4.030E-04				984
9. 0	10			4.257E-03	2.996E-04	8.475E-04	350.42
21. 2.89	55						984
9. 0	10			4.303E-03	3.062E-04	9.350E-04	350.42
21. 2.89	55			4.929E-03	3.859E-03	5.785E-03	984
9. 0	30						350.42
21. 2.89	55						984
9. 0	20	1.467E-02	4.621E-03				350.42
21. 2.89	52		4.983E-04				983
16.48	10			3.510E-03	3.165E-04	7.616E-04	350.74
21. 2.89	55						983
16.5	10			3.685E-03	4.163E-04	8.671E-04	350.74
21. 2.89	55			4.260E-03	3.289E-03	4.979E-03	983
16.5	30						350.74
21. 2.89	55						983
16.5	20	1.267E-02	3.844E-03				350.74
22. 2.89	52		4.079E-04				983
0.3	10			3.846E-03	2.956E-04	8.103E-04	351.04
22. 2.89	55						983
0.3	10			4.142E-03	3.478E-04	8.965E-04	351.04

Table 6.4.36. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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22. 2.89	55			4.884E-03	3.495E-03	5.633E-03	983
0.3	30						351.04
22. 2.89	55						983
0.3	20	1.391E-02	4.340E-03				351.04
22. 2.89	52		3.631E-04				984
8.2	10			3.739E-03	2.653E-04	7.976E-04	351.49
22. 2.89	55						984
8.2	10			3.910E-03	3.642E-04	8.670E-04	351.49
22. 2.89	55			4.747E-03	3.601E-03	5.519E-03	984
8.2	30						351.49
22. 2.89	55						984
8.2	20	1.426E-02	4.185E-03				351.49
22. 2.89	52		4.142E-04				984
16.33	10			3.657E-03	2.869E-04	8.465E-04	351.81
22. 2.89	55						984
16.33	10			3.949E-03	2.953E-04	8.736E-04	351.81
22. 2.89	55			4.895E-03	3.602E-03	5.577E-03	984
16.33	30						351.81
22. 2.89	55						984
16.33	20	1.495E-02	4.146E-03				351.81
23. 2.89	52		3.976E-04				984
0. 5	10			3.440E-03	2.389E-04	7.816E-04	352.15
23. 2.89	55						984
0. 7	10			3.695E-03	2.115E-04	8.667E-04	352.15
23. 2.89	55			4.546E-03	3.587E-03	5.475E-03	984
0. 7	30						352.15
23. 2.89	55						984
0. 7	20	1.356E-02	3.903E-03				352.15
24. 2.89	52		3.873E-04				982
8.15	10			3.238E-03	2.871E-04	7.235E-04	353.46
24. 2.89	55						982
8.15	10			3.520E-03	3.477E-04	7.843E-04	353.46
24. 2.89	55			4.253E-03	3.062E-03	5.113E-03	982
8.15	30						353.46
24. 2.89	55						982
8.15	20	1.274E-02	3.523E-03				353.46
25. 2.89	52		3.949E-04				982
20.1	10			3.162E-03	2.854E-04	7.319E-04	354.98
25. 2.89	55						982
20.1	10			3.312E-03	3.129E-04	7.784E-04	354.98
25. 2.89	55			4.218E-03	3.106E-03	4.731E-03	982
20.1	30						354.98
25. 2.89	55						982
20.1	20	1.134E-02	3.270E-03				354.98
28. 2.89	52		3.718E-04				983
1. 0	10			2.905E-03	2.735E-04	7.140E-04	357.16
28. 2.89	55						983
1. 5	10			2.996E-03	3.344E-04	7.133E-04	357.16
28. 2.89	55			4.097E-03	3.096E-03	4.677E-03	983
1. 5	30						357.16
28. 2.89	55						983
1. 5	20	1.267E-02	2.979E-03				357.16

Table 6.4.36. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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3. 3.89	52						979
2.25	10						358.12
3. 3.89	55						979
2.25	10						358.12
3. 3.89	55						979
2.25	30						358.12
3. 3.89	55						979
2.25	20						358.12
4. 3.89	52		4.433E-04				983
0.45	10			2.806E-03	3.150E-04	7.252E-04	359.42
4. 3.89	55						983
0.45	10			2.943E-03	3.183E-04	7.919E-04	359.42
4. 3.89	55			4.057E-03	3.010E-03	4.401E-03	983
0.45	30						359.42
4. 3.89	55						983
0.45	20	8.567E-03	2.861E-03				359.42
5. 3.89	55						87
2. 0	20						359.78
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Table 6.4.37. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.03		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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7. 4.89	52		4.156E-04				923
1.15	10			3.001E-03	3.076E-04	7.391E-04	361.78
7. 4.89	55						923
1.15	10			2.968E-03	2.190E-04	7.615E-04	361.78
7. 4.89	55			3.535E-03	2.643E-03	4.212E-03	923
1.15	30						361.78
7. 4.89	55						923
1.15	20	3.894E-03	2.952E-03				361.78
8. 4.89	52		4.168E-04				924
0.4	10			2.727E-03	2.903E-04	6.753E-04	362.8
8. 4.89	55						924
0.4	10			2.651E-03	3.210E-04	6.876E-04	362.8
8. 4.89	55			3.282E-03	2.396E-03	3.614E-03	924
0.4	30						362.8
8. 4.89	55						924
0.4	20	5.377E-03	2.528E-03				362.8
9. 4.89	52		4.379E-04				925
3.35	10			2.372E-03	3.009E-04	6.473E-04	363.99
9. 4.89	55						925
3.35	10			2.538E-03	3.232E-04	6.756E-04	363.99
9. 4.89	55			3.176E-03	2.383E-03	3.689E-03	925
3.35	30						363.99
9. 4.89	55						925
3.35	20	5.648E-03	2.403E-03				363.99
10. 4.89	52		3.511E-04				923
1.15	10			2.323E-03	2.700E-04	6.313E-04	364.82
10. 4.89	55						923
1.15	10			2.403E-03	2.902E-04	6.257E-04	364.82
10. 4.89	55			3.049E-03	2.296E-03	3.480E-03	923
1.15	30						364.82
10. 4.89	55						923
1.15	20	6.313E-03	2.299E-03				364.82
11. 4.89	52		3.161E-04				925
1.2	10			2.308E-03	2.403E-04	6.234E-04	365.83
11. 4.89	55						925
1.2	10			2.257E-03	2.818E-04	6.357E-04	365.83
11. 4.89	55			3.167E-03	2.343E-03	3.671E-03	925
1.2	30						365.83
11. 4.89	55						925
1.2	20	5.912E-03	2.318E-03				365.83
12. 4.89	52		3.846E-04				924
3.1	10			2.265E-03	2.743E-04	6.083E-04	366.92
12. 4.89	55						924
3.1	10			2.281E-03	2.987E-04	6.352E-04	366.92
12. 4.89	55			2.873E-03	2.276E-03	3.419E-03	924
3.1	30						366.92
12. 4.89	55						924
3.1	20	6.282E-03	2.162E-03				366.92
13. 4.89	52		3.863E-04				928
0.59	10			2.141E-03	2.528E-04	6.180E-04	367.78
13. 4.89	55						928
0.59	10			2.208E-03	2.701E-04	6.183E-04	367.78

Table 6.4.37. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.03		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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13. 4.89	55			2.950E-03	2.188E-03	3.388E-03	928
0.59	30						367.78
13. 4.89	55						928
0.59	20	5.912E-03	2.064E-03				367.78
14. 4.89	52		4.101E-04				922
1. 0	10			2.133E-03	2.878E-04	6.045E-04	368.78
14. 4.89	55						922
1. 0	10			2.106E-03	2.654E-04	6.049E-04	368.78
14. 4.89	55			2.872E-03	2.208E-03	3.232E-03	922
1. 0	30						368.78
14. 4.89	55						922
1. 0	20	5.837E-03	1.923E-03				368.78
15. 4.89	52		3.922E-04				922
0.3	10			2.137E-03	2.876E-04	5.897E-04	369.78
15. 4.89	55						922
0.3	10			2.061E-03	3.217E-04	5.950E-04	369.78
15. 4.89	55			2.846E-03	2.144E-03	3.281E-03	922
0.3	30						369.78
15. 4.89	55						922
0.3	20	6.137E-03	1.919E-03				369.78
16. 4.89	52		4.278E-04				923
0.45	10			2.053E-03	2.911E-04	5.895E-04	370.78
16. 4.89	55						923
0.45	10			2.104E-03	3.217E-04	5.891E-04	370.78
16. 4.89	55			2.764E-03	2.144E-03	3.345E-03	923
0.45	30						370.78
16. 4.89	55						923
0.45	20	6.143E-03	1.941E-03				370.78
17. 4.89	52						918
2.35	10						371.85
17. 4.89	55						918
2.35	10						371.85
17. 4.89	55			2.750E-03	1.914E-03	3.250E-03	918
2.35	30						371.85
17. 4.89	55						918
2.35	20	6.463E-03	1.829E-03				371.85
18. 4.89	52		4.905E-04				919
1. 0	10			1.575E-03	3.029E-04	4.637E-04	372.79
18. 4.89	55						919
1. 0	10			1.677E-03	3.098E-04	5.067E-04	372.79
18. 4.89	55			2.051E-03	1.625E-03	2.427E-03	919
1. 0	30						372.79
18. 4.89	55						919
1. 0	20	4.733E-03	1.420E-03				372.79
20. 4.89	52		4.921E-04				917
0.38	10			1.597E-03	3.051E-04	4.545E-04	374.79
20. 4.89	55						917
0.38	10			1.622E-03	3.589E-04	4.854E-04	374.79
20. 4.89	55			1.999E-03	1.557E-03	2.232E-03	917
0.38	30						374.79
20. 4.89	55						917
0.38	20	4.782E-03	1.380E-03				374.79

Table 6.4.37. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.03		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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21. 4.89	52		5.030E-04				918
0.36	10			1.660E-03	3.203E-04	4.678E-04	375.79
21. 4.89	55						918
0.36	10			1.566E-03	3.476E-04	4.871E-04	375.79
21. 4.89	55			2.017E-03	1.601E-03	2.318E-03	918
0.36	30						375.79
21. 4.89	55						918
0.36	20	4.743E-03	1.374E-03				375.79
22. 4.89	52		4.200E-04				918
0.42	10			1.795E-03	2.822E-04	5.615E-04	376.79
22. 4.89	55						918
0.42	10			1.966E-03	3.161E-04	5.828E-04	376.79
22. 4.89	55			2.686E-03	2.027E-03	3.021E-03	918
0.42	30						376.79
22. 4.89	55						918
0.42	20	6.104E-03	1.782E-03				376.79
23. 4.89	52		5.061E-04				916
0.28	10			1.339E-03	3.012E-04	4.629E-04	377.79
23. 4.89	55						916
0.28	10			1.653E-03	3.703E-04	4.820E-04	377.79
23. 4.89	55			2.046E-03	1.537E-03	2.354E-03	916
0.28	30						377.79
23. 4.89	55						916
0.28	20	4.555E-03	1.324E-03				377.79
24. 4.89	52		4.741E-04				916
0.42	10			1.547E-03	2.985E-04	4.458E-04	378.79
24. 4.89	55						916
0.42	10			1.537E-03	3.088E-04	4.911E-04	378.79
24. 4.89	55			1.999E-03	1.600E-03	2.225E-03	916
0.42	30						378.79
24. 4.89	55						916
0.42	20	4.748E-03	1.319E-03				378.79
25. 4.89	52						44
5. 0	10						379.86
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Table 6.4.38. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29. 4.89	52		3.034E-04				780
1.1	10			1.259E-03	2.767E-04	5.224E-04	380.66
29. 4.89	55						780
1.1	10			1.265E-03		5.342E-04	380.66
29. 4.89	55			1.565E-03	1.287E-03	1.806E-03	780
1.1	30						380.66
29. 4.89	55						780
1.1	20	2.887E-03	1.164E-03				380.66
30. 4.89	52		3.011E-04				786
0.58	10			1.426E-03	2.858E-04	5.319E-04	381.76
30. 4.89	55						786
0.58	10			1.418E-03	3.173E-04	5.530E-04	381.76
30. 4.89	55			1.550E-03	1.178E-03	1.700E-03	786
0.58	30						381.76
30. 4.89	55						786
0.58	20	3.385E-03	1.364E-03				381.76
1. 5.89	52		3.041E-04				792
1.15	10			1.477E-03	2.831E-04	5.490E-04	382.66
1. 5.89	55						792
1.15	10			1.515E-03	2.803E-04	4.703E-04	382.66
1. 5.89	55			1.572E-03	1.246E-03	1.817E-03	792
1.15	30						382.66
1. 5.89	55						792
1.15	20	3.508E-03	1.407E-03				382.66
2. 5.89	52		3.267E-04				791
0.58	10			1.434E-03	2.540E-04	5.373E-04	383.68
2. 5.89	55						791
0.58	10			1.548E-03	2.977E-04	5.434E-04	383.68
2. 5.89	55			1.488E-03	1.236E-03	1.784E-03	791
0.58	30						383.68
2. 5.89	55						791
0.58	20	3.863E-03	1.349E-03				383.68
2. 5.89	55						791
0.58	20						384.1
2. 5.89	52		4.101E-04				887
12.1	10			1.753E-03	3.313E-04	6.292E-04	384.1
2. 5.89	55						887
12.1	10			1.895E-03	3.968E-04	6.646E-04	384.1
2. 5.89	55			2.449E-03	1.808E-03	2.905E-03	887
12.1	30						384.1
2. 5.89	55						887
12.1	20	6.172E-03	1.745E-03				384.1
2. 5.89	52		3.976E-04				883
16.34	10			1.943E-03	3.358E-04	6.261E-04	384.27
2. 5.89	55						883
16.34	10			1.928E-03	3.636E-04	6.473E-04	384.27
2. 5.89	55			2.325E-03	1.786E-03	2.650E-03	883
16.34	30						384.27
2. 5.89	55						883
16.34	20	5.220E-03	1.780E-03				384.27
2. 5.89	52		3.800E-04				883
20.22	10			1.917E-03	3.149E-04	6.253E-04	384.43

Table 6.4.38. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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2. 5.89	55						883
20.22	10			2.022E-03	4.021E-04	6.716E-04	384.43
2. 5.89	55			2.243E-03	1.758E-03	2.459E-03	883
20.22	30						384.43
2. 5.89	55						883
20.22	20	5.442E-03	1.790E-03				384.43
3. 5.89	52		4.057E-04				885
0.33	10			1.878E-03	3.074E-04	5.897E-04	384.61
3. 5.89	55						885
0.33	10			1.955E-03	3.087E-04	6.169E-04	384.61
3. 5.89	55			2.859E-03	2.891E-03	2.866E-03	885
0.33	30						384.61
3. 5.89	55						885
0.33	20	5.323E-03	1.729E-03				384.61
3. 5.89	52		3.825E-04				883
8.1	10			1.859E-03	2.913E-04	5.861E-04	384.96
3. 5.89	55						883
8.1	10			1.978E-03	3.385E-04	6.233E-04	384.96
3. 5.89	55			2.161E-03	1.682E-03	2.494E-03	883
8.1	30						384.96
3. 5.89	55						883
8.1	20	4.872E-03	1.729E-03				384.96
3. 5.89	52		3.726E-04				883
11.54	10			1.868E-03	2.196E-04	5.852E-04	385.1
3. 5.89	55						883
11.54	10			1.796E-03	3.471E-04	5.924E-04	385.1
3. 5.89	55			2.255E-03	1.715E-03	2.506E-03	883
11.54	30						385.1
3. 5.89	55						883
11.54	20	4.641E-03	1.660E-03				385.1
4. 5.89	52		3.678E-04				884
8.3	10			1.725E-03	2.906E-04	5.673E-04	385.96
4. 5.89	55						884
8.3	10			1.805E-03	3.176E-04	5.788E-04	385.96
4. 5.89	55			2.094E-03	1.626E-03	2.383E-03	884
8.3	30						385.96
4. 5.89	55						884
8.3	20	5.193E-03	1.577E-03				385.96
5. 5.89	52		3.633E-04				883
8.4	10			1.672E-03	2.960E-04	5.578E-04	386.98
5. 5.89	55						883
8.4	10			1.799E-03	4.154E-04	5.885E-04	386.98
5. 5.89	55			2.127E-03	1.653E-03	2.366E-03	883
8.4	30						386.98
5. 5.89	55						883
8.4	20	4.571E-03	1.568E-03				386.98
6. 5.89	52		3.887E-04				883
8.47	10			1.705E-03	2.961E-04	5.660E-04	387.98
6. 5.89	55						883
8.47	10			1.746E-03	3.557E-04	5.894E-04	387.98
6. 5.89	55			2.153E-03	1.540E-03	2.241E-03	883
8.47	30						387.98

Table 6.4.38. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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6. 5.89	55						883
8.47	20	4.730E-03	1.578E-03				387.98
7. 5.89	52		3.842E-04				884
8.27	10			1.613E-03	2.976E-04	5.636E-04	388.96
7. 5.89	55						884
8.27	10			1.760E-03	4.025E-04	5.847E-04	388.96
7. 5.89	55			2.085E-03	1.661E-03	2.505E-03	884
8.27	30						388.96
7. 5.89	55						884
8.27	20	4.789E-03	1.551E-03				388.96
10. 5.89	52		3.845E-04				883
1. 2	10			1.714E-03	2.906E-04	5.552E-04	391.65
10. 5.89	55						883
1. 2	10			1.707E-03	2.827E-04	5.784E-04	391.65
10. 5.89	55			2.076E-03	1.588E-03	2.305E-03	883
1. 2	30						391.65
10. 5.89	55						883
1. 2	20	5.320E-03	1.571E-03				391.65
11. 5.89	52		3.671E-04				885
0. 9	10			1.781E-03	2.959E-04	5.674E-04	392.73
11. 5.89	55						885
0. 9	10			1.787E-03	2.956E-04	5.777E-04	392.73
11. 5.89	55			2.107E-03	1.678E-03	2.318E-03	885
0. 9	30						392.73
11. 5.89	55						885
0. 9	20	5.387E-03	1.627E-03				392.73
16. 5.89	52		3.592E-04				883
8.49	10			1.692E-03	3.016E-04	5.625E-04	397.98
16. 5.89	55						883
8.49	10			1.829E-03	4.530E-04	6.073E-04	397.98
16. 5.89	55			2.106E-03	1.666E-03	2.466E-03	883
8.49	30						397.98
16. 5.89	55						883
8.49	20	5.526E-03	1.595E-03				397.98
17. 5.89	52		3.863E-04				882
11.27	10			1.719E-03	3.071E-04	5.790E-04	399.06
17. 5.89	55						882
11.27	10			1.643E-03	2.552E-04	5.685E-04	399.06
17. 5.89	55			2.056E-03	1.603E-03	2.271E-03	882
11.27	30						399.06
17. 5.89	55						882
11.27	30						399.06
18. 5.89	52		3.783E-04				882
8.51	10			1.715E-03	2.989E-04	5.764E-04	399.98
18. 5.89	55						882
8.51	10			1.718E-03	3.084E-04	5.813E-04	399.98
18. 5.89	55			2.117E-03	1.640E-03	2.304E-03	882
8.51	30						399.98
18. 5.89	55						882
8.51	20	4.972E-03	1.559E-03				399.98
19. 5.89	52		3.747E-04				881
8.58	10			1.791E-03	2.992E-04	5.785E-04	400.98

Table 6.4.38. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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19. 5.89	55						881
8.58	10			1.789E-03	3.057E-04	5.991E-04	400.98
19. 5.89	55			2.183E-03	1.649E-03	2.577E-03	881
8.58	30						400.98
19. 5.89	55						881
8.58	20	5.264E-03	1.610E-03				400.98
20. 5.89	52		3.861E-04				882
8.47	10			1.774E-03	2.944E-04	5.829E-04	401.98
20. 5.89	55						882
8.47	10			1.755E-03	2.974E-04	5.854E-04	401.98
20. 5.89	55			2.011E-03	1.577E-03	2.275E-03	882
8.47	30						401.98
20. 5.89	55						882
8.47	20	5.030E-03	1.554E-03				401.98
20. 5.89	55						882
22. 0	20						402.59
21. 5.89	52						31
12. 0	10						403.1
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Table 6.4.39 RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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25. 5.89	52		3.305E-04				751
17.37	10			1.580E-03	3.081E-04	6.003E-04	404.64
25. 5.89	55						751
17.37	10			1.622E-03	3.067E-04	5.744E-04	404.64
25. 5.89	55			1.462E-03	1.202E-03	1.647E-03	751
17.37	30						404.64
25. 5.89	55						751
17.37	20	2.651E-03	1.352E-03				404.64
26. 5.89	52						756
17.58	10			1.644E-03	3.164E-04	5.891E-04	405.6
26. 5.89	55						756
17.58	10			1.687E-03	3.600E-04	5.849E-04	405.6
26. 5.89	55			1.583E-03	1.235E-03	1.770E-03	756
17.58	30						405.6
26. 5.89	55						756
17.58	20	3.751E-03	1.553E-03				405.6
27. 5.89	52		3.314E-04				757
17.1	10			1.766E-03	3.133E-04	5.950E-04	406.55
27. 5.89	55						757
17.1	10			1.791E-03	4.465E-04	5.930E-04	406.55
27. 5.89	55			1.503E-03	1.260E-03	1.809E-03	757
17.1	30						406.55
27. 5.89	55						757
17.1	20	3.976E-03	1.579E-03				406.55
28. 5.89	52		3.251E-04				757
17. 7	10			1.702E-03	3.150E-04	5.954E-04	407.5
28. 5.89	55						757
17. 7	10			1.768E-03	4.179E-04	5.997E-04	407.5
28. 5.89	55			1.596E-03	1.286E-03	1.807E-03	757
17. 7	30						407.5
28. 5.89	55						757
17. 7	20	3.904E-03	1.565E-03				407.5
29. 5.89	52						823
16. 0	10						408.4
29. 5.89	52		3.933E-04				823
16. 0	10			1.925E-03	3.501E-04	6.524E-04	408.4
29. 5.89	55						823
16. 0	10			1.866E-03	3.433E-04	6.828E-04	408.4
29. 5.89	55			2.234E-03	1.665E-03	2.400E-03	823
16. 0	30						408.4
29. 5.89	55						823
16. 0	20	5.841E-03	1.735E-03				408.94
29. 5.89	52		4.002E-04				822
21. 2	10			1.953E-03	3.716E-04	6.638E-04	408.6
29. 5.89	55						822
21. 2	10			1.941E-03	3.594E-04	6.650E-04	408.6
29. 5.89	55			1.985E-03	1.599E-03	2.286E-03	822
21. 2	30						408.6
29. 5.89	55						822
21. 2	20	5.063E-03	1.760E-03				408.6
30. 5.89	52		3.933E-04				821
0.4	10			1.973E-03	3.299E-04	6.322E-04	408.75

Table 6.4.39. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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30. 5.89	55						821
0.4	10			1.894E-03	3.821E-04	6.670E-04	408.75
30. 5.89	55			2.033E-03	1.647E-03	2.181E-03	821
0.4	30						408.75
30. 5.89	55						821
0.4	20	5.394E-03	1.743E-03				408.75
30. 5.89	52		3.872E-04				820
4. 5	10			1.961E-03	3.443E-04	6.692E-04	408.9
30. 5.89	55						820
4. 5	10			1.977E-03	3.076E-04	6.797E-04	408.9
30. 5.89	55			2.063E-03	1.673E-03	2.246E-03	820
4. 5	30						408.9
30. 5.89	55						820
4. 5	20	4.878E-03	1.829E-03				408.9
30. 5.89	52		3.723E-04				820
8.45	10			2.006E-03	3.386E-04	6.692E-04	409.1
30. 5.89	55						820
8.45	10			1.963E-03	3.905E-04	6.755E-04	409.1
30. 5.89	55			2.083E-03	1.697E-03	2.253E-03	820
8.45	30						409.1
30. 5.89	55						820
8.45	20	4.477E-03	1.809E-03				409.1
30. 5.89	52		3.805E-04				820
11.5	10			2.000E-03	3.417E-04	6.537E-04	409.25
30. 5.89	55						820
11.5	10			2.019E-03	2.804E-04	6.687E-04	409.25
30. 5.89	55			1.953E-03	1.630E-03	2.341E-03	820
11.5	30						409.25
30. 5.89	55						820
11.5	20	4.943E-03	1.789E-03				409.25
31. 5.89	52		4.197E-04				823
8.45	10			1.952E-03	3.446E-04	6.518E-04	410.05
31. 5.89	55						823
8.45	10			1.912E-03	4.008E-04	6.476E-04	410.05
31. 5.89	55			2.003E-03	1.635E-03	2.223E-03	823
8.45	30						410.05
31. 5.89	55						823
8.45	20	4.943E-03	1.795E-03				410.05
1. 6.89	52		3.864E-04				823
8.45	10			1.876E-03	3.450E-04	6.728E-04	411
1. 6.89	55						823
8.45	10			1.942E-03	4.028E-04	6.616E-04	411
1. 6.89	55			1.941E-03	1.641E-03	2.227E-03	823
8.45	30						411
1. 6.89	55						823
8.45	20	4.560E-03	1.729E-03				411
2. 6.89	52		3.814E-04				822
8.4	10			1.951E-03	3.278E-04	6.450E-04	411.95
2. 6.89	55						822
8.4	10			1.863E-03	3.633E-04	6.813E-04	411.95
2. 6.89	55			1.984E-03	1.564E-03	2.250E-03	822
8.4	30						411.95

Table 6.4.39. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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2. 6.89	55						822
8.4	20	4.578E-03	1.764E-03				411.95
3. 6.89	52		3.885E-04				822
9. 8	10			1.987E-03	3.282E-04	6.416E-04	412.89
3. 6.89	55						822
9. 8	10			1.922E-03	3.512E-04	6.359E-04	412.89
3. 6.89	55			1.910E-03	1.583E-03	2.278E-03	822
9. 8	30						412.89
3. 6.89	55						822
9. 8	20	5.144E-03	1.714E-03				412.89
4. 6.89	52		3.920E-04				822
8.5	10			1.938E-03	3.364E-04	6.192E-04	413.85
4. 6.89	55						822
8.5	10			1.882E-03	3.310E-04	6.570E-04	413.85
4. 6.89	55			1.947E-03	1.497E-03	2.202E-03	822
8.5	30						413.85
4. 6.89	55						822
8.5	20	5.015E-03	1.586E-03				413.85
5. 6.89	52		3.808E-04				822
8.24	10			1.921E-03	3.368E-04	6.267E-04	414.8
5. 6.89	55						822
8.24	10			1.904E-03	3.421E-04	6.372E-04	414.8
5. 6.89	52		3.716E-04				823
9.25	10			2.005E-03	3.767E-04	7.385E-04	414.8
5. 6.89	52		6.014E-04				823
9.4	10			2.132E-03	4.142E-04	7.581E-04	414.8
5. 6.89	52		6.976E-04				823
9.54	10			2.244E-03	4.602E-04	9.373E-04	414.8
5. 6.89	52		8.522E-04				1026
10.33	10			2.843E-03	5.133E-04	1.004E-03	414.91
5. 6.89	52		8.189E-04				1026
10.45	10			2.949E-03	4.900E-04	1.009E-03	414.92
5. 6.89	55						1026
10.45	10			2.932E-03	4.843E-04	1.106E-03	414.92
5. 6.89	55			6.994E-03	4.767E-03	9.196E-03	1026
10.45	30						414.92
5. 6.89	55						1026
10.45	20	3.411E-02	3.121E-03				414.93
5. 6.89	52		7.872E-04				1021
15.51	10			3.478E-03	4.826E-04	8.875E-04	414.93
5. 6.89	55						1021
15.51	10			3.611E-03	6.071E-04	1.072E-03	415.1
5. 6.89	55			5.739E-03	4.338E-03	6.658E-03	1021
15.51	30						415.1
5. 6.89	55						1021
15.51	20	3.960E-02	3.468E-03				415.1
5. 6.89	52		7.545E-04				1020
19.5	10			3.459E-03	4.802E-04	9.912E-04	415.3
5. 6.89	55						1020
19.5	10			3.670E-03	5.634E-04	1.108E-03	415.3
5. 6.89	55			5.688E-03	4.337E-03	6.673E-03	1020
19.5	30						415.3

Table 6.4.39. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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5. 6.89	55						1020
19.5	20	2.138E-02	3.457E-03				415.3
6. 6.89	52		8.003E-04				1021
0.25	10			3.508E-03	4.695E-04	9.322E-04	415.45
6. 6.89	55						1021
0.25	10			3.794E-03	5.279E-04	1.066E-03	415.45
6. 6.89	55			5.675E-03	4.433E-03	6.537E-03	1021
0.25	30						415.45
6. 6.89	55						1021
0.25	20	2.287E-02	3.588E-03				415.45
6. 6.89	52		7.849E-04				1020
4.18	10			3.572E-03	5.000E-04	1.006E-03	415.6
6. 6.89	55						1020
4.18	10			3.740E-03	3.536E-04	1.049E-03	415.6
6. 6.89	55			5.717E-03	4.293E-03	6.556E-03	1020
4.18	30						415.6
6. 6.89	55						1020
4.18	20	2.187E-02	3.559E-03				415.6
6. 6.89	52		7.880E-04				1019
8.31	10			3.570E-03	4.630E-04	9.652E-04	415.75
6. 6.89	55						1019
8.31	10			3.660E-03	3.822E-04	1.022E-03	415.75
6. 6.89	55			5.733E-03	4.323E-03	6.651E-03	1019
8.31	30						415.75
6. 6.89	55						1019
8.31	20	2.218E-02	3.523E-03				415.75
6. 6.89	52		7.625E-04				1023
16. 0	10			3.707E-03	4.587E-04	1.027E-03	416.15
6. 6.89	55						1023
16. 0	10			3.924E-03	4.836E-04	1.106E-03	416.15
6. 6.89	55			6.008E-03	4.493E-03	7.039E-03	1023
16. 0	30						416.15
6. 6.89	55						1023
16. 0	20	2.829E-02	3.854E-03				416.15
6. 6.89	52		7.481E-04				1023
19.5	10			3.705E-03	4.586E-04	9.849E-04	416.3
6. 6.89	55						1023
19.5	10			3.988E-03	5.449E-04	1.082E-03	416.3
6. 6.89	55			5.846E-03	4.570E-03	6.819E-03	1023
19.5	30						416.3
6. 6.89	55						1023
19.5	20	2.435E-02	3.836E-03				416.3
7. 6.89	52		7.756E-04				1023
0.33	10			3.691E-03	4.520E-04	1.013E-03	416.35
7. 6.89	55						1023
0.33	10			3.974E-03	4.581E-04	1.040E-03	416.35
7. 6.89	55			5.783E-03	4.498E-03	6.777E-03	1023
0.33	30						416.35
7. 6.89	55						1023
0.33	20	2.396E-02	3.856E-03				416.35
7. 6.89	52		7.440E-04				1022
16. 8	10			3.762E-03	4.396E-04	9.836E-04	417.05

Table 6.4.39. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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7. 6.89	55						1022
16. 8	10			4.068E-03	4.970E-04	1.060E-03	417.05
7. 6.89	55			5.881E-03	4.418E-03	6.897E-03	1022
16. 8	30						417.05
7. 6.89	55						1022
16. 8	20	2.372E-02	3.898E-03				417.05
8. 6.89	52		7.569E-04				1024
16.2	10			4.169E-03	4.507E-04	9.150E-04	418
8. 6.89	55						1024
16.2	10			4.315E-03	6.124E-04	1.044E-03	418
8. 6.89	55			5.867E-03	4.463E-03	6.790E-03	1024
16.2	30						418
8. 6.89	55						1024
16.2	20	3.029E-02	4.203E-03				418
9. 6.89	52		7.381E-04				1024
7.48	10			4.691E-03	4.679E-04	9.955E-04	418.65
9. 6.89	55						1024
7.48	10			4.859E-03	5.099E-04	1.044E-03	418.65
9. 6.89	55			5.962E-03	4.664E-03	6.909E-03	1024
7.48	30						418.65
9. 6.89	55						1024
7.48	20	5.303E-02	4.882E-03				418.65
9. 6.89	52		7.660E-04				1023
10.4	10			4.597E-03	4.341E-04	9.388E-04	418.75
9. 6.89	52		2.657E-04				1023
10.55	10			5.333E-03	2.714E-04	5.530E-04	418.76
9. 6.89	52		2.981E-04				837
11.1	10			6.772E-03	2.847E-04	5.767E-04	418.77
9. 6.89	52		2.815E-04				837
11.3	10			7.259E-03	2.887E-04	6.002E-04	418.8
9. 6.89	55						837
11.3	10			7.239E-03	3.112E-04	6.030E-04	418.8
9. 6.89	55			2.221E-03	1.594E-03	3.382E-03	837
11.3	30						418.8
9. 6.89	55						837
11.3	20	2.213E-01	7.408E-03				418.8
9. 6.89	52		3.472E-04				818
16.43	10			5.233E-03	3.103E-04	5.895E-04	419
9. 6.89	55						818
16.43	10			4.914E-03	2.934E-04	5.472E-04	419
9. 6.89	55			1.895E-03	1.558E-03	2.174E-03	818
16.43	30						419
9. 6.89	55						818
16.43	20	2.058E-02	4.847E-03				419
9. 6.89	52		3.439E-04				828
19.55	10			4.116E-03	3.075E-04	6.011E-04	419.15
9. 6.89	55						828
19.55	10			4.235E-03	3.933E-04	6.018E-04	419.15
9. 6.89	55			1.856E-03	1.501E-03	2.035E-03	828
19.55	30						419.15
9. 6.89	55						828
19.55	20	1.698E-02	3.911E-03				419.15

Table 6.4.39. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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10. 6.89	52		3.342E-04				831
0. 0	10			3.219E-03	3.027E-04	5.583E-04	419.25
10. 6.89	55						831
0. 0	10			3.340E-03	4.356E-04	5.740E-04	419.25
10. 6.89	55			1.849E-03	1.451E-03	2.154E-03	831
0. 0	30						419.25
10. 6.89	55						831
0. 0	20	1.453E-02	3.043E-03				419.25
10. 6.89	52		3.287E-04				831
3.56	10			2.730E-03	2.921E-04	5.929E-04	419.4
10. 6.89	55						831
3.56	10			2.795E-03	3.162E-04	5.916E-04	419.4
10. 6.89	55			1.967E-03	1.481E-03	2.323E-03	831
3.56	30						419.4
10. 6.89	55						831
3.56	20	1.193E-02	2.675E-03				419.4
10. 6.89	52		3.266E-04				832
8.3	10			2.421E-03	3.119E-04	5.773E-04	419.65
10. 6.89	55						832
8.3	10			3.004E-03	5.778E-04	7.296E-04	419.65
10. 6.89	55			1.942E-03	1.472E-03	2.150E-03	832
8.3	30						419.65
10. 6.89	55						832
8.3	20	1.168E-02	2.292E-03				419.65
10. 6.89	52		3.452E-04				832
11.52	10			2.282E-03	3.058E-04	5.974E-04	419.75
10. 6.89	55						832
11.52	10			2.280E-03	3.811E-04	6.180E-04	419.75
10. 6.89	55			1.999E-03	1.502E-03	2.177E-03	832
11.52	30						419.75
10. 6.89	55						832
11.52	20	1.122E-02	2.110E-03				419.75
10. 6.89	52		3.348E-04				832
17. 9	10			2.016E-03	3.066E-04	5.977E-04	420
10. 6.89	55						832
17. 9	10			2.071E-03	2.803E-04	5.914E-04	420
10. 6.89	55			1.940E-03	1.479E-03	2.131E-03	832
17. 9	30						420
10. 6.89	55						832
17. 9	20	1.035E-02	1.867E-03				420
10. 6.89	52		3.493E-04				831
20.22	10			1.881E-03	2.802E-04	5.948E-04	420.1
10. 6.89	55						831
20.22	10			1.833E-03	2.686E-04	5.820E-04	420.1
10. 6.89	55			1.822E-03	1.421E-03	2.055E-03	831
20.22	30						420.1
10. 6.89	55						831
20.22	20	8.508E-03	1.816E-03				420.1
11. 6.89	52		3.232E-04				834
16.17	10			1.778E-03	3.056E-04	5.880E-04	420.85
11. 6.89	55						834
16.17	10			1.780E-03	3.692E-04	6.029E-04	420.85

Table 6.4.39. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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11. 6.89	55			1.882E-03	1.486E-03	2.125E-03	834
16.17	30						420.85
11. 6.89	55						834
16.17	20	6.106E-03	1.712E-03				420.85
12. 6.89	52		3.144E-04				833
16.12	10			1.771E-03	3.151E-04	5.698E-04	421.8
12. 6.89	55						833
16.12	10			1.825E-03	3.006E-04	6.116E-04	421.8
12. 6.89	55			1.750E-03	1.440E-03	2.102E-03	833
16.12	30						421.8
12. 6.89	55						833
16.12	20	5.274E-03	1.608E-03				421.8
13. 6.89	52		3.319E-04				831
16.12	10			1.695E-03	3.076E-04	5.738E-04	422.75
13. 6.89	55						831
16.12	10			1.740E-03	3.673E-04	5.843E-04	422.75
13. 6.89	55			1.771E-03	1.395E-03	1.869E-03	831
16.12	30						422.75
13. 6.89	55						831
16.12	20	4.635E-03	1.594E-03				422.75
14. 6.89	52		3.333E-04				827
16.17	10			1.721E-03	3.018E-04	5.861E-04	423.7
14. 6.89	55						827
16.17	10			1.755E-03	3.488E-04	5.699E-04	423.7
14. 6.89	55			1.641E-03	1.312E-03	1.738E-03	827
16.17	30						423.7
14. 6.89	55						827
16.17	20	3.815E-03	1.520E-03				423.7
15. 6.89	55						39
7. 0	20						423.75
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Table 6.4.40. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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18. 6.89	52						779
8.59	10						423.75
18. 6.89	52		3.275E-04				779
8.59	10			1.186E-03	3.161E-04	6.206E-04	424.13
18. 6.89	55						779
8.59	10			1.214E-03	3.373E-04	6.255E-04	424.13
18. 6.89	55			1.552E-03	1.227E-03	1.726E-03	779
8.59	30						424.13
18. 6.89	55						779
8.59	20	2.566E-03	1.114E-03				424.13
19. 6.89	52		3.241E-04				784
0.45	10			1.620E-03	3.075E-04	6.003E-04	424.82
19. 6.89	55						784
0.45	10			1.721E-03	4.106E-04	6.022E-04	424.82
19. 6.89	55			1.529E-03	1.245E-03	1.718E-03	784
0.45	30						424.82
19. 6.89	55						784
0.45	20	3.016E-03	1.434E-03				424.82
20. 6.89	52		3.315E-04				787
0.5	10			1.707E-03	3.395E-04	6.384E-04	425.82
20. 6.89	55						787
0.5	10			1.730E-03	3.081E-04	5.876E-04	425.82
20. 6.89	55			1.549E-03	1.218E-03	1.779E-03	787
0.5	30						425.82
20. 6.89	55						787
0.5	20	2.985E-03	1.528E-03				425.82
21. 6.89	52		3.243E-04				760
0.5	10			1.620E-03	2.152E-04	5.484E-04	426.82
21. 6.89	55						760
0.5	10			1.516E-03	2.921E-04	5.288E-04	426.82
21. 6.89	55			1.243E-03	1.032E-03	1.387E-03	760
0.5	30						426.82
21. 6.89	55						760
0.5	20	2.854E-03	1.399E-03				426.82
21. 6.89	52		3.077E-04				761
8.42	10			1.582E-03	3.197E-04	5.682E-04	427.03
21. 6.89	52		3.473E-04				866
9. 0	10			1.518E-03	3.092E-04	6.606E-04	427.04
21. 6.89	52		7.415E-04				866
9.12	10			2.587E-03	4.990E-04	1.191E-03	427.05
21. 6.89	52		7.460E-04				866
9.3	10			2.439E-03	4.945E-04	9.953E-04	427.06
21. 6.89	52		7.267E-04				866
9.45	10			2.468E-03	4.770E-04	9.671E-04	427.07
21. 6.89	52		6.997E-04				1032
10. 0	10			2.582E-03	4.835E-04	9.569E-04	427.09
21. 6.89	52		7.034E-04				1032
10.53	10			2.511E-03	4.585E-04	9.101E-04	427.12
21. 6.89	55						1032
10.53	10			2.860E-03	5.403E-04	1.002E-03	427.12
21. 6.89	55			5.534E-03	3.892E-03	7.135E-03	1032
10.53	30						427.12

Table 6.4.40. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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21. 6.89	55						1032
10.53	20	1.995E-02	2.813E-03				427.12
21. 6.89	52		7.278E-04				1029
16.15	10			2.998E-03	4.466E-04	8.902E-04	427.32
21. 6.89	55						1029
16.15	10			2.977E-03		9.400E-04	427.32
21. 6.89	55			4.696E-03	3.399E-03	5.190E-03	1029
16.15	30						427.32
21. 6.89	55						1029
16.15	20	1.235E-02	2.850E-03				427.32
21. 6.89	52		6.982E-04				1028
19.3	10			3.043E-03	4.224E-04	9.228E-04	427.44
21. 6.89	55						1028
19.3	10			3.130E-03	5.024E-04	9.333E-04	427.44
21. 6.89	55			4.503E-03	3.531E-03	5.302E-03	1028
19.3	30						427.44
21. 6.89	55						1028
19.3	20	1.068E-02	2.824E-03				427.44
21. 6.89	52		6.933E-04				1028
23.54	10			2.975E-03	4.405E-04	8.039E-04	427.65
21. 6.89	55						1028
23.54	10			2.942E-03	3.349E-04	8.635E-04	427.65
21. 6.89	55			4.299E-03	3.329E-03	4.973E-03	1028
23.54	30						427.65
21. 6.89	55						1028
23.54	20	1.010E-02	2.793E-03				427.65
22. 6.89	52		6.728E-04				1028
2.55	10			2.831E-03	4.238E-04	8.397E-04	427.8
22. 6.89	55						1028
2.55	10			2.974E-03	5.083E-04	8.861E-04	427.8
22. 6.89	55			4.344E-03	3.500E-03	5.007E-03	1028
2.55	30						427.8
22. 6.89	55						1028
2.55	20	1.053E-02	2.783E-03				427.8
22. 6.89	52		6.643E-04				1029
16.35	10			2.818E-03	4.263E-04	8.244E-04	428.35
22. 6.89	55						1029
16.35	10			2.994E-03	4.518E-04	8.684E-04	428.35
22. 6.89	55			4.243E-03	3.339E-03	4.780E-03	1029
16.35	30						428.35
22. 6.89	55						1029
16.35	20	1.041E-02	2.829E-03				428.35
23. 6.89	52		6.866E-04				1027
17.3	10			2.960E-03	4.294E-04	8.283E-04	429.37
23. 6.89	55						1027
17.3	10			3.150E-03	5.248E-04	8.618E-04	429.37
23. 6.89	55			4.290E-03	3.256E-03	4.931E-03	1027
17.3	30						429.37
23. 6.89	55						1027
17.3	20	1.392E-02	2.869E-03				429.37
24. 6.89	52		6.721E-04				1027
16.1	10			3.259E-03	3.907E-04	8.070E-04	430.33

Table 6.4.40. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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24. 6.89	55						1027
16.1	10			3.279E-03	3.906E-04	8.559E-04	430.33
24. 6.89	55			4.352E-03	3.363E-03	5.103E-03	1027
16.1	30						430.33
24. 6.89	55						1027
16.1	20	1.778E-02	3.053E-03				430.33
25. 6.89	52		6.482E-04				1031
16.35	10			3.478E-03	4.320E-04	8.307E-04	431.34
25. 6.89	55						1031
16.35	10			3.617E-03	4.853E-04	8.718E-04	431.34
25. 6.89	55			4.611E-03	3.471E-03	5.340E-03	1031
16.35	30						431.34
25. 6.89	55						1031
16.35	20	2.174E-02	3.396E-03				431.34
28. 6.89	52		6.420E-04				1032
11.48	10			4.530E-03	4.218E-04	8.673E-04	433.71
28. 6.89	55						1032
11.48	10			4.691E-03	4.075E-04	9.312E-04	433.71
28. 6.89	55			5.221E-03	3.706E-03	6.435E-03	1032
11.48	30						433.71
28. 6.89	55						1032
11.48	20	1.573E-01	4.994E-03				433.71
28. 6.89	52		6.153E-04				1031
16. 3	10			4.793E-03	4.272E-04	8.841E-04	433.87
28. 6.89	55						1031
16. 3	10			4.714E-03	4.413E-04	9.056E-04	433.87
28. 6.89	55			4.712E-03	3.606E-03	5.474E-03	1031
16. 3	30						433.87
28. 6.89	55						1031
16. 3	20	6.000E-02	4.603E-03				433.87
30. 6.89	52		5.817E-04				1032
8.28	10			4.868E-03	4.116E-04	8.927E-04	435.43
30. 6.89	55						1032
8.28	10			5.408E-03	7.526E-04	9.912E-04	435.43
30. 6.89	55			5.189E-03	3.772E-03	6.687E-03	1032
8.28	30						435.43
30. 6.89	55						1032
8.28	20	1.143E-01	5.527E-03				435.43
30. 6.89	52		6.261E-04				1030
16.14	10			5.302E-03	4.378E-04	9.345E-04	435.74
30. 6.89	55						1030
16.14	10			5.462E-03	3.971E-04	9.487E-04	435.74
30. 6.89	55			4.937E-03	3.808E-03	6.061E-03	1030
16.14	30						435.74
30. 6.89	55						1030
16.14	20	1.010E-01	5.462E-03				435.74
1. 7.89	52		6.105E-04				1029
0.4	10			5.181E-03	4.255E-04	9.119E-04	436.07
1. 7.89	55						1029
0.4	10			5.647E-03	4.507E-04	9.558E-04	436.07
1. 7.89	55			4.918E-03	3.741E-03	5.910E-03	1029
0.4	30						436.07

Table 6.4.40. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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1. 7.89	55						1029
0.4	20	6.906E-02	5.095E-03				436.07
1. 7.89	52		6.263E-04				1031
15.57	10			5.260E-03	4.409E-04	8.906E-04	436.64
1. 7.89	55						1031
15.57	10			5.271E-03	4.310E-04	9.482E-04	436.64
1. 7.89	55			4.727E-03	3.563E-03	5.553E-03	1031
15.57	30						436.64
1. 7.89	55						1031
15.57	20	5.927E-02	5.095E-03				436.64
2. 7.89	52		6.612E-04				1031
16. 8	10			5.593E-03	4.471E-04	9.423E-04	437.57
2. 7.89	55						1031
16. 8	10			5.616E-03	5.551E-04	9.856E-04	437.57
2. 7.89	55			4.991E-03	3.740E-03	5.949E-03	1031
16. 8	30						437.57
2. 7.89	55						1031
16. 8	20	1.155E-01	5.507E-03				437.57
4. 7.89	52		6.098E-04				1022
20.31	10			4.904E-03	4.269E-04	8.566E-04	439.69
4. 7.89	55						1022
20.31	10			5.112E-03	4.830E-04	9.357E-04	439.69
4. 7.89	55			4.405E-03	3.406E-03	5.349E-03	1022
20.31	30						439.69
4. 7.89	55						1022
20.31	20	5.823E-02	4.959E-03				439.69
5. 7.89	52		5.703E-04				1022
0.5	10			4.757E-03	4.036E-04	8.907E-04	439.87
5. 7.89	55			4.611E-03	3.387E-03	5.543E-03	1022
0.5	30						439.87
5. 7.89	55						1022
0.5	20	6.928E-02	5.074E-03				439.87
5. 7.89	52		6.155E-04				1022
3.58	0			4.916E-03	4.319E-04	8.917E-04	440.02
5. 7.89	55						1022
3.58	10			5.142E-03	4.541E-04	9.603E-04	440.02
5. 7.89	55			4.559E-03	3.437E-03	5.385E-03	1022
3.58	30						440.02
5. 7.89	55						1022
3.58	20	4.910E-02	4.911E-03				440.02
5. 7.89	52		6.196E-04				1022
8.1	10			4.690E-03	4.319E-04	8.926E-04	440.14
5. 7.89	52		6.231E-04				1022
8.17	10			4.744E-03	4.259E-04	8.885E-04	440.15
5. 7.89	52		6.157E-04				1022
8.23	10			4.636E-03	4.196E-04	8.831E-04	440.16
5. 7.89	52		5.694E-04				1022
8.29	10			4.628E-03	4.197E-04	8.788E-04	440.17
5. 7.89	52		5.852E-04				1022
8.49	10			4.658E-03	4.371E-04	8.675E-04	440.18
5. 7.89	52		5.999E-04				1021
9. 2	10			4.504E-03	4.179E-04	8.876E-04	440.19

Table 6.4.40. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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5. 7.89	52		6.797E-04				1021
9. 6	10			4.831E-03	4.644E-04	1.019E-03	440.19
5. 7.89	52		7.500E-04				1021
9.15	10			4.806E-03	4.950E-04	1.040E-03	440.2
5. 7.89	52		6.975E-04				1021
9.22	10			4.842E-03	4.845E-04	1.027E-03	440.2
5. 7.89	52		7.459E-04				1021
9.34	10			4.774E-03	4.597E-04	1.007E-03	440.21
5. 7.89	52		7.370E-04				1021
9.44	10			4.676E-03	4.549E-04	9.707E-04	440.2
5. 7.89	55						1021
9.44	10			5.031E-03	5.136E-04	1.047E-03	440.2
5. 7.89	55			6.151E-03	4.502E-03	7.767E-03	1021
9.44	30						440.2
5. 7.89	55						1021
9.44	20	9.158E-02	5.125E-03				440.2
5. 7.89	52		7.332E-04				1057
13. 0	10			5.172E-03	4.962E-04	1.019E-03	440.31
5. 7.89	55						1057
13. 0	10			5.398E-03	5.034E-04	1.090E-03	440.2
5. 7.89	55			5.852E-03	4.360E-03	7.168E-03	1057
13. 0	30						440.2
5. 7.89	55						1057
13. 0	20	1.103E-01	5.545E-03				440.2
5. 7.89	52		7.365E-04				1056
17.4	10			6.018E-03	4.815E-04	1.104E-03	440.5
5. 7.89	55						1056
17.4	10			6.245E-03	5.063E-04	1.152E-03	440.5
5. 7.89	55			6.020E-03	4.561E-03	7.234E-03	1056
17.4	30						440.5
5. 7.89	55						1056
17.4	20	1.361E-01	3.508E-03				440.5
5. 7.89	52		7.182E-04				1055
21.57	10			6.061E-03	4.863E-04	1.007E-03	440.69
5. 7.89	55						1055
21.57	10			6.317E-03	4.306E-04	1.099E-03	440.69
5. 7.89	55			6.161E-03	4.605E-03	7.364E-03	1055
21.57	30						440.69
5. 7.89	55						1055
21.57	20	1.426E-01	6.508E-03				440.69
6. 7.89	52		7.162E-04				1055
1. 5	10			6.117E-03	4.960E-04	1.044E-03	440.8
6. 7.89	55						1055
1. 5	10			6.480E-03	5.509E-04	1.120E-03	440.8
6. 7.89	55			5.766E-03	4.267E-03	6.969E-03	1055
1. 5	30						440.8
6. 7.89	55						1055
1. 5	20	9.018E-02	6.386E-03				440.8
6. 7.89	52		7.318E-04				1054
6.23	10			6.517E-03	5.010E-04	1.031E-03	441.01
6. 7.89	55						1054
6.23	10			6.697E-03	5.392E-04	1.104E-03	441.01

Table 6.4.40. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. B		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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6. 7.89	55			5.778E-03	4.239E-03	7.130E-03	1054
6.23	30						441.01
6. 7.89	55						1054
6.23	20	1.304E-01	6.887E-03				441.01
6. 7.89	52		7.121E-04				1053
17.13	10			7.425E-03	4.782E-04	1.092E-03	441.43
6. 7.89	55						1053
17.13	10			7.575E-03	4.621E-04	1.134E-03	441.43
6. 7.89	55			6.632E-03	4.593E-03	7.485E-03	1053
17.13	30						441.43
6. 7.89	55						1053
17.13	20	1.496E-01	7.736E-03				441.43
7. 7.89	52		6.860E-04				1052
16.34	10			8.062E-03	5.128E-04	1.175E-03	442.34
7. 7.89	55						1052
16.34	10			8.248E-03	6.018E-04	1.203E-03	442.34
7. 7.89	55			6.355E-03	4.799E-03	7.637E-03	1052
16.34	30						442.34
7. 7.89	55						1052
16.34	20	1.585E-01	8.550E-03				442.34
7. 7.89	55						1090
20. 0	20						442.85
7. 7.89	55						1090
20. 0	20						442.85
8. 7.89	52		1.332E-03				1106
16.47	10			2.675E-02	9.375E-04	2.240E-03	443.25
8. 7.89	55						1106
16.47	10			2.922E-02	1.025E-03	4.264E-03	443.25
8. 7.89	55			1.484E-02	1.056E-02	2.031E-02	1106
16.47	30						443.25
8. 7.89	55						1106
16.47	20	9.501E-01	6.208E-02				443.25
9. 7.89	52		1.243E-03				1106
16.5	10			2.396E-02	9.754E-04	2.331E-03	444.18
9. 7.89	55						1106
16.5	0			2.846E-02	1.132E-03	2.870E-03	444.18
9. 7.89	55			1.497E-02	1.047E-02	2.000E-02	1106
16.5	30						444.18
9. 7.89	55						1106
16.5	20	5.855E-01	6.329E-02				444.18
10. 7.89	52		1.196E-03				1105
22.48	10			2.247E-02	9.712E-04	2.183E-03	445.27
10. 7.89	55						1105
22.48	10			2.725E-02	1.262E-03	3.130E-03	445.27
10. 7.89	55			1.632E-02	1.234E-02	2.091E-02	1105
22.48	30						445.27
10. 7.89	55						1105
22.48	20	6.281E-01	6.506E-02				445.27
11. 7.89	55						72
3. 0	20						445.35
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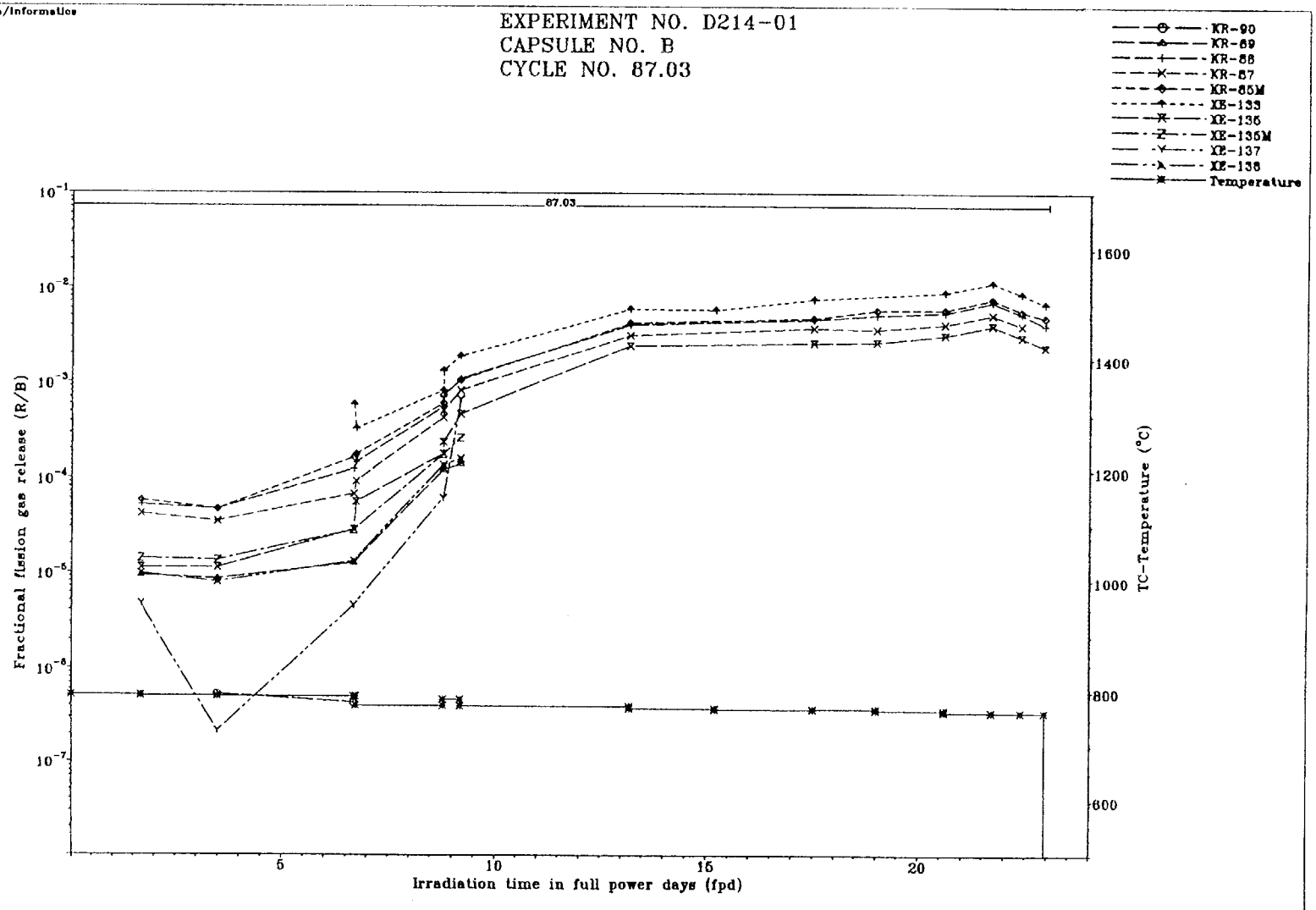

Fig. 6.4.21. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

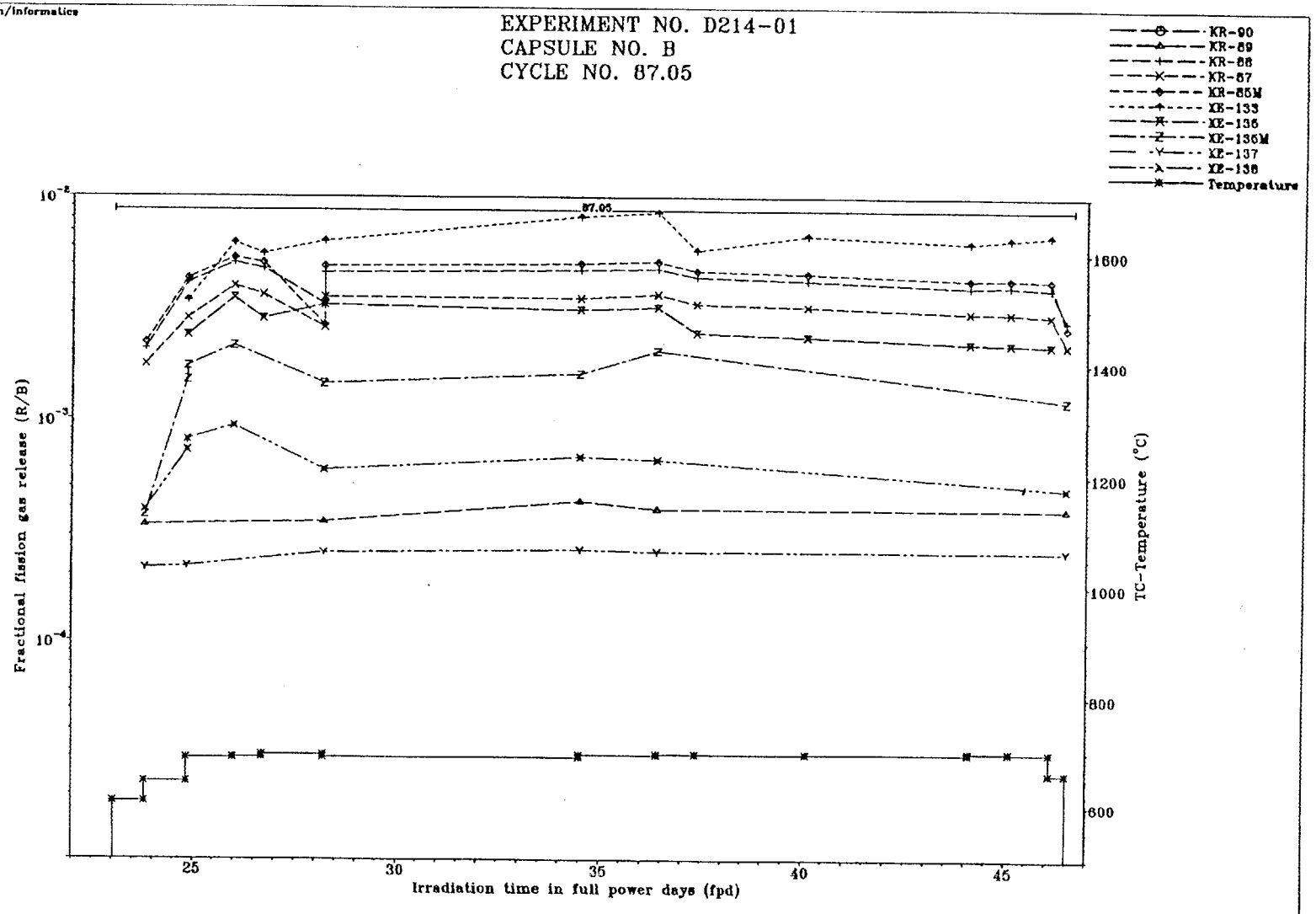

Fig. 6.4.22. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

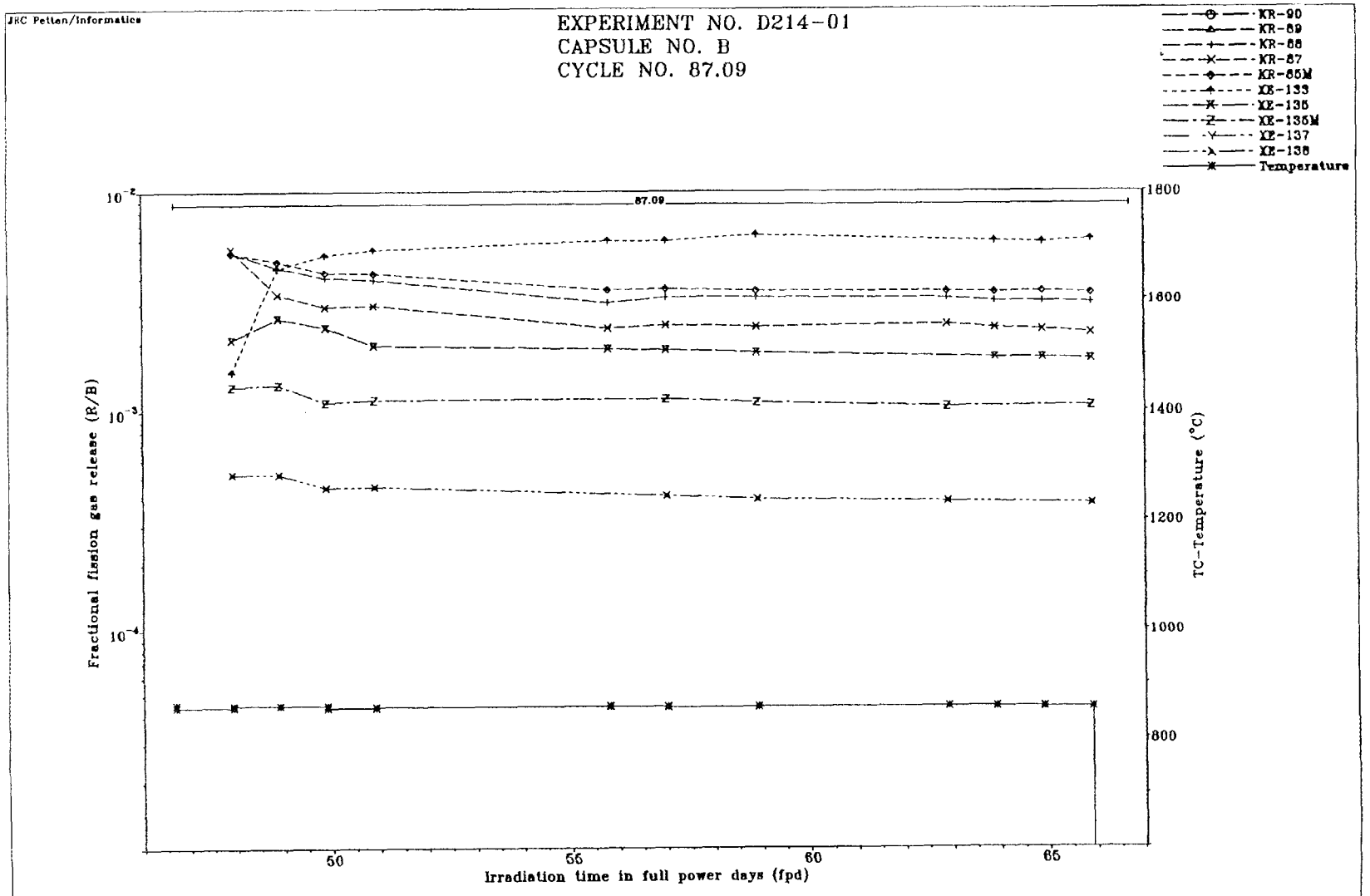

Fig. 6.4.23. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

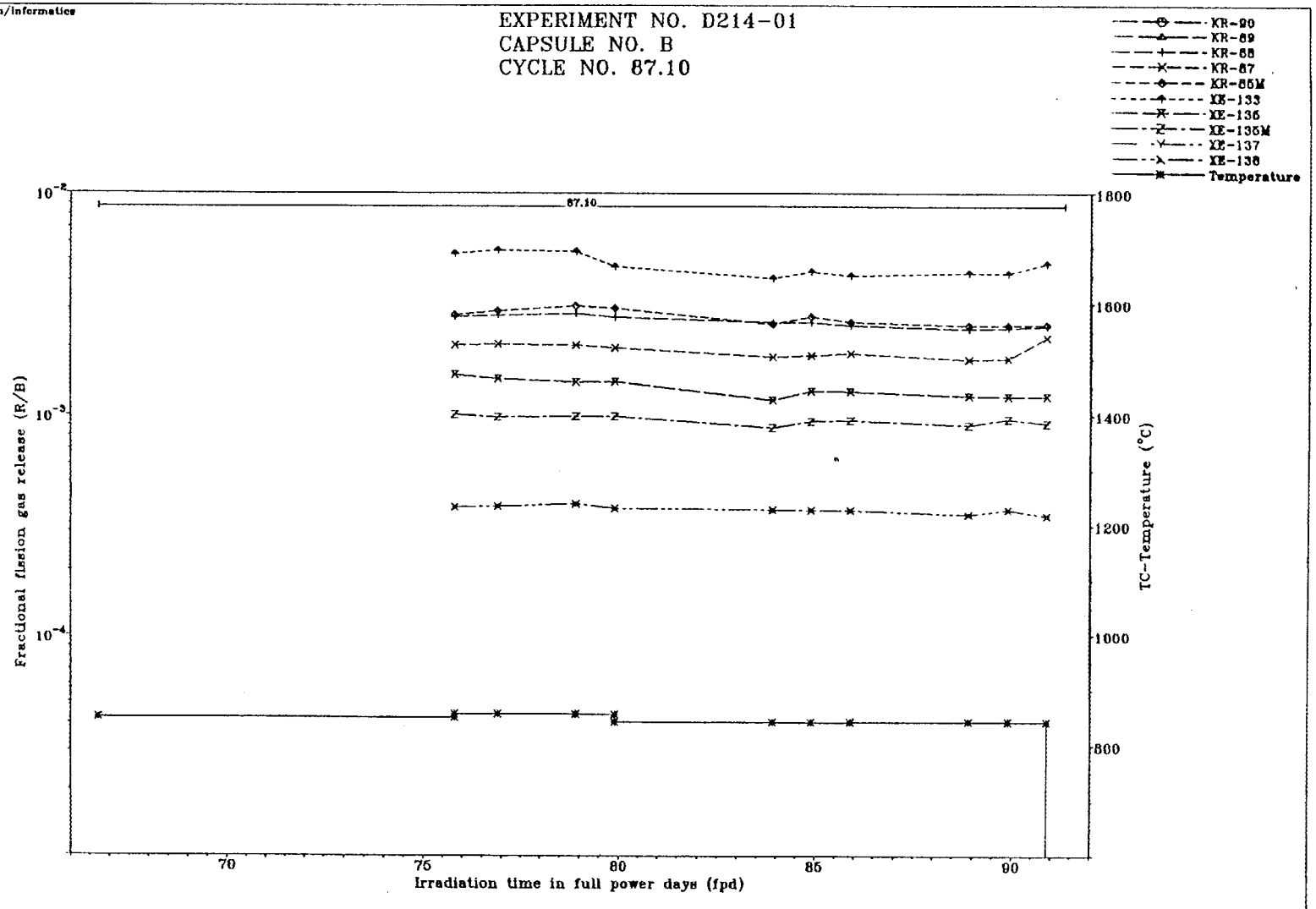

Fig. 6.4.24. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

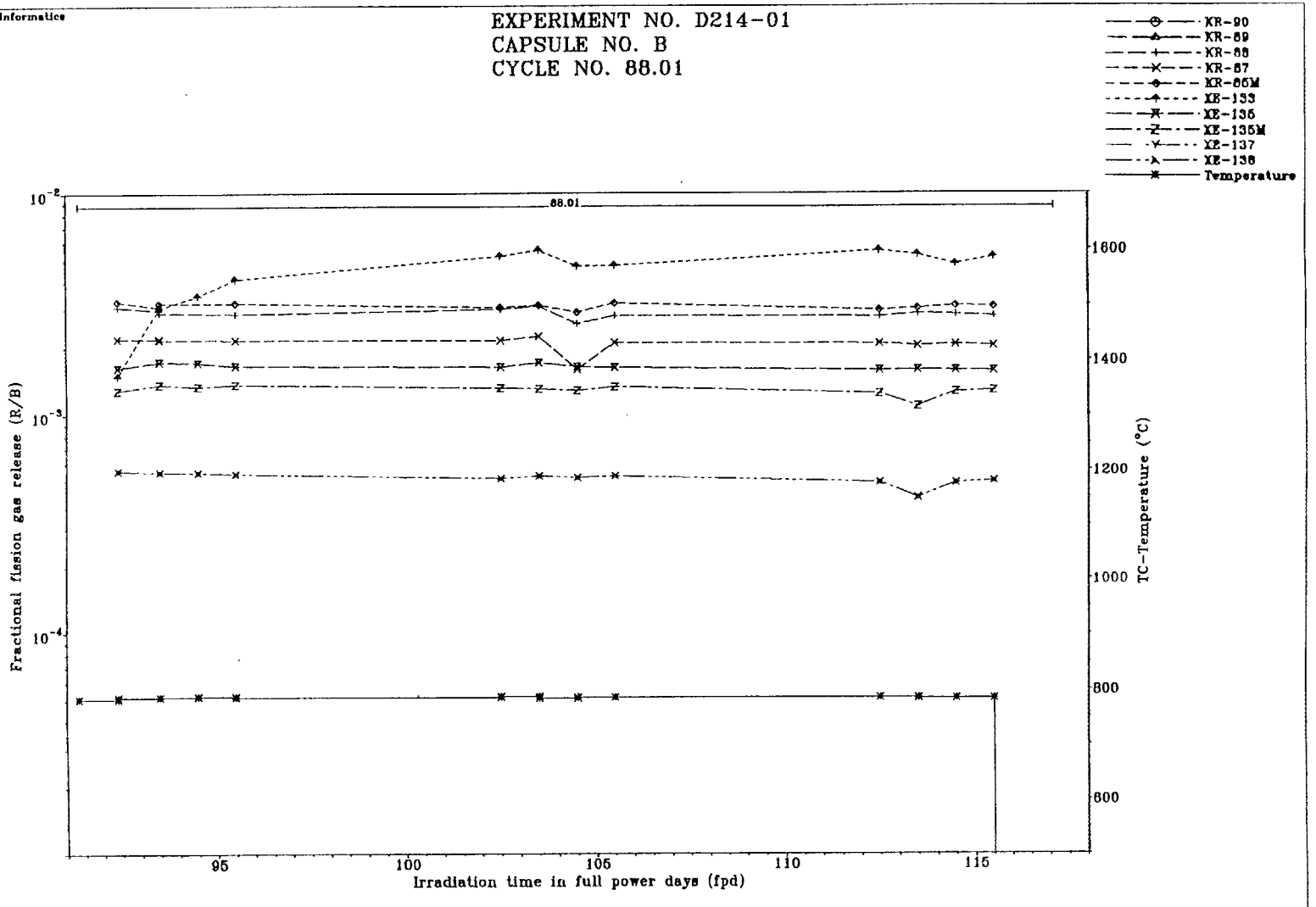

Fig. 6.4.25. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

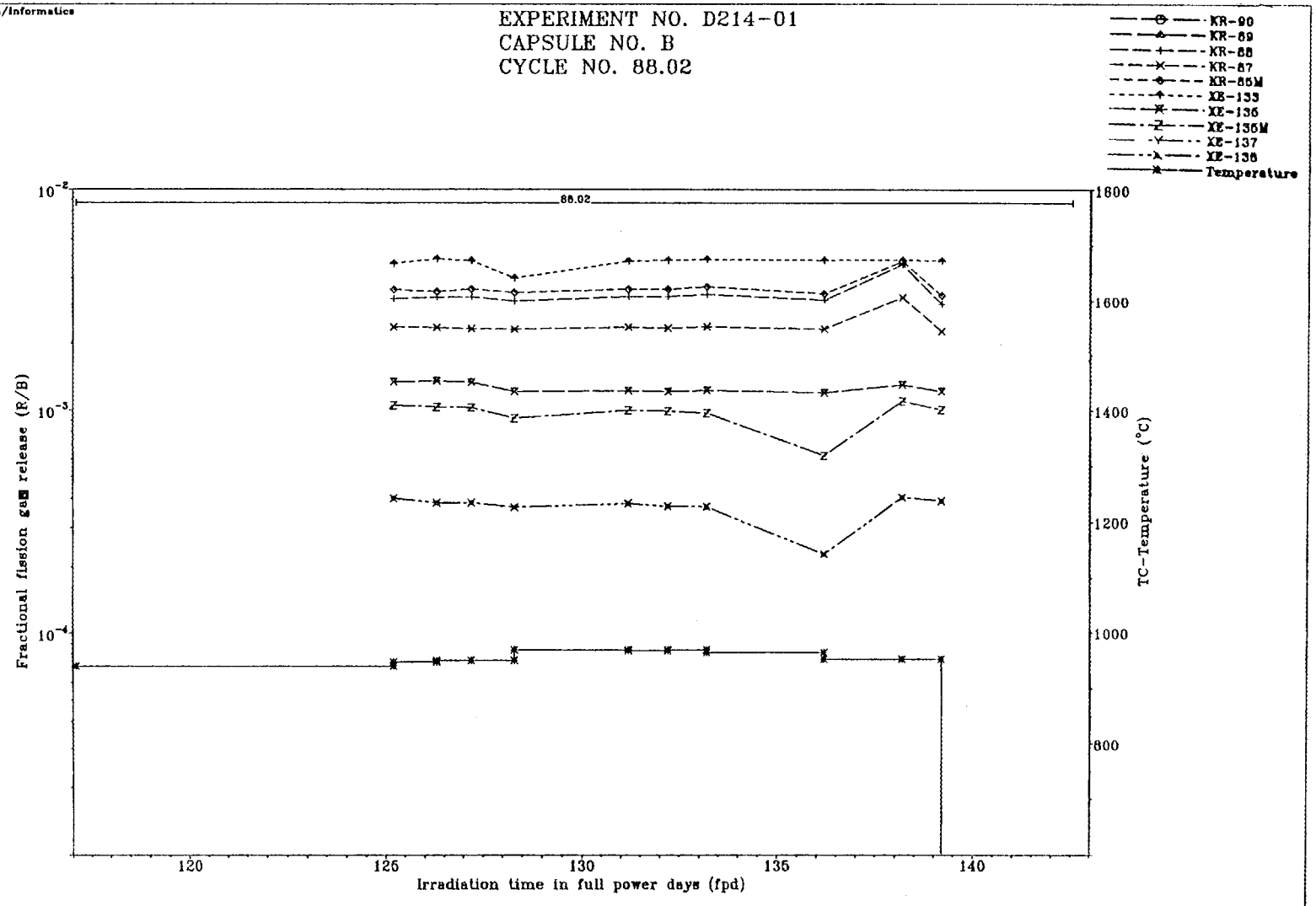

Fig. 6.4.26. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

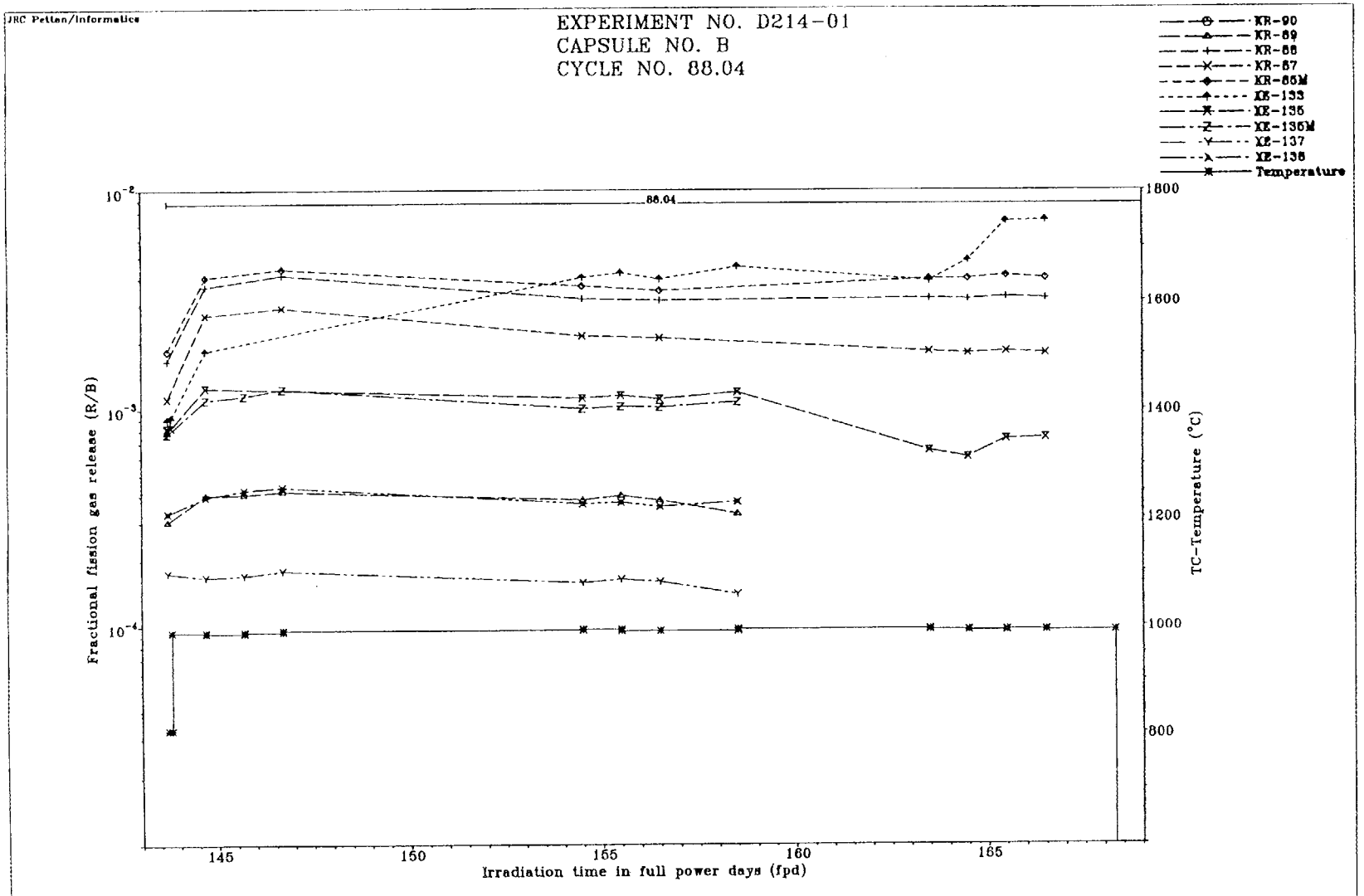

Fig. 6.4.27. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

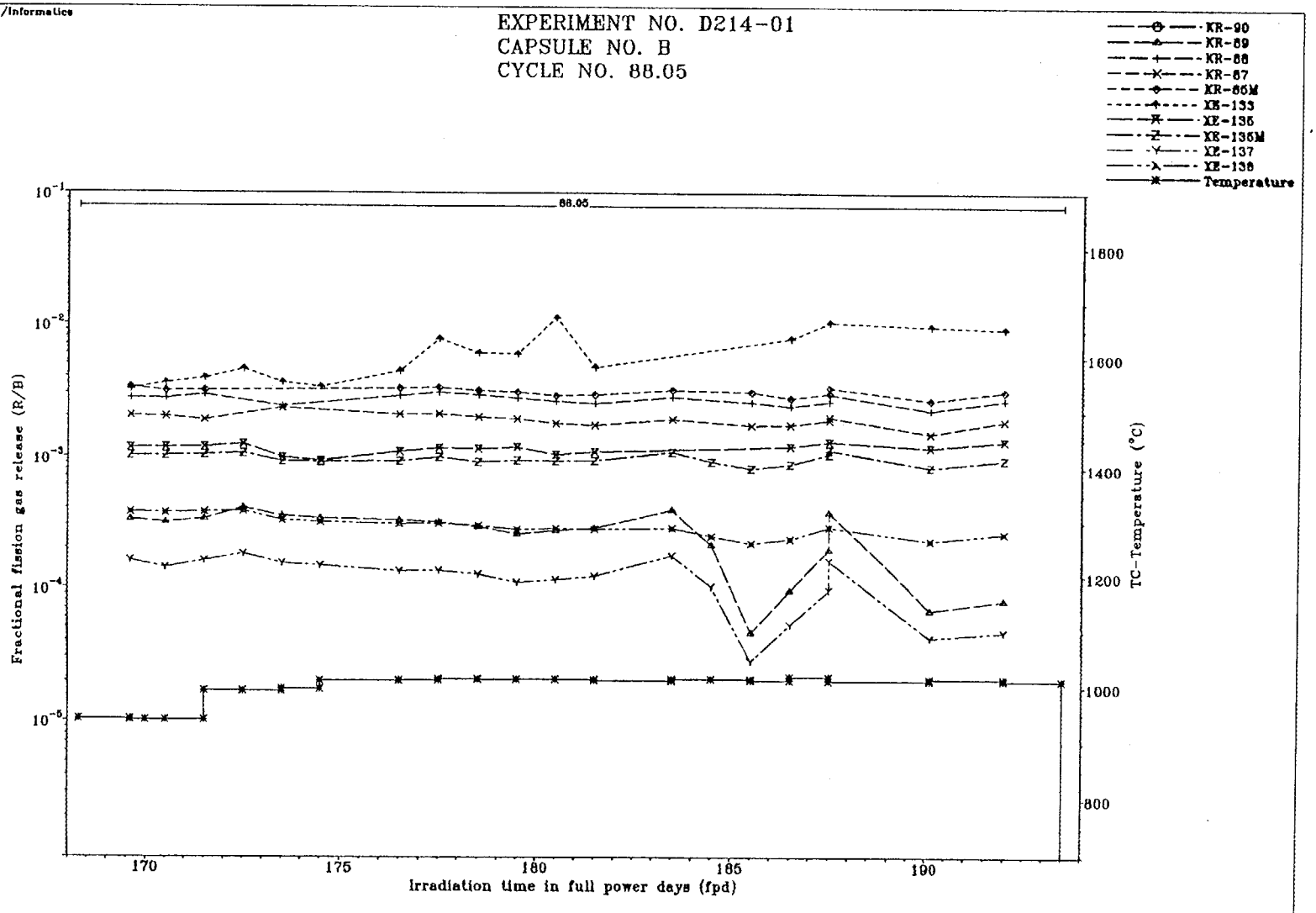

Fig. 6.4.28. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

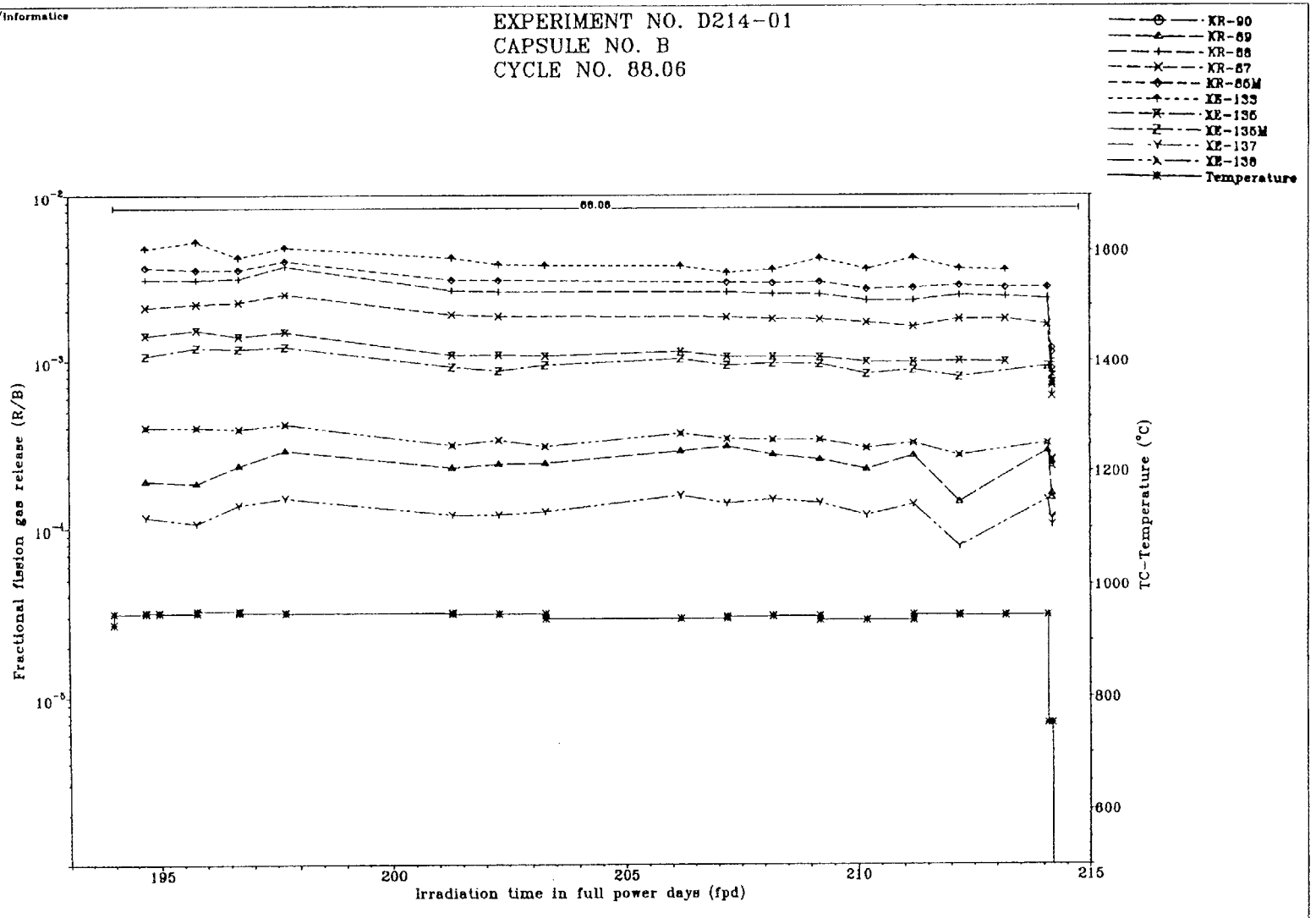

Fig. 6.4.29. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

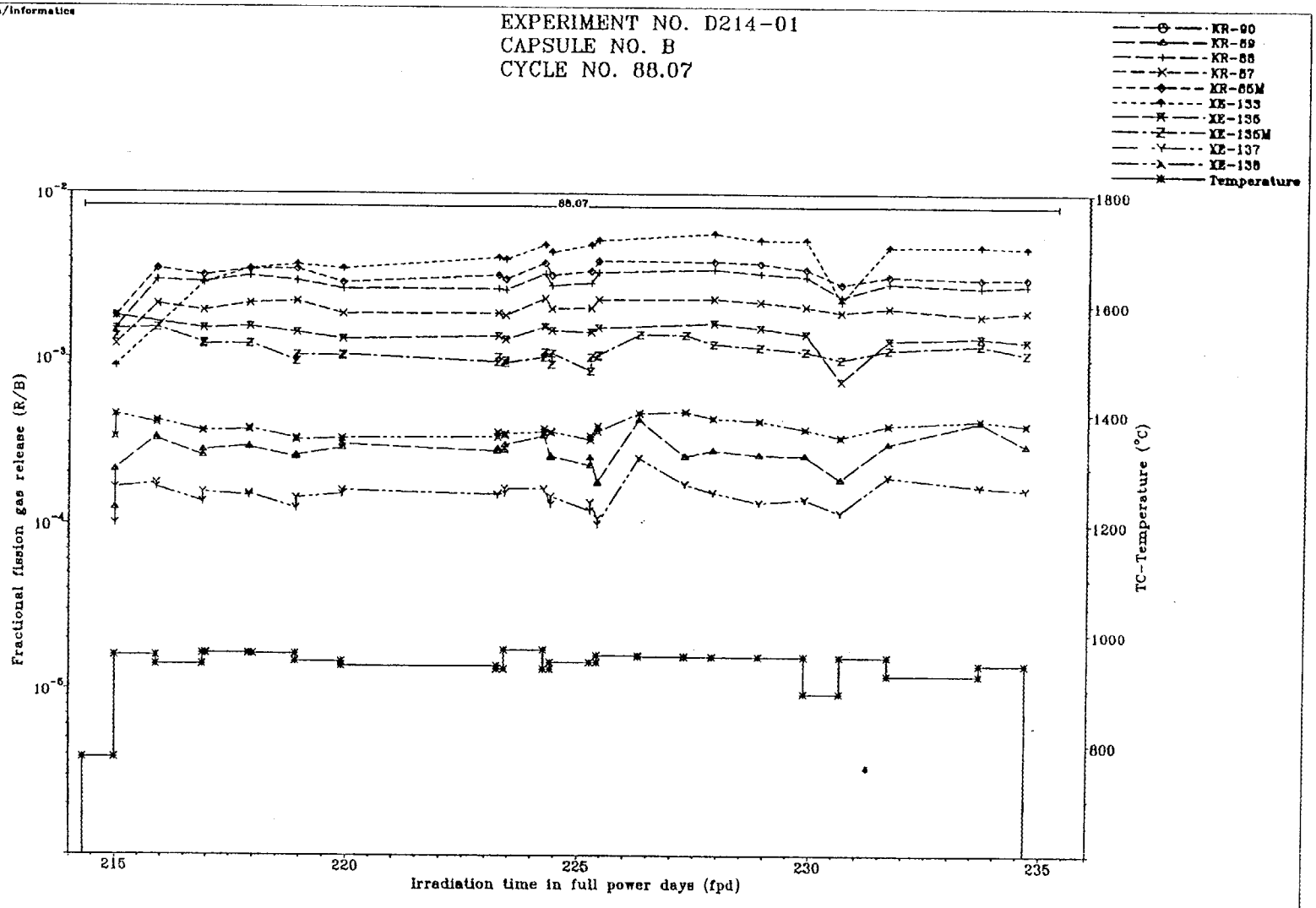

Fig. 6.4.30. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

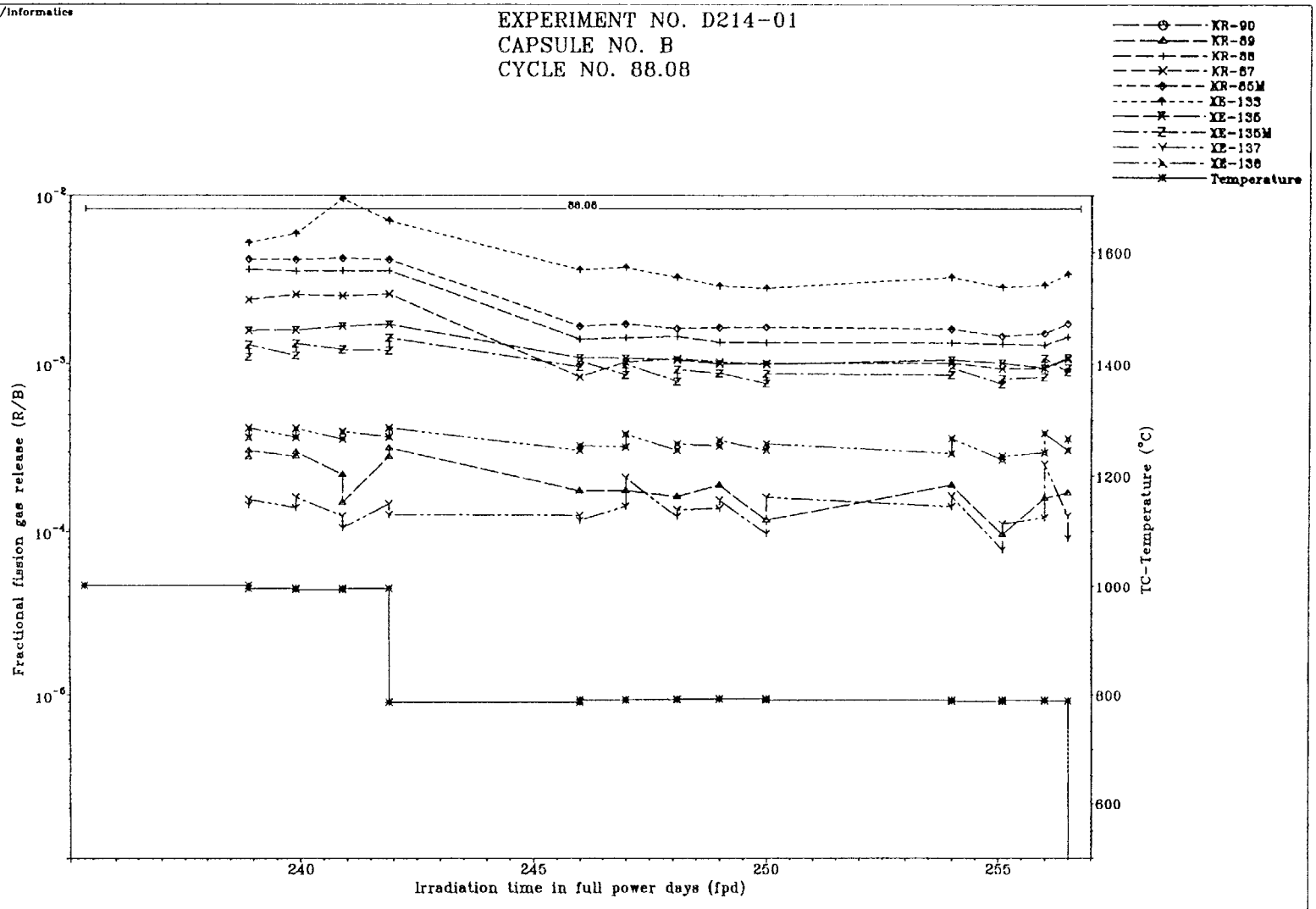

Fig. 6.4.31. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

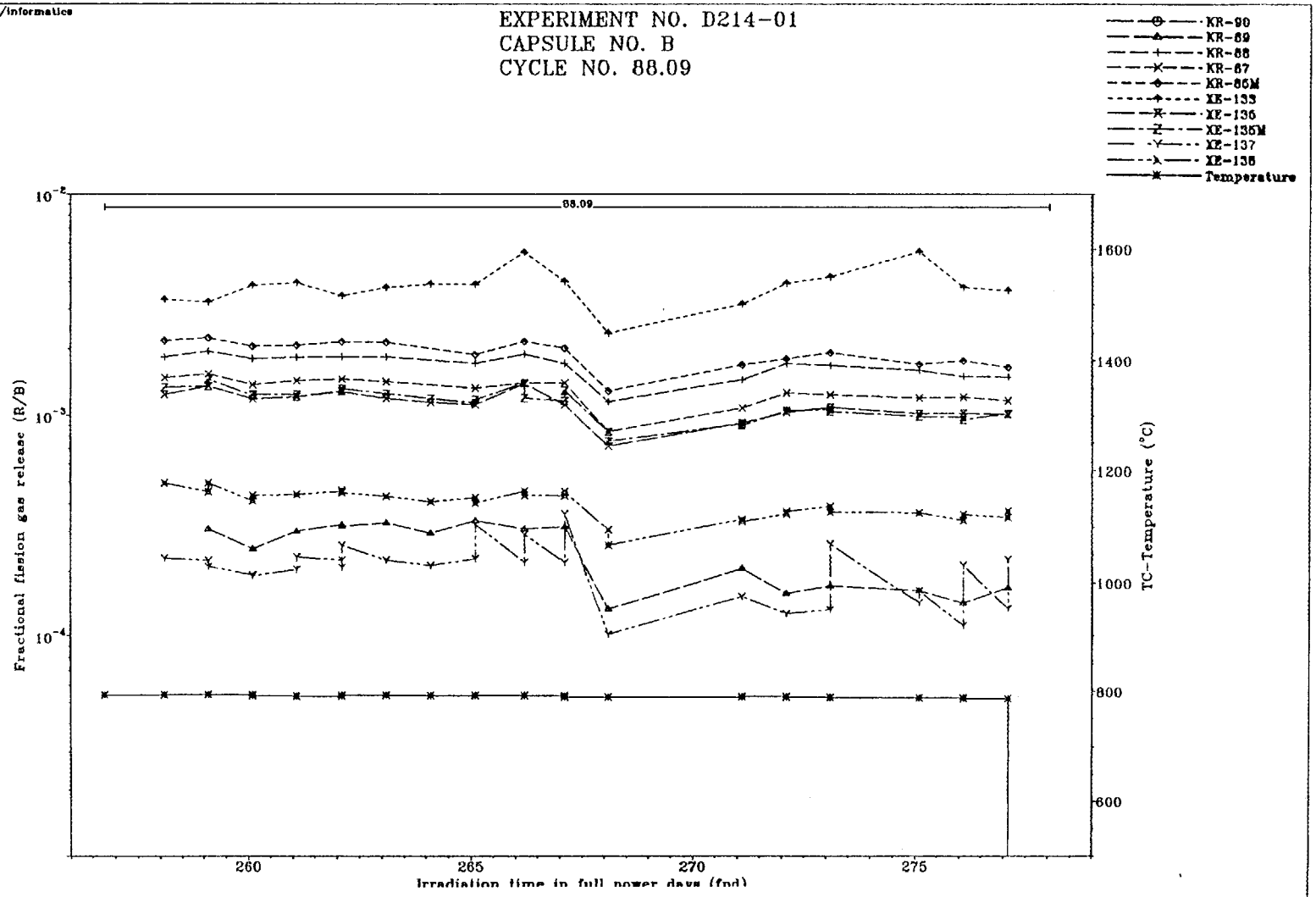

Fig. 6.4.32. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

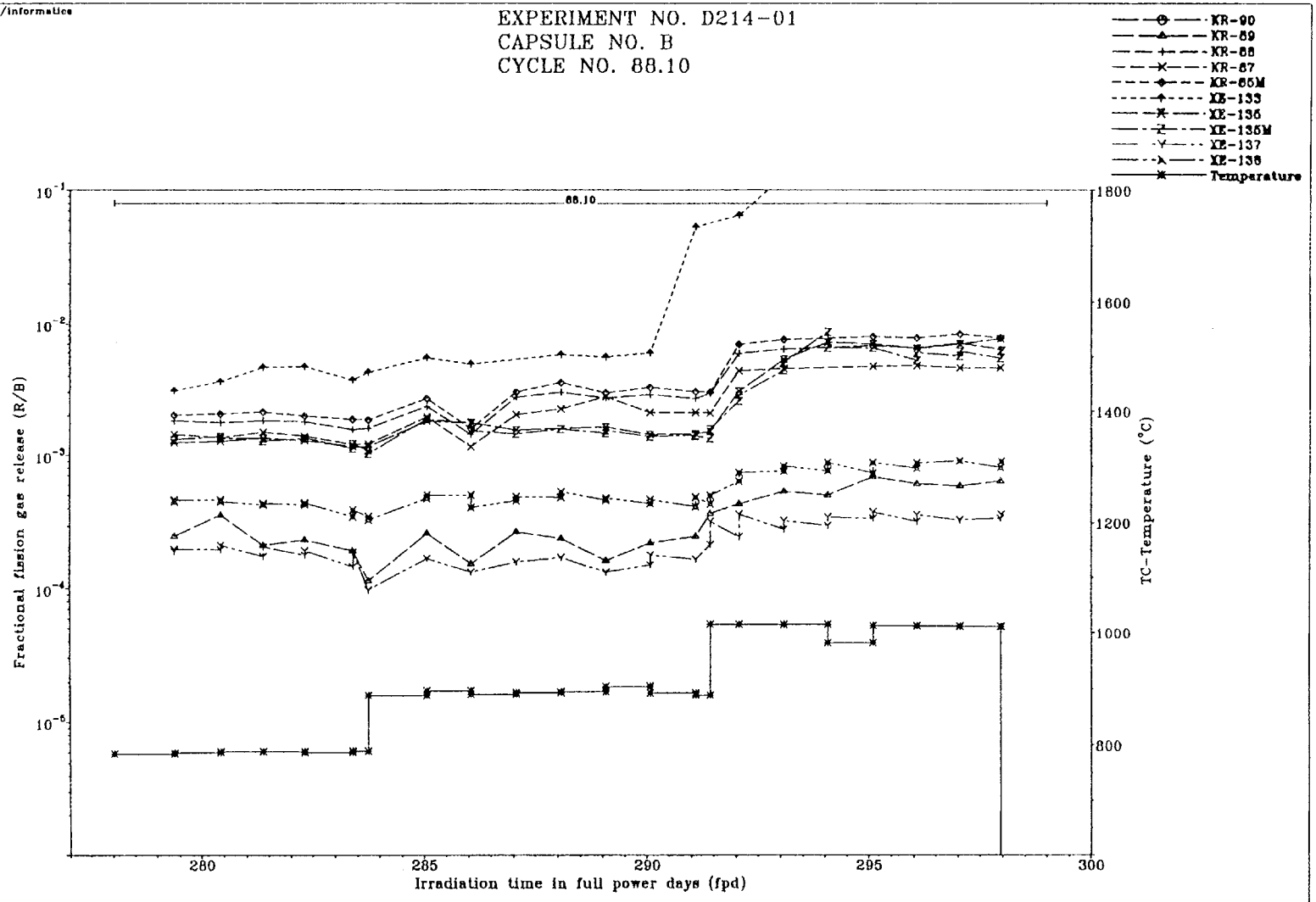

Fig. 6.4.33. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

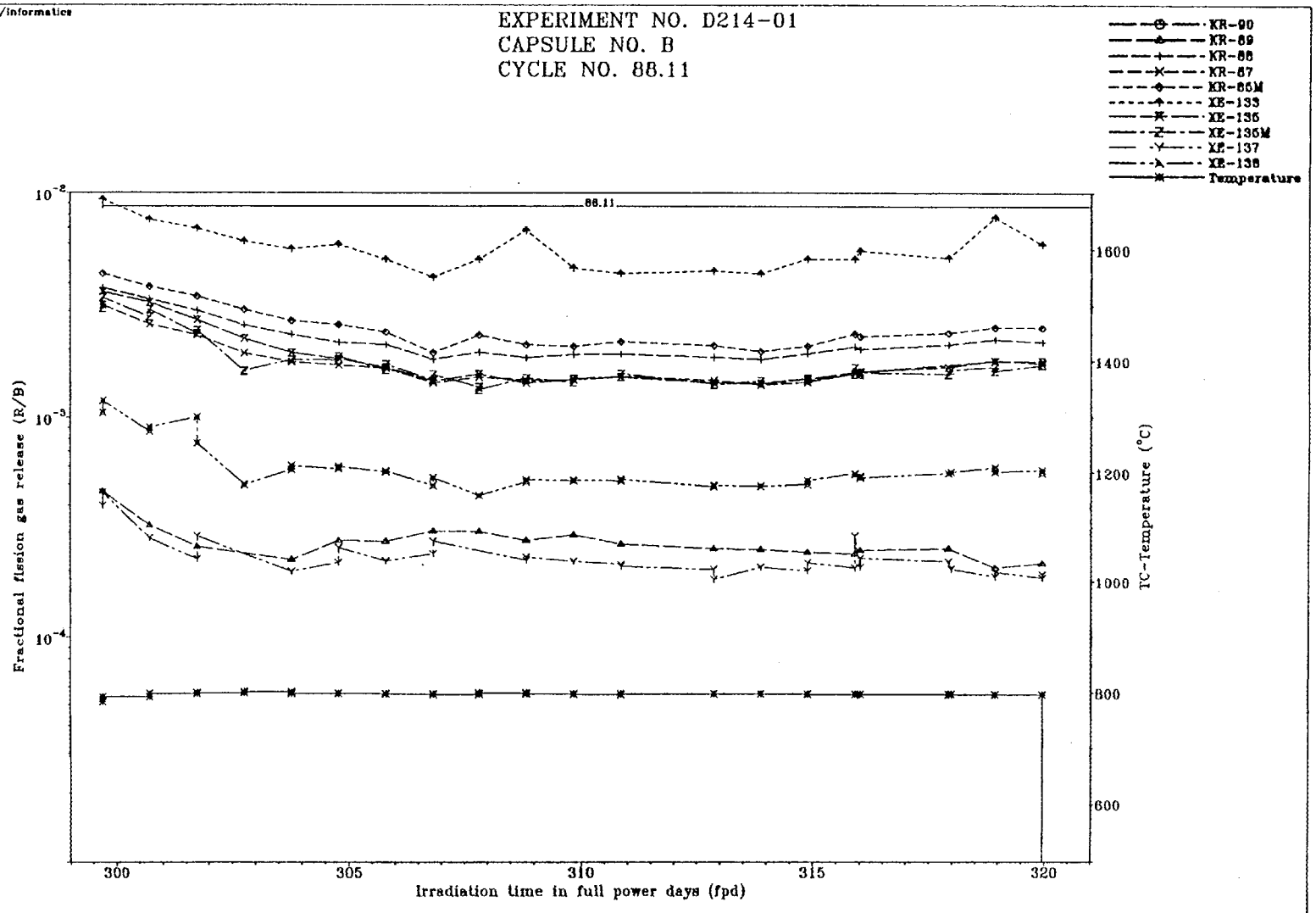

Fig. 6.4.34. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

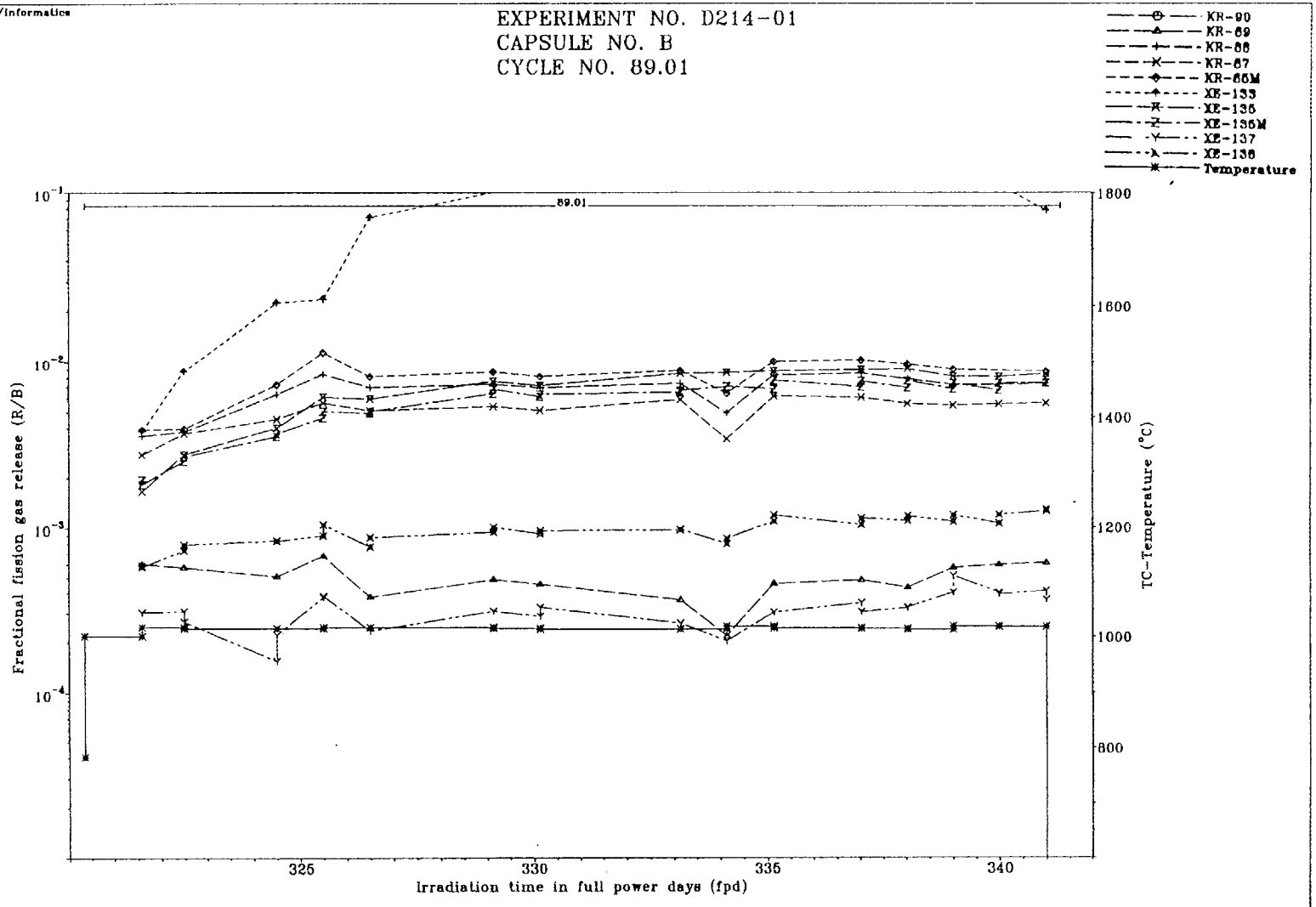

Fig. 6.4.35. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

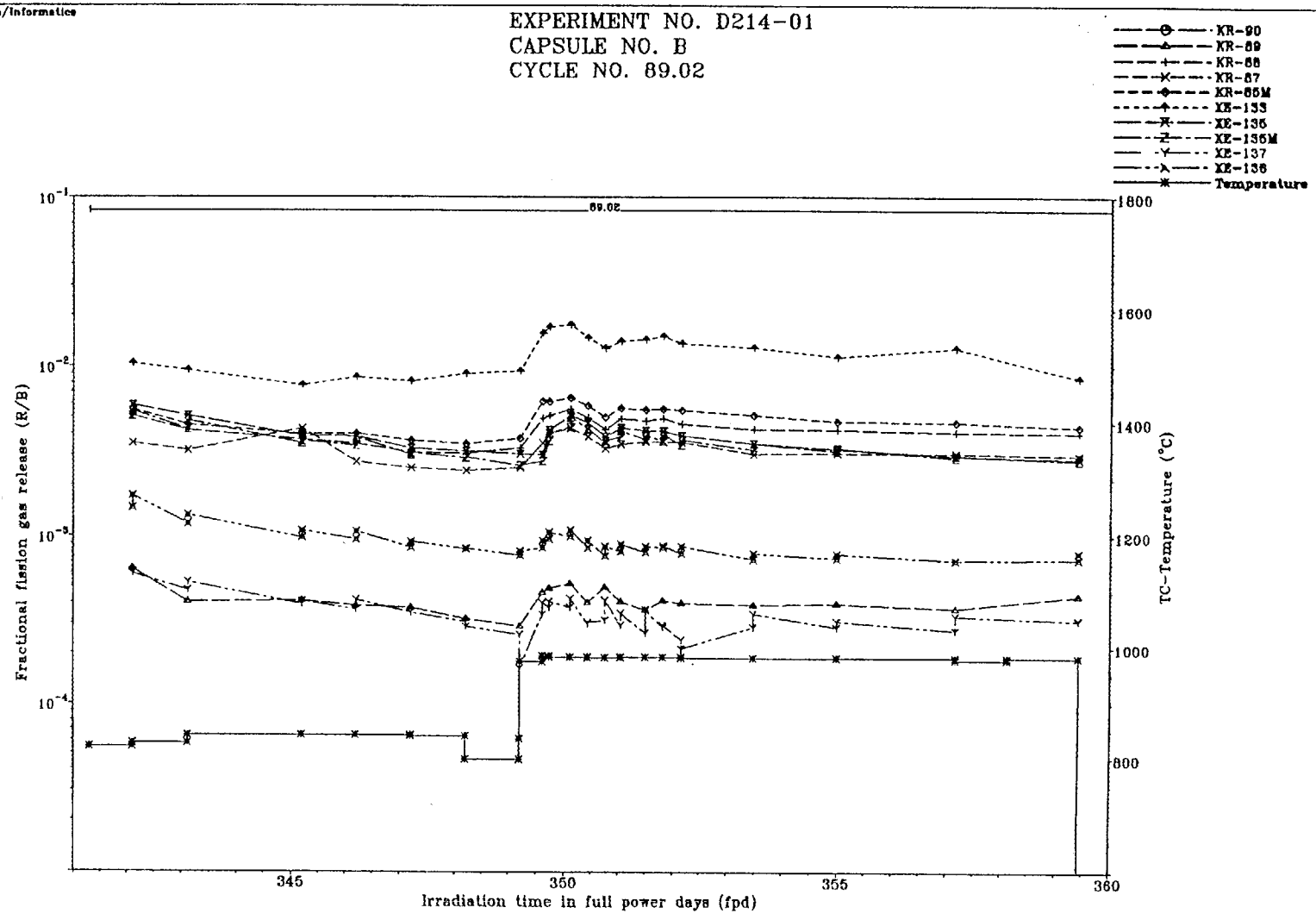

Fig. 6.4.36. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

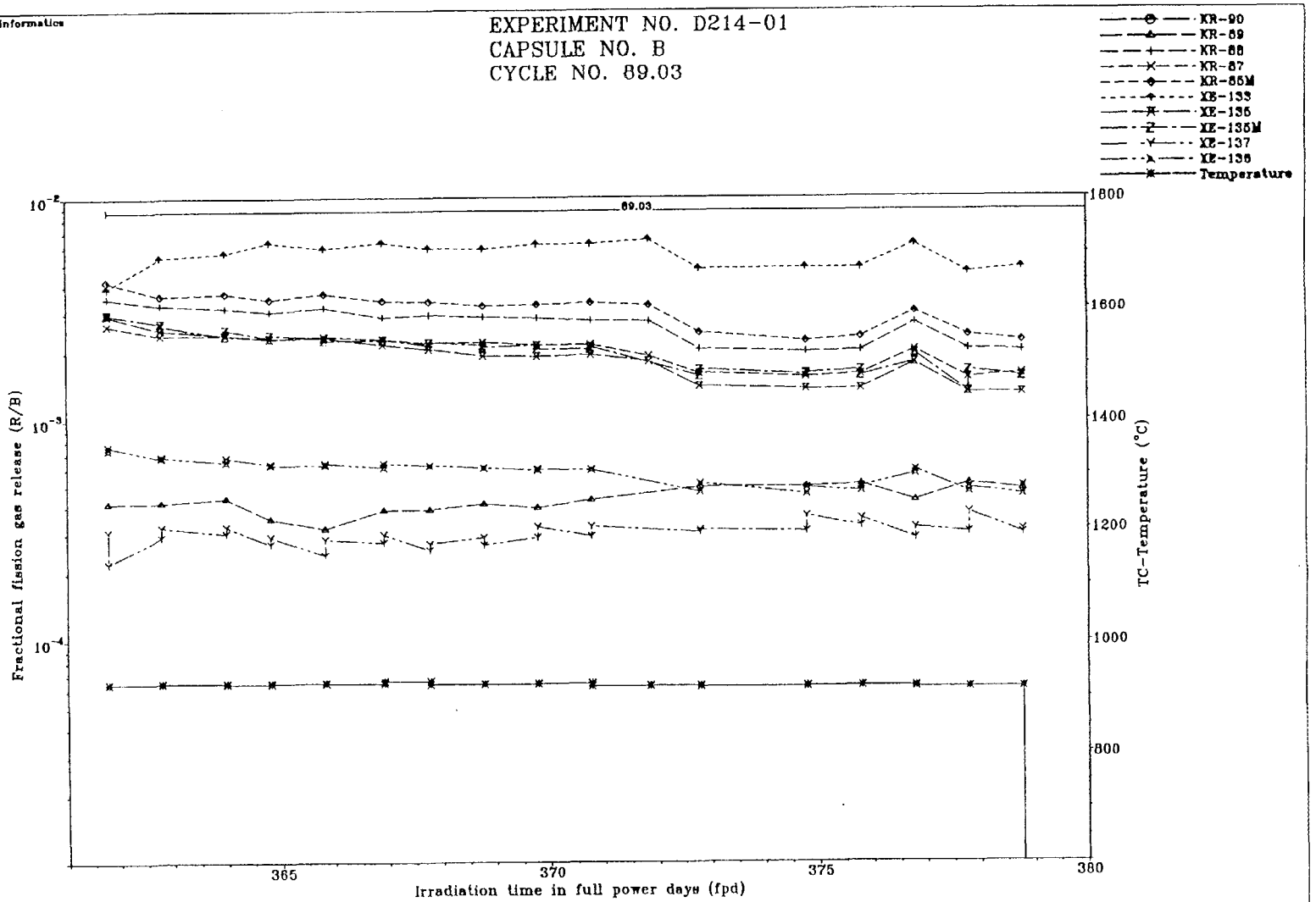

Fig. 6.4.37. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

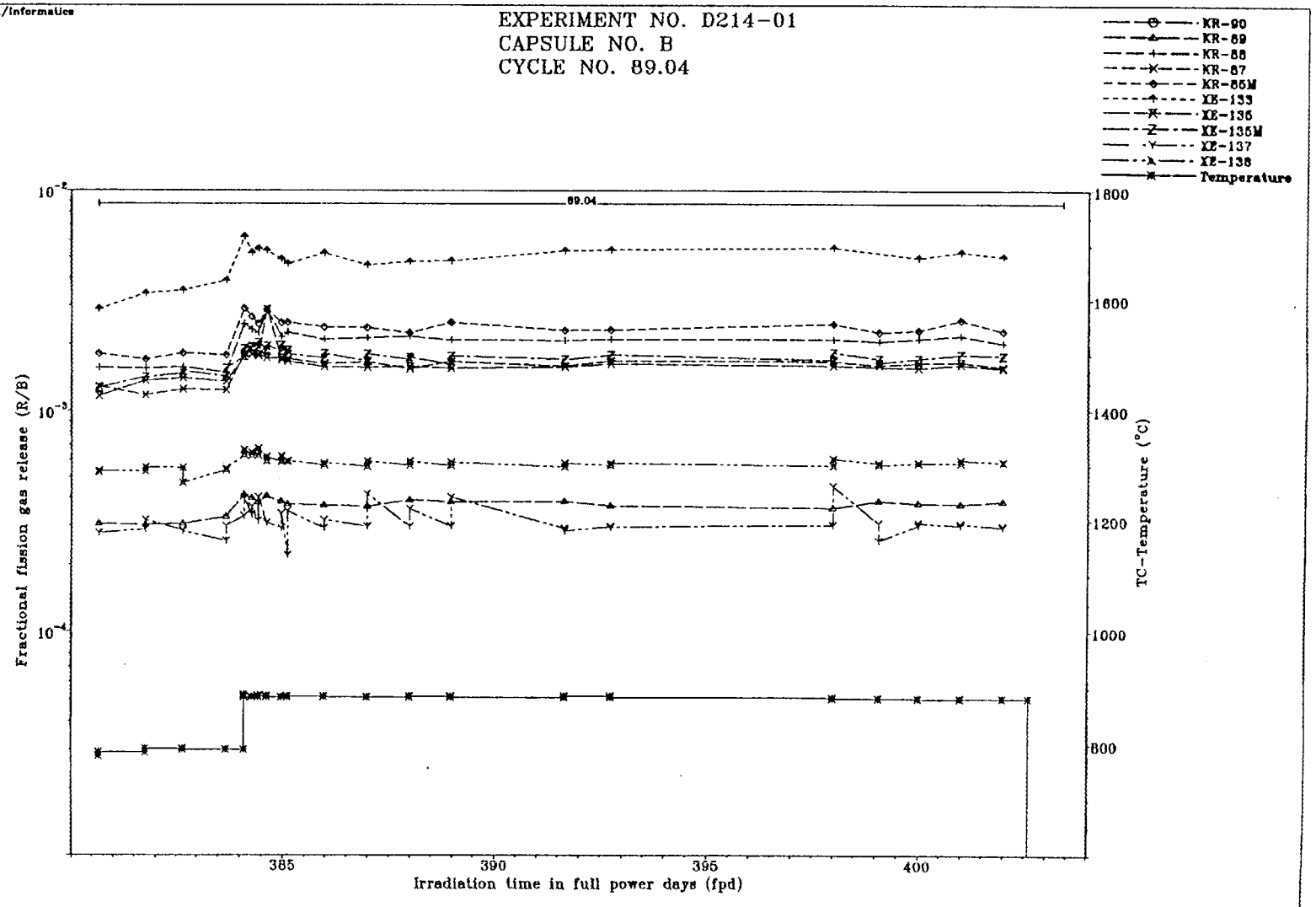

Fig. 6.4.38. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

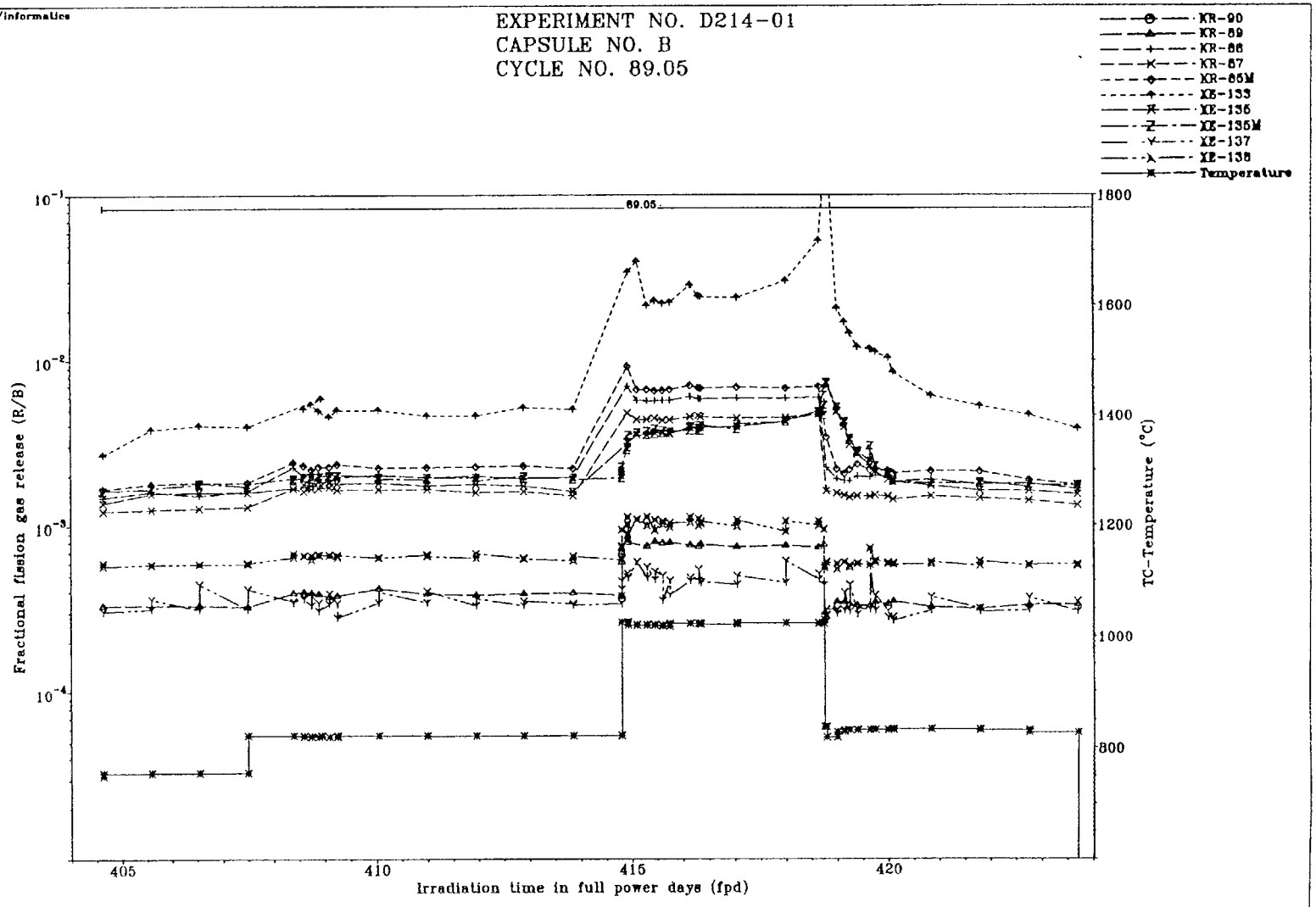

Fig. 6.4.39. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

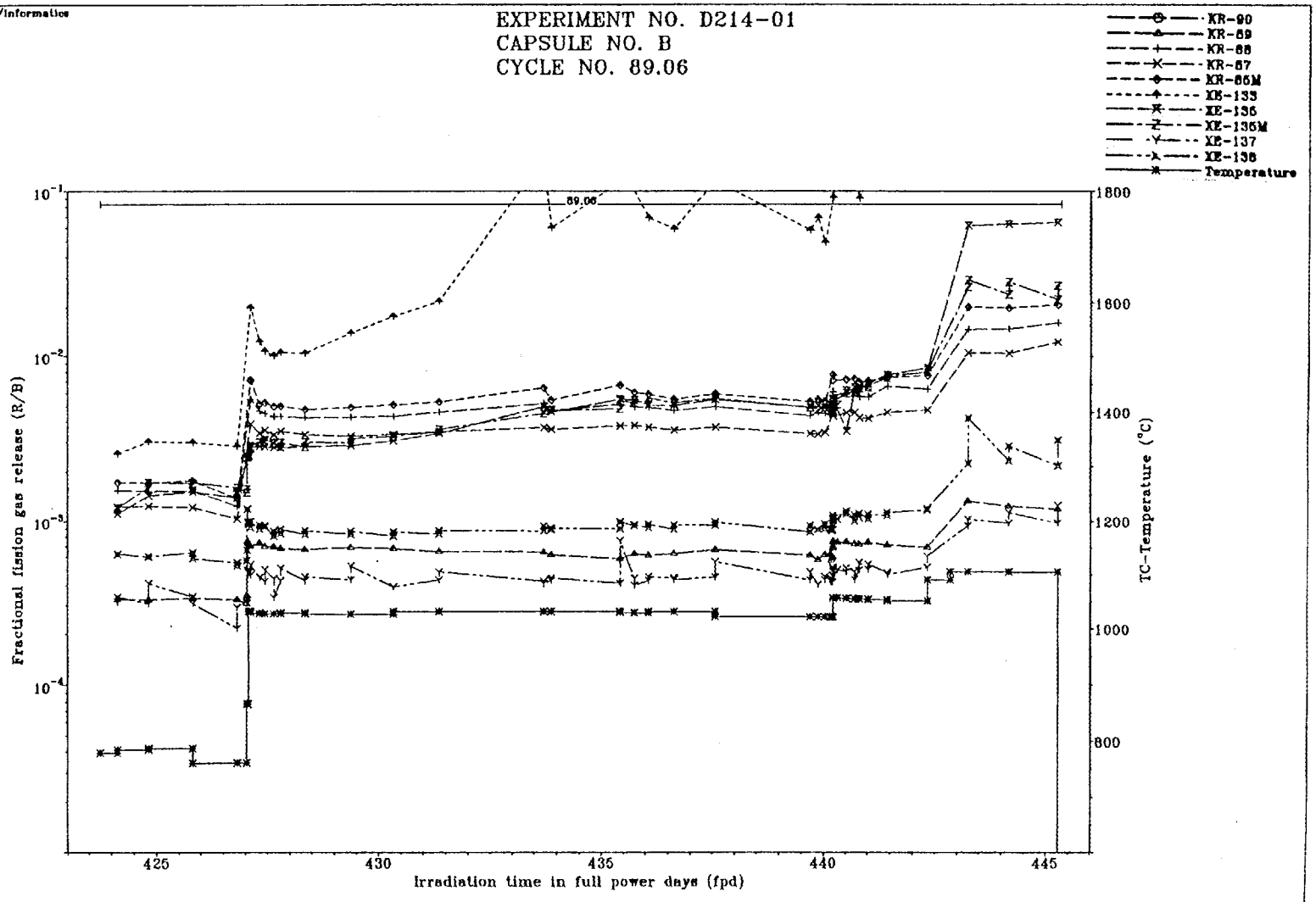

Fig. 6.4.40. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Table 6.4.41. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. 214.01			CAPSULE NO. C		CYCLE NO. 87.03		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
10. 4.87	12						786
0. 0	0						0.5
10. 4.87	12			4.366E-05	3.464E-05	4.596E-05	776
16. 3	0		1.274E-05	1.357E-05	3.877E-06	9.130E-06	1.8
10. 4.87	14			4.179E-05	3.035E-05	3.961E-05	776
16. 3	0		1.314E-05				1.8
11. 4.87	11	3.645E-07	7.545E-06				769
17.32	10			1.293E-05	3.893E-06	7.555E-06	3.6
11. 4.87	14			3.666E-05	2.877E-05	3.598E-05	769
18. 3	0		1.355E-05				3.6
13. 4.87	21	7.909E-07	1.080E-05				769
16.45	10			2.347E-05	5.090E-06	1.107E-05	6.9
13. 4.87	24			5.260E-05	3.850E-05	6.168E-05	769
17. 5	40	6.442E-05	2.978E-05				6.92
16. 4.87	14		1.151E-05				816
22. 7	10			4.384E-05	6.006E-06	3.257E-05	8.75
16. 4.87	14			3.625E-04	2.518E-04	4.063E-04	816
22. 7	40	5.447E-04	1.079E-04				8.75
21. 4.87	15			3.595E-03		4.137E-03	904
16.14	40	4.752E-03	1.792E-03				12.6
24. 4.87	25			3.559E-03	2.750E-03	3.700E-03	893
12.57	40	4.450E-03	1.803E-03				15.1
28. 4.87	25			4.258E-03	3.285E-03	4.435E-03	887
19.59	40	6.265E-03	2.244E-03				18.5
30. 4.87	25			4.674E-03	3.540E-03	4.932E-03	881
12.17	40	6.836E-03	2.509E-03				19.8
1. 5.87	25			4.108E-03	2.502E-03	4.602E-03	879
22.44	40	7.203E-03	2.450E-03				21
3. 5.87	25			4.025E-03	3.278E-03	4.219E-03	874
2.49	40	7.100E-03	2.895E-03				21.9
4. 5.87	25			6.002E-03	4.686E-03	6.377E-03	881
2.49	40	9.751E-03	3.107E-03				22.8
4. 5.87	25						266
16. 0	40						23.03
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Table 6.4.42. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 87.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
6. 6.87	35						30
0. 0	10						23.03
6. 6.87	35						829
18.54	10			9.086E-04		9.143E-04	23.8
6. 6.87	35			6.353E-03	5.112E-03	6.247E-03	829
18.54	30						23.8
6. 6.87	35						829
18.54	20	3.199E-03	1.840E-03				23.8
8. 6.87	35						815
12.32	10			5.568E-04		1.989E-04	25.65
8. 6.87	35			6.286E-03	4.490E-03	6.344E-03	815
12.32	30						25.65
8. 6.87	35						815
12.32	20	7.657E-03	4.471E-03				25.65
9. 6.87	35			6.030E-03	5.026E-03	6.228E-03	819
6.25	30						26.4
9. 6.87	35						819
6.25	20	7.035E-03	3.834E-03				26.4
10. 6.87	35						819
0.17	10			1.136E-03			27.1
10. 6.87	35			3.766E-03	2.958E-03	4.009E-03	819
0.17	30						27.1
10. 6.87	35			7.800E-03	5.989E-03	8.051E-03	819
0.17	40	8.270E-03	4.115E-03				27.1
12. 6.87	35						820
0.49	10			1.110E-03	1.248E-04	5.764E-04	29.1
12. 6.87	35			6.551E-03	5.055E-03	6.710E-03	820
0.49	30						29.1
12. 6.87	35						820
0.49	20	1.005E-02	4.308E-03				29.1
13. 6.87	35						821
1. 2	10			1.084E-03	1.534E-04		30.1
13. 6.87	35			6.480E-03	4.934E-03	6.712E-03	821
1. 2	30						30.1
15. 6.87	35						818
11. 5	10			1.089E-03		4.674E-04	32.6
15. 6.87	35			6.143E-03	4.638E-03	6.343E-03	818
11. 5	30						32.6
15. 6.87	35						818
11. 5	20	1.031E-02	3.982E-03				32.6
16. 6.87	35						819
8.42	10			8.834E-04		3.522E-04	33.4
16. 6.87	35			6.229E-03	4.802E-03	6.478E-03	819
8.42	30						33.4
16. 6.87	35						819
8.42	20	1.062E-02	4.018E-03				33.4
16. 6.87	35						819
14.18	10			1.037E-03		2.979E-04	33.65
16. 6.87	35			5.848E-03	4.502E-03	6.174E-03	819
14.18	30						33.65
16. 6.87	35						819
14.18	20	1.071E-02	4.318E-03				33.65

Table 6.4.42. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 87.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
16. 6.87	35						819
21. 0	10			2.049E-04		7.753E-05	33.85
16. 6.87	35			8.510E-03	6.609E-03	8.914E-03	819
21. 0	40	1.578E-02	4.252E-03				33.85
17. 6.87	35						818
17.1	10			9.464E-04	1.338E-04		34.75
17. 6.87	35			6.476E-03	4.932E-03	6.724E-03	818
17.1	30						34.75
17. 6.87	35						818
17.1	20	1.128E-02	4.574E-03				34.75
18. 6.87	35			9.207E-03	7.253E-03	9.900E-03	819
13. 0	40	1.170E-02	4.903E-03				35.65
19. 6.87	35						820
11. 0	10			1.201E-03	1.297E-04	2.015E-04	36.6
19. 6.87	35			6.516E-03	4.916E-03	6.898E-03	820
11. 0	40	8.485E-03	3.353E-03				36.6
20. 6.87	35		2.370E-04				820
9.36	10			1.019E-03	1.718E-04	5.190E-05	37.5
20. 6.87	35			5.818E-03	4.356E-03	6.198E-03	820
9.36	30						37.5
20. 6.87	35			4.332E-03	3.509E-03	4.726E-03	820
9.36	30						37.5
20. 6.87	35			5.947E-03	4.479E-03	6.230E-03	819
16.56	40	7.725E-03	2.844E-03				37.7
21. 6.87	35			6.701E-03	4.945E-03	7.098E-03	818
0.52	40	2.344E-02	3.131E-03				38
21. 6.87	35			6.697E-03	7.241E-03	7.075E-03	819
3.42	40	2.414E-02	3.249E-03				38.2
21. 6.87	35			7.740E-03	5.754E-03	8.485E-03	819
8.37	40	4.313E-02	4.003E-03				38.5
21. 6.87	35			8.883E-03	6.377E-03	9.890E-03	820
17.53	40	5.016E-02	5.239E-03				38.7
22. 6.87	35			7.363E-03	7.720E-03	7.865E-03	819
0.4	30						39
22. 6.87	35			6.987E-03	5.274E-03	7.409E-03	819
3.42	40	3.575E-02	4.117E-03				39.2
22. 6.87	35			7.560E-03	5.857E-03	7.720E-03	819
8.29	40	3.347E-02	4.450E-03				39.45
22. 6.87	35			8.258E-03	6.732E-03	8.685E-03	821
11.57	40	3.356E-02	4.925E-03				39.6
23. 6.87	35			7.115E-03	8.094E-03	7.697E-03	819
8.22	40	2.434E-02	4.631E-03				40.45
23. 6.87	35			7.969E-03	6.359E-03	8.740E-03	820
13.28	40	2.632E-02	5.232E-03				40.65
24. 6.87	35			6.699E-03	5.211E-03	7.069E-03	820
8.22	30						41.45
24. 6.87	35						820
8.22	20	3.919E-02	7.008E-03				41.45
25. 6.87	35			5.723E-03	4.508E-03	5.953E-03	819
8.17	30						42.45
25. 6.87	35						819
8.17	20	1.437E-02	5.686E-03				42.45

Table 6.4.42. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 87.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
26. 6.87	35			6.073E-03	4.755E-03	6.475E-03	819
8.24	30						43.45
26. 6.87	35						819
8.24	20	1.220E-02	4.782E-03				43.45
27. 6.87	35			5.933E-03	4.556E-03	6.231E-03	820
11.32	40	7.451E-03	3.055E-03				44.6
28. 6.87	35			6.064E-03	4.618E-03	6.452E-03	820
9. 6	30						45.5
28. 6.87	35						820
9. 6	20	1.136E-02	4.221E-03				45.5
29. 6.87	35			6.018E-03	4.521E-03	6.342E-03	818
8.45	40	7.464E-03	3.012E-03				46.5
29. 6.87	35						80
17. 0	30						46.68
---	---						

Table 6.4.43. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 87.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
29.10.87	35						925
1. 0	10						46.68
29.10.87	35						925
1.17	10			1.357E-03		4.886E-04	48.2
29.10.87	35			5.084E-03	4.007E-03	5.655E-03	925
1.17	30						48.2
29.10.87	35						925
1.17	20	2.586E-02	2.878E-03				48.2
30.10.87	35						926
0.54	10			1.599E-03		5.808E-04	49.2
30.10.87	35			5.609E-03	4.154E-03	5.947E-03	926
0.54	30						49.2
30.10.87	35						926
0.54	20	5.557E-03	3.275E-03				49.2
31.10.87	35						922
1.34	10			2.083E-03		8.430E-04	50.2
31.10.87	35			5.510E-03	4.035E-03	5.910E-03	922
1.34	30						50.2
31.10.87	35						922
1.34	20	6.932E-03	3.291E-03				50.2
1.11.87	35						922
1.45	10			1.576E-03		5.985E-04	51.2
1.11.87	35			5.311E-03	4.050E-03	5.784E-03	922
1.45	30						51.2
1.11.87	35						922
1.45	20	7.549E-03	3.065E-03				51.2
2.11.87	35						921
0.38	10			1.449E-03		5.202E-04	52.2
2.11.87	35			5.384E-03	4.013E-03	5.793E-03	921
0.38	30						52.2
2.11.87	35						921
0.38	20	7.834E-03	2.990E-03				52.2
2.11.87	35			5.114E-03	3.845E-03	5.544E-03	920
7.18	30						52.5
2.11.87	35						920
7.18	20	6.766E-03	2.556E-03				52.5
2.11.87	35						921
12.17	10			9.405E-04		3.544E-04	52.7
2.11.87	35			5.518E-03	3.954E-03	6.137E-03	921
12.17	30						52.7
2.11.87	35						921
12.17	20	8.311E-03	2.941E-03				52.7
2.11.87	35						922
17.53	10			2.489E-03		7.440E-04	52.8
2.11.87	35			6.922E-03	4.491E-03	8.857E-03	922
17.53	30						52.8
2.11.87	35						922
17.53	20	1.138E-01	4.916E-03				52.8
2.11.87	35			7.898E-03	5.365E-03	9.742E-03	923
22.41	30						52.9
2.11.87	35			8.998E-03	5.873E-03	1.143E-02	923
22.41	30						52.9

Table 6.4.43. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 87.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
2.11.87	35						923
22.41	20	1.070E-01	6.659E-03				52.9
3.11.87	35						922
3.51	10			3.391E-03		1.017E-03	53.1
3.11.87	35			6.312E-03	4.932E-03	7.906E-03	922
3.51	30						53.1
3.11.87	35						922
9. 2	10			2.105E-03		5.352E-04	53.5
3.11.87	35			6.973E-03	4.878E-03	7.868E-03	922
9. 2	30						53.5
3.11.87	35						922
9. 2	20	6.264E-02	8.031E-03				53.5
3.11.87	35						924
15. 5	10			3.657E-03		1.124E-03	53.6
3.11.87	35			6.534E-03	4.988E-03	7.349E-03	924
15. 5	30						53.6
3.11.87	35						924
15. 5	20	5.103E-02	7.133E-03				53.6
4.11.87	35						923
4.13	10			3.519E-03		8.508E-04	54.2
4.11.87	35			6.811E-03	5.108E-03	7.684E-03	923
4.13	30						54.2
4.11.87	35						923
4.13	20	6.154E-02	7.342E-03				54.2
5.11.87	35						924
0.24	10			3.374E-03		9.157E-04	55
5.11.87	35			6.513E-03	4.785E-03	7.263E-03	924
0.24	30						55
5.11.87	35						924
0.24	20	5.410E-02	8.094E-03				55
6.11.87	35						931
13. 0	10			1.494E-03		4.651E-04	56.5
6.11.87	35			6.453E-03	4.962E-03	7.121E-03	931
13. 0	30						56.5
6.11.87	35						931
13. 0	20	3.935E-01	5.838E-02				56.5
7.11.87	35						923
8.29	10			2.856E-03		7.996E-04	57
7.11.87	35			6.355E-03	4.745E-03	6.812E-03	923
8.29	30						57
7.11.87	35						923
8.29	20	3.736E-02	4.978E-03				57
8.11.87	35						923
8.26	10			1.779E-03		4.285E-04	58
8.11.87	35			8.163E-03	4.549E-03	8.873E-03	923
8.26	30						58
8.11.87	35						923
8.26	20	9.044E-02	5.976E-03				58
9.11.87	35						923
8.17	10			2.532E-03		6.929E-04	59.2
9.11.87	35			6.048E-03	4.572E-03	8.630E-03	923
8.17	30						59.2

Table 6.4.43. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 87.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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9.11.87	35						923
8.17	20	3.389E-02	4.637E-03				59.2
10.11.87	35						925
8.23	10			2.663E-03		7.209E-04	60.2
10.11.87	35			5.459E-03	4.096E-03	2.130E-03	925
8.23	30						60.2
10.11.87	35			4.384E-03	3.332E-03	3.782E-03	925
11. 5	30						60.3
10.11.87	35						925
11. 5	20	2.163E-02	5.731E-03				60.3
10.11.87	35			3.852E-03	2.958E-03	3.305E-03	926
13.56	30						60.4
10.11.87	35						926
13.56	20	1.717E-02	4.524E-03				60.4
10.11.87	35			3.946E-03	3.005E-03	4.244E-03	925
17.12	30						60.5
10.11.87	35						925
17.12	20	1.353E-02	5.788E-03				60.5
10.11.87	35			3.892E-03	2.891E-03	4.132E-03	924
19.56	30						60.6
10.11.87	35						924
19.56	20	1.238E-02	4.003E-03				60.6
10.11.87	35			4.213E-03	3.202E-03	1.387E-03	924
22.49	30						60.7
10.11.87	35						924
22.49	20	1.190E-02	4.792E-03				60.7
11.11.87	35						928
1.35	10			2.585E-03		7.258E-04	60.9
11.11.87	35			5.418E-03	4.169E-03	5.895E-03	928
1.35	40	1.019E-02	4.670E-03				60.9
11.11.87	35						926
4.26	10			2.605E-03		7.756E-04	61.2
11.11.87	35			5.461E-03	4.044E-03	5.816E-03	926
4.26	40	9.743E-03	4.460E-03				61.2
11.11.87	35						924
7.1	10			2.390E-03		7.054E-04	61.4
11.11.87	35			5.170E-03	4.036E-03	9.794E-03	924
7.1	40	9.630E-03	4.394E-03				61.4
11.11.87	35						924
10.46	10			1.679E-03		4.801E-04	61.5
11.11.87	35			5.355E-03	4.031E-03	2.333E-03	924
10.46	40	1.062E-02	4.341E-03				61.5
12.11.87	35						925
8.26	10			1.658E-03		4.748E-04	62.4
12.11.87	35			4.953E-03	3.720E-03	1.007E-02	925
8.26	30						62.4
12.11.87	35						925
8.26	20	1.107E-02	5.650E-03				62.4
13.11.87	35						924
8.26	10			1.591E-03		4.156E-04	63.4
13.11.87	35			4.729E-03	3.492E-03	8.257E-03	924
8.26	30						63.4

Table 6.4.43. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 87.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
13.11.87	35						924
8.26	20	9.867E-03	3.543E-03				63.4
14.11.87	35						924
9. 6	10			8.295E-04		2.153E-04	64.4
14.11.87	35			6.600E-03	3.487E-03	5.565E-03	924
9. 6	30						64.4
14.11.87	35						924
9. 6	20	9.147E-03	5.170E-03				64.4
15.11.87	35						922
8.41	10			1.571E-03		4.622E-04	65.4
15.11.87	35			6.700E-03	3.338E-03	4.926E-03	922
8.41	30						65.4
15.11.87	35						922
8.41	20	8.119E-03	4.196E-03				65.4
16.11.87	35						921
8.51	10			1.870E-03		5.911E-04	66.4
16.11.87	35			5.191E-03	3.225E-03	5.499E-03	921
8.51	30						66.4
16.11.87	35						80
17. 0	30						66.71
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Table 6.4.44. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	C	CYCLE NO.	87.10	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
23.11.87	35						925
0. 0	30						66.71
23.11.87	35			3.338E-03	2.588E-03	4.242E-03	925
13.25	30						70.6
23.11.87	35						925
13.25	20	7.203E-03	7.584E-04				70.6
24.11.87	35			2.019E-03	4.653E-03		926
11.55	30						72.5
25.11.87	35			1.165E-02	4.412E-03	7.362E-03	927
0.27	30						72.9
25.11.87	35						927
0.27	20	2.081E-01					72.9
25.11.87	35			2.360E-03	4.161E-03	1.480E-02	927
8.35	30						73.4
25.11.87	35						927
8.35	30						73.4
26.11.87	35						927
8.51	10			2.964E-03		7.491E-04	74.4
26.11.87	35			9.977E-03	4.078E-03	9.356E-03	927
8.51	30						74.4
26.11.87	35						927
8.51	20	3.530E-02					74.4
27.11.87	35						934
8.56	10			2.555E-03		5.762E-04	75.4
27.11.87	35			9.162E-03	3.795E-03	9.406E-03	934
8.56	30						75.4
27.11.87	35						932
11.4	10			2.139E-03		5.657E-04	75.45
27.11.87	35			6.951E-03	3.580E-03	8.772E-03	932
11.4	30						75.45
27.11.87	35						931
14.26	10			2.041E-03		5.624E-04	75.5
27.11.87	35			6.684E-03	3.627E-03	8.555E-03	931
14.26	30						75.5
27.11.87	35						929
17.13	10			1.955E-03		5.584E-04	75.55
27.11.87	35			4.454E-03	3.215E-03	9.516E-03	929
17.13	30						75.55
27.11.87	35						930
21. 0	10			1.734E-03		4.274E-04	75.6
27.11.87	35			4.435E-03	3.398E-03	5.558E-03	930
21. 0	30						75.6
28.11.87	35						931
0.34	10			1.879E-03		5.388E-04	75.8
28.11.87	35			4.505E-03	3.470E-03	9.858E-03	931
0.34	30						75.8
28.11.87	35						932
3.46	10			1.862E-03		4.827E-04	76
28.11.87	35			4.464E-03	3.370E-03	4.783E-03	932
3.46	30						76
28.11.87	35						931
8.56	10			1.828E-03		4.913E-04	76.4

Table 6.4.44. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 87.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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28.11.87	35			4.413E-03	3.329E-03	6.800E-03	931
8.56	30						76.4
28.11.87	35						931
11.43	10			1.822E-03		5.239E-04	76.5
28.11.87	35			4.395E-03	3.319E-03	5.572E-03	931
11.43	30						76.5
28.11.87	35						931
16.5	10			1.653E-03		4.526E-04	76.6
28.11.87	35			4.280E-03	3.226E-03	8.598E-03	931
16.5	30						76.6
28.11.87	35						930
19.55	10			1.471E-03		4.012E-04	76.7
28.11.87	35			4.195E-03	3.139E-03	6.546E-03	930
19.55	30						76.7
29.11.87	35						930
0.49	10			1.707E-03		5.179E-04	76.9
29.11.87	35			4.290E-03	3.179E-03	6.732E-03	930
0.49	30						76.9
29.11.87	35						930
3.53	10			1.642E-03		4.521E-04	77.2
29.11.87	35			4.203E-03	3.147E-03	7.074E-03	930
3.53	30						77.2
29.11.87	35						931
8.31	10			1.614E-03		4.715E-04	77.4
29.11.87	35			4.214E-03	3.145E-03	4.540E-03	931
8.31	30						77.4
29.11.87	35						931
11.14	10			1.613E-03		4.526E-04	77.5
29.11.87	35			4.165E-03	3.132E-03	7.125E-03	931
11.14	30						77.5
29.11.87	35						931
16.54	10			1.106E-03	2.162E-04		77.6
29.11.87	35			2.461E-03	1.864E-03	2.543E-03	931
16.54	30						77.6
29.11.87	35						931
16.54	20	4.644E-03	1.631E-03				77.6
30.11.87	35						930
0.17	10			1.459E-03		4.052E-04	78
30.11.87	35			4.001E-03	2.971E-03	4.252E-03	930
0.17	30						78
30.11.87	35						929
3. 0	10			1.569E-03		4.400E-04	78.2
30.11.87	35			3.961E-03	2.880E-03	4.369E-03	929
3. 0	30						78.2
30.11.87	35						928
8.33	10			1.594E-03		4.508E-04	78.3
30.11.87	35			3.997E-03	2.937E-03	4.338E-03	928
8.33	30						78.3
30.11.87	35						928
8.33	20	7.804E-03	2.557E-03				78.3
1.12.87	35						932
8.3	10			1.521E-03		4.292E-04	79.3

Table 6.4.44. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 87.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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1.12.87	35			3.797E-03	2.815E-03	4.189E-03	932
8.3	30						79.3
1.12.87	35						932
8.3	20	7.092E-03	2.331E-03				79.3
2.12.87	35						929
8.22	10			1.547E-03		4.299E-04	80.3
2.12.87	35			2.867E-03	1.525E-03	3.426E-03	929
8.22	30						80.3
2.12.87	35						929
8.22	20	6.886E-03	2.322E-03				80.3
3.12.87	35						927
8.28	10			1.512E-03		4.226E-04	81.3
3.12.87	35			3.707E-03	2.636E-03	4.088E-03	927
8.28	30						81.3
3.12.87	35						927
8.28	20	6.693E-03	2.211E-03				81.3
4.12.87	35						925
8.35	10			1.456E-03		4.086E-04	82.3
4.12.87	35			3.451E-03	2.456E-03	3.784E-03	925
8.35	30						82.3
4.12.87	35						925
8.35	20	6.468E-03	2.145E-03				82.3
7.12.87	35						911
8.45	10			1.443E-03		4.199E-04	84.3
7.12.87	35			2.589E-03	1.361E-03	3.191E-03	911
8.45	30						84.3
7.12.87	35						911
8.45	20	5.621E-03	2.013E-03				84.3
8.12.87	35						909
8.4	10			1.409E-03		4.095E-04	85.3
8.12.87	35			2.998E-03	2.160E-03	3.352E-03	909
8.4	30						85.3
8.12.87	35						909
8.4	20	5.628E-03	1.876E-03				85.3
9.12.87	35						908
8.37	10			1.419E-03		4.120E-04	86.3
9.12.87	35			2.949E-03	2.107E-03	3.315E-03	908
8.37	30						86.3
9.12.87	35						908
8.37	20	5.998E-03	1.897E-03				86.3
10.12.87	35						908
8.43	10			1.348E-03		4.092E-04	87.3
10.12.87	35			2.916E-03	2.087E-03	3.232E-03	908
8.43	30						87.3
10.12.87	35						908
8.43	20	5.787E-03	1.836E-03				87.3
11.12.87	35						907
8.38	10			1.368E-03		3.971E-04	88.3
11.12.87	35			2.898E-03	2.061E-03	3.241E-03	907
8.38	30						88.3
11.12.87	35						907
8.38	20	6.188E-03	1.821E-03				88.3

Table 6.4.44. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 87.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
12.12.87	35						907
8.15	10			1.284E-03		3.974E-04	89.3
12.12.87	35			2.903E-03	2.053E-03	3.242E-03	907
8.15	30						89.3
12.12.87	35						907
8.15	20	5.999E-03	1.809E-03				89.3
13.12.87	35						906
8.14	10			1.299E-03		3.928E-04	90.3
13.12.87	35			2.903E-03	2.030E-03	3.172E-03	906
8.14	30						90.3
13.12.87	35						906
8.14	20	6.104E-03	1.769E-03				90.3
14.12.87	35						72
17. 0	20						91.34
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Table 6.4.45. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
8. 1.88	35						807
0. 0	10						91.34
8. 1.88	35		2.746E-04				807
8.45	10			1.286E-03	1.795E-04	4.288E-04	92.6
8. 1.88	35			2.273E-03	1.258E-03	2.717E-03	807
8.45	30						92.6
8. 1.88	35						807
8.45	20	2.261E-03	2.072E-03				92.6
9. 1.88	35						809
8.43	10			1.701E-03		5.706E-04	93.6
9. 1.88	35			2.951E-03	2.102E-03	3.269E-03	809
8.43	30						93.6
9. 1.88	35						809
8.43	20	3.498E-03	2.166E-03				93.6
10. 1.88	35						810
8.35	10			1.681E-03		5.596E-04	94.6
10. 1.88	35			2.936E-03	2.118E-03	3.277E-03	810
8.35	30						94.6
10. 1.88	35						810
8.35	20	4.144E-03	2.162E-03				94.6
11. 1.88	35						810
8.4	10			1.668E-03		5.685E-04	95.6
11. 1.88	35			2.938E-03	2.117E-03	3.285E-03	810
8.4	30						95.6
11. 1.88	35						810
11.25	10			1.522E-03		4.808E-04	95.7
11. 1.88	35			3.428E-03	2.301E-03	3.681E-03	810
11.25	30						95.7
11. 1.88	35						810
11.25	20	5.776E-03	2.675E-03				95.7
11. 1.88	35						812
16. 9	10			2.550E-03		9.575E-04	96
11. 1.88	35			5.533E-03	3.506E-03	1.247E-02	812
16. 9	30						96
11. 1.88	35						812
16. 9	20	5.732E-02	8.727E-03				96
11. 1.88	35						810
19.54	10			3.099E-03		1.171E-03	96.1
11. 1.88	35			5.392E-03	3.681E-03	1.163E-02	810
19.54	30						96.1
11. 1.88	35						810
19.54	20	4.764E-02	1.267E-02				96.1
12. 1.88	35						811
0.44	10			3.394E-03		1.248E-03	96.4
12. 1.88	35			8.389E-03	3.777E-03	1.281E-02	811
0.44	30						96.4
12. 1.88	35						811
0.44	20	4.165E-02	1.351E-02				96.4
12. 1.88	35						812
4.24	10			3.476E-03		1.239E-03	96.5
12. 1.88	35			5.896E-03	3.879E-03	9.611E-03	812
4.24	30						96.5

Table 6.4.45. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
12. 1.88	35						812
4.24	20	3.613E-02	1.293E-02				96.5
12. 1.88	35						812
8.4	10			3.423E-03		1.206E-03	96.7
12. 1.88	35			5.359E-03	4.053E-03	9.734E-03	812
8.4	30						96.7
12. 1.88	35						812
8.4	20	4.516E-02	1.317E-02				96.7
13. 1.88	35						809
8.38	10			3.603E-03		1.194E-03	97.7
13. 1.88	35			6.329E-03	4.669E-03	6.995E-03	809
8.38	30						97.7
13. 1.88	35						809
8.38	20	3.171E-02	1.493E-02				97.7
14. 1.88	35						812
8.43	10			3.598E-03		1.190E-03	98.7
14. 1.88	35			6.189E-03	4.615E-03	6.835E-03	812
8.43	30						98.7
14. 1.88	35						812
8.43	20	2.963E-02	1.180E-02				98.7
15. 1.88	35						812
8.41	10			3.283E-03			99.7
15. 1.88	35			6.017E-03	4.399E-03	6.544E-03	812
8.41	30						99.7
15. 1.88	35						813
11.22	10			3.126E-03		1.035E-03	99.8
15. 1.88	35			1.240E-02	4.394E-03	1.384E-02	813
11.22	30						99.8
15. 1.88	35						813
11.22	20	2.923E-02	1.354E-02				99.8
15. 1.88	35						813
16.48	10			3.074E-03		1.023E-03	100
15. 1.88	35			5.642E-03	4.347E-03	5.961E-03	813
16.48	30						100
15. 1.88	35						813
16.48	20	1.985E-02	1.248E-02				100
15. 1.88	35						812
21.33	10			3.067E-03		9.954E-04	100.2
16. 1.88	35						812
0.2	10			2.794E-03		9.466E-04	100.4
16. 1.88	35			6.500E-03	4.943E-03	6.808E-03	812
0.2	30						100.4
16. 1.88	35						812
0.2	20	1.561E-02	1.304E-02				100.4
16. 1.88	35						812
8.15	10			2.613E-03		9.764E-04	100.6
16. 1.88	35			5.285E-03	4.078E-03	5.492E-03	812
8.15	30						100.6
16. 1.88	35						812
8.15	20	1.269E-02	6.965E-03				100.6
17. 1.88	35						811
8.2	10			2.521E-03		9.145E-04	101.7

Table 6.4.45. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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17. 1.88	35			3.910E-03	2.192E-03	4.510E-03	811
8.2	30						101.7
17. 1.88	35						811
8.2	20	1.031E-02	4.063E-03				101.7
18. 1.88	35						811
8.15	10			2.361E-03		8.427E-04	102.7
18. 1.88	35			5.141E-03	3.845E-03	5.400E-03	811
8.15	30						102.7
18. 1.88	35						811
8.15	20	9.809E-03	4.053E-03				102.7
19. 1.88	35						811
8.25	10			2.383E-03		8.089E-04	103.7
19. 1.88	35			4.823E-03	3.632E-03	5.198E-03	811
8.25	30						103.7
19. 1.88	35						811
8.25	20	9.238E-03	3.780E-03				103.7
20. 1.88	35						808
8. 5	10			2.234E-03		7.720E-04	104.7
20. 1.88	35			4.439E-03	3.336E-03	4.768E-03	808
8. 5	30						104.7
20. 1.88	35						808
8. 5	20	8.458E-03	3.446E-03				104.7
21. 1.88	35						809
8. 3	10			2.271E-03		7.548E-04	105.7
21. 1.88	35			4.442E-03	3.233E-03	4.713E-03	809
8. 3	30						105.7
21. 1.88	35						809
8. 3	20	8.330E-03	3.381E-03				105.7
22. 1.88	35						810
8. 3	10			2.225E-03		7.572E-04	106.7
22. 1.88	35			4.246E-03	3.182E-03	4.648E-03	810
8. 3	30						106.7
22. 1.88	35						810
8. 3	20	8.031E-03	3.247E-03				106.7
23. 1.88	35						811
9.12	10			2.293E-03		7.401E-04	107.7
23. 1.88	35			4.138E-03	3.059E-03	4.511E-03	811
9.12	30						107.7
23. 1.88	35						811
9.12	20	7.384E-03	3.111E-03				107.7
24. 1.88	35						810
9. 7	10			2.160E-03		6.948E-04	108.7
24. 1.88	35			3.870E-03	2.877E-03	4.202E-03	810
9. 7	30						108.7
24. 1.88	35						810
9. 7	20	7.479E-03	3.009E-03				108.7
25. 1.88	35						811
8.41	10			2.127E-03		6.855E-04	109.7
25. 1.88	35			3.815E-03	2.771E-03	4.163E-03	811
8.41	30						109.7
25. 1.88	35						811
8.41	20	6.928E-03	2.861E-03				109.7

Table 6.4.45. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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26. 1.88	35						811
8.44	10			2.138E-03		6.790E-04	110.7
26. 1.88	35			3.742E-03	2.736E-03	4.113E-03	811
8.44	30						110.7
26. 1.88	35						811
8.44	20	6.866E-03	2.788E-03				110.7
27. 1.88	35						809
8.42	10			2.108E-03		6.692E-04	111.7
27. 1.88	35			3.704E-03	2.720E-03	4.093E-03	809
8.42	30						111.7
27. 1.88	35						809
8.42	20	6.946E-03	2.775E-03				111.7
28. 1.88	35						808
8.41	10			2.057E-03		6.452E-04	112.7
28. 1.88	35			3.557E-03	2.603E-03	3.952E-03	808
8.41	30						112.7
28. 1.88	35						808
8.41	20	7.401E-03	2.677E-03				112.7
29. 1.88	35						807
8.39	10			2.098E-03		6.516E-04	113.7
29. 1.88	35			3.688E-03	2.613E-03	3.939E-03	807
8.39	30						113.7
29. 1.88	35						807
8.39	20	6.779E-03	2.749E-03				113.7
30. 1.88	35						808
9.21	10			2.022E-03		6.310E-04	114.7
30. 1.88	35			3.514E-03	2.543E-03	3.866E-03	808
9.21	30						114.7
30. 1.88	35						808
9.21	20	6.847E-03	2.663E-03				114.7
31. 1.88	35						807
8.4	10			1.996E-03		6.230E-04	115.7
31. 1.88	35			3.409E-03	2.481E-03	3.816E-03	807
8.4	30						115.7
31. 1.88	35						807
8.4	20	6.778E-03	2.619E-03				115.7
1. 2.88	35						807
8.38	10			1.999E-03		6.236E-04	116.7
1. 2.88	35			3.383E-03	2.448E-03	3.765E-03	807
8.38	30						116.7
1. 2.88	35						807
8.38	20	6.613E-03	2.576E-03				116.7
1. 2.88	35						30
20. 0	20						117.1
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Table 6.4.46. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	C	CYCLE NO.	88.02	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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10. 2.88	35						807
0. 0	10						117.1
10. 2.88	35						806
16.24	10			1.573E-03		4.849E-04	123.8
10. 2.88	35			2.361E-03	1.728E-03	2.619E-03	806
16.24	30						123.8
10. 2.88	35						806
16.24	20	4.724E-03	1.895E-03				123.8
11. 2.88	35						810
16. 6	10			1.598E-03		4.888E-04	124.8
11. 2.88	35			2.420E-03	1.759E-03	2.671E-03	810
16. 6	30						124.8
11. 2.88	35						810
16. 6	20	4.729E-03	1.889E-03				124.8
12. 2.88	35						806
16. 9	10			1.548E-03		4.684E-04	125.8
12. 2.88	35			2.346E-03	1.708E-03	2.610E-03	806
16. 9	30						125.8
12. 2.88	35						806
16. 9	20	4.964E-03	1.873E-03				125.8
13. 2.88	35						805
16.23	10			1.577E-03		4.923E-04	126.8
13. 2.88	35			2.306E-03	1.705E-03	2.566E-03	805
16.23	30						126.8
13. 2.88	35						805
16.23	20	4.982E-03	1.856E-03				126.8
18. 2.88	35						812
8.4	10			1.424E-03		4.407E-04	131.6
18. 2.88	35			2.251E-03	1.640E-03	2.511E-03	812
8.4	30						131.6
18. 2.88	35						812
8.4	20	5.051E-03	1.771E-03				131.6
20. 2.88	35						812
8.28	10			1.463E-03		4.670E-04	133.5
20. 2.88	35			2.275E-03	1.655E-03	2.490E-03	812
8.28	30						133.5
20. 2.88	35						812
8.28	20	5.284E-03	1.756E-03				133.5
21. 2.88	35						811
8.24	10			1.560E-03		4.927E-04	134.5
21. 2.88	35			2.267E-03	1.654E-03	2.509E-03	811
8.24	30						134.5
21. 2.88	35						811
8.24	20	5.369E-03	1.835E-03				134.5
27. 2.88	35						799
9.2	10			1.542E-03		4.952E-04	140.5
27. 2.88	35			2.319E-03	1.709E-03	2.587E-03	799
9.2	30						140.5
27. 2.88	35						799
9.2	20	5.901E-03	1.893E-03				140.5
28. 2.88	35						798
8.34	10			1.570E-03		4.962E-04	141.5

Table 6.4.46. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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28. 2.88	35			2.259E-03	1.664E-03	2.527E-03	798
8.34	30						141.5
28. 2.88	35						798
8.34	20	5.119E-03	1.857E-03				141.5
29. 2.88	35						797
8.28	10			1.584E-03		5.041E-04	142.5
29. 2.88	35			2.284E-03	1.689E-03	2.552E-03	797
8.28	30						142.5
29. 2.88	45						63
18. 0	10						142.54
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Table 6.4.47. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	C	CYCLE NO.	88.04	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
30. 4.88	45		2.759E-04				788
8.27	10			1.486E-03	1.955E-04	4.817E-04	144.9
30. 4.88	45			1.977E-03	1.441E-03	2.227E-03	788
8.27	30						144.9
30. 4.88	45						788
8.27	20	2.321E-03	1.651E-03				144.9
1. 5.88	45		2.633E-04				789
9.52	10			1.444E-03	1.770E-04	4.688E-04	146
1. 5.88	45			1.977E-03	1.461E-03	2.236E-03	789
9.52	30						146
1. 5.88	45						789
9.52	20	2.672E-03	1.665E-03				146
3. 5.88	45		2.397E-04				789
9. 4	10			1.175E-03	1.616E-04	3.862E-04	147.9
3. 5.88	45			1.505E-03	1.127E-03	1.696E-03	789
9. 4	30						147.9
3. 5.88	45						789
9. 4	20	2.655E-03	1.250E-03				147.9
4. 5.88	45			1.578E-03	1.115E-03	1.726E-03	788
8.2	30						149
4. 5.88	45						788
8.2	20	2.826E-03	1.274E-03				149
9. 5.88	45		3.587E-04				783
0.24	10			2.013E-03	2.709E-04	7.166E-04	154
9. 5.88	45						783
0.24	20	6.204E-03	2.416E-03				154
10. 5.88	45		2.405E-04				781
0.57	10			1.916E-03	1.986E-04	6.755E-04	155
10. 5.88	45			2.687E-03	1.894E-03	2.765E-03	781
0.57	30						155
10. 5.88	45						781
0.57	20	5.586E-03	2.319E-03				155
14. 5.88	45		4.338E-04				779
0.28	10			1.895E-03	3.055E-04	6.708E-04	159
14. 5.88	45			2.453E-03	1.639E-03	2.595E-03	779
0.28	30						159
14. 5.88	45						779
0.28	20	4.779E-03	2.057E-03				159
15. 5.88	45		4.225E-04				779
0.27	10			2.107E-03	3.021E-04	6.921E-04	160
15. 5.88	45			2.604E-03	1.806E-03		779
0.27	30						160
15. 5.88	45						779
0.27	20	5.532E-03	2.234E-03				160
19. 5.88	45		2.940E-04				778
0.12	10			1.757E-03	2.153E-04	5.898E-04	164
19. 5.88	45			2.547E-03	1.806E-03	2.688E-03	778
0.12	30						164
19. 5.88	45						778
0.12	20	5.472E-03	2.076E-03				164
20. 5.88	45		3.859E-04				778
0.22	10			1.813E-03	2.728E-04	6.144E-04	165

Table 6.4.47. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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20. 5.88	45			2.401E-03	1.831E-03	2.704E-03	778
0.22	30						165
20. 5.88	45						778
0.22	20	5.445E-03	2.075E-03				165
22. 5.88	45		3.298E-04				774
0.16	10			1.726E-03	2.162E-04	5.555E-04	167
22. 5.88	45			2.445E-03	1.747E-03	2.730E-03	774
0.16	30						167
22. 5.88	45						774
0.16	20	5.492E-03	2.086E-03				167
23. 5.88	45		3.021E-04				772
0. 6	10			1.710E-03	2.219E-04	5.526E-04	168
23. 5.88	45			2.386E-03	1.710E-03	2.698E-03	772
0. 6	30						168
23. 5.88	45						772
0. 6	20	5.556E-03	2.029E-03				168
23. 5.88	45						75
17. 0	10						168.29
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Table 6.4.48. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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28. 5.88	45		3.351E-04				787
9. 5	10			1.824E-03	2.399E-04	6.024E-04	169.8
28. 5.88	45			2.468E-03	1.763E-03	2.805E-03	787
9. 5	30						169.8
28. 5.88	45						787
9. 5	20	4.424E-03	2.058E-03				169.8
29. 5.88	45			2.609E-03	1.781E-03	2.788E-03	788
8.55	30						170.8
29. 5.88	45						788
8.55	20	4.942E-03	2.089E-03				170.8
30. 5.88	45		9.002E-05				789
8.54	10			1.469E-03	9.653E-05	4.652E-04	171.8
30. 5.88	45						789
8.54	20	4.958E-03	2.070E-03				171.8
31. 5.88	45			2.549E-03	1.690E-03	2.709E-03	788
9.45	30						172.8
31. 5.88	45						788
9.45	20	5.073E-03	2.023E-03				172.8
1. 6.88	45		2.547E-04				783
8.45	10			1.457E-03	1.724E-04	4.672E-04	173.8
1. 6.88	45			1.902E-03	1.363E-03	2.088E-03	783
8.45	30						173.8
1. 6.88	45						783
8.45	20	4.097E-03	1.547E-03				173.8
2. 6.88	45			1.827E-03	1.355E-03	2.065E-03	781
8.45	30						174.8
2. 6.88	42		3.413E-04				782
9.52	10			1.344E-03	1.974E-04	4.258E-04	174.8
2. 6.88	42		3.490E-04				782
10. 0	10			1.345E-03	1.994E-04	4.143E-04	174.8
2. 6.88	42		3.267E-04				782
10.39	10			1.232E-03	2.071E-04		174.9
2. 6.88	42		3.354E-04				782
11.22	10			1.284E-03	1.989E-04	4.001E-04	174.9
2. 6.88	42		3.614E-04				782
13. 2	10			1.405E-03	2.242E-04	4.712E-04	175
2. 6.88	42		3.789E-04				782
13.53	10			1.387E-03	2.062E-04	4.835E-04	175
2. 6.88	42		3.951E-04				761
15. 3	10			1.477E-03	2.160E-04	5.925E-04	175
2. 6.88	42		3.907E-04				781
16. 0	10			1.438E-03	2.808E-04	5.519E-04	175
2. 6.88	42		3.910E-04				785
17.3	10			8.715E-04	2.785E-04	5.764E-04	175.1
2. 6.88	42		4.041E-04				783
21.44	10			2.004E-03	4.254E-04	6.731E-04	175.2
3. 6.88	42		1.412E-04				786
3.12	10			1.025E-03	1.841E-04	3.355E-04	175.6
3. 6.88	42		2.399E-04				784
14.1	10			4.714E-04	1.503E-04	4.394E-04	176
3. 6.88	45						784
14.18	10			3.992E-03	4.927E-04	1.255E-03	176

Table 6.4.48. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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3. 6.88	45			4.194E-03	2.990E-03	4.697E-03	784
14.18	30						176
4. 6.88	45		4.226E-04				782
8.3	10			2.853E-03	3.802E-04	7.939E-04	176.8
4. 6.88	45			4.282E-03	3.161E-03	5.334E-03	782
8.3	30						176.8
4. 6.88	45						782
8.3	20	1.112E-01	6.031E-03				176.8
5. 6.88	45		4.173E-04				782
8.2	10			2.845E-03	3.564E-04	7.837E-04	177.8
5. 6.88	45			4.646E-03	3.243E-03	5.666E-03	782
8.2	30						177.8
5. 6.88	45						782
8.2	20	1.824E-01	6.568E-03				177.8
6. 6.88	45		4.327E-04				783
8.31	10			2.742E-03	3.953E-04	8.000E-04	178.8
6. 6.88	45			3.541E-03	2.834E-03	4.042E-03	783
8.31	30						178.8
6. 6.88	45						783
8.31	20	3.536E-02	5.381E-03				178.8
7. 6.88	45		4.627E-04				781
8.38	10			2.575E-03	3.850E-04	7.945E-04	178.8
7. 6.88	45			3.297E-03	2.509E-03	3.864E-03	781
8.38	30						178.8
8. 6.88	45		4.602E-04				781
8.15	10			2.521E-03	3.909E-04	7.192E-04	180.8
8. 6.88	45			3.307E-03	2.638E-03	3.970E-03	781
8.15	30						180.8
8. 6.88	45						781
8.15	20	2.558E-02	4.314E-03				180.8
9. 6.88	45		4.413E-04				779
8.14	10			2.609E-03	3.957E-04	7.173E-04	181.8
9. 6.88	45			3.286E-03	2.709E-03	4.016E-03	779
8.14	30						181.8
9. 6.88	42		3.681E-04				781
10.22	10			2.010E-03	3.254E-04	6.020E-04	181.8
9. 6.88	42		3.076E-04				781
10.36	10			1.364E-03	2.223E-04	3.797E-04	181.8
9. 6.88	42		3.061E-04				780
12. 0	10			1.415E-03	2.118E-04	3.918E-04	181.9
9. 6.88	42		2.124E-04				780
13. 0	10			8.529E-04	1.593E-04	2.491E-04	181.9
9. 6.88	42		1.751E-04				780
13.2	10			8.740E-04	1.412E-04	2.410E-04	181.9
9. 6.88	42		1.620E-04				780
14.4	10			8.435E-04	2.128E-04	2.868E-04	182
9. 6.88	45			3.174E-03	2.382E-03	3.071E-03	779
16. 2	30						182
9. 6.88	42		2.684E-04				779
16.24	10			1.726E-03	1.911E-04	4.598E-04	182
9. 6.88	45			2.998E-03	2.303E-03	3.318E-03	780
17.3	30						182

Table 6.4.48. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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9. 6.88	42		2.150E-04				780
17.5	10			1.578E-03	2.155E-04	4.660E-04	182.1
9. 6.88	42		3.062E-04				780
19.16	10			1.448E-03	2.013E-04	3.758E-04	182.2
9. 6.88	45			2.582E-03	1.446E-03	2.655E-03	779
20.22	30						182.2
9. 6.88	42		4.765E-04				779
20.41	10			1.853E-03	3.180E-04	4.909E-04	182.2
9. 6.88	45			3.225E-03	2.342E-03	3.366E-03	779
21.5	30						182.2
10. 6.88	45			3.212E-03	2.404E-03	2.683E-03	779
4.34	30						182.6
10. 6.88	42		3.464E-04				779
4.53	10			1.181E-03	2.328E-04	3.956E-04	182.6
10. 6.88	45			3.136E-03	2.380E-03	3.352E-03	779
6. 0	30						182.7
10. 6.88	42		2.882E-04				779
8.3	10			1.140E-03	2.074E-04	3.218E-04	182.8
10. 6.88	45			3.352E-03	2.331E-03	3.427E-03	779
9.5	30						182.8
10. 6.88	42		4.099E-04				779
10.1	10			1.569E-03	2.834E-04	5.148E-04	182.8
10. 6.88	45			3.048E-03	2.347E-03	3.250E-03	779
10.2	30						182.9
10. 6.88	42		3.470E-04				779
10.4	10			1.019E-03	2.490E-04	4.126E-04	182.9
10. 6.88	45			2.096E-03	1.737E-03	2.459E-03	782
13. 0	30						182.9
10. 6.88	42		3.539E-04				783
14.55	10			1.315E-03	2.439E-04	4.457E-04	183
10. 6.88	45			2.783E-03	2.292E-03	3.155E-03	783
15.2	30						183
11. 6.88	45		4.604E-04				780
10.43	10			1.922E-03	3.041E-04	6.812E-04	183.9
11. 6.88	45						781
12.51	20	7.541E-03	2.752E-03				183.9
12. 6.88	45		3.956E-04				780
8.47	10			1.812E-03	2.896E-04	5.984E-04	184.7
12. 6.88	45			2.326E-03	1.725E-03	2.713E-03	781
9.38	30						184.7
12. 6.88	45						781
10.38	20	6.012E-03	2.362E-03				184.7
13. 6.88	45		3.589E-04				779
8.48	10			1.667E-03	2.549E-04	5.729E-04	185.7
13. 6.88	45			2.571E-03	1.911E-03	2.767E-03	779
9.48	30						185.7
13. 6.88	45						780
10.48	20	5.344E-03	2.231E-03				185.8
14. 6.88	45		3.397E-04				778
8.41	10			1.630E-03	2.426E-04	5.525E-04	186.7
14. 6.88	45			2.473E-03	1.845E-03	2.769E-03	778
8.41	30						186.7

Table 6.4.48. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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14. 6.88	45						778
8.41	20	5.541E-03	2.208E-03				186.8
15. 6.88	45		3.452E-04				778
8.28	10			1.674E-03	2.463E-04	5.503E-04	187.7
15. 6.88	45			2.560E-03	1.876E-03	2.815E-03	778
8.28	30						187.7
15. 6.88	45						778
8.28	20	5.534E-03	2.190E-03				187.7
16. 6.88	45		2.016E-04				777
0.43	10			1.559E-03	1.553E-04	5.253E-04	188.5
16. 6.88	45			2.313E-03	1.779E-03	2.704E-03	777
0.43	30						188.5
16. 6.88	45						777
0.43	20	5.472E-03	2.129E-03				188.5
17. 6.88	45		2.395E-04				776
0.45	10			1.544E-03	1.774E-04	5.335E-04	189.5
17. 6.88	45			2.333E-03	1.783E-03	2.786E-03	776
0.45	30						189.5
17. 6.88	45						776
0.45	20	5.596E-03	2.137E-03				189.5
18. 6.88	45						771
0.42	20	5.009E-03					190.5
19. 6.88	45			1.594E-03	8.373E-04	1.980E-03	769
1.36	30						191.5
19. 6.88	45						769
1.36	20	5.106E-03	1.691E-03				191.5
20. 6.88	45						768
0.57	10			4.824E-04		1.522E-04	192.5
20. 6.88	45			1.800E-03	1.141E-03	2.088E-03	768
0.57	30						192.5
20. 6.88	45						0
18. 0	30						193.5
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Table 6.4.49. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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25. 6.88	45						705
0. 0	10						193.5
25. 6.88	45		4.045E-04				705
0.28	10			1.910E-03	2.947E-04	6.455E-04	195.2
25. 6.88	45			2.395E-03	1.900E-03	2.843E-03	705
0.28	30						195.2
25. 6.88	45						705
0.28	20	4.677E-03	2.409E-03				195.2
26. 6.88	45		3.797E-04				711
0.19	10			1.986E-03	2.817E-04	6.410E-04	196.2
26. 6.88	45			2.533E-03	1.948E-03	3.002E-03	711
0.19	30						196.2
26. 6.88	45						711
0.19	20	5.493E-03	2.576E-03				196.2
27. 6.88	45		3.846E-04				712
0. 8	10			2.031E-03	2.811E-04	6.661E-04	197.2
27. 6.88	45			2.563E-03	1.842E-03	2.827E-03	712
0. 8	30						197.2
27. 6.88	45						712
0. 8	20	5.756E-03	2.456E-03				197.2
28. 6.88	45			2.712E-03	1.989E-03	3.078E-03	713
0.41	30						198.2
28. 6.88	42		3.722E-04				714
10. 1	10			1.509E-03	2.405E-04	5.043E-04	198.5
28. 6.88	45		3.399E-04				714
10. 7	10			1.572E-03	2.848E-04	5.201E-04	198.5
28. 6.88	45			1.914E-03	1.611E-03	2.378E-03	714
10. 7	30						198.5
28. 6.88	45						714
10. 7	20	5.351E-03	2.068E-03				198.5
28. 6.88	42		3.548E-04				714
11.3	10			1.540E-03	2.475E-04	5.188E-04	198.52
28. 6.88	45		3.911E-04				714
11.34	10			1.818E-03	3.015E-04	6.011E-04	198.52
28. 6.88	45			1.324E-03	1.486E-03	1.558E-03	714
11.34	30						198.52
28. 6.88	45			3.293E-03	2.428E-03	4.124E-03	714
13.15	30						198.6
28. 6.88	42		2.522E-04				713
15.44	10			1.402E-03	2.196E-04	4.345E-04	198.62
28. 6.88	45		5.371E-04				713
15.5	10			2.415E-03	4.303E-04	7.141E-04	198.62
28. 6.88	42		3.235E-04				713
17.15	10			1.946E-03		5.150E-04	198.65
28. 6.88	45						713
17.22	10			2.186E-03	2.314E-04	6.725E-04	198.65
28. 6.88	45			3.627E-03	2.244E-03	5.160E-03	713
17.22	30						198.65
28. 6.88	45						713
21. 4	10			2.394E-03		6.047E-04	198.9
28. 6.88	42		1.927E-04				713
22.25	10			2.408E-03	2.154E-04	5.295E-04	198.95

Table 6.4.49. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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28. 6.88	45						713
22.35	10			3.273E-03	2.414E-04	7.263E-04	198.95
29. 6.88	45		4.529E-04				711
0.35	10			2.785E-03	1.809E-04	8.031E-04	199.2
29. 6.88	45			6.968E-03	3.852E-03	1.052E-02	711
0.35	30						199.2
29. 6.88	45		2.932E-04				710
4. 0	10			3.791E-03	2.061E-04	8.175E-04	199.2
29. 6.88	42		2.283E-04				712
16.12	10			3.346E-03	3.334E-04	6.563E-04	199.6
29. 6.88	45						712
16.12	10			4.423E-03	4.607E-04	9.114E-04	199.6
29. 6.88	45		2.687E-04				712
18. 0	10				2.263E-04	2.753E-04	199.64
29. 6.88	45		4.349E-04				711
19.46	10			3.708E-03	4.948E-04	6.489E-04	199.7
29. 6.88	45		1.171E-04				711
19.46	10			2.801E-03	2.006E-04	5.253E-04	199.7
29. 6.88	45						713
21.14	10				3.053E-04		199.9
29. 6.88	45		1.490E-04				713
21.35	10						199.9
29. 6.88	45			5.891E-03	3.807E-03	6.809E-03	713
21.35	30						199.9
30. 6.88	45			5.347E-03	3.846E-03	6.820E-03	711
13.17	30						200.7
1. 7.88	45		2.911E-04				710
8.36	10			4.552E-03	3.459E-04	9.994E-04	201.5
1. 7.88	45			6.855E-03	4.179E-03		710
8.36	30						201.5
1. 7.88	45						710
8.36	30						201.5
2. 7.88	45		1.305E-04				710
9.47	10			4.700E-03	3.122E-04	1.020E-03	202.5
3. 7.88	45		2.436E-04				709
11. 0	10			3.730E-03	2.801E-04	8.564E-04	203.7
9. 7.88	45						741
0.55	10			3.417E-03	3.363E-04	9.326E-04	207.7
9. 7.88	45			5.943E-03	4.266E-03	6.911E-03	741
0.55	30						207.7
10. 7.88	45		4.604E-04				741
0.32	10			3.291E-03	4.021E-04	9.130E-04	208.7
10. 7.88	45			6.106E-03	4.412E-03	6.305E-03	741
0.32	30						208.7
10. 7.88	45						741
0.32	20	2.048E-02	1.545E-02				208.7
11. 7.88	45		4.317E-04				741
0.51	10			3.502E-03	3.835E-04	9.342E-04	209.7
12. 7.88	45		2.795E-04				735
1.37	10			2.769E-03	2.317E-04	7.339E-04	210.7
12. 7.88	45			5.492E-03	4.064E-03	6.339E-03	735
1.37	40	1.829E-02	5.891E-03				210.7

Table 6.4.49. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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13. 7.88	45		4.947E-04				736
0.57	10			3.231E-03	1.589E-04	8.506E-04	211.7
13. 7.88	45			4.881E-03	3.480E-03	5.552E-03	736
0.57	30						211.7
13. 7.88	45						736
0.57	20	1.889E-02	9.007E-03				211.7
14. 7.88	45		2.641E-04				739
0.27	10			4.180E-03	4.532E-04	1.129E-03	212.7
14. 7.88	45			5.386E-03	3.735E-03	5.719E-03	739
0.27	30						212.7
15. 7.88	45		4.140E-04				737
0.23	10			3.069E-03	3.584E-04	8.022E-04	213.7
15. 7.88	45			4.818E-03	3.418E-03	5.474E-03	737
0.23	30						213.7
15. 7.88	45						737
0.23	20	1.945E-02	6.074E-03				213.7
18. 7.88	45						26
5. 0	20						214.3
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Table 6.4.50. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.07		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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9. 9.88	42						751
0. 0	10						214.3
9. 9.88	42		3.475E-04				755
2.55	10			1.314E-03	2.751E-04	5.808E-04	215.3
9. 9.88	45		4.165E-04				755
3. 5	10			2.852E-03	3.410E-04	7.751E-04	215.3
9. 9.88	45			4.893E-03	3.740E-03	5.291E-03	755
3. 5	30						215.3
9. 9.88	45						755
3. 5	20	4.626E-03	5.747E-03				215.3
10. 9.88	42		3.937E-04				756
1.19	10			2.516E-03	2.817E-04	5.711E-04	216.3
10. 9.88	45		3.567E-04				756
1.31	10			2.700E-03	3.578E-04	6.159E-04	216.3
10. 9.88	45			4.744E-03	3.341E-03	5.131E-03	756
1.31	30						216.3
10. 9.88	45						756
1.31	20	7.550E-03	5.583E-03				216.3
11. 9.88	42		7.527E-04				757
3. 0	10			1.969E-03	4.916E-04	6.872E-04	217.3
11. 9.88	45			5.237E-03	3.489E-03	5.475E-03	757
3.15	30						217.3
11. 9.88	45						757
3.15	20	1.094E-02	6.004E-03				217.3
12. 9.88	42		3.995E-04				756
1.2	10			2.531E-03	2.851E-04	6.147E-04	218.3
12. 9.88	45		3.537E-04				756
1.32	10			2.689E-03	2.701E-04	6.648E-04	218.3
12. 9.88	45			5.154E-03	3.762E-03	5.975E-03	756
1.32	30						218.3
12. 9.88	45						756
1.32	20	1.260E-02	6.207E-03				218.3
13. 9.88	42		3.380E-04				757
0.37	10			2.429E-03	2.495E-04	6.019E-04	219.3
13. 9.88	45		2.830E-04				757
0.5	10			2.773E-03	2.331E-04	6.798E-04	219.3
13. 9.88	45			5.097E-03	3.619E-03	5.510E-03	757
0.5	30						219.3
13. 9.88	45						757
0.5	20	1.452E-02	6.184E-03				219.3
14. 9.88	42		3.078E-04				755
1.17	10			2.122E-03	2.221E-04	4.858E-04	220.3
14. 9.88	45		2.627E-04				755
1.32	10			2.408E-03	1.819E-04	5.747E-04	220.3
14. 9.88	45			4.586E-03	3.178E-03	4.945E-03	755
1.32	30						220.3
14. 9.88	45						755
1.32	20	1.431E-02	5.683E-03				220.3
14. 9.88	42		3.403E-04				756
9. 1	10			2.484E-03	2.731E-04	5.823E-04	220.7
14. 9.88	42		2.877E-04				756
9.15	10			1.927E-03	2.333E-04	4.715E-04	220.7

Table 6.4.50. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.07		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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14. 9.88	42		2.506E-04				756
9.29	10			1.807E-03	2.138E-04	3.780E-04	220.7
14. 9.88	42		3.905E-04				754
11.25	10			2.674E-03	3.205E-04	6.584E-04	220.79
14. 9.88	42		2.804E-04				754
11.5	10			1.975E-03	2.693E-04	4.412E-04	220.8
14. 9.88	42		1.783E-04				755
12.46	10			1.595E-03	2.135E-04	4.006E-04	220.83
14. 9.88	42		2.972E-04				755
13.34	10			1.915E-03	2.650E-04	4.906E-04	220.85
14. 9.88	42		2.220E-04				755
13.58	10			1.532E-03	1.998E-04	3.949E-04	220.86
14. 9.88	42		2.720E-04				755
14.46	10			1.688E-03	1.865E-04	3.672E-04	220.9
14. 9.88	42		1.609E-04				755
15.55	10			1.353E-03	1.491E-04	3.102E-04	220.93
14. 9.88	45		7.460E-04				753
19. 5	10			4.316E-03	4.823E-04	1.166E-03	221.03
14. 9.88	45		4.231E-04				754
22.5	10			4.361E-03	5.464E-04	1.081E-03	221.2
15. 9.88	45						754
0. 5	10			2.340E-03		6.035E-04	221.27
15. 9.88	45						754
0.56	10			1.163E-03		5.877E-04	221.31
15. 9.88	45						754
1.56	10			2.247E-03		5.337E-04	221.34
15. 9.88	45						754
2.55	10			2.106E-03		5.470E-04	221.37
15. 9.88	45						755
3.52	10			2.104E-03		5.234E-04	221.4
15. 9.88	45						755
4.53	10			1.735E-03	5.618E-04	4.809E-04	221.43
15. 9.88	45						754
5.53	10			1.322E-03		5.285E-04	221.46
15. 9.88	45						755
6.5	10			2.131E-03		4.262E-04	221.5
15. 9.88	45						754
8.2	10			1.940E-03		5.151E-04	221.57
15. 9.88	45			2.691E-03	2.993E-03	3.706E-03	754
8.2	30						221.57
15. 9.88	45		3.356E-04				754
9.38	10			1.663E-03		7.019E-04	221.64
15. 9.88	45			7.098E-03	4.230E-03	8.861E-03	752
12.29	30						221.75
15. 9.88	45			7.001E-03	4.173E-03	8.689E-03	753
13.39	30						221.8
15. 9.88	45			4.811E-03	3.875E-03	5.660E-03	752
15.36	30						221.88
15. 9.88	45						753
17.58	10			2.064E-03		5.205E-04	221.95
15. 9.88	45			3.014E-03	3.016E-03	3.827E-03	753
17.58	30						221.95

Table 6.4.50. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.07		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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15. 9.88	45						752
19.58	10			2.018E-03		4.824E-04	222.03
15. 9.88	45			3.651E-03	3.050E-03	4.347E-03	752
19.58	30						222.03
15. 9.88	45						753
21.27	10			2.314E-03		4.687E-04	222.11
15. 9.88	45			3.912E-03	3.295E-03	4.590E-03	753
21.27	30						222.11
16. 9.88	45						753
0.27	10			1.585E-03		5.153E-04	222.25
16. 9.88	45			2.506E-03	2.919E-03	3.703E-03	753
0.27	30						222.25
16. 9.88	45						753
2.24	10			1.707E-03		5.366E-04	222.32
16. 9.88	45			3.592E-03	2.973E-03	3.871E-03	753
2.24	30						222.32
16. 9.88	45						754
6. 3	10			2.037E-03		4.526E-04	222.47
16. 9.88	45			3.251E-03	2.778E-03	4.183E-03	754
6. 3	30						222.47
16. 9.88	45						753
8.26	10			1.531E-03		5.057E-04	222.55
16. 9.88	45			3.614E-03	3.023E-03	3.613E-03	753
8.26	30						222.55
16. 9.88	45						753
9.36	10			2.956E-03		7.370E-04	222.59
16. 9.88	45			5.353E-03	3.676E-03	3.443E-03	753
9.36	30						222.59
16. 9.88	45						754
12.3	10			3.660E-03	3.457E-04	9.859E-04	222.7
16. 9.88	45		2.608E-04				751
14. 0	10			3.492E-03	2.408E-04	8.533E-04	222.75
16. 9.88	45			4.711E-03	3.814E-03	5.863E-03	751
14. 0	30						222.75
17. 9.88	42		2.100E-04				753
8.15	10			1.564E-03	1.816E-04	2.966E-04	223.54
17. 9.88	45		2.833E-04				753
8.35	10			1.318E-03		3.434E-04	223.55
17. 9.88	45			5.729E-03	4.680E-03	6.118E-03	753
8.35	30						223.55
17. 9.88	45						753
8.35	20	3.326E-02	8.990E-03				223.55
17. 9.88	42		1.389E-04				751
11.15	10			9.419E-04	1.368E-04	2.057E-04	223.65
17. 9.88	45		1.844E-04				751
11.37	10			1.207E-03	1.802E-04	3.247E-04	223.66
17. 9.88	45			5.763E-03	4.692E-03	6.734E-03	751
11.37	30						223.66
17. 9.88	45						751
11.37	20	4.423E-02	1.006E-02				223.66
18. 9.88	42		1.535E-04				752
8. 0	10			6.805E-04			224.53

Table 6.4.50. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.07		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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18. 9.88	45		1.394E-04				752
8.22	10			8.460E-04		2.325E-04	224.54
18. 9.88	45			5.496E-03	4.430E-03	6.182E-03	752
8.22	30						224.54
18. 9.88	45						752
8.22	20	4.722E-02	9.894E-03				224.54
18. 9.88	42		1.951E-04				753
11.3	10			7.514E-04	1.112E-04	2.414E-04	224.67
18. 9.88	45			5.843E-03	4.655E-03	6.600E-03	753
12. 6	30						224.68
18. 9.88	45						753
12. 6	20	4.852E-02	1.032E-02				224.68
19. 9.88	42						751
8. 9	10			6.385E-04			225.53
19. 9.88	45						751
8.32	10			6.653E-04		4.774E-04	225.54
19. 9.88	45						751
8.32	20	3.725E-02	9.533E-03				225.54
20. 9.88	45		4.824E-04				751
8.32	10			3.828E-03	3.895E-04	1.007E-03	226.54
20. 9.88	45			6.373E-03	4.796E-03	7.243E-03	751
8.32	30						226.54
20. 9.88	45						751
8.32	20	3.129E-02	9.204E-03				226.54
21. 9.88	45						749
9.25	10			2.630E-03		7.225E-04	227.57
21. 9.88	45			6.122E-03	4.653E-03	6.884E-03	749
9.25	30						227.57
21. 9.88	45						749
9.25	20	2.335E-02	8.424E-03				227.57
22. 9.88	45		6.293E-04				751
8.25	10			3.649E-03	4.867E-04	1.001E-03	228.53
22. 9.88	45			5.701E-03	4.452E-03	6.282E-03	751
8.25	30						228.53
22. 9.88	45						751
8.25	20	1.964E-02	7.554E-03				228.53
23. 9.88	45		5.653E-04				750
8.15	10			3.238E-03	6.083E-04	1.001E-03	229.53
23. 9.88	45			5.716E-03	4.371E-03	5.863E-03	750
8.15	30						229.53
23. 9.88	45						750
8.15	20	1.891E-02	6.595E-03				229.53
24. 9.88	45		5.504E-04				749
16.53	10			3.843E-03	4.815E-04	1.077E-03	230.88
24. 9.88	45			5.664E-03	4.316E-03	5.950E-03	749
16.53	30						230.88
24. 9.88	45						749
16.53	20	1.906E-02	6.396E-03				230.88
25. 9.88	45		5.898E-04				747
17.52	10			3.637E-03	4.509E-04	1.033E-03	231.92
25. 9.88	45			5.158E-03	3.918E-03	6.094E-03	747
17.52	30						231.92

Table 6.4.50. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.07		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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25. 9.88	45						747
17.52	20	1.726E-02	5.949E-03				231.92
26. 9.88	45		6.155E-04				746
17.18	10			3.674E-03	4.689E-04	1.070E-03	232.9
26. 9.88	45			5.470E-03	3.855E-03	5.838E-03	746
17.18	30						232.9
26. 9.88	45						746
17.18	20	1.752E-02	6.059E-03				232.9
27. 9.88	45		5.708E-04				744
17.19	10			3.775E-03	4.947E-04	9.792E-04	233.9
27. 9.88	45			5.001E-03	3.743E-03	5.706E-03	744
17.19	30						233.9
27. 9.88	45						744
17.19	20	2.091E-02	5.848E-03				233.9
28. 9.88	45		6.168E-04				745
16.32	10			3.091E-03	4.957E-04	9.463E-04	234.88
28. 9.88	45			4.689E-03	3.300E-03	4.832E-03	745
16.32	30						234.88
28. 9.88	45						745
16.32	20	1.563E-02	5.275E-03				234.88
29. 9.88	45						55
3. 0	20						235.33
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Table 6.4.51. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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5.10.88	45						754
0. 0	10						235.33
5.10.88	45		3.281E-04				754
9.18	10			4.643E-03	3.345E-04	1.223E-03	237.2
5.10.88	45			6.883E-03	4.824E-03	7.413E-03	754
9.18	40	1.610E-02	7.106E-03				237.2
5.10.88	45			7.748E-03	5.514E-03	9.060E-03	754
9.18	40	1.627E-02	7.745E-03				237.2
6.10.88	42		2.014E-04				756
8.48	10						238.2
6.10.88	45		1.770E-04				756
8.54	10			3.757E-03	2.560E-04	9.627E-04	238.2
6.10.88	45			6.108E-03	4.608E-03	7.039E-03	756
8.54	40	1.689E-02	6.089E-03				238.2
6.10.88	45			7.600E-03	5.529E-03	9.015E-03	756
8.54	40	2.049E-02	8.120E-03				238.2
7.10.88	42		3.696E-04				758
8.46	10						239.2
7.10.88	45		3.664E-04				758
8.51	10			1.267E-03	2.804E-04	3.594E-04	239.2
7.10.88	45			5.345E-03	3.764E-03	5.695E-03	758
8.51	30						239.2
7.10.88	45						758
8.51	20	1.599E-02	6.112E-03				239.2
8.10.88	42		2.938E-04				756
9. 1	10						240.2
8.10.88	45		3.834E-04				756
9. 8	10			3.135E-03	3.316E-04	8.955E-04	240.2
8.10.88	45			4.940E-03	3.689E-03	5.819E-03	756
9. 8	30						240.2
8.10.88	45						756
9. 8	20	1.661E-02	5.924E-03				240.2
9.10.88	42		3.178E-04				757
8.38	10						241.2
9.10.88	45		4.483E-04				757
8.44	10			3.418E-03	3.784E-04	9.268E-04	241.2
9.10.88	45			4.870E-03	3.668E-03	5.633E-03	757
8.44	30						241.2
9.10.88	45						757
8.44	20	1.734E-02	5.927E-03				241.2
10.10.88	42		3.195E-04				756
8.45	10						242.2
10.10.88	45			4.908E-03	3.646E-03	5.802E-03	756
8.52	30						242.2
10.10.88	45						756
8.52	20	1.706E-02	5.711E-03				242.2
10.10.88	42		2.146E-04				755
15.22	10						242.4
10.10.88	45						755
15.3	10			3.831E-03	5.965E-04	9.970E-04	242.4
10.10.88	45			6.176E-03	4.195E-03	6.847E-03	755
15.3	30						242.4

Table 6.4.51. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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10.10.88	45						755
15.3	20	3.134E-02	6.487E-03				242.4
10.10.88	42		1.409E-04				754
18.5	10						242.56
10.10.88	45						754
18.58	10			3.434E-03	2.042E-04	9.966E-04	242.56
10.10.88	45			6.083E-03	4.101E-03	6.563E-03	754
18.58	30						242.56
10.10.88	45						754
18.58	20	5.031E-02	7.670E-03				242.56
11.10.88	45						756
2.13	10			1.398E-03	1.234E-04	8.285E-04	242.86
11.10.88	45			5.444E-03	4.319E-03	6.523E-03	756
2.13	30						242.86
11.10.88	45						756
2.13	20	6.760E-02	8.777E-03				242.86
11.10.88	45						755
10.42	10			3.003E-03		7.356E-04	243.2
11.10.88	45			5.448E-03	4.406E-03	6.160E-03	755
10.42	30						243.2
11.10.88	45						755
10.42	20	5.054E-02	9.201E-03				243.2
11.10.88	45						757
17.2	10			3.056E-03	1.362E-04	7.960E-04	243.5
11.10.88	45			5.319E-03	4.371E-03	5.967E-03	757
17.2	30						243.5
11.10.88	45						757
17.2	20	5.266E-02	1.043E-02				243.5
12.10.88	42		1.232E-04				757
2.15	10						243.9
12.10.88	45						757
2.25	10			1.763E-03		7.821E-04	243.9
12.10.88	45			7.494E-03	5.832E-03	8.647E-03	757
2.25	30						243.9
12.10.88	45						757
2.25	20	5.602E-02	9.660E-03				243.9
12.10.88	45						757
9.32	10			2.472E-03		7.074E-04	244.2
12.10.88	45			5.265E-03	4.720E-03	6.046E-03	757
9.32	30						244.2
12.10.88	45						757
9.32	20	5.093E-02	9.775E-03				244.2
12.10.88	42		2.078E-04				756
14.56	10						244.4
12.10.88	42		1.889E-04				756
15. 0	10						244.4
12.10.88	42		1.709E-04				756
15. 2	10						244.4
12.10.88	42		2.379E-04				756
15. 4	10						244.4
12.10.88	42		1.980E-04				756
15. 6	10						244.4

Table 6.4.51. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
12.10.88	42		2.399E-04				756
15.11	10						244.4
12.10.88	45						756
15.27	10			1.296E-03	1.113E-04	3.003E-04	244.4
12.10.88	45						756
15.22	10			2.296E-03	5.386E-04	7.731E-04	244.4
12.10.88	45						756
15.22	10			2.085E-03		1.533E-03	244.4
12.10.88	45			5.109E-03	4.255E-03	6.327E-03	756
15.22	30						244.4
12.10.88	45						756
15.22	20	5.111E-02	9.778E-03				244.4
13.10.88	45						754
3.12	10			1.489E-03		7.798E-04	244.9
13.10.88	45			6.328E-03	5.176E-03	7.352E-03	754
3.12	30						244.9
13.10.88	45						754
3.12	20	5.267E-02	9.457E-03				244.9
13.10.88	42		1.655E-04				755
11. 4	10						245.2
13.10.88	45						755
11. 6	10			2.546E-03	6.097E-04	5.691E-04	245.2
13.10.88	45			4.641E-03	3.769E-03	4.389E-03	755
11. 6	30						245.2
13.10.88	45						755
11. 6	20	2.572E-02	5.628E-03				245.2
14.10.88	42		1.616E-04				754
11. 3	10						246.3
14.10.88	45						754
11. 7	10			1.624E-03		6.063E-04	246.3
14.10.88	45			4.983E-03	4.260E-03	6.072E-03	754
11. 7	30						246.3
14.10.88	45						754
11. 7	20	4.600E-02	9.540E-03				246.3
15.10.88	42		1.531E-04				753
9.4	10						247.2
15.10.88	45						753
9.42	10			1.860E-03		6.889E-04	247.2
15.10.88	45			5.011E-03	4.204E-03	6.347E-03	753
9.42	30						247.2
15.10.88	45						753
9.42	20	5.319E-02	9.076E-03				247.2
16.10.88	42		1.164E-04				752
8.5	10						248.2
16.10.88	45						752
8.54	10			2.940E-03	5.362E-04	7.451E-04	248.2
16.10.88	45			5.047E-03	4.301E-03	5.113E-03	752
8.54	30						248.2
16.10.88	45						752
8.54	20	4.082E-02	8.951E-03				248.2
17.10.88	42		1.113E-04				752
9. 0	10						249.2

Table 6.4.51. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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17.10.88	45						752
9. 3	10			1.003E-03		6.850E-04	249.2
17.10.88	45			5.423E-03	3.987E-03	5.895E-03	752
9. 3	30						249.2
17.10.88	45						752
9. 3	20	4.825E-02	8.947E-03				249.2
18.10.88	42		2.004E-04				752
9.45	10						250.2
18.10.88	45						752
9.47	10			3.033E-03	3.533E-04	1.075E-03	250.2
18.10.88	45			5.290E-03	4.480E-03	6.262E-03	752
9.47	30						250.2
18.10.88	45			7.987E-03	5.805E-03	8.443E-03	752
9.47	40	3.929E-02	8.705E-03				250.2
18.10.88	42		3.185E-04				752
15.49	10						250.5
18.10.88	45						752
15.51	10			4.024E-03	4.380E-04	1.096E-03	250.5
18.10.88	45			5.540E-03	4.179E-03	6.169E-03	752
15.51	30						250.5
18.10.88	45						752
15.51	20	3.306E-02	8.717E-03				250.5
19.10.88	42		1.718E-04				751
8.5	10						251.2
19.10.88	45						751
8.52	10			1.669E-03	3.833E-04	7.083E-04	251.2
19.10.88	45			5.295E-03	3.742E-03	5.830E-03	751
8.52	30						251.2
19.10.88	45						751
8.52	20	2.435E-02	7.600E-03				251.2
19.10.88	42		2.255E-04				750
16.4	10						251.5
19.10.88	45						750
16.41	10			1.953E-03	3.559E-04	7.307E-04	251.5
19.10.88	45			4.892E-03	3.951E-03	5.677E-03	750
16.41	30						251.5
19.10.88	45						750
16.41	20	2.129E-02	7.016E-03				251.5
20.10.88	42		2.375E-04				750
0.22	10						251.9
20.10.88	45						750
0.25	10			3.421E-03	6.081E-04	1.160E-03	251.9
20.10.88	45			4.795E-03	3.873E-03	5.895E-03	750
0.25	30						251.9
20.10.88	45						750
0.25	20	1.923E-02	6.694E-03				251.9
20.10.88	42		1.945E-04				750
9.12	10						252.2
20.10.88	45						750
9.15	10			1.472E-03		6.143E-04	252.2
20.10.88	45			5.539E-03	3.859E-03	4.249E-03	750
9.15	30						252.2

Table 6.4.51. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.08		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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20.10.88	45						750
9.15	20	1.888E-02	6.504E-03				252.2
20.10.88	42		2.494E-04				750
16.25	10						252.5
20.10.88	45						750
16.26	10			2.281E-03	1.051E-04	9.919E-04	252.5
20.10.88	45			5.120E-03	4.071E-03	5.730E-03	750
16.26	30						252.5
20.10.88	45						750
16.26	20	1.739E-02	6.641E-03				252.5
21.10.88	42		1.635E-04				749
2. 4	10						253
21.10.88	45						749
2. 6	10			3.059E-03	2.641E-04	8.928E-04	253
21.10.88	45			4.885E-03	3.524E-03	5.427E-03	749
2. 6	30						253
21.10.88	45						749
2. 6	20	1.543E-02	6.216E-03				253
21.10.88	42		1.338E-04				749
9.32	10						253.3
21.10.88	45						749
9.37	10			3.185E-03	3.252E-04	9.549E-04	253.3
21.10.88	45			4.492E-03	3.604E-03	4.876E-03	749
9.37	30						253.3
21.10.88	45						749
9.37	20	1.619E-02	6.076E-03				253.3
22.10.88	42		1.178E-04				747
9.49	10						254.3
22.10.88	45						747
9.52	10			3.347E-03	3.039E-04	1.000E-03	254.3
22.10.88	45			5.020E-03	3.993E-03	3.696E-03	747
9.52	30						254.3
22.10.88	45						747
9.52	20	1.686E-02	6.528E-03				254.3
23.10.88	42		1.946E-04				746
8.32	10						255.3
23.10.88	45						746
8.34	10			3.443E-03	3.181E-04	9.693E-04	255.3
23.10.88	45			5.241E-03	4.114E-03	6.311E-03	746
8.34	30						255.3
23.10.88	45						746
8.34	20	1.702E-02	6.442E-03				255.3
24.10.88	42		1.585E-04				747
8.3	10						256.3
24.10.88	45						747
8.36	10			3.218E-03	1.505E-04	9.111E-04	256.3
24.10.88	45			4.624E-03	3.443E-03	5.912E-03	747
8.36	30						256.3
24.10.88	45						747
8.36	20	1.543E-02	6.003E-03				256.3
25.10.88	45						70
1. 0	20						256.77

Table 6.4.52. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29.10.88	52						764
0. 0	10						256.77
29.10.88	52		1.730E-03				764
9.52	10						258.5
29.10.88	55						764
9.55	10			8.927E-03	1.014E-03	3.002E-03	258.5
29.10.88	55			1.155E-02	8.181E-03	1.149E-02	764
9.55	40	2.155E-02	9.901E-03				258.5
30.10.88	52		8.170E-04				765
9.1	10						259.5
30.10.88	55						765
9.14	10			8.854E-03	1.146E-03	2.794E-03	259.5
30.10.88	55			1.160E-02	8.544E-03	1.165E-02	765
9.14	30						259.5
30.10.88	55						765
9.14	20	2.867E-02	1.121E-02				259.5
31.10.88	52		1.254E-03				767
8.58	10						260.5
31.10.88	55						766
9. 0	10			8.810E-03	1.089E-03	2.743E-03	260.5
31.10.88	55			1.086E-02	7.855E-03	1.095E-02	766
9. 0	30						260.5
31.10.88	55						766
9. 0	20	2.749E-02	1.038E-02				260.5
1.11.88	52		1.209E-03				762
9.4	10						261.5
1.11.88	55						762
9.43	10			8.487E-03	1.511E-03	2.778E-03	261.5
1.11.88	55			1.147E-02	8.280E-03	1.124E-02	762
9.43	30						261.5
1.11.88	55						762
9.43	20	3.886E-02	1.110E-02				261.5
2.11.88	52		7.997E-04				761
9. 2	10						262.5
2.11.88	55						761
9.1	10			9.101E-03	4.982E-04	2.959E-03	262.5
2.11.88	55			1.178E-02	9.945E-03	1.221E-02	761
9.1	30						262.5
2.11.88	55						761
9.1	20	4.205E-02	1.218E-02				262.5
3.11.88	52		1.060E-03				764
9.15	10						263.5
3.11.88	55						764
9.18	10			9.482E-03	8.932E-04	2.973E-03	263.5
3.11.88	55			1.310E-02	1.019E-02	1.210E-02	764
9.18	30						263.5
3.11.88	55						764
9.18	20	3.923E-02	1.276E-02				263.5
4.11.88	52		1.125E-03				763
8.56	10						264.5
4.11.88	55						764
9. 0	10			9.785E-03	1.138E-03	3.236E-03	264.5

Table 6.4.52. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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4.11.88	55			1.226E-02	1.006E-02	1.349E-02	764
9. 0	40	4.610E-02	1.199E-02				264.5
5.11.88	52		9.848E-04				759
10.12	10						265.5
5.11.88	55						759
10.15	10			8.995E-03	1.080E-03	1.565E-03	265.5
5.11.88	55			1.200E-02	8.787E-03	1.197E-02	759
10.15	30						265.5
5.11.88	55						759
10.15	20	4.879E-02	1.273E-02				265.5
6.11.88	52		1.038E-03				762
9. 0	10						266.5
6.11.88	55						762
9. 4	10			9.528E-03	1.409E-03	3.106E-03	266.5
6.11.88	55			1.231E-02	1.000E-02	1.204E-02	762
9. 4	30						266.5
6.11.88	55						762
9. 4	20	4.847E-02	1.273E-02				266.5
7.11.88	55						761
9.52	10			8.246E-03	5.606E-04	2.745E-03	267.5
7.11.88	55			1.218E-02	8.840E-03	1.213E-02	761
9.42	30						267.5
7.11.88	55						761
9.52	20	4.873E-02	1.253E-02				267.5
8.11.88	52		1.126E-03				759
9. 1	10						268.5
8.11.88	55						759
9. 5	10			8.089E-03	1.074E-03	2.835E-03	268.5
8.11.88	55			1.101E-02	7.883E-03	1.067E-02	759
9. 5	30						268.5
8.11.88	55						759
9. 5	20	3.301E-02	1.050E-02				268.5
9.11.88	52		1.089E-03				760
15.59	10						269.75
9.11.88	55						759
16. 3	10			8.124E-03	7.248E-04	2.663E-03	269.75
9.11.88	55			1.148E-02	8.124E-03	1.149E-02	759
16. 3	30						269.75
9.11.88	55						759
16. 3	20	3.563E-02	1.152E-02				269.75
10.11.88	52		1.223E-03				761
0.52	10						270.1
10.11.88	55						761
0.55	10			8.413E-03	1.250E-03	2.785E-03	270.1
10.11.88	55			1.104E-02	8.687E-03	1.080E-02	761
0.55	30						270.1
10.11.88	55						761
0.55	20	3.289E-02	1.035E-02				270.1
10.11.88	52		1.086E-03				758
9.57	10						270.5
10.11.88	55						758
10. 0	10			8.758E-03	1.117E-03	2.821E-03	270.5

Table 6.4.52. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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10.11.88	55			1.118E-02	7.855E-03	1.086E-02	758
10. 0	30						270.5
10.11.88	55						758
10. 0	20	3.160E-02	1.028E-02				270.5
11.11.88	52		1.268E-03				757
9. 2	10						271.5
11.11.88	55						757
9. 5	10			8.438E-03	1.224E-03	2.788E-03	271.5
11.11.88	55			1.066E-02	7.435E-03	1.051E-02	757
9. 5	30						271.5
11.11.88	55						757
9. 5	20	3.030E-02	1.014E-02				271.5
12.11.88	52		1.058E-03				756
8.56	10						272.5
12.11.88	55						756
8.58	10			8.390E-03	1.147E-03	2.610E-03	272.5
12.11.88	55			1.042E-02	7.461E-03	9.978E-03	756
8.58	30						272.5
12.11.88	55						756
8.58	20	2.717E-02	9.711E-03				272.5
13.11.88	52		9.975E-04				755
8.47	10						273.5
13.11.88	55						755
8.5	10			7.883E-03	9.031E-04	2.701E-03	273.5
13.11.88	55			1.018E-02	7.342E-03	1.005E-02	755
8.5	30						273.5
13.11.88	55						755
8.5	20	2.567E-02	9.591E-03				273.5
13.11.88	52		1.154E-03				755
16.58	10						273.8
13.11.88	55						754
17. 0	10			8.614E-03	1.085E-03	2.696E-03	273.8
13.11.88	55			1.029E-02	7.485E-03	1.029E-02	754
17. 0	30						273.8
13.11.88	55						754
17. 0	20	2.631E-02	1.001E-02				273.8
14.11.88	52		1.058E-03				756
0.3	10						274.1
14.11.88	55						756
0.35	10			7.954E-03	1.099E-03	2.459E-03	274.1
14.11.88	55			9.601E-03	7.677E-03	9.871E-03	756
0.35	30						274.1
14.11.88	55						756
0.35	20	2.570E-02	7.039E-03				274.1
14.11.88	52		1.044E-03				755
8.43	10						274.5
14.11.88	55						755
8.45	10			7.968E-03	1.021E-03	2.620E-03	274.5
14.11.88	55			9.094E-03	7.084E-03	8.996E-03	755
8.45	30						274.5
14.11.88	55						755
8.45	20	2.502E-02	8.733E-03				274.5

Table 6.4.52. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.09		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
15.11.88	52		1.102E-03				754
9. 3	10						275.5
15.11.88	55						754
9. 4	10			8.645E-03	1.282E-03	2.501E-03	275.5
15.11.88	55			8.248E-03	7.247E-03	9.393E-03	754
9. 4	30						275.5
15.11.88	55						754
9. 4	20	2.424E-02	8.796E-03				275.5
16.11.88	52		1.010E-03				754
8.45	10						276.5
16.11.88	55						754
8.48	10			7.455E-03	1.097E-03	2.358E-03	276.5
16.11.88	55			7.765E-03	6.119E-03	8.749E-03	754
8.48	30						276.5
16.11.88	55						754
8.48	20	2.351E-02	8.417E-03				276.5
17.11.88	52		9.868E-04				753
8.48	10						277.5
17.11.88	55						753
8.51	10			6.960E-03	8.845E-04	2.223E-03	277.5
17.11.88	55			7.973E-03	5.685E-03	8.052E-03	753
8.51	30						277.5
17.11.88	55						753
8.51	20	2.227E-02	7.700E-03				277.5
18.11.88	55						22
7. 0	20						278.03
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Table 6.4.53. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	C	CYCLE NO.	88.10	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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22.11.88	52						909
16.23	10						278.03
22.11.88	52		8.569E-04				909
16.23	10						278.7
22.11.88	55						909
16.25	10			6.266E-03	7.979E-04	2.458E-03	278.7
22.11.88	55			1.737E-02	1.396E-02	1.658E-02	909
16.25	30						278.7
22.11.88	55						909
16.25	20	3.267E-02	8.859E-03				278.7
23.11.88	52		9.204E-04				901
16.43	10						279.72
23.11.88	55						901
16.46	10			7.277E-03	6.104E-04	2.150E-03	279.72
23.11.88	55			1.651E-02	1.251E-02	1.641E-02	901
16.46	30						279.72
23.11.88	55						901
16.43	20	2.629E-02	9.751E-03				279.72
24.11.88	52		9.986E-04				925
16.25	10						280.7
24.11.88	55						925
16.28	10			7.922E-03	6.239E-04	2.167E-03	280.7
24.11.88	55			1.556E-02	1.202E-02	1.504E-02	925
16.28	30						280.7
24.11.88	55						925
16.28	20	3.002E-02	1.062E-02				280.7
25.11.88	55						926
18.37	10			7.944E-03	7.963E-04	2.025E-03	281.81
25.11.88	55			1.423E-02	1.213E-02	1.494E-02	926
18.37	30						281.81
25.11.88	55						926
18.37	20	3.066E-02	1.040E-02				281.81
26.11.88	52		1.070E-03				925
17.1	10						282.74
26.11.88	55						925
17.17	10			9.204E-03	1.796E-03	2.492E-03	282.74
26.11.88	55			1.343E-02	1.031E-02	1.347E-02	925
17.17	30						282.74
26.11.88	55						925
17.17	20	3.158E-02	9.181E-03				282.74
28.11.88	52		7.621E-04				927
10. 9	10						284.44
28.11.88	55						927
10. 9	10			5.916E-03	3.404E-04	1.441E-03	284.44
28.11.88	55			1.044E-02	8.438E-03	1.167E-02	927
10. 9	30						284.44
28.11.88	55						927
10. 9	20	2.694E-02	7.354E-03				284.44
29.11.88	52		1.175E-03				927
8.41	10						285.39
29.11.88	55						927
8.46	10			7.393E-03	7.127E-04	1.943E-03	285.39

Table 6.4.53. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29.11.88	55			1.485E-02	1.140E-02	1.415E-02	927
8.46	30						285.39
29.11.88	55						927
8.46	20	3.680E-02	9.625E-03				285.39
30.11.88	55						926
8.53	10			7.862E-03	8.927E-04	1.913E-03	286.39
30.11.88	55			1.713E-02	1.333E-02	1.592E-02	926
8.53	30						286.39
30.11.88	55						926
8.53	20	3.555E-02	1.055E-02				286.39
1.12.88	52		9.691E-04				927
8.47	10						287.39
1.12.88	55						927
8.53	10			7.618E-03	7.308E-04	2.281E-03	287.39
1.12.88	55			1.503E-02	1.213E-02	1.496E-02	927
8.53	30						287.39
1.12.88	55						927
8.53	20	3.698E-02	1.065E-02				287.33
2.12.88	52		8.770E-04				926
9. 9	10						288.41
2.12.88	55						926
9.13	10			7.757E-03		2.074E-03	288.41
2.12.88	55			1.598E-02	1.294E-02	1.559E-02	926
9.13	30						288.41
2.12.88	55						926
9.13	20	4.565E-02	1.194E-02				288.41
4.12.88	52		9.007E-04				922
9.49	10						290.43
4.12.88	55						922
9.49	10					3.056E-03	290.43
4.12.88	55			1.462E-02	1.214E-02	1.385E-02	922
9.49	30						290.43
4.12.88	55						922
9.49	20	3.563E-02	1.061E-02				290.43
5.12.88	52		8.779E-04				921
13.46	10						291.6
5.12.88	55						921
13.5	10			8.318E-03	6.087E-04	2.252E-03	291.6
5.12.88	55			1.674E-02	1.311E-02	1.715E-02	921
13.5	30						291.6
5.12.88	55						921
13.5	20	4.649E-02	1.225E-02				291.6
6.12.88	52		6.853E-04				921
8.55	10						292.4
6.12.88	55						921
8.58	10			8.747E-03	6.685E-04	2.289E-03	292.4
6.12.88	55			1.596E-02	1.228E-02	1.524E-02	921
8.58	30						292.4
6.12.88	55						921
8.58	20	3.593E-02	1.142E-02				292.4
7.12.88	52		1.026E-03				920
9.33	10						293.42

Table 6.4.53. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.10		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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7.12.88	55						920
9.35	10			7.988E-03	9.187E-04	2.023E-03	293.42
7.12.88	55			1.574E-02	1.248E-02	1.523E-02	920
9.35	30						293.42
7.12.88	55						920
9.35	20	3.711E-02	1.100E-02				293.42
8.12.88	52		8.910E-04				919
8.53	10						294.4
8.12.88	55						919
8.55	10			7.953E-03	7.679E-04	2.012E-03	294.4
8.12.88	55			1.344E-02	1.158E-02	1.401E-02	919
8.55	30						294.4
8.12.88	55						919
8.55	20	3.335E-02	1.027E-02				294.4
9.12.88	52		1.138E-03				918
9. 4	10						295.4
9.12.88	55						918
9. 6	10			8.032E-03	7.292E-04	1.979E-03	295.4
9.12.88	55			1.214E-02	1.022E-02	1.296E-02	918
9. 6	30						295.4
9.12.88	55						918
9. 6	20	3.605E-02	1.014E-02				295.4
10.12.88	55						803
9. 2	10			6.996E-03		1.340E-03	296.39
10.12.88	55						803
9. 2	20		7.581E-03				296.39
11.12.88	52		1.057E-03				913
8.38	10						297.38
11.12.88	55						913
8.46	10			7.014E-03	6.773E-04	1.696E-03	297.38
11.12.88	55			1.160E-02	9.011E-03	1.175E-02	913
8.46	30						297.38
11.12.88	55						913
8.46	20	3.017E-02	8.379E-03				297.38
12.12.88	52		1.103E-03				913
8.17	10						298.37
12.12.88	55						913
8.2	10			7.218E-03	7.104E-04	1.804E-03	298.37
12.12.88	55			1.030E-02	8.778E-03	1.143E-02	913
8.2	30						298.37
12.12.88	55						913
8.2	20	3.530E-02	8.444E-03				298.37
13.12.88	55						19
5. 0	20						298.95
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Table 6.4.54. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	C	CYCLE NO.	88.11	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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16.12.88	52						764
16.54	10						298.95
16.12.88	52		7.505E-04				764
16.54	10			5.106E-03	6.533E-04	1.640E-03	300.3
16.12.88	55						764
16.54	10			5.412E-03	6.794E-04	1.701E-03	300.3
16.12.88	53						764
16.54	10						300.3
16.12.88	52						764
16.54	10						300.3
17.12.88	52		6.712E-04				766
19.47	10			5.040E-03	5.764E-04	1.322E-03	301.15
17.12.88	55						766
19.47	10			5.717E-03	5.463E-04	1.814E-03	301.15
17.12.88	53						766
19.47	10						301.15
17.12.88	55						766
19.47	20	1.516E-02	6.881E-03				301.15
18.12.88	52		7.518E-04				770
17.2	10			5.627E-03	7.050E-04	1.605E-03	302.03
18.12.88	55						770
17.2	10			5.909E-03	5.835E-04	1.747E-03	302.03
18.12.88	55			6.869E-03	5.003E-03	7.822E-03	770
17.2	30						302.03
18.12.88	55						770
17.2	20	1.772E-02	7.018E-03				302.03
19.12.88	52		8.459E-04				771
16.18	10			5.593E-03	6.864E-04	1.540E-03	303.01
19.12.88	55						771
16.24	10			5.922E-03	7.265E-04	1.774E-03	303.01
19.12.88	55			6.989E-03	5.176E-03	7.425E-03	771
16.24	30						303.01
19.12.88	55						771
16.24	20	1.860E-02	6.690E-03				303.01
20.12.88	52		8.080E-04				770
16.58	10			5.201E-03	6.848E-04	1.440E-03	304.02
20.12.88	55						770
16.58	10			5.919E-03	7.320E-04	1.713E-03	304.02
20.12.88	55			6.356E-03	4.659E-03	7.218E-03	770
16.58	30						304.02
20.12.88	55						770
16.58	20	1.805E-02	6.421E-03				304.02
21.12.88	52		8.632E-04				767
16.55	10			4.802E-03	6.929E-04	1.374E-03	305.02
21.12.88	55						767
16.55	10			5.803E-03	7.678E-04	1.680E-03	305.02
21.12.88	55			5.936E-03	4.516E-03	6.675E-03	767
16.55	30						305.02
21.12.88	55						767
16.55	20	1.795E-02	6.141E-03				305.02
22.12.88	52		7.930E-04				768
16.5	10			4.649E-03	6.547E-04	1.243E-03	306.04

Table 6.4.54. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.11		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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22.12.88	55						768
16.5	10			4.507E-03		1.194E-03	306.04
22.12.88	55			5.510E-03	4.538E-03	6.603E-03	768
16.5	30						306.04
22.12.88	55						768
16.5	20	1.878E-02	5.955E-03				306.04
23.12.88	52		8.223E-04				767
16.5	10			4.544E-03	6.643E-04	1.320E-03	307.04
23.12.88	55						767
16.55	10			5.282E-03	7.946E-04	1.539E-03	307.04
23.12.88	55			5.421E-03	4.005E-03	6.055E-03	767
16.55	30						307.04
23.12.88	55						767
16.55	20	1.773E-02	5.676E-03				307.04
24.12.88	52		5.561E-04				766
16.39	10			4.413E-03	4.760E-04	1.312E-03	308.05
24.12.88	55						766
16.43	10			4.748E-03	4.817E-04	1.419E-03	308.04
24.12.88	55			5.251E-03	3.901E-03	5.906E-03	766
16.43	30						308.04
24.12.88	55						766
16.43	20	1.729E-02	5.407E-03				308.04
25.12.88	52		8.444E-04				767
16.3	10			4.674E-03	5.533E-04	1.303E-03	309.05
25.12.88	55						767
16.35	10			4.468E-03		1.313E-03	309.05
25.12.88	55			5.024E-03	4.317E-03	6.236E-03	767
16.35	30						309.05
25.12.88	55						767
16.35	20	1.782E-02	5.546E-03				309.05
26.12.88	52		8.315E-04				765
16.36	10			5.166E-03	6.683E-04	1.357E-03	310.05
26.12.88	55						765
16.38	10			5.243E-03	6.829E-04	1.552E-03	310.05
26.12.88	55			5.448E-03	4.157E-03	5.671E-03	765
16.38	30						310.05
26.12.88	55						765
16.38	20	1.816E-02	5.547E-03				310.05
27.12.88	52		7.730E-04				765
16.38	10			4.917E-03	6.354E-04	1.334E-03	311.05
27.12.88	55						765
16.4	10			5.187E-03	6.674E-04	1.509E-03	311.05
27.12.88	55			5.329E-03	4.040E-03	5.983E-03	765
16.4	30						311.05
27.12.88	55						765
16.4	20	1.752E-02	4.719E-03				311.05
28.12.88	52		8.107E-04				766
16.39	10			4.901E-03	6.447E-04	1.282E-03	312.05
28.12.88	55						766
16.44	10			5.229E-03	7.142E-04	1.497E-03	312.05
28.12.88	55			5.685E-03	4.288E-03	6.015E-03	766
16.44	30						312.05

Table 6.4.54. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.11		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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28.12.88	55						766
16.44	20	1.817E-02	5.498E-03				312.05
29.12.88	52		8.297E-04				766
17.15	10			5.133E-03	6.545E-04	1.366E-03	313.06
29.12.88	55						766
17.2	10			5.331E-03	6.901E-04	1.554E-03	313.06
29.12.88	55			5.442E-03	3.784E-03	6.050E-03	766
17.2	30						313.06
29.12.88	55						766
17.2	20	1.827E-02	5.594E-03				313.06
30.12.88	52		7.651E-04				763
16.54	10			4.615E-03	6.363E-04	1.298E-03	314.06
30.12.88	55						763
16.57	10			5.211E-03	6.823E-04	1.489E-03	314.06
30.12.88	55			5.591E-03	3.976E-03	5.965E-03	763
16.57	30						314.06
30.12.88	55						763
16.57	20	1.895E-02	5.522E-03				314.06
31.12.88	52		7.043E-04				762
16.2	10			4.849E-03	5.889E-04	1.452E-03	315.07
31.12.88	55						762
16.22	10			5.703E-03	6.728E-04	1.581E-03	315.07
31.12.88	55			5.770E-03	4.305E-03	6.498E-03	762
16.22	30						315.07
31.12.88	55						762
16.22	20	2.049E-02	6.019E-03				315.07
1. 1.89	52		6.514E-04				762
16.55	10			4.909E-03	5.595E-04	1.372E-03	316.08
1. 1.89	55						762
16.59	10			5.476E-03	6.542E-04	1.488E-03	316.08
1. 1.89	55			5.665E-03	4.667E-03	6.575E-03	762
16.59	30						316.08
1. 1.89	55						762
16.59	20	2.029E-02	6.072E-03				316.08
2. 1.89	52		6.526E-04				760
17.23	10			5.014E-03	5.732E-04	1.422E-03	317.09
2. 1.89	55						760
17.25	10			5.485E-03	5.675E-04	1.584E-03	317.09
2. 1.89	55			5.641E-03	4.468E-03	6.384E-03	760
17.25	30						317.09
2. 1.89	55						760
17.25	20	2.010E-02	6.008E-03				317.09
3. 1.89	52		5.536E-04				760
16.55	10			4.867E-03	5.046E-04	1.327E-03	318.1
3. 1.89	55						760
16.57	10			5.324E-03	4.858E-04	1.504E-03	318.1
3. 1.89	55			6.145E-03	4.135E-03	6.323E-03	760
16.57	30						318.1
3. 1.89	55						760
16.57	20	2.079E-02	6.247E-03				318.1
4. 1.89	52		4.790E-04				757
16.33	10			5.432E-03	4.846E-04	1.506E-03	319.11

Table 6.4.54. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 88.11		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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4. 1.89	55						757
16.33	10			5.845E-03	3.953E-04	1.624E-03	319.11
4. 1.89	55			6.216E-03	4.551E-03	7.059E-03	757
16.33	30						319.11
4. 1.89	55						757
16.33	20	2.331E-02	6.848E-03				319.11
5. 1.89	52		5.049E-04				757
15.59	10			5.164E-03	4.548E-04	1.511E-03	320.12
5. 1.89	55						757
16. 1	10			5.836E-03	6.196E-04	1.656E-03	320.12
5. 1.89	55			6.441E-03	4.625E-03	7.116E-03	757
16. 1	30						320.12
5. 1.89	55						757
16. 1	20	2.347E-02	6.996E-03				320.12
6. 1.89	55						35
4. 0	20						320.5
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Table 6.4.55. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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18. 1.89	52						765
0.45	10						320.35
18. 1.89	52		7.690E-04				765
0.45	10						321.85
18. 1.89	55						765
0.48	10			5.540E-03	6.405E-04	1.519E-03	321.85
18. 1.89	55			5.301E-03	4.019E-03	5.928E-03	765
0.48	30						321.85
18. 1.89	55						765
0.48	20	9.633E-03	5.751E-03				321.85
19. 1.89	52		8.650E-04				766
0.38	10						322.83
19. 1.89	55						766
0.4	10			5.534E-03	8.042E-04	1.522E-03	322.83
19. 1.89	55			5.222E-03	4.164E-03	6.034E-03	766
0.4	30						322.83
19. 1.89	55						766
0.4	20	1.182E-02	5.763E-03				322.83
19. 1.89	52		7.400E-04				766
8.3	10						323.15
19. 1.89	55						766
8.36	10			5.874E-03	7.595E-04	1.560E-03	323.15
19. 1.89	55			5.556E-03	4.150E-03	6.321E-03	766
8.36	30						323.15
19. 1.89	55						766
8.36	20	1.388E-02	6.136E-03				323.15
19. 1.89	52		8.902E-04				766
16.4	10						323.47
19. 1.89	55						766
16.4	10			6.048E-03	8.389E-04	1.681E-03	323.47
19. 1.89	55			6.293E-03	4.673E-03	7.172E-03	766
16.4	30						323.47
19. 1.89	55						766
16.4	20	1.617E-02	6.381E-03				323.47
20. 1.89	52		9.105E-04				764
0.4	10						323.83
20. 1.89	55						764
0.43	10			6.592E-03	8.410E-04	1.813E-03	323.83
20. 1.89	55			7.447E-03	5.084E-03	7.945E-03	764
0.43	30						323.83
20. 1.89	55						764
0.43	20	1.739E-02	7.169E-03				323.83
21. 1.89	52		9.572E-04				765
0.35	10						324.83
21. 1.89	55						765
0.38	10			6.883E-03	7.500E-04	1.918E-03	324.83
21. 1.89	55				6.077E-03	7.456E-03	765
0.38	30						324.83
21. 1.89	55						765
0.38	20	1.903E-02	7.576E-03				324.83
22. 1.89	52		9.875E-04				763
0.3	10						325.83

Table 6.4.55. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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22. 1.89	55						763
0.33	10			6.862E-03	7.131E-04	1.752E-03	325.83
22. 1.89	55			7.228E-03	5.357E-03	8.221E-03	763
0.33	30						325.83
22. 1.89	55						763
0.33	20	2.063E-02	7.625E-03				325.83
23. 1.89	52		9.503E-04				764
0.35	10						326.83
23. 1.89	55						764
0.38	10			6.955E-03	8.164E-04	2.037E-03	326.83
23. 1.89	55			8.268E-03	6.108E-03	8.454E-03	764
0.38	30						326.83
23. 1.89	55						764
0.38	20	2.177E-02	7.705E-03				326.83
23. 1.89	52		9.975E-04				765
16.3	10						327.5
23. 1.89	55						765
16.33	10			7.659E-03	9.520E-04	2.195E-03	327.5
23. 1.89	55			9.660E-03	6.471E-03	9.834E-03	765
16.33	30						327.5
23. 1.89	55						765
16.33	20	3.457E-02	8.513E-03				327.5
23. 1.89	52		1.089E-03				765
20. 5	10						327.8
23. 1.89	55						765
20. 8	10			7.837E-03	7.893E-04	2.214E-03	327.8
23. 1.89	55			9.885E-03	6.663E-03	1.027E-02	765
20. 8	30						327.8
23. 1.89	55						765
20. 8	20	4.490E-02	9.385E-03				327.8
24. 1.89	52		9.244E-04				765
1. 0	10						328
24. 1.89	55			1.069E-02	7.243E-03	1.118E-02	765
1. 7	30						328
24. 1.89	55						765
1. 7	20	4.953E-02	1.009E-02				328
24. 1.89	52		1.074E-03				765
4.1	10						328.2
24. 1.89	55						765
4.2	10			6.906E-03	8.981E-04	2.201E-03	328.2
24. 1.89	55			8.229E-03	6.136E-03	8.376E-03	765
4.2	30						328.2
24. 1.89	55						765
4.2	20	3.668E-02	7.808E-03				328.2
24. 1.89	52		1.061E-03				765
8. 9	10						328.36
24. 1.89	55						765
8.12	10			9.598E-03	1.318E-03	3.132E-03	328.36
24. 1.89	55			1.266E-02	8.495E-03	1.314E-02	765
8.12	30						328.36
24. 1.89	55						765
8.12	20	5.679E-02	1.207E-02				328.36

Table 6.4.55. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	C	CYCLE NO.	89.01	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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25. 1.89	52		1.166E-03				764
9.2	10						329.36
25. 1.89	55						764
9.22	10			9.293E-03	9.049E-04	2.936E-03	329.36
25. 1.89	55			1.105E-02	9.298E-03	1.161E-02	764
9.22	30						329.36
25. 1.89	55						764
9.22	20	4.828E-02	1.167E-02				329.36
26. 1.89	52		1.275E-03				763
8.44	10						330.36
26. 1.89	55						763
8.47	10			9.949E-03	1.079E-03	3.208E-03	330.36
26. 1.89	55			1.167E-02	9.216E-03	1.170E-02	763
8.47	30						330.36
26. 1.89	55						763
8.47	20	4.493E-02	1.181E-02				330.36
27. 1.89	55						763
1.15	10			9.449E-03	1.089E-03	3.116E-03	330.99
27. 1.89	55			1.249E-02	8.926E-03	1.255E-02	763
1.15	30						330.99
27. 1.89	55						763
1.15	20	4.839E-02	1.295E-02				330.99
27. 1.89	52		8.065E-04				764
9.3	10						331.31
27. 1.89	55						764
9.33	10			9.288E-03	1.385E-03	3.044E-03	331.31
27. 1.89	55			1.264E-02	9.323E-03	1.261E-02	764
9.33	30						331.31
27. 1.89	55						764
9.33	20	4.713E-02	1.262E-02				331.31
27. 1.89	52		1.051E-03				763
16.3	10						331.63
27. 1.89	55						763
16.32	10			5.205E-03	7.138E-04	1.772E-03	331.63
27. 1.89	55			1.226E-02	9.159E-03	1.171E-02	763
16.32	30						331.63
27. 1.89	55						763
16.32	20	5.020E-02	1.249E-02				331.63
27. 1.89	52		1.081E-03				762
20.23	10						331.81
27. 1.89	55						762
20.25	10			9.820E-03	1.111E-03	3.172E-03	331.81
27. 1.89	55			1.276E-02	1.006E-02	1.225E-02	762
20.25	30						331.81
27. 1.89	55						762
20.25	20	5.094E-02	1.329E-02				331.81
28. 1.89	52		1.109E-03				762
0.4	10						331.98
28. 1.89	55						762
0.4	10			9.439E-03	8.017E-04	3.146E-03	331.98
28. 1.89	55			1.211E-02	9.268E-03	1.151E-02	762
0.4	30						331.98

Table 6.4.55. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	C	CYCLE NO.	89.01	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
28. 1.89	55						762
0.4	20	5.506E-02	1.350E-02				331.98
28. 1.89	55						762
3.35	10			9.907E-03	9.142E-04	3.192E-03	332.11
28. 1.89	55						762
3.35	20	5.747E-02	1.371E-02				332.11
28. 1.89	52		8.991E-04				762
8.45	10						332.27
28. 1.89	55						762
8.48	10			8.847E-03	1.019E-03	3.159E-03	332.27
28. 1.89	55			1.253E-02	1.018E-02	1.247E-02	762
8.48	30						332.27
28. 1.89	55						762
8.48	20	5.267E-02	1.307E-02				332.27
28. 1.89	52		1.143E-03				762
12.38	10						332.42
28. 1.89	55			1.258E-02	8.914E-03	1.224E-02	762
12.42	30						332.42
28. 1.89	55						762
12.42	20	5.312E-02	1.293E-02				332.42
30. 1.89	52		7.492E-04				762
9.3	10						334.3
30. 1.89	55			1.193E-02	8.563E-03	1.154E-02	762
9.35	30						334.3
30. 1.89	55						762
9.35	20	5.305E-02					334.3
31. 1.89	52		9.002E-04				758
8.45	10						335.26
31. 1.89	55						758
8.48	10			9.539E-03	8.580E-04	3.160E-03	335.26
31. 1.89	55			1.235E-02	1.013E-02	1.216E-02	758
8.48	30						335.26
31. 1.89	55						758
8.48	20	5.561E-02	1.338E-02				335.26
31. 1.89	52		1.175E-03				759
16. 0	10						335.54
31. 1.89	55						759
16. 2	10			1.060E-02	1.237E-03	3.429E-03	335.54
31. 1.89	55			1.156E-02	9.175E-03	1.143E-02	759
16. 2	30						335.54
31. 1.89	55						759
16. 2	20	3.997E-02	1.211E-02				335.54
31. 1.89	52		1.163E-03				760
19.5	10						335.6
31. 1.89	55						760
19.52	10			9.617E-03	1.011E-03	3.061E-03	335.6
31. 1.89	55			1.100E-02	8.707E-03	1.081E-02	760
19.52	30						335.6
31. 1.89	55						760
19.52	20	3.579E-02	1.170E-02				335.6
1. 2.89	52		1.085E-03				758
0.15	10						335.76

Table 6.4.55. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	C	CYCLE NO.	89.01	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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1. 2.89	55						758
0.2	10			8.813E-03	9.627E-04	2.714E-03	335.76
1. 2.89	55			1.053E-02	7.585E-03	1.007E-02	758
0.2	30						335.76
1. 2.89	55						758
0.2	20	3.074E-02	1.111E-02				335.76
1. 2.89	52		1.177E-03				757
4.1	10						335.94
1. 2.89	55						757
4.15	10			9.043E-03	9.340E-04	2.822E-03	335.94
1. 2.89	55			1.042E-02	8.310E-03	1.029E-02	757
4.15	30						335.94
1. 2.89	55						757
4.15	20	2.957E-02	1.062E-02				335.94
1. 2.89	55						758
8.55	10			9.000E-03	1.006E-03	2.958E-03	336.14
1. 2.89	55			1.094E-02	8.635E-03	1.067E-02	758
8.55	30						336.14
1. 2.89	55						758
8.55	20	2.955E-02	1.107E-02				336.14
2. 2.89	52		8.639E-04				758
8.45	10						337.14
2. 2.89	55						758
8.5	10			8.537E-03	1.257E-03	2.680E-03	337.14
2. 2.89	55			1.075E-02	8.413E-03	1.064E-02	758
8.5	30						337.14
2. 2.89	55						758
8.5	20	2.996E-02	1.059E-02				337.14
3. 2.89	52		9.501E-04				757
9.1	10						338.11
3. 2.89	55						757
9.13	10			7.320E-03	9.550E-04	2.173E-03	338.11
3. 2.89	55			8.428E-03	6.065E-03	8.483E-03	757
9.13	30						338.11
3. 2.89	55						757
9.13	20	2.133E-02	8.115E-03				338.11
4. 2.89	52		1.121E-03				756
8.5	10						339.11
4. 2.89	55						756
8.52	10			7.292E-03	1.159E-03	2.173E-03	339.11
4. 2.89	55			7.580E-03	6.059E-03	8.257E-03	756
8.52	30						339.11
4. 2.89	55						756
8.52	20	2.110E-02	7.903E-03				339.11
5. 2.89	52		1.000E-03				757
8.3	10						340.11
5. 2.89	55						757
8.32	10			7.008E-03	7.380E-04	2.132E-03	340.11
5. 2.89	55			7.419E-03	5.691E-03	8.351E-03	757
8.32	30						340.11
5. 2.89	55						757
8.32	20	2.154E-02	7.858E-03				340.11

Table 6.4.55. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.01		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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6. 2.89	52		9.460E-04				756
8.35	10						341.1
6. 2.89	55						756
8.37	10			6.774E-03	8.329E-04	2.147E-03	341.1
6. 2.89	55			7.344E-03	6.116E-03	8.219E-03	756
8.37	30						341.1
6. 2.89	55						756
8.37	20	2.249E-02	7.806E-03				341.1
7. 2.89	55						32
3. 0	20						341.31
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Table 6.4.56. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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11. 2.89	52		9.275E-04				788
9.26	10						341.43
11. 2.89	55						788
9.29	10			5.615E-03	7.991E-04	1.788E-03	341.43
11. 2.89	55			6.966E-03	5.432E-03	7.346E-03	788
9.29	30						341.43
11. 2.89	55						788
9.29	20	1.100E-02	6.174E-03				341.43
12. 2.89	52		9.336E-04				794
8.42	10						342.43
12. 2.89	55						794
8.45	10			5.684E-03	9.564E-04	1.708E-03	342.43
12. 2.89	55			6.669E-03	4.713E-03	7.126E-03	794
8.45	30						342.43
12. 2.89	55						794
8.45	20	1.325E-02	6.172E-03				342.43
15. 2.89	52		8.507E-04				808
9.5	10						344.54
15. 2.89	55						808
9.5	10			4.867E-03	7.062E-04	1.553E-03	344.54
15. 2.89	55			6.249E-03	4.812E-03	6.934E-03	808
9.55	30						344.54
15. 2.89	55						808
9.55	20	9.940E-03	4.923E-03				344.54
16. 2.89	52		8.739E-04				804
10.35	10						345.54
16. 2.89	55						804
10.39	10			6.291E-03	6.973E-04	1.735E-03	345.54
16. 2.89	55			7.113E-03	5.294E-03	7.881E-03	804
10.39	30						345.54
16. 2.89	55						804
10.39	20	1.433E-02	6.846E-03				345.54
17. 2.89	52		8.975E-04				804
8.55	10						346.5
17. 2.89	55						804
9. 0	10			5.984E-03	8.116E-04	1.719E-03	346.5
17. 2.89	55			6.488E-03	5.379E-03	7.469E-03	804
9. 0	30						346.5
17. 2.89	55						804
9. 0	20	1.542E-02	6.411E-03				346.5
18. 2.89	52		7.896E-04				803
9. 0	10						347.5
18. 2.89	55						803
9. 0	10			6.018E-03	7.501E-04	1.621E-03	347.5
18. 2.89	55			6.491E-03	4.836E-03	7.430E-03	803
9. 0	30						347.5
18. 2.89	55						803
9. 0	20	1.649E-02	6.455E-03				347.5
19. 2.89	52		8.226E-04				802
8.46	10						348.5
19. 2.89	55						802
8.49	10			5.888E-03	6.655E-04	1.599E-03	348.5

Table 6.4.56. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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19. 2.89	55			6.257E-03	5.092E-03	7.269E-03	802
8.49	30						348.5
19. 2.89	55						802
8.49	20	1.731E-02	6.261E-03				348.5
20. 2.89	52		7.992E-04				801
8. 0	10						349.46
20. 2.89	55						801
8. 0	10			5.530E-03	6.373E-04	1.535E-03	349.46
20. 2.89	55			6.208E-03	4.642E-03	7.086E-03	801
8. 0	30						349.46
20. 2.89	55						801
8. 0	20	1.768E-02	6.031E-03				349.46
20. 2.89	55						801
18.36	10			8.192E-03	8.487E-04	2.583E-03	349.9
20. 2.89	55			1.173E-02	9.304E-03	1.290E-02	801
18.36	30						349.9
20. 2.89	55						801
18.36	20	1.182E-01	1.167E-02				349.9
21. 2.89	52		5.990E-04				800
12.24	10						350.62
21. 2.89	55						800
12.28	10			9.409E-03	1.797E-03	3.064E-03	350.62
21. 2.89	55			1.213E-02	8.887E-03	1.234E-02	800
12.28	30						350.62
21. 2.89	55						800
12.28	20		1.386E-02				350.62
21. 2.89	52		1.156E-03				798
20.5	10						350.94
21. 2.89	55						798
20.5	10			9.181E-03		2.874E-03	350.94
21. 2.89	55			1.109E-02	7.923E-03	1.101E-02	798
20.5	30						350.94
21. 2.89	55						798
20.5	20	8.853E-02	1.249E-02				350.94
22. 2.89	52		9.295E-04				800
4.3	10						351.34
22. 2.89	55						800
4.3	10			8.733E-03	1.129E-03	3.006E-03	351.34
22. 2.89	55			1.208E-02	9.901E-03	1.208E-02	800
4.3	30						351.34
22. 2.89	55						800
4.3	20	7.384E-02	1.374E-02				351.34
22. 2.89	52		9.494E-04				801
11.52	10						351.64
22. 2.89	55						801
11.55	10			9.367E-03	1.145E-03	3.030E-03	351.64
22. 2.89	55			1.239E-02	1.004E-02	1.195E-02	801
11.55	30						351.64
22. 2.89	55						801
11.55	20	8.375E-02	1.314E-02				351.64
22. 2.89	52		7.496E-04				800
20. 0	10						351.96

Table 6.4.56. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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22. 2.89	55						800
20. 0	10			9.399E-03	8.685E-04	3.195E-03	351.96
22. 2.89	55			1.270E-02	9.713E-03	1.179E-02	800
20. 0	30						351.96
22. 2.89	55						800
20. 0	20	7.830E-02	1.404E-02				351.96
23. 2.89	52		7.564E-04				799
4. 0	10						352.32
23. 2.89	55						799
4. 0	10			9.360E-03	1.181E-03	3.100E-03	352.32
23. 2.89	55			1.237E-02	1.023E-02	1.236E-02	799
4. 0	30						352.32
23. 2.89	55						799
4. 0	20	7.461E-02	1.360E-02				352.32
23. 2.89	52		9.940E-04				799
17. 0	10						352.72
23. 2.89	55						799
17. 0	10			8.008E-03	5.541E-04	2.744E-03	352.72
23. 2.89	55			1.200E-02	9.896E-03	1.102E-02	799
17. 0	30						352.72
23. 2.89	55						799
17. 0	20	7.341E-02	1.795E-02				352.72
24. 2.89	52		1.002E-03				799
4.25	10						353.3
24. 2.89	55						799
4.28	10			8.731E-03		3.096E-03	353.3
24. 2.89	55			1.201E-02	8.924E-03	1.155E-02	799
4.28	30						353.3
24. 2.89	55						799
4.28	20	6.838E-02	1.262E-02				353.3
24. 2.89	52		6.768E-04				799
13.33	10						353.67
24. 2.89	55						799
13.35	10			9.532E-03			353.67
24. 2.89	55			9.009E-03	5.297E-03	9.465E-03	799
13.35	30						353.67
24. 2.89	55						799
13.35	20	4.839E-02	1.158E-02				353.67
24. 2.89	52		1.242E-03				799
16.28	10						353.79
24. 2.89	55						799
16.31	10				1.135E-03	3.075E-03	353.79
24. 2.89	55			1.123E-02	8.708E-03	1.081E-02	799
16.31	30						353.79
24. 2.89	55						799
16.31	20	4.394E-02	1.139E-02				353.79
24. 2.89	52		1.134E-03				797
19.58	10						353.92
24. 2.89	55						797
20. 0	10			9.186E-03	1.616E-03	2.933E-03	353.92
24. 2.89	55			1.133E-02	9.218E-03	1.115E-02	797
20. 0	30						353.92

Table 6.4.56. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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24. 2.89	55						797
20. 0	20		1.127E-02				353.92
25. 2.89	55						797
0.42	10			8.443E-03	1.085E-03		354.11
25. 2.89	55			1.109E-02	8.198E-03	9.865E-03	797
0.42	30						354.11
25. 2.89	55						797
0.42	20	3.213E-02	1.067E-02				354.11
25. 2.89	55						797
4. 1	10			7.932E-03	1.026E-03	2.806E-03	354.27
25. 2.89	55			1.062E-02	7.870E-03	1.034E-02	797
4. 1	30						354.27
25. 2.89	55						797
4. 1	20	2.941E-02	1.071E-02				354.27
25. 2.89	52		1.106E-03				797
9. 8	10						354.47
25. 2.89	55						797
9.1	10			7.936E-03	1.590E-03	2.681E-03	354.47
25. 2.89	55			1.013E-02	8.203E-03	1.005E-02	797
9.1	30						354.47
25. 2.89	55						797
9.1	20	2.808E-02	9.729E-03				354.47
25. 2.89	55						797
12.54	10			7.369E-03	6.443E-04	2.643E-03	354.66
25. 2.89	55			1.063E-02	7.709E-03	9.693E-03	797
12.54	30						354.66
25. 2.89	55						797
12.54	20	2.713E-02	9.613E-03				354.66
26. 2.89	52		1.196E-03				797
0.28	10						355.12
26. 2.89	55						797
0.3	10			7.668E-03	9.586E-04	2.583E-03	355.12
26. 2.89	55			9.068E-03	7.349E-03	9.834E-03	797
0.3	30						355.12
26. 2.89	55						797
0.3	20	2.347E-02	9.118E-03				355.12
26. 2.89	52		1.070E-03				797
3.53	10						355.29
26. 2.89	55						797
3.56	10			8.072E-03	1.005E-03	2.710E-03	355.29
26. 2.89	55			1.018E-02	7.097E-03	9.907E-03	797
3.56	30						355.29
26. 2.89	55						797
3.56	20	2.418E-02	9.099E-03				355.29
26. 2.89	52		1.118E-03				795
8.54	10						355.46
26. 2.89	55						796
9. 2	10			7.278E-03	1.071E-03	2.452E-03	355.46
26. 2.89	55			9.012E-03	6.633E-03	8.899E-03	796
9. 2	30						355.46
26. 2.89	55						796
9. 2	20	2.171E-02	8.053E-03				355.46

Table 6.4.56. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.02		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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26. 2.89	52		1.095E-03				798
12.19	10						355.64
26. 2.89	55						798
12.21	10			7.400E-03	1.191E-03	2.604E-03	355.64
26. 2.89	55			9.460E-03	6.604E-03	9.332E-03	798
12.21	30						355.64
26. 2.89	55						798
12.21	20	2.329E-02	8.321E-03				355.64
26. 2.89	52		1.129E-03				798
16.55	10						355.82
26. 2.89	55						798
16.58	10			7.522E-03	7.272E-04	2.449E-03	355.82
26. 2.89	55			9.684E-03	7.025E-03	9.559E-03	798
16.58	30						355.82
26. 2.89	55						798
16.58	20	2.233E-02	8.746E-03				355.82
26. 2.89	52		1.162E-03				798
20.3	10						355.94
26. 2.89	55						798
20.34	10			7.507E-03	9.710E-04	2.361E-03	355.92
26. 2.89	55			9.943E-03	7.008E-03	9.701E-03	798
20.34	30						355.92
26. 2.89	55						798
20.34	20	2.341E-02	8.656E-03				355.92
27. 2.89	52		1.142E-03				798
0.3	10						356.18
27. 2.89	55						798
0.32	10			7.745E-03	1.065E-03	2.426E-03	356.18
27. 2.89	55			9.584E-03	6.892E-03	9.246E-03	798
0.32	30						356.18
27. 2.89	55						798
0.32	20	2.183E-02	8.527E-03				356.18
27. 2.89	52		1.057E-03				796
3.5	10						356.32
27. 2.89	55						796
3.52	10			6.993E-03	1.113E-03	2.386E-03	356.32
27. 2.89	55			8.122E-03	6.637E-03	9.412E-03	796
3.52	30						356.32
27. 2.89	55						796
3.52	20	2.109E-02	8.270E-03				356.32
27. 2.89	52		1.143E-03				795
8.45	10						356.46
27. 2.89	55						795
8.47	10			7.970E-03	1.114E-03	2.488E-03	356.46
27. 2.89	55			9.178E-03	6.757E-03	9.213E-03	795
8.47	30						356.46
27. 2.89	55						795
8.47	20	2.181E-02	8.360E-03				356.46
28. 2.89	52		1.075E-03				797
8.45	10						357.46
28. 2.89	55						797
8. 4	10			7.246E-03	1.131E-03	2.254E-03	357.46

Table 6.4.56. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	C	CYCLE NO.	89.02	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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28. 2.89	55			8.601E-03	6.183E-03	8.762E-03	797
8.45	30						357.46
28. 2.89	55						797
8.45	20	2.046E-02	7.635E-03				357.46
3. 3.89	52		7.062E-04				802
10.27	10						358.45
3. 3.89	55						802
10.27	10			5.109E-03	4.673E-04	1.938E-03	358.45
3. 3.89	55			8.750E-03	6.169E-03	8.384E-03	802
10.27	30						358.45
3. 3.89	55						802
10.27	30						358.45
4. 3.89	52		9.490E-04				788
9. 0	10						359.46
4. 3.89	55						788
9. 0	10			6.446E-03	9.264E-04	2.041E-03	359.46
4. 3.89	55			7.817E-03	6.045E-03	8.138E-03	788
9. 0	30						359.46
4. 3.89	55						788
9. 0	20	1.467E-02	6.965E-03				359.46
5. 3.89	55						65
2. 0	20						359.78
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Table 6.4.57. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO.	D214-01		CAPSULE NO.	C	CYCLE NO.	89.03	
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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7. 4.89	52						718
8.4	10						360.11
7. 4.89	52		8.489E-04				718
8.4	10			4.575E-03	7.168E-04	1.428E-03	362.15
7. 4.89	55						718
8.4	10			5.080E-03	9.206E-04	1.601E-03	362.15
7. 4.89	55			4.352E-03	3.663E-03	4.879E-03	718
8.4	30						362.15
7. 4.89	55						718
8.4	20	6.465E-03	4.914E-03				362.15
8. 4.89	52		1.013E-03				720
8.45	10			5.595E-03	8.641E-04	1.769E-03	363.16
8. 4.89	55						720
8.45	10			6.198E-03	8.811E-04	1.950E-03	363.16
8. 4.89	55			5.697E-03	4.712E-03	6.312E-03	720
8.45	30						363.16
8. 4.89	55						720
8.45	20	1.077E-02	6.388E-03				363.16
9. 4.89	52		9.429E-04				720
9.21	10			5.316E-03	8.145E-04	1.583E-03	364.18
9. 4.89	55						720
9.21	10			5.692E-03	8.029E-04	1.817E-03	364.18
9. 4.89	55			5.790E-03	4.419E-03	5.945E-03	720
9.21	30						364.18
9. 4.89	55						720
9.21	20	1.170E-02	6.035E-03				364.18
10. 4.89	52		9.001E-04				718
8.35	10			5.049E-03	7.683E-04	1.520E-03	364.14
10. 4.89	55						718
8.35	10			5.637E-03	7.830E-04	1.753E-03	364.14
10. 4.89	55			5.094E-03	4.051E-03	5.730E-03	718
8.35	30						364.14
10. 4.89	55						718
8.35	20	1.261E-02	5.788E-03				364.14
11. 4.89	52		9.279E-04				722
9. 0	10			5.133E-03	7.203E-04	1.588E-03	365.16
11. 4.89	55						722
9. 0	10			5.579E-03	6.628E-04	1.738E-03	365.16
11. 4.89	55			5.680E-03	4.688E-03	5.972E-03	722
9. 0	30						365.16
11. 4.89	55						722
9. 0	20	1.475E-02	6.286E-03				365.16
12. 4.89	52		9.270E-04				722
9. 0	10			5.272E-03	7.935E-04	1.585E-03	367.16
12. 4.89	55						722
9. 0	10			5.521E-03	8.616E-04	1.705E-03	367.16
12. 4.89	55			5.578E-03	4.300E-03	5.966E-03	722
9. 0	30						367.16
12. 4.89	55						722
9. 0	20	1.399E-02	5.930E-03				367.16
13. 4.89	52		9.599E-04				726
9. 5	10			5.180E-03	8.068E-04	1.523E-03	368.16

Table 6.4.57. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.03		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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13. 4.89	55						726
9. 5	10			5.500E-03	8.457E-04	1.727E-03	368.16
13. 4.89	55			5.575E-03	4.338E-03	5.978E-03	726
9. 5	30						368.16
13. 4.89	55						726
9. 5	20	1.452E-02	5.784E-03				368.16
14. 4.89	52		9.269E-04				723
9. 0	10			4.911E-03	7.585E-04	1.492E-03	369.16
14. 4.89	55						723
9. 0	10			5.467E-03	7.026E-04	1.663E-03	369.16
14. 4.89	55			5.105E-03	4.067E-03	5.592E-03	723
9. 0	30						369.16
14. 4.89	55						723
9. 0	20	1.451E-02	5.752E-03				369.16
15. 4.89	52		9.362E-04				723
11.34	10			4.884E-03	8.108E-04	1.474E-03	370.24
15. 4.89	55						723
11.34	10			5.350E-03	8.416E-04	1.659E-03	370.24
15. 4.89	55			5.242E-03	3.945E-03	5.689E-03	723
11.34	30						370.24
15. 4.89	55						723
11.34	20	1.422E-02	5.451E-03				370.24
16. 4.89	52		9.091E-04				724
11.23	10			4.924E-03	7.400E-04	1.463E-03	371.24
16. 4.89	55						724
11.23	10			5.202E-03	7.093E-04	1.603E-03	371.24
16. 4.89	55			5.295E-03	3.957E-03	5.235E-03	724
11.23	30						371.24
16. 4.89	55						724
11.23	20	1.411E-02	5.414E-03				371.24
17. 4.89	52		9.522E-04				723
8.4	10			4.699E-03	7.574E-04	1.437E-03	372.16
17. 4.89	55						723
8.4	10			5.176E-03	7.332E-04	1.627E-03	372.16
17. 4.89	55			4.845E-03	3.901E-03	5.591E-03	723
8.4	30						372.16
17. 4.89	55						723
8.4	20	1.416E-02	5.333E-03				372.16
18. 4.89	52		8.838E-04				722
8.44	10			4.796E-03	7.010E-04	1.409E-03	373.16
18. 4.89	55						722
8.44	10			5.270E-03	6.600E-04	1.594E-03	373.16
18. 4.89	55			4.862E-03	3.797E-03	5.107E-03	722
8.44	30						373.16
18. 4.89	55						722
8.44	20	1.429E-02	5.267E-03				373.16
19. 4.89	52		8.703E-04				721
9.33	10			4.681E-03	7.030E-04	1.409E-03	374.18
19. 4.89	55						721
9.33	10			4.977E-03	7.274E-04	1.545E-03	374.18
19. 4.89	55			4.331E-03	3.639E-03	4.981E-03	721
9.33	30						374.18

Table 6.4.57. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.03		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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19. 4.89	55						721
9.33	20	1.432E-02	5.059E-03				374.18
20. 4.89	52		7.992E-04				719
9.45	10			4.558E-03	6.919E-04	1.360E-03	375.18
20. 4.89	55						719
9.45	10			4.962E-03	7.576E-04	1.502E-03	375.18
20. 4.89	55			4.473E-03	3.786E-03	5.042E-03	719
9.45	30						375.18
20. 4.89	55						719
9.45	20	1.488E-02	5.051E-03				375.18
21. 4.89	52		8.180E-04				719
9.1	10			4.543E-03	6.815E-04	1.352E-03	376.16
21. 4.89	55						719
9.1	10			4.800E-03	7.851E-04	1.427E-03	376.16
21. 4.89	55			4.872E-03	3.673E-03	5.198E-03	719
9.1	30						376.16
21. 4.89	55						719
9.1	20	1.429E-02	5.089E-03				376.16
22. 4.89	52		8.024E-04				717
9.1	10			4.726E-03	6.726E-04	1.330E-03	377.16
22. 4.89	55						717
9.1	10			4.996E-03	6.455E-04	1.523E-03	377.16
22. 4.89	55			4.453E-03	3.552E-03	4.830E-03	717
9.1	30						377.16
22. 4.89	55						717
9.1	20	1.478E-02	5.072E-03				377.16
23. 4.89	52		7.946E-04				716
8.5	10			4.611E-03	6.977E-04	1.342E-03	378.16
23. 4.89	55			4.921E-03	4.254E-03	5.036E-03	716
8.5	30						378.16
23. 4.89	55						716
8.5	20	1.536E-02	4.927E-03				378.16
24. 4.89	52		8.154E-04				717
8.5	10			4.143E-03	6.626E-04	1.220E-03	379.16
24. 4.89	55						717
8.5	10			4.731E-03	8.723E-04	1.412E-03	379.16
24. 4.89	55			4.351E-03	3.276E-03	4.660E-03	717
8.5	30						379.16
24. 4.89	55						717
8.5	20	1.377E-02	4.738E-03				379.16
25. 4.89	55						28
5. 0	20						379.79
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Table 6.4.58. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29. 4.89	52						748
8.57	10						379.86
29. 4.89	52		8.994E-04				748
8.57	10			4.562E-03	7.389E-04	1.422E-03	380.98
29. 4.89	52		8.994E-04				748
8.57	10			4.562E-03	7.389E-04	1.422E-03	380.98
29. 4.89	55						748
8.57	10			5.186E-03	7.806E-04	1.645E-03	380.98
29. 4.89	55			5.180E-03	4.150E-03	5.926E-03	748
8.57	30						380.98
29. 4.89	55						748
8.57	20	1.177E-02	5.319E-03				380.98
30. 4.89	52		8.682E-04				754
9. 5	10			5.146E-03	7.175E-04	1.509E-03	381.98
30. 4.89	55						754
9. 5	10			5.664E-03	8.321E-04	1.622E-03	381.98
30. 4.89	55			5.097E-03	4.212E-03	5.595E-03	754
9. 5	30						381.98
30. 4.89	55						754
9. 5	20	1.330E-02	5.692E-03				381.98
1. 5.89	52		8.763E-04				757
8. 2	10			5.014E-03	7.489E-04	1.440E-03	382.94
1. 5.89	55						757
8. 2	10			5.734E-03	8.399E-04	1.670E-03	382.94
1. 5.89	55			5.503E-03	4.064E-03	5.809E-03	757
8. 2	30						382.94
1. 5.89	55						757
8. 2	20	1.394E-02	5.827E-03				382.94
2. 5.89	52		8.684E-04				758
8.15	10			4.889E-03	7.303E-04	1.416E-03	383.96
2. 5.89	55						758
8.15	10			5.540E-03	7.306E-04	1.625E-03	383.96
2. 5.89	55			5.511E-03	4.132E-03	5.865E-03	758
8.15	30						383.96
2. 5.89	55						758
8.15	20	1.531E-02	5.638E-03				383.96
3. 5.89	52		8.811E-04				758
16.15	10			5.122E-03	7.205E-04	1.453E-03	385.28
3. 5.89	55						758
16.15	10			5.489E-03	7.168E-04	1.586E-03	385.28
3. 5.89	55			5.016E-03	4.068E-03	5.728E-03	758
16.15	30						385.28
3. 5.89	55						758
16.15	20	1.478E-02	5.561E-03				385.28
4. 5.89	52		8.795E-04				756
16.28	10			4.867E-03	7.066E-04		386.29
4. 5.89	55						756
16.28	10			5.452E-03	7.798E-04	1.574E-03	386.29
4. 5.89	55			5.018E-03	3.624E-03	5.732E-03	756
16.28	30						386.29
4. 5.89	55						756
16.28	20	1.584E-02	5.452E-03				386.29

Table 6.4.58. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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5. 5.89	52		9.025E-04				755
17. 5	10			4.711E-03	7.119E-04	1.346E-03	387.31
5. 5.89	55						755
17. 5	10			5.650E-03	6.991E-04	1.540E-03	387.31
5. 5.89	55			4.700E-03	3.848E-03	5.410E-03	755
17. 5	30						387.31
5. 5.89	55						755
17. 2	20	1.482E-02	5.300E-03				387.31
6. 5.89	52		8.360E-04				755
17.1	10			4.702E-03	6.868E-04	1.373E-03	388.22
6. 5.89	55						755
17.1	10			5.201E-03	8.626E-04	1.536E-03	388.22
6. 5.89	55			4.794E-03	3.753E-03	5.491E-03	755
17.1	30						388.22
6. 5.89	55						755
17.1	20	1.575E-02	5.305E-03				388.22
7. 5.89	52		8.694E-04				755
16.48	10			4.749E-03	7.239E-04	1.365E-03	389.27
7. 5.89	55						755
16.48	10			5.349E-03	7.853E-04	1.513E-03	389.27
7. 5.89	55			4.832E-03	3.843E-03	5.472E-03	755
16.48	30						389.27
7. 5.89	55						755
16.48	20	1.724E-02	5.316E-03				389.27
8. 5.89	52		8.412E-04				755
8.44	10						389.98
8. 5.89	55						755
8.44	10			5.230E-03	8.494E-04	1.602E-03	389.98
8. 5.89	55			5.017E-03	3.800E-03	5.494E-03	755
8.44	30						389.98
8. 5.89	55						755
8.44	20	1.345E-02	4.360E-03				389.98
8. 5.89	52		9.789E-04				756
11.58	10						390.1
8. 5.89	55						756
11.58	10			7.917E-03	9.887E-04	2.597E-03	390.1
8. 5.89	55			1.653E-02	8.365E-03	2.368E-02	756
11.58	30						390.1
8. 5.89	55						756
11.58	20	1.676E+00	1.289E-02				390.1
8. 5.89	55						755
16.3	10			1.224E-02		2.097E-03	390.27
8. 5.89	55			1.994E-02	1.047E-02	2.932E-02	755
16.3	30						390.27
8. 5.89	55						755
16.3	20	1.662E+00	5.310E-02				390.27
8. 5.89	52		8.923E-04				754
20.28	10						390.44
8. 5.89	55						754
20.28	10			2.010E-02	9.090E-04	3.592E-03	390.44
8. 5.89	55			2.017E-02	1.196E-02	2.264E-02	754
20.28	30						390.44

Table 6.4.58. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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8. 5.89	55						754
20.28	20	1.644E+00	5.927E-02				390.44
9. 5.89	52		3.037E-04				755
1.4	10						390.62
9. 5.89	55						755
1.4	10			1.647E-02	4.585E-04	3.429E-03	390.62
9. 5.89	55			1.876E-02	1.213E-02	2.259E-02	755
1.4	30						390.62
9. 5.89	55						755
1.4	20	1.598E+00	5.872E-02				390.62
9. 5.89	52		4.096E-04				755
5. 7	10						390.82
9. 5.89	55						755
5. 7	10			1.611E-02		3.370E-03	390.82
9. 5.89	55			1.747E-02	1.340E-02	2.035E-02	755
5. 7	30						390.82
9. 5.89	55						755
5. 7	20	9.080E-01	5.856E-02				390.82
9. 5.89	52		6.602E-04				756
8.34	10						390.96
9. 5.89	55						756
8.34	10			1.974E-02	1.190E-03	4.057E-03	390.96
9. 5.89	55			1.749E-02	1.296E-02	1.836E-02	756
8.34	30						390.96
9. 5.89	55						756
8.34	20	9.431E-01	5.905E-02				390.96
9. 5.89	52		6.841E-04				755
12.28	10						391.12
9. 5.89	55						755
12.28	10			1.844E-02	1.208E-03	4.289E-03	391.12
9. 5.89	55			1.887E-02	1.537E-02		755
12.28	30						391.12
9. 5.89	55						755
12.28	20	9.103E-01	5.878E-02				391.12
10. 5.89	52		3.450E-04				755
8.32	10						391.98
10. 5.89	55						755
8.32	10			8.993E-03		4.273E-03	391.98
10. 5.89	55			1.775E-02	1.440E-02	1.888E-02	755
8.32	30						391.98
10. 5.89	55						755
8.32	20	2.464E-01					391.98
11. 5.89	52		6.434E-04				754
8.34	10						392.96
11. 5.89	55						754
8.34	10			1.291E-02		4.399E-03	392.96
11. 5.89	55			1.912E-02	1.487E-02	1.932E-02	754
8.34	30						392.96
11. 5.89	55						754
8.34	20	1.824E-01	5.685E-02				392.96
11. 5.89	52		4.870E-04				754
12. 1	10						393.1

Table 6.4.58. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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11. 5.89	55						754
12. 1	10			1.229E-02	5.004E-04		393.1
11. 5.89	55			1.936E-02	1.478E-02	2.114E-02	754
12. 1	30						393.1
11. 5.89	55						754
12. 1	20	1.902E-01	5.125E-02				393.1
11. 5.89	52		7.020E-04				753
16. 0	10						393.27
11. 5.89	55						753
16. 0	10			1.250E-02	8.077E-04	4.625E-03	393.27
11. 5.89	55			1.861E-02	1.708E-02	2.035E-02	753
16. 0	30						393.27
11. 5.89	55						753
16. 0	20	1.693E-01	5.770E-02				393.27
11. 5.89	55						754
19.2	10			1.360E-02		4.208E-03	393.4
11. 5.89	55			2.047E-02	1.783E-02	2.013E-02	754
19.2	30						393.4
11. 5.89	55						754
19.2	20	1.613E-01	5.793E-02				393.4
12. 5.89	52		2.405E-04				754
0.43	10						393.65
12. 5.89	55						754
0.43	10			7.356E-03		3.089E-03	393.65
12. 5.89	55			2.201E-02	1.898E-02	2.206E-02	754
0.43	30						393.65
12. 5.89	55						754
0.43	20	1.677E-01					393.65
12. 5.89	52		2.343E-04				753
4. 5	10						393.77
12. 5.89	55						753
4. 5	10			9.821E-03			393.77
12. 5.89	55			1.805E-02	1.494E-02	1.834E-02	753
4. 5	30						393.77
12. 5.89	55						753
4. 5	20	1.561E-01	4.910E-02				393.77
12. 5.89	55						754
8.34	10			3.019E-03		4.199E-03	393.98
12. 5.89	55			1.873E-02	1.692E-02	1.886E-02	754
8.34	30						393.98
12. 5.89	55						754
8.34	20	1.561E-01					393.98
12. 5.89	52		1.112E-03				753
12.19	10						394.1
12. 5.89	55						753
12.19	10			1.390E-02		4.092E-03	394.1
12. 5.89	55			1.810E-02	1.554E-02	1.794E-02	753
12.19	30						394.1
12. 5.89	55						753
12.19	20	1.085E-01	4.629E-02				394.1
12. 5.89	52		8.852E-04				754
16.2	10						394.27

Table 6.4.58. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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12. 5.89	55						754
16.2	10			1.457E-02	7.916E-04	4.049E-03	394.27
12. 5.89	55			1.637E-02	1.453E-02	1.641E-02	754
16.2	30						394.27
12. 5.89	55						754
16.2	20	7.959E-02	3.809E-02				394.27
12. 5.89	52		8.014E-04				754
20.15	10						394.44
12. 5.89	55						754
20.15	10			1.419E-02	1.698E-03	4.150E-03	394.44
12. 5.89	55			1.619E-02	1.387E-02	1.513E-02	754
20.15	30						394.44
12. 5.89	55						754
20.15	20	7.257E-02	3.068E-02				394.44
13. 5.89	52		3.999E-04				754
0.58	10						394.65
13. 5.89	55						754
0.58	10			1.296E-02		3.296E-03	394.65
13. 5.89	55			1.617E-02	1.237E-02	1.613E-02	754
0.58	30						394.65
13. 5.89	55						754
0.58	20	6.819E-02	2.275E-02				394.65
13. 5.89	52		7.422E-04				753
4.2	10						394.77
13. 5.89	55						753
4.2	10			1.383E-02	1.157E-03	4.231E-03	394.77
13. 5.89	55			1.662E-02	1.317E-02	1.680E-02	753
4.2	30						394.77
13. 5.89	55						753
4.2	20	6.389E-02	2.249E-02				394.77
13. 5.89	52		9.279E-04				754
9. 8	10						394.98
13. 5.89	55						754
9. 8	10			1.269E-02	6.054E-04	3.675E-03	394.98
13. 5.89	55			2.634E-02	1.745E-02	3.267E-02	754
9. 8	30						394.98
13. 5.89	55						754
9. 8	20	6.248E-02	2.097E-02				394.98
13. 5.89	52		1.287E-03				753
12.12	10						395.1
13. 5.89	55						753
12.12	10			1.356E-02	2.224E-03	4.132E-03	395.1
13. 5.89	55			1.676E-02	1.422E-02	1.616E-02	753
12.12	30						395.1
13. 5.89	55						753
12.12	20	5.847E-02	2.138E-02				395.1
13. 5.89	52		8.132E-04				753
15.58	10						395.27
13. 5.89	55						753
15.58	10			1.043E-02	1.224E-03	3.908E-03	395.27
13. 5.89	55			1.505E-02	1.283E-02	1.580E-02	753
15.58	30						395.27

Table 6.4.58. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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13. 5.89	55						753
15.58	20	5.180E-02	2.008E-02				395.27
13. 5.89	52		8.253E-04				753
19.4	10						395.4
13. 5.89	55						753
19.4	10			1.256E-02	7.285E-04	3.799E-03	395.4
13. 5.89	55			1.514E-02	1.292E-02	1.463E-02	753
19.4	30						395.4
13. 5.89	55						753
19.4	20	5.538E-02	1.991E-02				395.4
14. 5.89	52		4.658E-04				753
1.46	10						395.69
14. 5.89	55						753
1.46	10			1.103E-02		3.301E-03	395.69
14. 5.89	55						753
1.46	20						395.69
14. 5.89	55						753
1.46	20	5.402E-02	1.957E-02				395.69
14. 5.89	52		4.779E-04				753
4.59	10						395.82
14. 5.89	55						753
4.59	10			9.088E-03		3.678E-03	395.82
14. 5.89	55			1.607E-02	1.134E-02	1.590E-02	753
4.59	30						395.82
14. 5.89	55						753
4.59	20	5.420E-02	2.037E-02				395.82
14. 5.89	55						754
8.48	10			1.301E-02	2.247E-03	3.822E-03	395.98
14. 5.89	55			1.599E-02	1.095E-02	1.537E-02	754
8.49	30						395.98
14. 5.89	55						754
8.48	20	4.753E-02	1.890E-02				395.98
14. 5.89	52		8.435E-04				752
15.5	10						396.27
14. 5.89	55						752
15.5	10			1.231E-02	1.044E-03	3.608E-03	396.27
14. 5.89	55			1.548E-02	1.223E-02	1.505E-02	752
15.5	30						396.27
14. 5.89	55						752
15.5	20	4.866E-02	1.935E-02				396.27
15. 5.89	52		9.542E-04				747
16.33	10						397.27
15. 5.89	55						747
16.33	10			1.363E-02	1.373E-03	3.755E-03	397.27
15. 5.89	55			1.405E-02	1.145E-02	1.461E-02	747
16.33	30						397.27
15. 5.89	55						747
16.33	20	4.267E-02	1.760E-02				397.27
16. 5.89	52		1.349E-03				748
16.23	10						398.27
16. 5.89	55						748
16.23	10			1.248E-02	1.320E-03	3.616E-03	398.27

Table 6.4.58. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.04		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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16. 5.89	55			1.340E-02	1.001E-02	1.325E-02	748
16.23	30						398.27
16. 5.89	55						748
16.23	20	4.290E-02	1.703E-02				398.27
17. 5.89	52		1.181E-03				747
16.33	10						399.27
17. 5.89	55						747
16.33	10			1.220E-02	1.374E-03	3.349E-03	399.27
17. 5.89	55			1.317E-02	9.191E-03	1.320E-02	747
16.33	30						399.27
17. 5.89	55						747
16.33	20	4.147E-02	1.583E-02				399.27
18. 5.89	52		1.053E-03				745
16.25	10						400.27
18. 5.89	55						745
16.25	10			1.213E-02	1.139E-03	3.371E-03	400.27
18. 5.89	55			1.233E-02	9.402E-03	1.308E-02	745
16.25	30						400.27
18. 5.89	55						745
16.25	20	4.241E-02	1.620E-02				400.27
19. 5.89	52		1.095E-03				747
16.42	10						401.27
19. 5.89	55						747
16.42	10			1.153E-02	1.008E-03	3.185E-03	401.27
19. 5.89	55			1.267E-02	9.043E-03	1.320E-02	747
16.42	30						401.27
19. 5.89	55						747
16.42	20	4.196E-02	1.551E-02				401.27
20. 5.89	52		1.331E-03				746
16.14	10						402.27
20. 5.89	55						746
16.14	10			1.237E-02	1.372E-03	3.475E-03	402.27
20. 5.89	55			1.264E-02	8.897E-03	1.295E-02	746
16.14	30						402.27
20. 5.89	55						746
16.14	20	4.376E-02	1.523E-02				402.27
21. 5.89	55						17
12. 0	20						402.59
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Table 6.4.59. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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26. 5.89	52						727
1.48	10						402.61
26. 5.89	52		1.412E-03				727
1.48	10			9.330E-03	1.362E-03	2.609E-03	404.95
26. 5.89	55						727
1.48	10			1.305E-02	1.384E-03	3.720E-03	404.95
26. 5.89	55			1.325E-02	9.776E-03	1.350E-02	727
1.48	30						404.95
26. 5.89	55						727
1.48	20	2.798E-02	1.593E-02				404.95
27. 5.89	52		1.440E-03				729
0.46	10			1.011E-02	1.417E-03	2.757E-03	405.95
27. 5.89	55						729
0.46	10			1.425E-02	1.278E-03	4.029E-03	405.95
27. 5.89	55			1.286E-02	1.004E-02	1.367E-02	729
0.46	30						405.95
27. 5.89	55						729
0.46	20	3.394E-02	1.616E-02				405.95
28. 5.89	52		1.421E-03				729
0.59	10			1.019E-02	1.450E-03	2.640E-03	406.9
28. 5.89	55						729
0.59	10			1.309E-02	1.343E-03	3.585E-03	406.9
28. 5.89	55			1.235E-02	9.496E-03	1.299E-02	729
0.59	30						406.9
28. 5.89	55						729
0.59	20	3.564E-02	1.568E-02				406.9
29. 5.89	52		1.526E-03				731
0.35	10			9.902E-03	1.276E-03	2.309E-03	407.9
29. 5.89	55						731
0.35	10			1.347E-02	1.675E-03	3.488E-03	407.9
29. 5.89	55			1.281E-02	9.408E-03	1.328E-02	731
0.35	30						407.9
29. 5.89	55						731
0.35	20	4.040E-02	1.588E-02				407.9
30. 5.89	52		1.297E-03				732
16.33	10			9.797E-03	1.295E-03	2.758E-03	409.43
30. 5.89	55						732
16.33	10			1.333E-02	1.561E-03	3.490E-03	409.43
30. 5.89	55			1.258E-02	8.521E-03	1.304E-02	732
16.33	30						409.43
30. 5.89	55						732
16.33	20	4.158E-02	1.535E-02				409.43
31. 5.89	52		1.285E-03				730
17.52	10			9.796E-03	1.232E-03	2.451E-03	410.44
31. 5.89	55						730
17.52	10			1.242E-02		3.191E-03	410.44
31. 5.89	55			1.240E-02	8.348E-03	1.270E-02	730
17.52	30						410.44
31. 5.89	55						730
17.52	20	4.128E-02	1.551E-02				410.44
1. 6.89	52		1.474E-03				731
16.55	10			1.106E-02	1.366E-03	2.740E-03	411.35

Table 6.4.59. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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1. 6.89	55						731
16.55	10			1.275E-02	1.176E-03	3.709E-03	411.35
1. 6.89	55			1.216E-02	8.338E-03	1.268E-02	731
16.55	30						411.35
1. 6.89	55						731
16.55	20	4.194E-02	1.508E-02				411.35
2. 6.89	52		1.307E-03				730
17.25	10			1.029E-02	1.224E-03	2.577E-03	412.32
2. 6.89	55						730
17.25	10			1.207E-02	8.246E-04	3.495E-03	412.32
2. 6.89	55			1.135E-02	8.409E-03	1.270E-02	730
17.25	30						412.32
2. 6.89	55						730
17.25	20	4.403E-02	1.530E-02				412.32
3. 6.89	52		1.333E-03				730
16.35	10			9.507E-03	1.303E-03	2.483E-03	413.24
3. 6.89	55						730
16.35	10			1.187E-02	1.172E-03	3.133E-03	413.24
3. 6.89	55			1.148E-02	8.028E-03	1.232E-02	730
16.35	30						413.24
3. 6.89	55						730
16.35	20	4.288E-02	1.432E-02				413.24
4. 6.89	52						730
16.4	10			1.013E-02		2.475E-03	414.19
4. 6.89	55						730
16.4	10			1.218E-02	1.157E-03	3.460E-03	414.19
4. 6.89	55			1.142E-02	7.828E-03	1.199E-02	730
16.4	30						414.19
4. 6.89	55						730
16.4	20	4.095E-02	1.396E-02				414.19
7. 6.89	52		1.161E-03				710
3.58	10			8.423E-03		2.256E-03	416.5
7. 6.89	55						710
3.58	10			1.090E-02	1.503E-03	2.950E-03	416.5
7. 6.89	55			9.828E-03	7.029E-03	1.044E-02	710
3.48	30						416.5
7. 6.89	55						710
3.58	20	3.732E-02	1.245E-02				416.5
8. 6.89	52		1.236E-03				708
0.3	10			9.552E-03	1.170E-03	2.533E-03	417.3
8. 6.89	55						708
0.3	10			1.085E-02	1.235E-03	2.906E-03	417.3
8. 6.89	55			9.698E-03	6.973E-03	1.032E-02	708
0.3	30						417.3
8. 6.89	55						708
0.3	20	3.694E-02	1.242E-02				417.3
9. 6.89	52		1.221E-03				709
0.38	10			9.452E-03	1.181E-03	2.260E-03	418.25
9. 6.89	55						709
0.38	10			1.089E-02	1.261E-03	2.929E-03	418.25
9. 6.89	55			8.780E-03	6.640E-03	1.007E-02	709
0.38	30						418.25

Table 6.4.59. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.05		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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9. 6.89	55						709
0.38	20	3.668E-02	1.227E-02				418.25
11. 6.89	52		1.245E-03				708
0.38	10			9.034E-03	1.239E-03	2.427E-03	420.15
11. 6.89	55						708
0.38	10			1.099E-02	1.202E-03	2.918E-03	420.15
11. 6.89	55			9.350E-03	6.799E-03	9.973E-03	708
0.38	30						420.15
11. 6.89	55						708
0.38	20	3.743E-02	1.219E-02				420.15
12. 6.89	52		1.241E-03				705
0.3	10			8.889E-03	1.203E-03	2.370E-03	421.1
12. 6.89	55						705
0.3	10			1.048E-02	1.324E-03	2.836E-03	421.1
12. 6.89	55			9.183E-03	6.577E-03	9.596E-03	705
0.3	30						421.1
12. 6.89	55						705
0.3	20	3.876E-02	1.175E-02				421.1
13. 6.89	52		1.242E-03				704
0.45	10			8.935E-03	1.188E-03	2.342E-03	422.05
13. 6.89	55						704
0.45	10			1.032E-02	1.418E-03	2.807E-03	422.05
13. 6.89	55			8.163E-03	6.058E-03	9.215E-03	704
0.45	30						422.05
13. 6.89	55						704
0.45	20	3.535E-02	1.123E-02				422.05
14. 6.89	52		1.208E-03				702
0.45	10			8.648E-03	1.173E-03	2.341E-03	423
14. 6.89	55						702
0.45	10			1.036E-02	1.200E-03	2.799E-03	423
14. 6.89	55			8.596E-03	5.987E-03	9.279E-03	702
0.45	30						423
14. 6.89	55						702
0.45	20	3.418E-02	1.126E-02				423
15. 6.89	55						24
7. 0	20						423.75
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Table 6.4.60. RUBICON - R/B values
Source: JRC-IAM Petten, HFR Unit, The Netherlands

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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19. 6.89	52						735
8.52	10						423.75
19. 6.89	52		1.306E-03				735
8.52	10			9.987E-03	1.265E-03	2.510E-03	425.13
19. 6.89	55						735
8.52	10			1.164E-02	1.716E-03	3.141E-03	425.13
19. 6.89	55			9.209E-03	7.549E-03	1.050E-02	735
8.52	30						425.13
19. 6.89	55						735
8.52	20	2.876E-02	1.228E-02				425.13
20. 6.89	52		1.299E-03				737
8.53	10			9.753E-03	1.280E-03	2.512E-03	426.13
20. 6.89	55						737
8.53	10			1.145E-02	1.383E-03	3.098E-03	426.13
20. 6.89	55			1.005E-02	6.973E-03	1.074E-02	737
8.53	30						426.13
20. 6.89	55						737
8.53	20	3.133E-02	1.257E-02				426.13
23. 6.89	52		1.127E-03				704
0.17	10			8.817E-03	1.185E-03	2.752E-03	428.66
23. 6.89	55						704
0.17	10			9.686E-03	1.177E-03	2.574E-03	428.66
23. 6.89	55			7.705E-03	6.092E-03	8.503E-03	704
0.17	30						428.66
23. 6.89	55						704
0.17	20	3.123E-02	1.078E-02				428.66
24. 6.89	52		1.252E-03				704
0.15	10			8.641E-03	1.125E-03	2.249E-03	429.59
24. 6.89	55						704
0.11	10			9.713E-03	1.273E-03	2.651E-03	429.59
24. 6.89	55			7.778E-03	5.967E-03	8.489E-03	704
0.11	30						429.59
24. 6.89	55						704
0.11	20	2.987E-02	1.057E-02				429.59
25. 6.89	52		1.161E-03				703
0.11	10			8.916E-03	1.105E-03	2.242E-03	430.52
25. 6.89	55						703
0.11	10			9.253E-03	1.070E-03	2.662E-03	430.52
25. 6.89	55			8.126E-03	5.922E-03	8.368E-03	703
0.11	30						430.52
25. 6.89	55						703
0.11	20	3.014E-02	1.048E-02				430.52
26. 6.89	52		1.224E-03				703
0. 0	10			9.170E-03	1.115E-03	2.303E-03	431.43
26. 6.89	55						703
0. 0	10			9.614E-03	1.141E-03	2.639E-03	431.43
26. 6.89	55			7.852E-03	5.885E-03	8.503E-03	703
0. 0	30						431.43
26. 6.89	55						703
0. 0	20	3.042E-02	1.039E-02				431.43
26. 6.89	52		1.129E-03				703
7.58	10						431.73

Table 6.4.60. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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26. 6.89	52		8.385E-04				703
8.2	10						431.73
26. 6.89	52		1.090E-03				703
8.41	10						431.73
26. 6.89	52		1.086E-03				703
8.52	10						431.73
26. 6.89	52		1.084E-03				703
9. 5	10						431.76
26. 6.89	52		1.046E-03				703
9.18	10						431.76
26. 6.89	52		1.096E-03				703
9.31	10						431.77
26. 6.89	52		1.078E-03				703
9.37	10						431.77
26. 6.89	52		1.147E-03				703
9.45	10						431.78
26. 6.89	55						705
10. 2	10			9.223E-03	1.139E-03	2.966E-03	431.79
26. 6.89	55			1.575E-02	8.630E-03	1.821E-02	705
10. 2	30						431.79
26. 6.89	55						705
10. 2	20	1.891E-01	1.484E-02				431.79
26. 6.89	52		1.267E-03				704
12.32	10						431.86
26. 6.89	55						704
12.32	10			1.565E-02	1.078E-03	4.511E-03	431.86
26. 6.89	55			2.639E-02	1.425E-02	3.187E-02	704
12.32	30						431.86
26. 6.89	55						704
12.32	20	5.218E-01	4.920E-02				431.86
26. 6.89	52		1.151E-03				704
16.1	10						432.01
26. 6.89	55						704
16.1	10			1.965E-02	7.974E-04	4.885E-03	432.01
26. 6.89	55			2.218E-02	1.500E-02	2.322E-02	704
16.1	30						432.01
26. 6.89	55						704
16.1	20	#######	6.248E-02				432.01
26. 6.89	52		1.246E-03				703
19.3	10						432.12
26. 6.89	55						703
19.3	10			1.962E-02	9.211E-04	5.071E-03	432.12
26. 6.89	55			2.047E-02	1.302E-02	2.206E-02	703
19.3	30						432.12
26. 6.89	55						703
19.3	20	4.731E-01	5.726E-02				432.12
27. 6.89	52		1.206E-03				702
0.31	10						432.32
27. 6.89	55						702
0.31	10			1.896E-02	1.545E-03	5.558E-03	432.32
27. 6.89	55			2.015E-02	1.495E-02	2.153E-02	702
0.31	30						432.32

Table 6.4.60. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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27. 6.89	55						702
0.31	20	3.727E-01	5.034E-02				432.32
27. 6.89	52		1.044E-03				703
4.19	10						432.47
27. 6.89	55						703
4.19	10			1.907E-02	1.023E-03	5.465E-03	432.47
27. 6.89	55			2.005E-02	1.504E-02	2.112E-02	703
4.19	30						432.47
27. 6.89	55						703
4.19	20	3.944E-01	4.943E-02				432.47
27. 6.89	52		1.100E-03				704
8.4	10						432.62
27. 6.89	55						704
8.4	10			1.873E-02	1.579E-03	5.509E-03	432.62
27. 6.89	55			1.962E-02	1.516E-02	1.915E-02	704
8.4	30						432.62
27. 6.89	55						704
8.4	20	2.177E-01	5.002E-02				432.62
27. 6.89	52		8.904E-04				704
11.46	10						432.73
27. 6.89	55						704
11.46	10			1.861E-02		5.268E-03	432.73
27. 6.89	55			1.930E-02	1.338E-02	1.986E-02	704
11.46	30						432.73
27. 6.89	55						704
11.46	20	1.914E-01	4.834E-02				432.73
27. 6.89	52		1.331E-03				704
16.25	10						432.92
27. 6.89	55						704
16.25	10			1.790E-02		5.642E-03	432.92
27. 6.89	55			1.811E-02	1.438E-02	1.955E-02	704
16.25	30						432.92
27. 6.89	55						704
16.25	20	1.854E-01	4.831E-02				432.92
27. 6.89	52		4.832E-04				704
19.4	10						433.03
27. 6.89	55						704
19.4	10			1.690E-02	1.154E-03	5.397E-03	433.03
27. 6.89	55			1.768E-02	1.514E-02	1.979E-02	704
19.4	30						433.03
27. 6.89	55						704
19.4	20	1.739E-01	4.763E-02				433.03
28. 6.89	52		1.068E-03				704
0.3	10						433.23
28. 6.89	55						704
0.3	10			1.915E-02	1.302E-03	5.781E-03	433.23
28. 6.89	55			1.966E-02	1.418E-02	1.945E-02	704
0.3	30						433.23
28. 6.89	55						704
0.3	20	1.554E-01	4.741E-02				433.23
28. 6.89	55						704
4.19	10			1.867E-02	1.016E-03	5.644E-03	433.39

Table 6.4.60. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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28. 6.89	55			1.970E-02	1.433E-02	1.961E-02	704
4.19	30						433.39
28. 6.89	55						704
4.19	20	1.846E-01	4.764E-02				433.39
28. 6.89	52		1.419E-03				705
8.28	10						433.54
28. 6.89	55						705
8.28	10			1.938E-02	1.712E-03	6.029E-03	433.54
28. 6.89	55			2.056E-02	1.614E-02	2.008E-02	705
8.28	30						433.54
28. 6.89	55						705
8.28	20	1.663E-01	4.815E-02				433.54
28. 6.89	52		7.372E-04				703
20. 0	10						434.01
28. 6.89	55						703
20. 0	10			1.725E-02	8.240E-04	5.358E-03	434.01
28. 6.89	55						703
20. 0	30						434.01
28. 6.89	55						703
20. 0	20	1.364E-01	4.656E-02				434.01
29. 6.89	52						703
0.21	10						434.18
29. 6.89	52		1.302E-03				703
0.21	10						434.18
29. 6.89	55						703
0.21	10			1.855E-02	1.601E-03	5.817E-03	434.18
29. 6.89	55			1.867E-02	1.500E-02	1.956E-02	703
0.21	30						434.18
29. 6.89	55						703
0.21	20	1.437E-01	4.750E-02				434.18
29. 6.89	52		5.851E-04				704
4. 1	10						434.33
29. 6.89	55						704
4. 1	10			1.601E-02		5.337E-03	434.33
29. 6.89	55			1.894E-02	1.494E-02	2.015E-02	704
4. 1	30						434.33
29. 6.89	55						704
4. 1	20	1.474E-01	4.624E-02				434.33
29. 6.89	55						704
8.42	10			1.116E-02		3.597E-03	434.48
29. 6.89	55			1.894E-02	1.488E-02	2.076E-02	704
8.42	30						434.48
29. 6.89	55						704
8.42	20	1.879E-01	3.747E-02				434.48
29. 6.89	52		4.706E-04				761
11. 8	10						434.61
29. 6.89	55						761
11. 8	10			2.091E-02		6.657E-03	434.61
29. 6.89	55			2.250E-02	1.708E-02	2.313E-02	761
11. 8	30						434.61
29. 6.89	55						761
11. 8	20	1.752E-01	5.599E-02				434.61

Table 6.4.60. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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29. 6.89	52		4.252E-04				761
13.31	10						434.69
29. 6.89	55						761
13.31	10			2.149E-02		6.786E-03	434.69
29. 6.89	55			2.094E-02	1.879E-02	2.127E-02	761
13.31	30						434.69
29. 6.89	55						761
13.31	20		5.596E-02				434.69
29. 6.89	52		3.743E-04				761
16.13	10						434.8
29. 6.89	55						761
16.13	10			2.184E-02		6.927E-03	434.8
29. 6.89	55			2.125E-02	1.922E-02	2.323E-02	761
16.13	30						434.8
29. 6.89	55						761
16.13	20		5.251E-02				434.8
29. 6.89	52		3.056E-04				760
19.46	10						434.92
29. 6.89	55						760
19.46	10			2.028E-02		6.720E-03	434.92
29. 6.89	55			2.159E-02	1.863E-02	2.183E-02	760
19.46	30						434.92
29. 6.89	55						760
19.46	20	1.577E-01	5.110E-02				434.92
30. 6.89	52		1.061E-03				759
0.4	10						435.11
30. 6.89	55						759
0.4	10			2.258E-02		7.345E-03	435.11
30. 6.89	55			2.270E-02	1.979E-02	2.258E-02	759
0.4	30						435.11
30. 6.89	55						759
0.4	20	1.558E-01	5.696E-02				435.11
30. 6.89	52		7.083E-04				760
3.44	10						435.22
30. 6.89	55						760
3.44	10			2.191E-02		1.534E-02	435.22
30. 6.89	55			2.302E-02	1.997E-02	2.455E-02	760
3.44	30						435.22
30. 6.89	55						760
3.44	20	1.448E-01	5.307E-02				435.22
30. 6.89	52		7.371E-04				759
11.58	10						435.52
30. 6.89	55						759
11.58	10			2.317E-02		7.201E-03	435.52
30. 6.89	55			2.242E-02	2.003E-02	2.214E-02	759
11.58	30						435.52
30. 6.89	55						759
11.58	20	1.636E-01	5.192E-02				435.52
30. 6.89	52		6.201E-04				755
19.5	10						435.89
30. 6.89	55						755
19.5	10			2.273E-02		7.127E-03	435.89

Table 6.4.60. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
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30. 6.89	55			2.068E-02	1.935E-02	2.049E-02	755
19.5	30						435.89
30. 6.89	55						755
19.5	20	1.433E-01	4.992E-02				435.89
1. 7.89	52		5.965E-04				756
4.5	10						436.23
1. 7.89	55						756
4.5	10			2.016E-02		6.781E-03	436.23
1. 7.89	55			2.362E-02	1.749E-02	2.245E-02	756
4.5	30						436.23
1. 7.89	55						756
4.5	20	1.396E-01	6.020E-02				436.23
2. 7.89	52		9.327E-04				756
0.37	10						437.01
2. 7.89	55						756
0.37	10			2.081E-02		6.803E-03	437.01
2. 7.89	55			2.206E-02	1.695E-02	2.189E-02	756
0.37	30						437.01
2. 7.89	55						756
0.37	20	1.314E-01	5.960E-02				437.01
3. 7.89	52		1.012E-03				756
0.3	10						437.97
3. 7.89	55						756
0.3	10			2.364E-02		7.338E-03	437.97
3. 7.89	55			1.687E-02	1.359E-02	1.660E-02	756
0.3	30						437.97
3. 7.89	55						756
0.3	20	1.315E-01	5.035E-02				437.97
3. 7.89	52		2.921E-04				742
9.58	10						438.28
3. 7.89	55						742
9.58	10			2.466E-02		8.588E-03	438.28
3. 7.89	55			2.159E-02	1.736E-02	2.078E-02	742
9.58	30						438.28
3. 7.89	55						742
9.58	20	9.741E-02	6.240E-02				438.28
3. 7.89	52		2.258E-04				749
12.3	10						438.36
3. 7.89	55						749
12.3	10			1.532E-02	8.391E-04	5.512E-03	438.36
3. 7.89	55			2.114E-02	1.707E-02	2.038E-02	749
12.3	30						438.36
3. 7.89	55						749
12.3	20	8.535E-02	4.664E-02				438.36
3. 7.89	52		2.406E-04				747
16.1	10						438.51
3. 7.89	55						747
16.1	10			1.602E-02	1.763E-03	5.590E-03	438.51
3. 7.89	55			1.930E-02	1.648E-02	2.049E-02	747
16.1	30						438.51
3. 7.89	55						747
16.1	20	7.224E-02	4.537E-02				438.51

Table 6.4.60. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
3. 7.89	52		1.211E-03				744
20. 0	10						438.66
3. 7.89	55						744
20. 0	10			1.653E-02	1.177E-03	5.295E-03	438.66
3. 7.89	55			1.917E-02	1.537E-02	1.929E-02	744
20. 0	30						438.66
3. 7.89	55						744
20. 0	20	6.552E-02	2.582E-02				438.66
4. 7.89	52		1.002E-03				746
1. 0	10						438.94
4. 7.89	55						746
1. 0	10			1.592E-02	1.206E-03	5.067E-03	438.94
4. 7.89	55			1.902E-02	1.533E-02	1.991E-02	746
1. 0	30						438.94
4. 7.89	55						746
1. 0	20	6.512E-02	2.592E-02				438.94
4. 7.89	52		6.073E-04				745
4.21	10						439.05
4. 7.89	55						745
4.21	10			9.481E-03	1.107E-03	5.374E-03	439.05
4. 7.89	55			1.955E-02	1.529E-02	1.939E-02	745
4.21	30						439.05
4. 7.89	55						745
4.21	20	6.612E-02	2.559E-02				439.05
4. 7.89	52		1.071E-03				745
8.45	10						439.2
4. 7.89	55						745
8.45	10			1.585E-02		5.263E-03	439.2
4. 7.89	55			1.989E-02	1.601E-02	1.779E-02	745
8.45	30						439.2
4. 7.89	55						745
8.45	20	6.076E-02	2.460E-02				439.2
7. 7.89	52		5.547E-04				735
0.27	10						441.73
7. 7.89	55						735
0.27	10			1.519E-02		5.189E-03	441.73
7. 7.89	55			1.680E-02	1.184E-02	1.665E-02	735
0.27	30						441.73
7. 7.89	55						735
0.27	20	4.795E-02	2.152E-02				441.73
7. 7.89	55						735
0.27	20						441.73
8. 7.89	52		4.873E-04				791
0.48	10						442.81
8. 7.89	55			2.018E-02	1.761E-02	2.170E-02	791
0.48	30						442.81
8. 7.89	55						791
0.48	20	6.666E-02	2.284E-02				442.81
8. 7.89	52						786
12. 0	10						442.99
9. 7.89	52		7.869E-04				784
0.57	10						443.74

Table 6.4.60. (continued)

RUBICON -- R/B RATES							
EXPERIMENT NO. D214-01			CAPSULE NO. C		CYCLE NO. 89.06		
DATE	GM	KR-90	KR-89	KR-88	KR-87	KR-85M	TEMP
TIME	SV	XE-133	XE-135	XE-135M	XE-137	XE-138	FPD
---	---	---	---	---	---	---	---
9. 7.89	55						784
0.57	10			1.660E-02	1.929E-03	5.208E-03	443.74
9. 7.89	55			2.131E-02	1.670E-02	2.094E-02	784
0.57	30						443.74
9. 7.89	55						784
0.57	20	1.791E-01	6.611E-02				443.74
10. 7.89	52		1.641E-03				784
1.15	10						444.68
10. 7.89	55						784
1.15	10			1.659E-02	1.041E-03	4.990E-03	444.68
10. 7.89	55			2.075E-02	1.472E-02	2.108E-02	784
1.15	30						444.68
10. 7.89	55						784
1.15	20	6.117E-02	2.277E-02				444.68
10. 7.89	52		1.122E-03				780
16.41	10						445.01
10. 7.89	55						780
16.41	10			1.702E-02	1.685E-03	5.453E-03	445.01
10. 7.89	55			2.266E-02	1.772E-02	2.330E-02	780
16.41	30						445.01
10. 7.89	55						780
16.41	20	9.377E-02	2.502E-02				445.01
11. 7.89	55						59
3. 0	20						445.35
---	---						

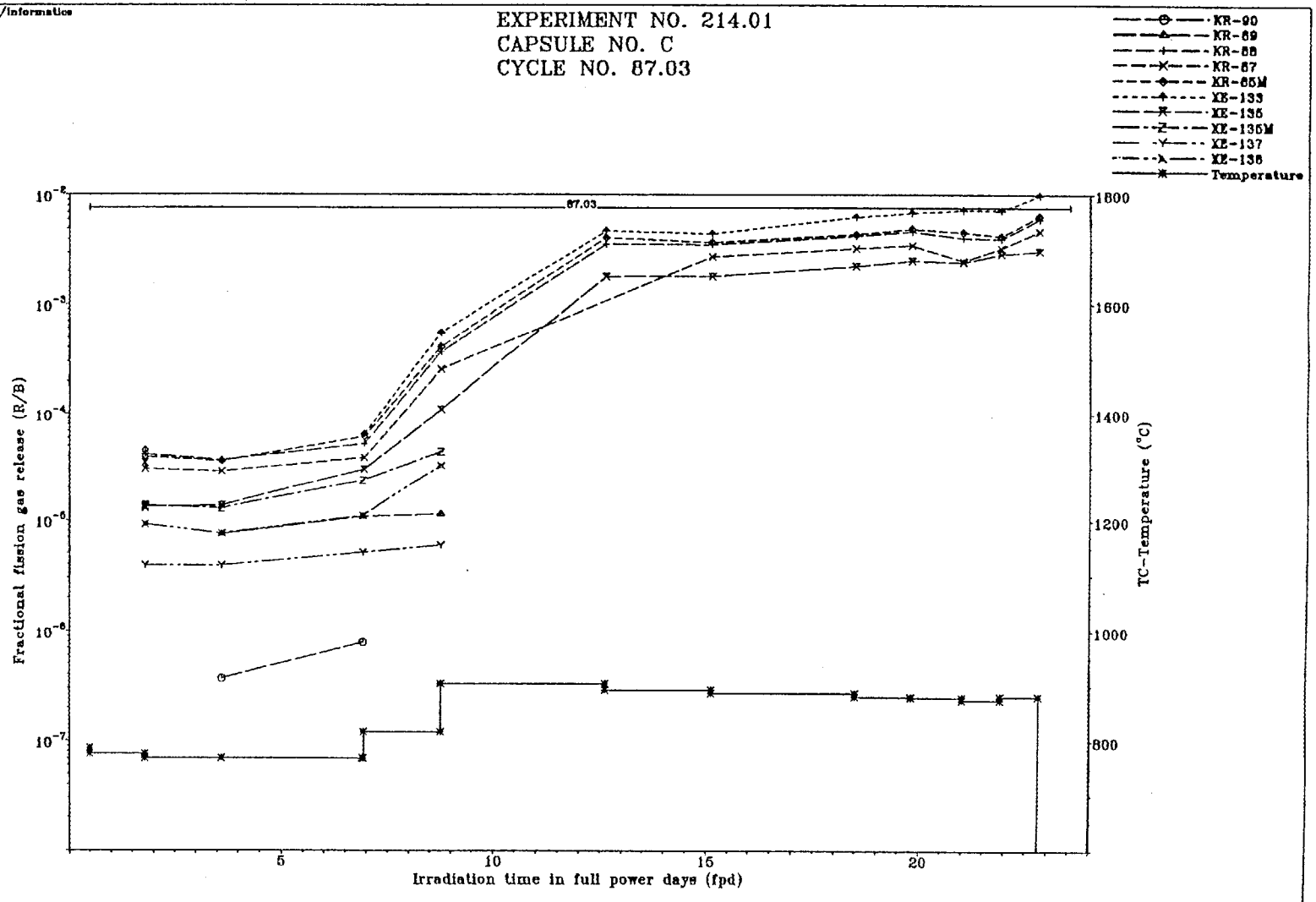

Fig. 6.4.41. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

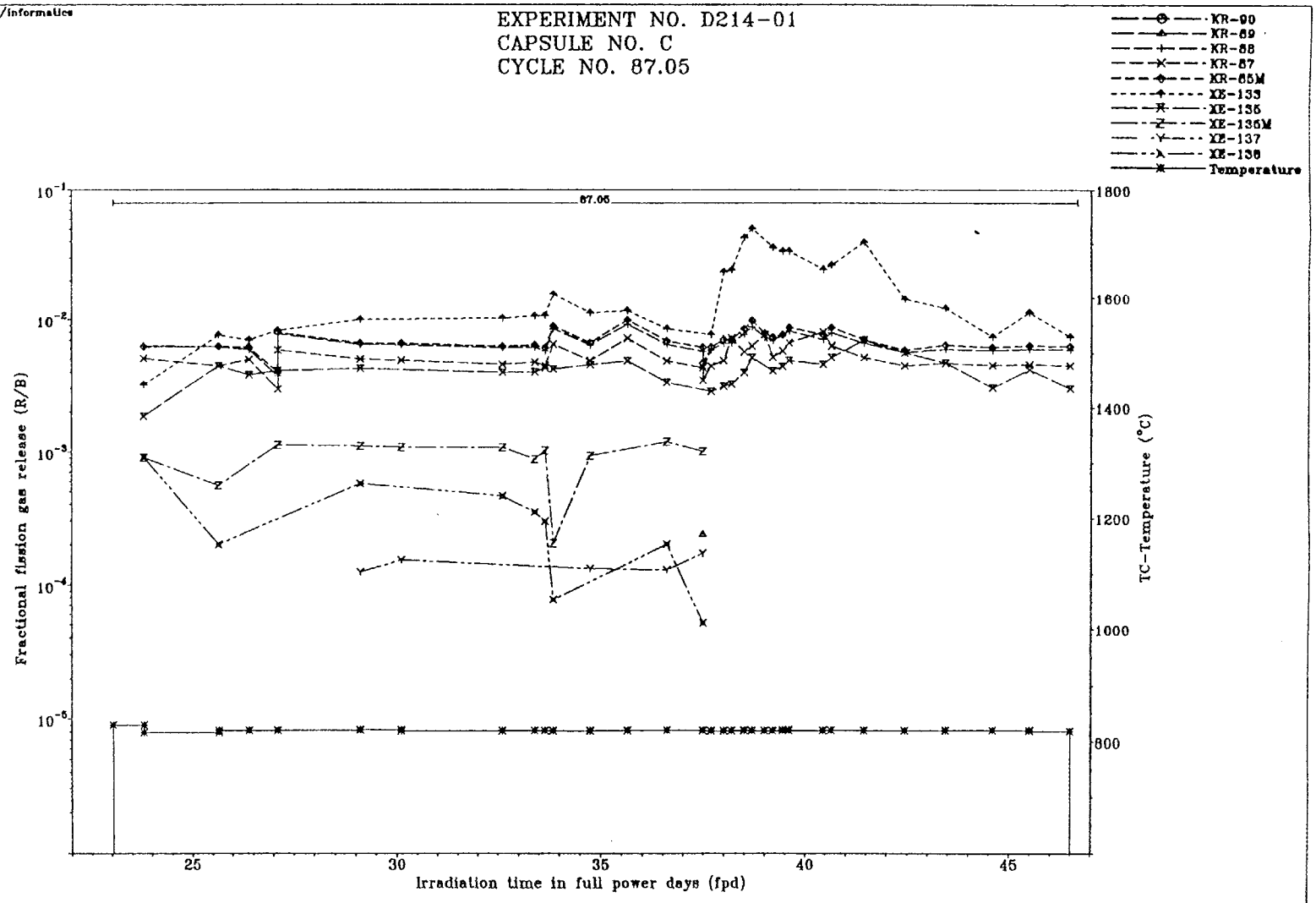

Fig. 6.4.42. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

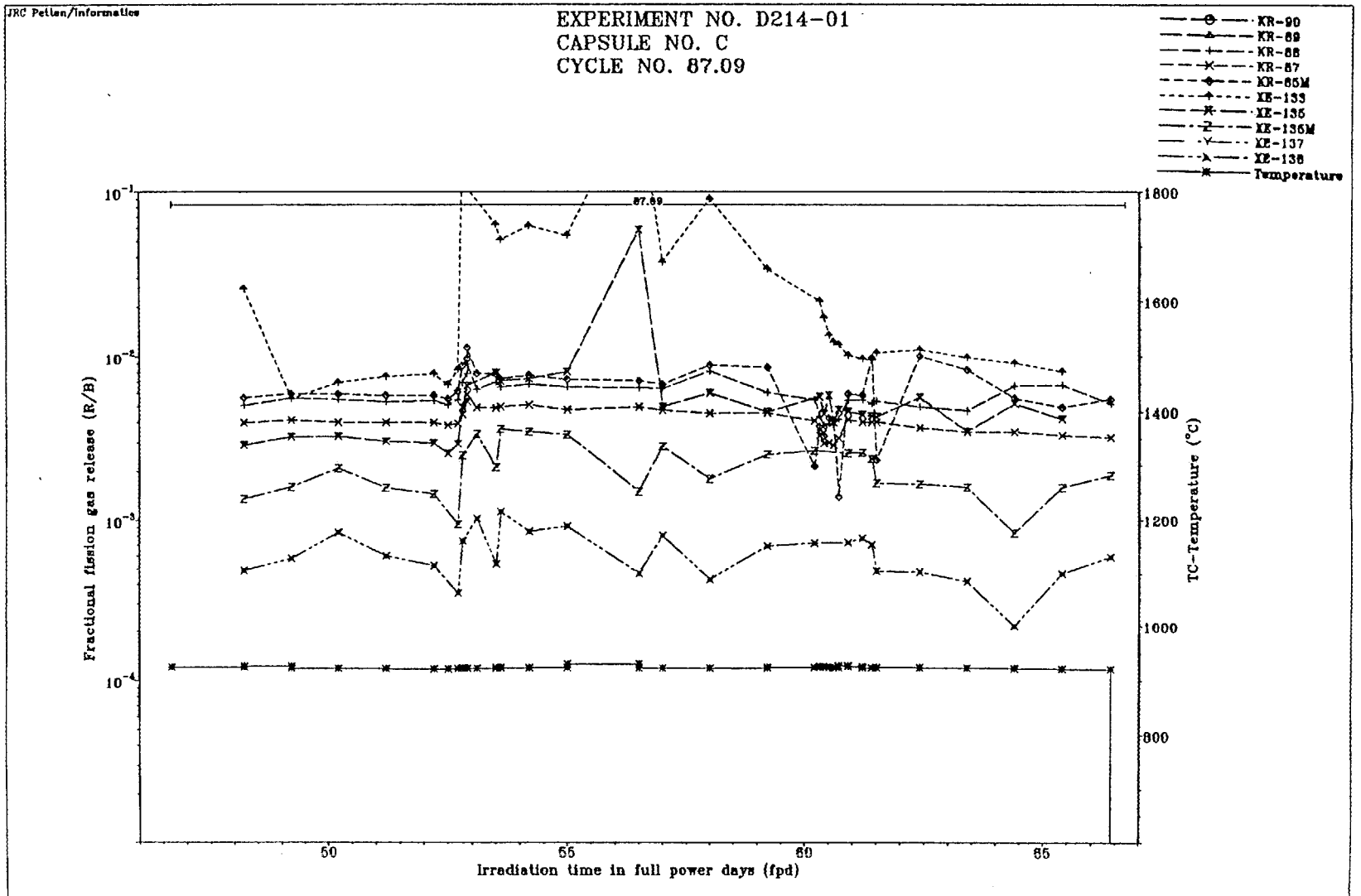

Fig. 6.4.43. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

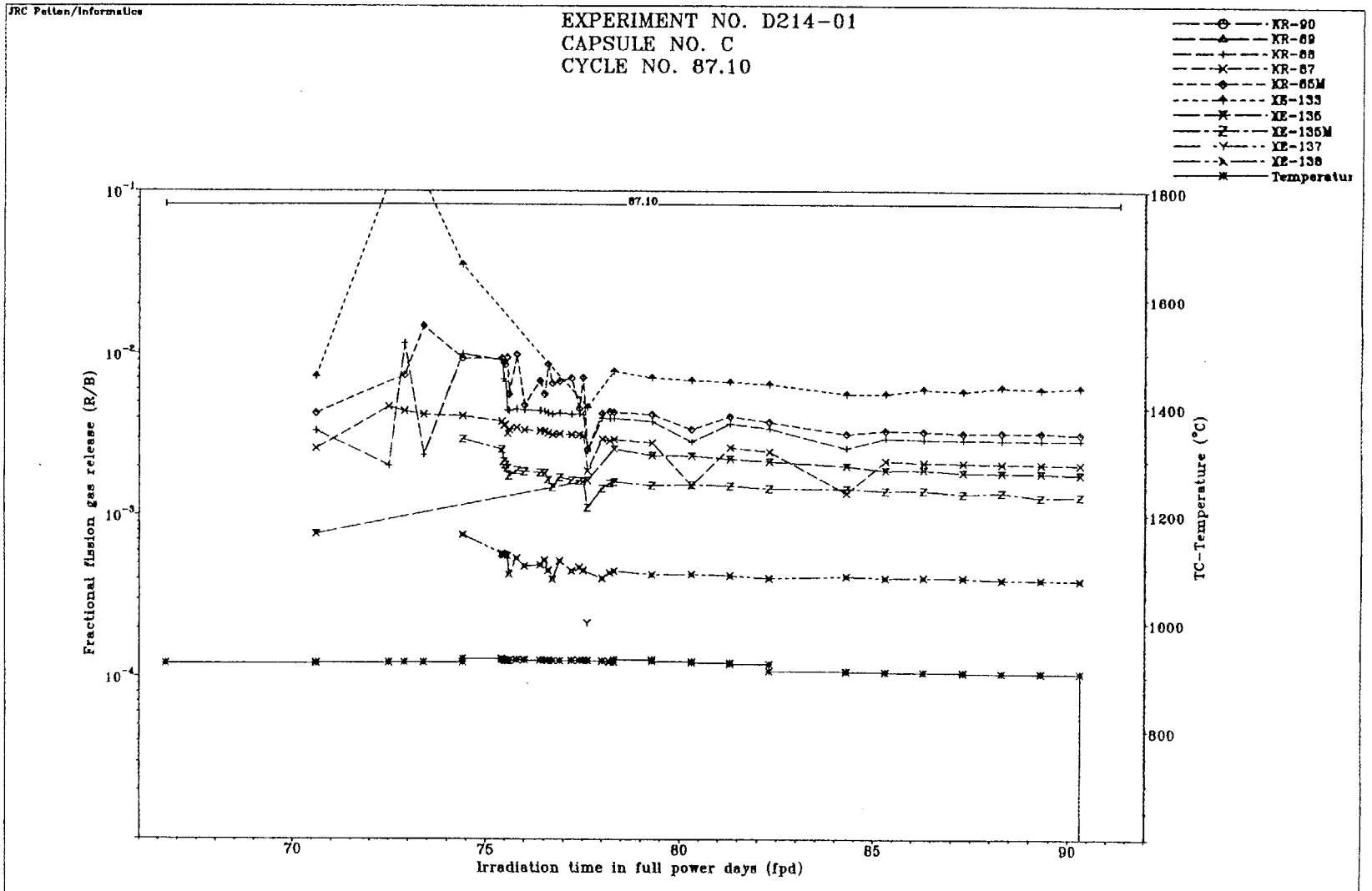

Fig. 6.4.44. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

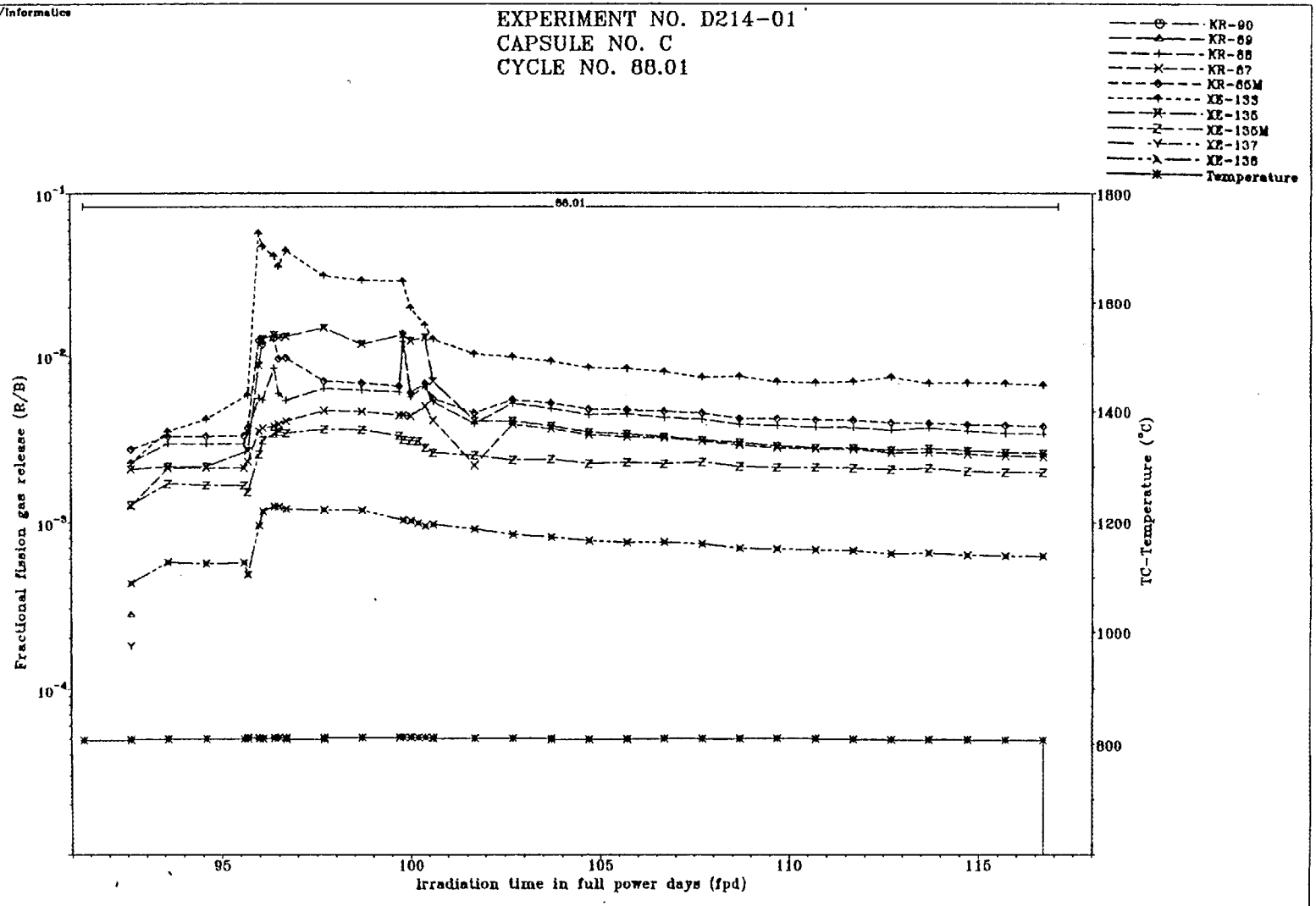

Fig. 6.4.45. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

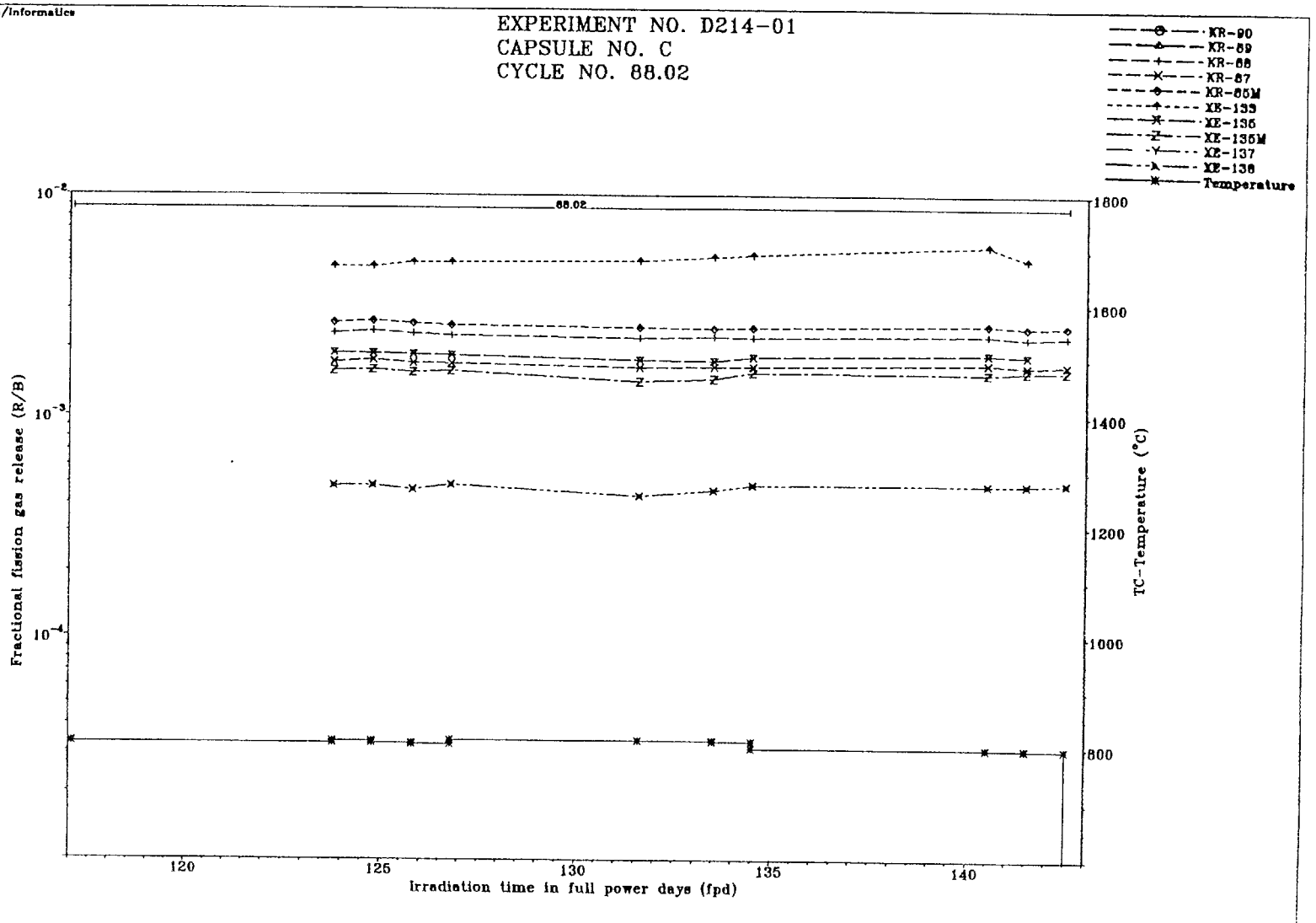

Fig. 6.4.46. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

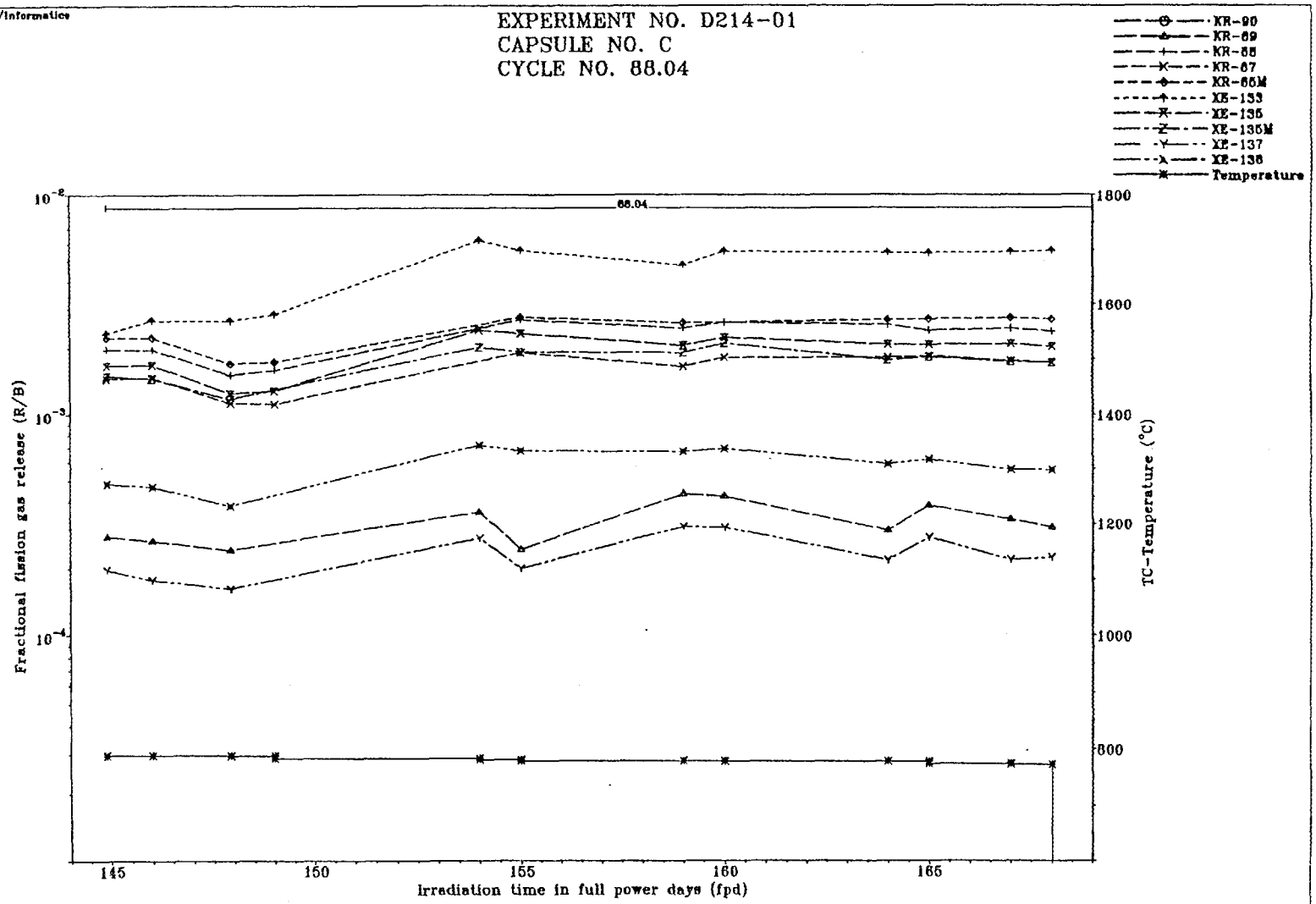

Fig. 6.4.47. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

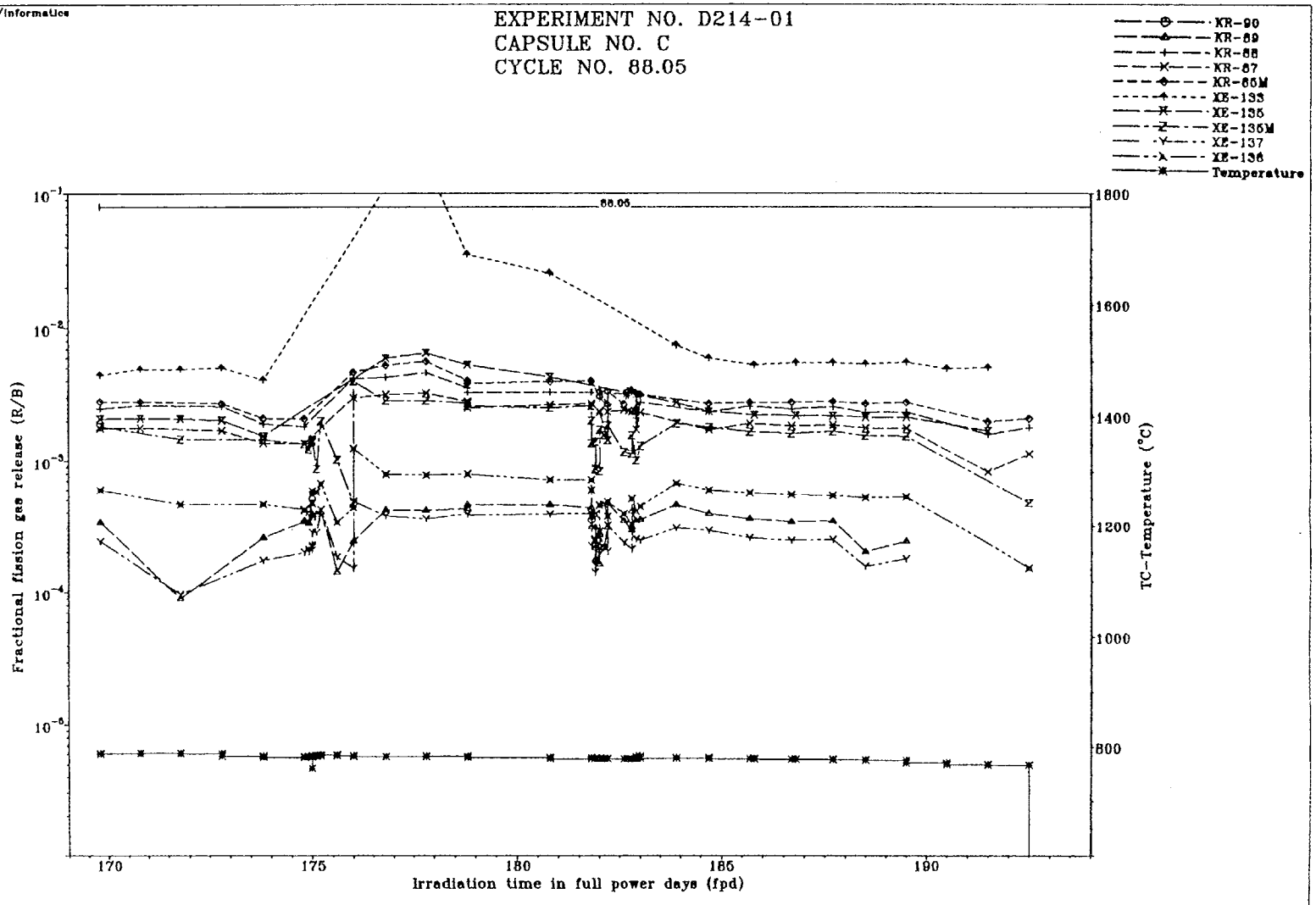

Fig. 6.4.48. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

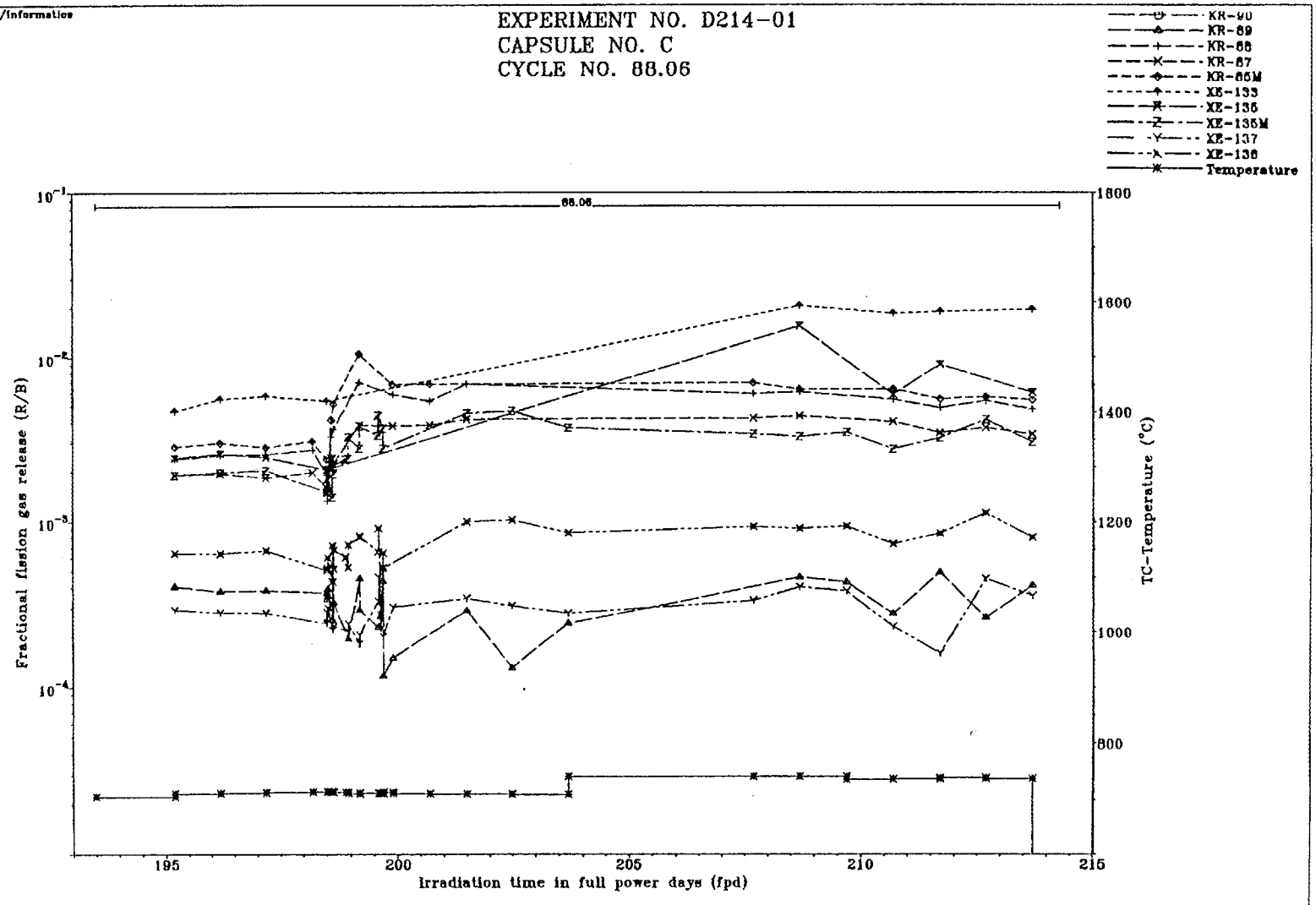

Fig. 6.4.49. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

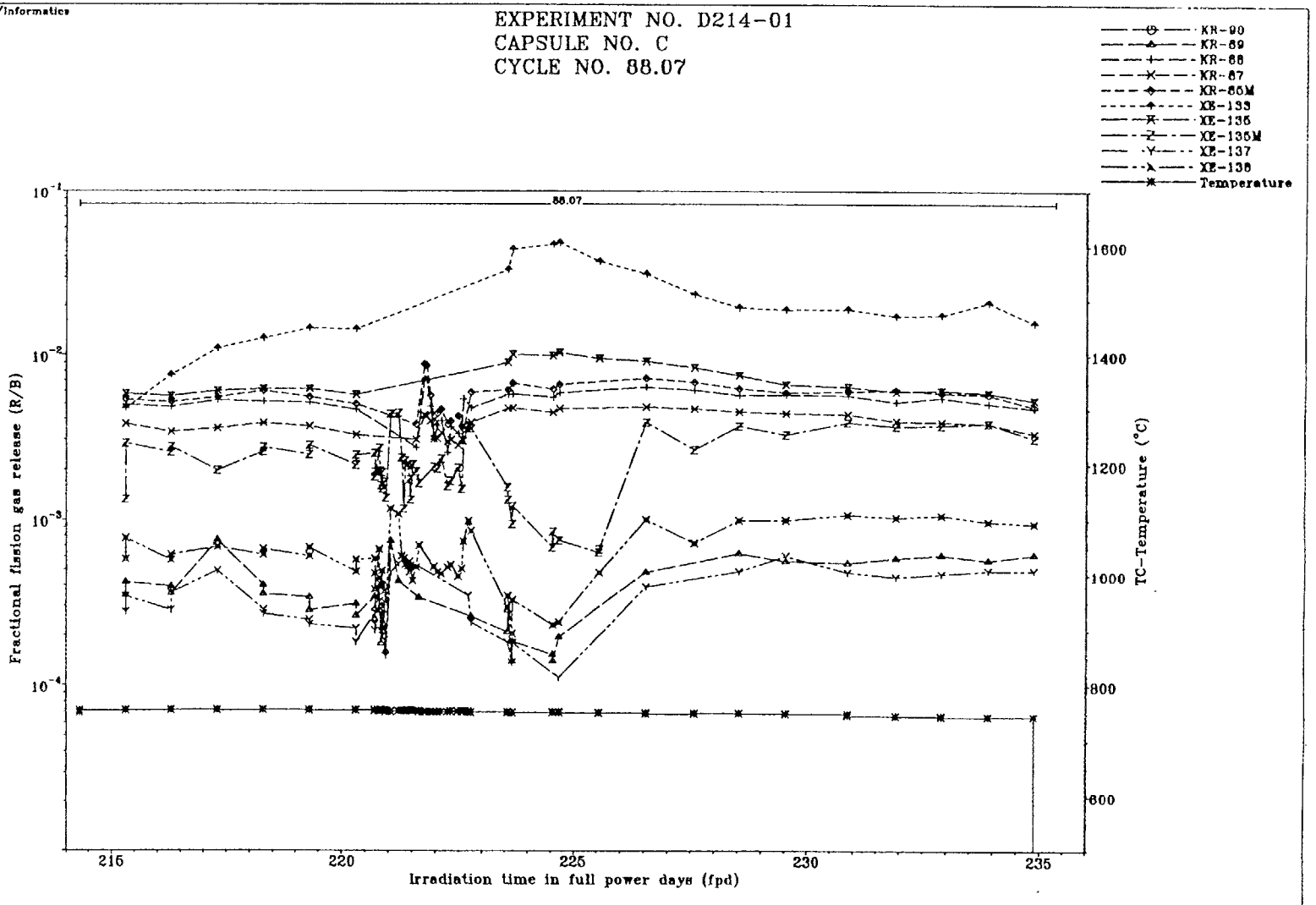

Fig. 6.4.50. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

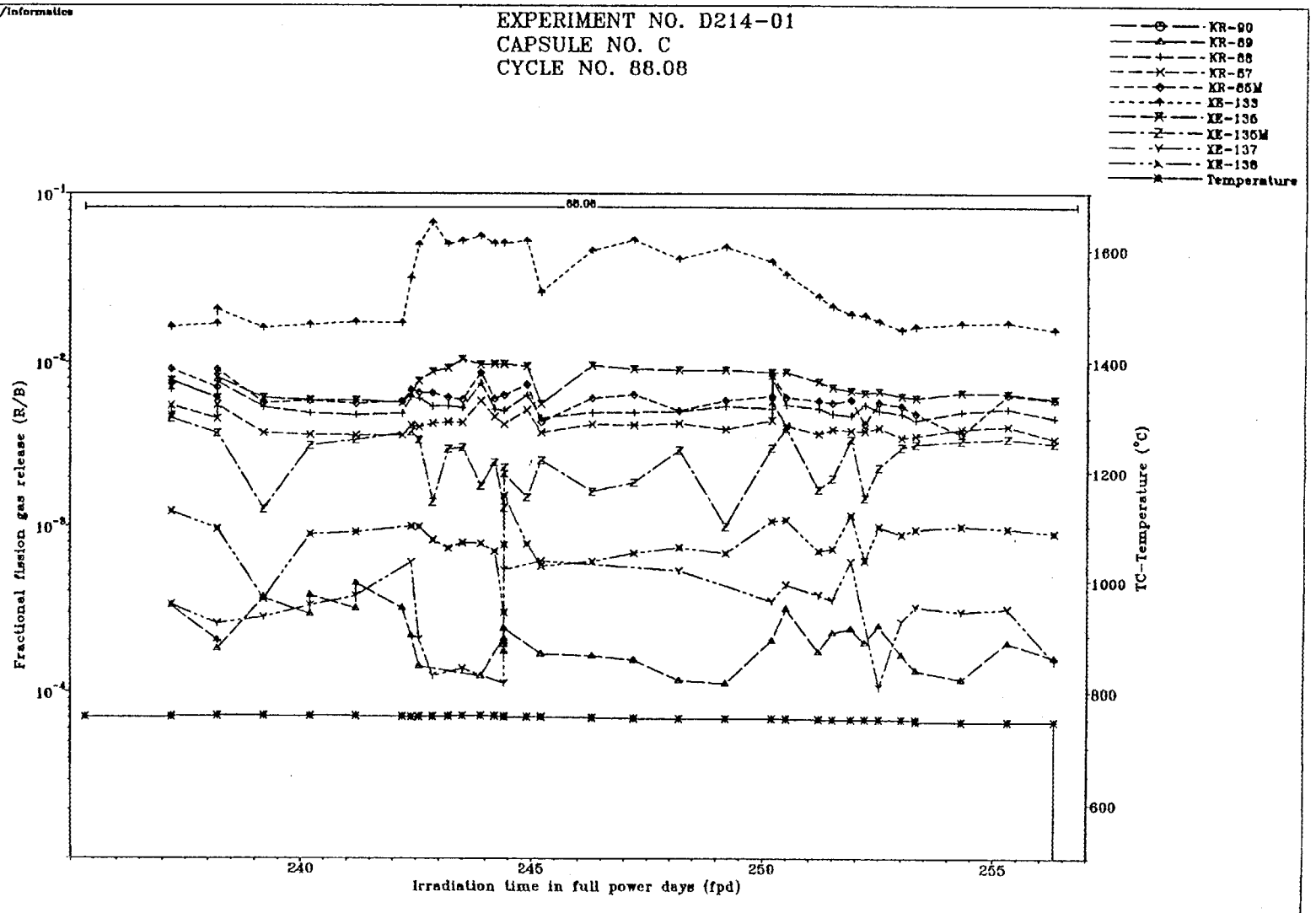

Fig. 6.4.51. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

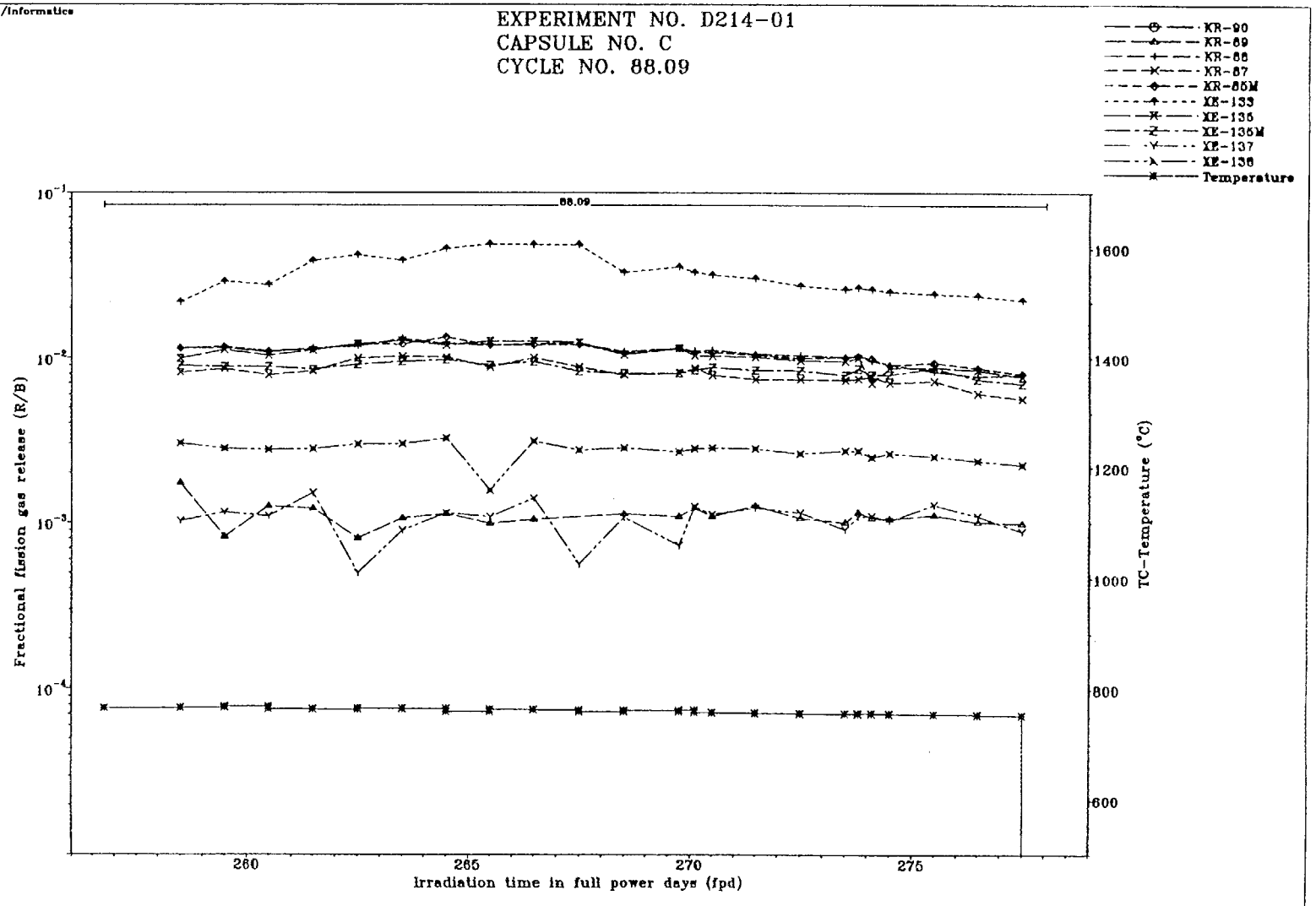

Fig. 6.4.52. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

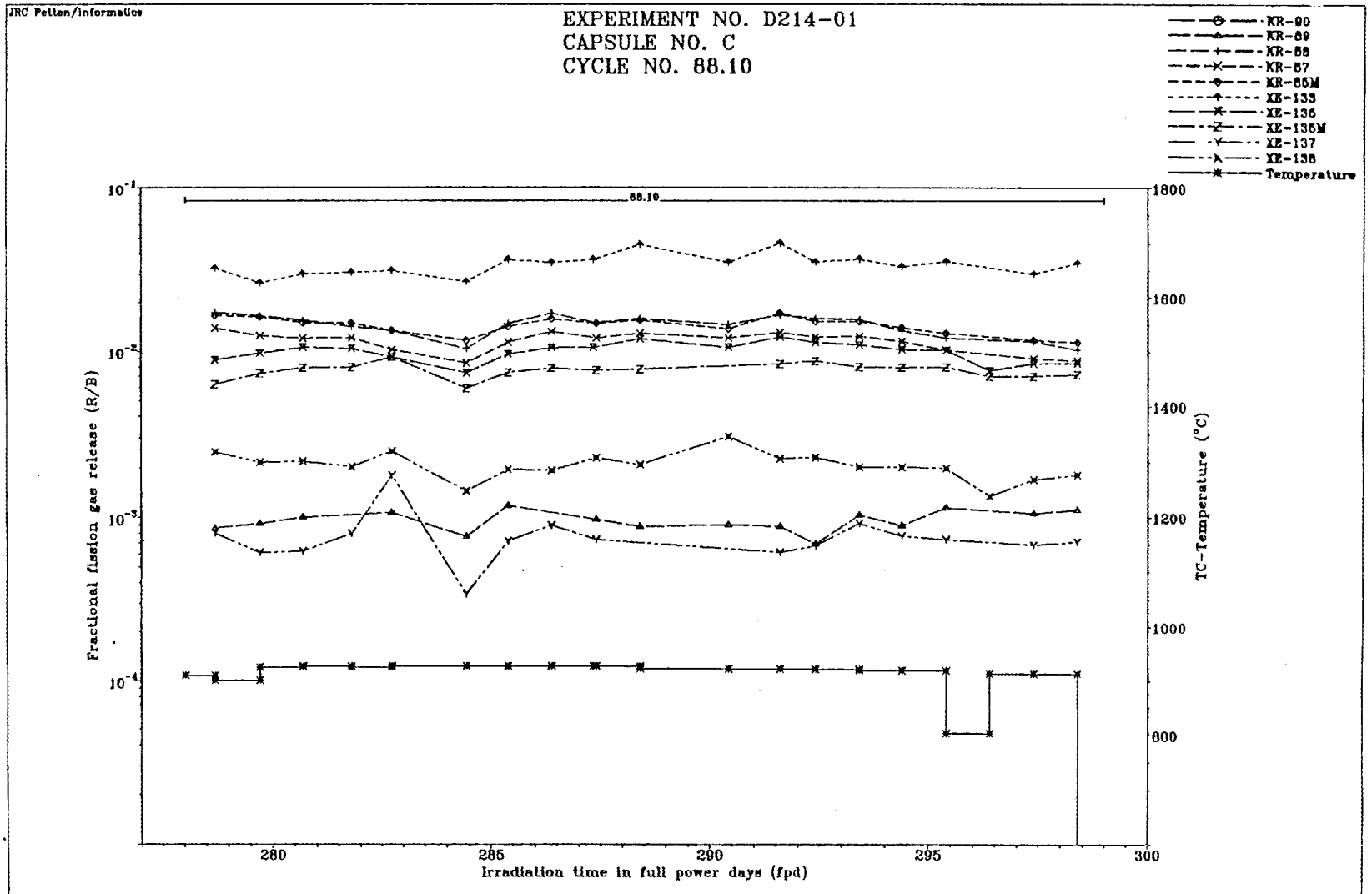

Fig. 6.4.53. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

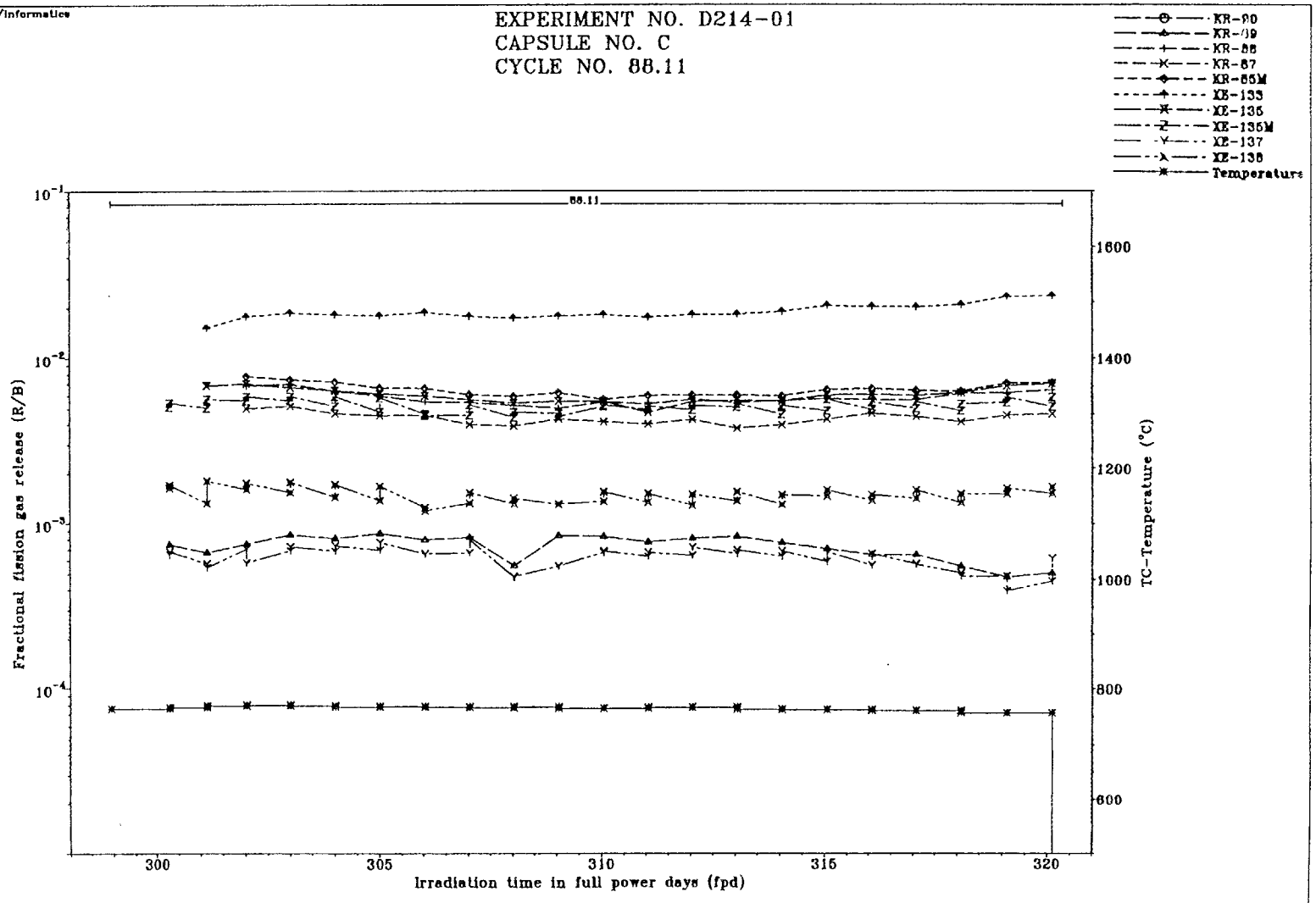

Fig. 6.4.54. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

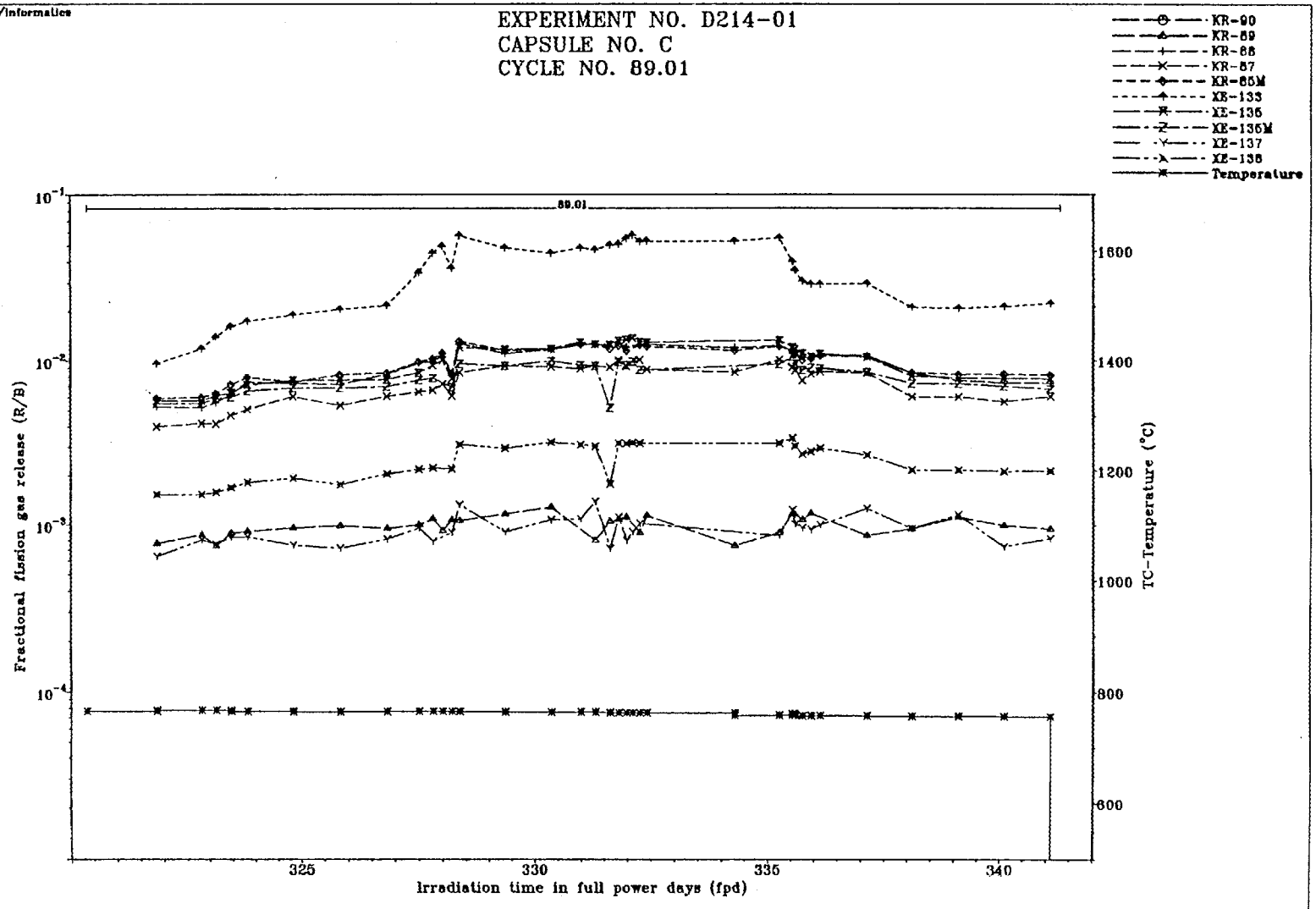

Fig. 6.4.55. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

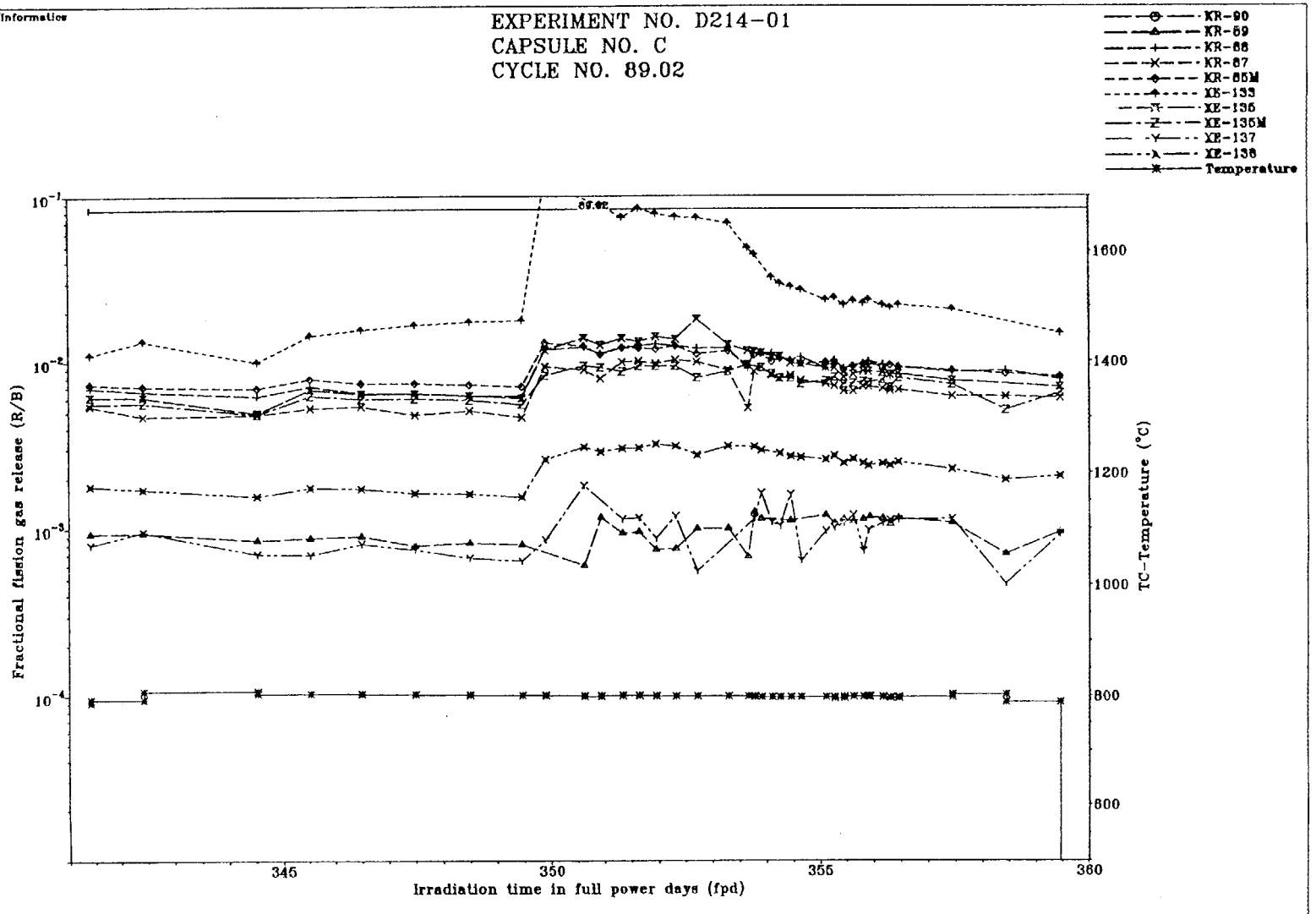

Fig. 6.4.56. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

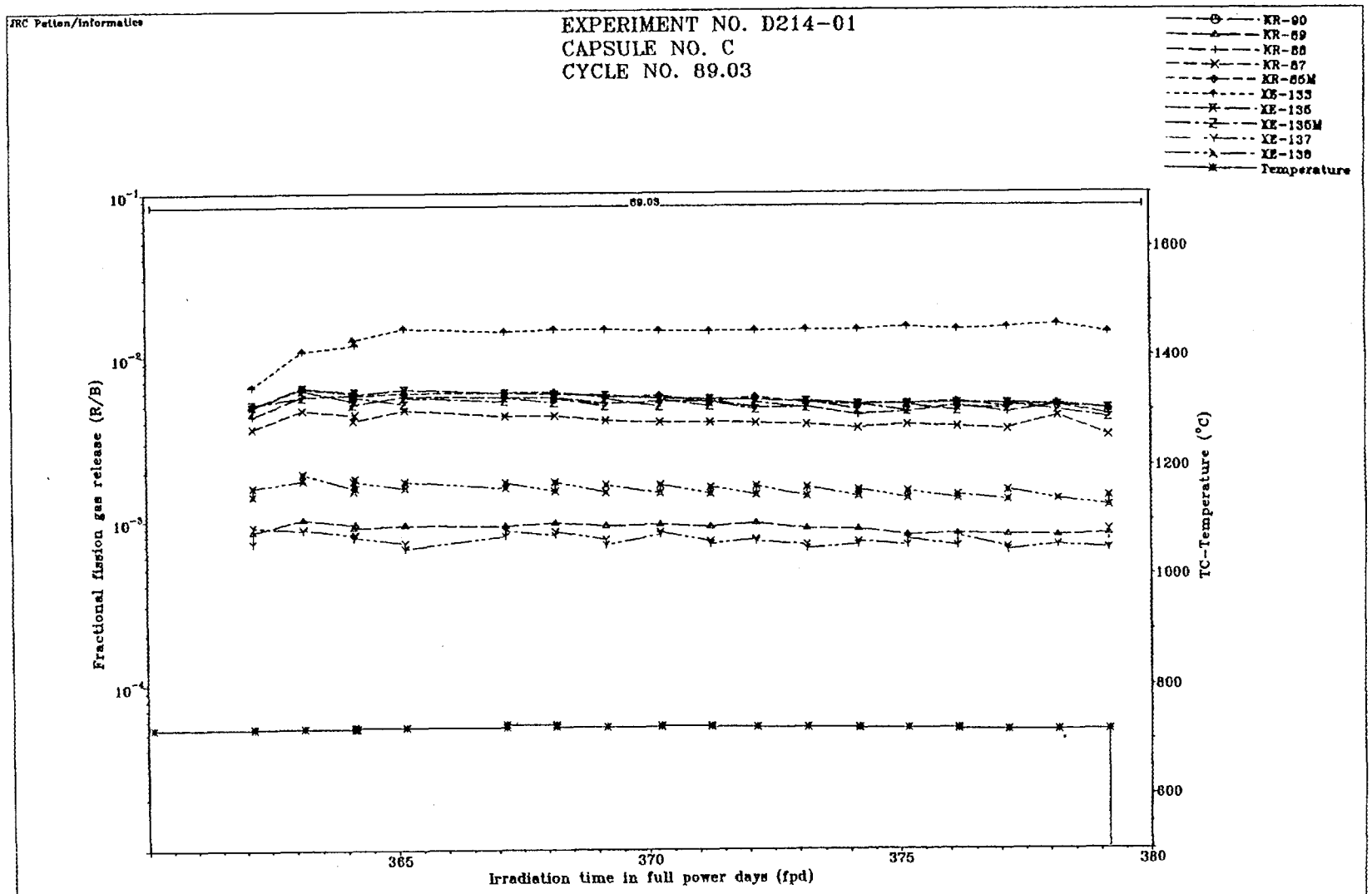

Fig. 6.4.57. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

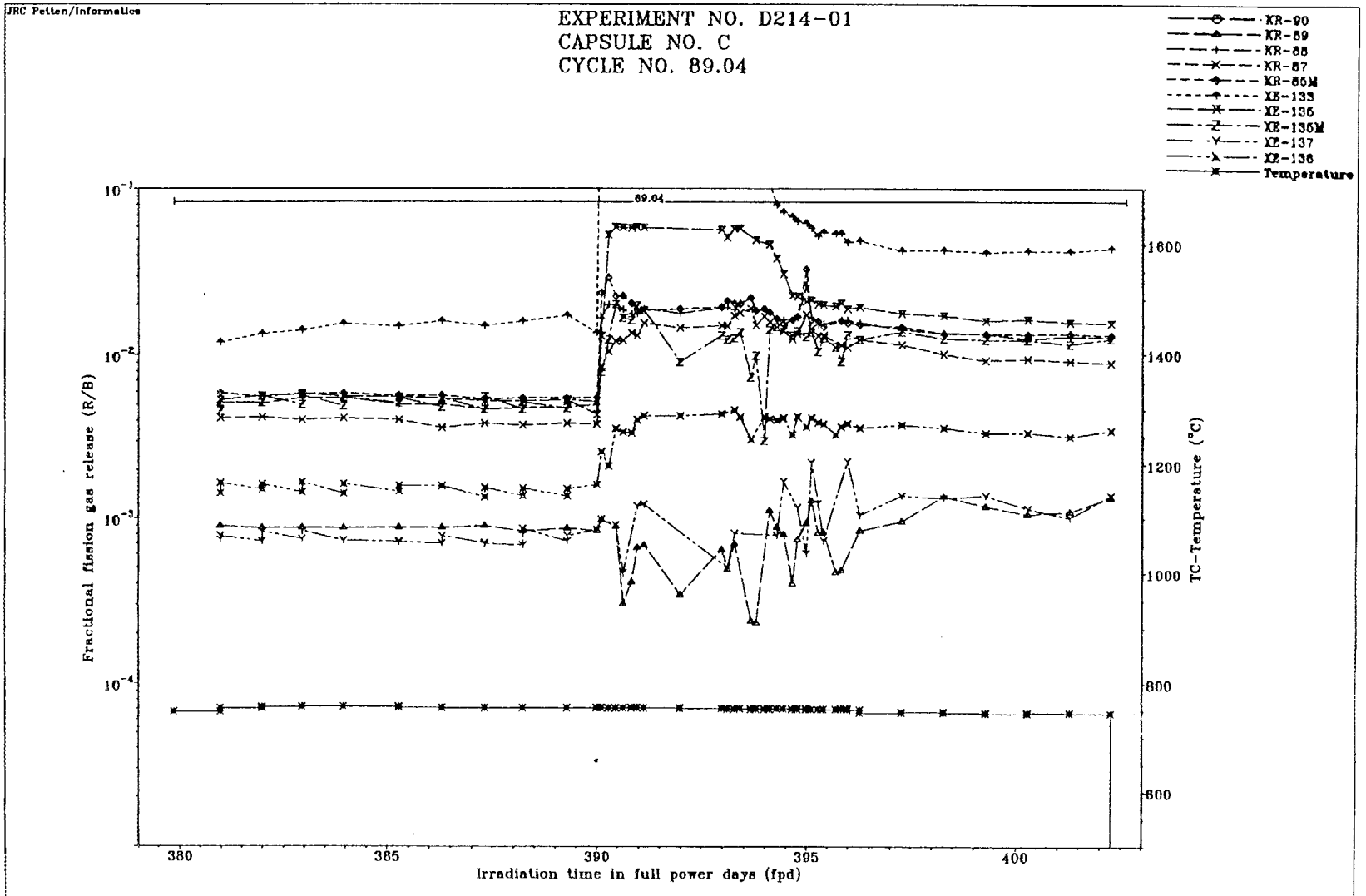

Fig. 6.4.58. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

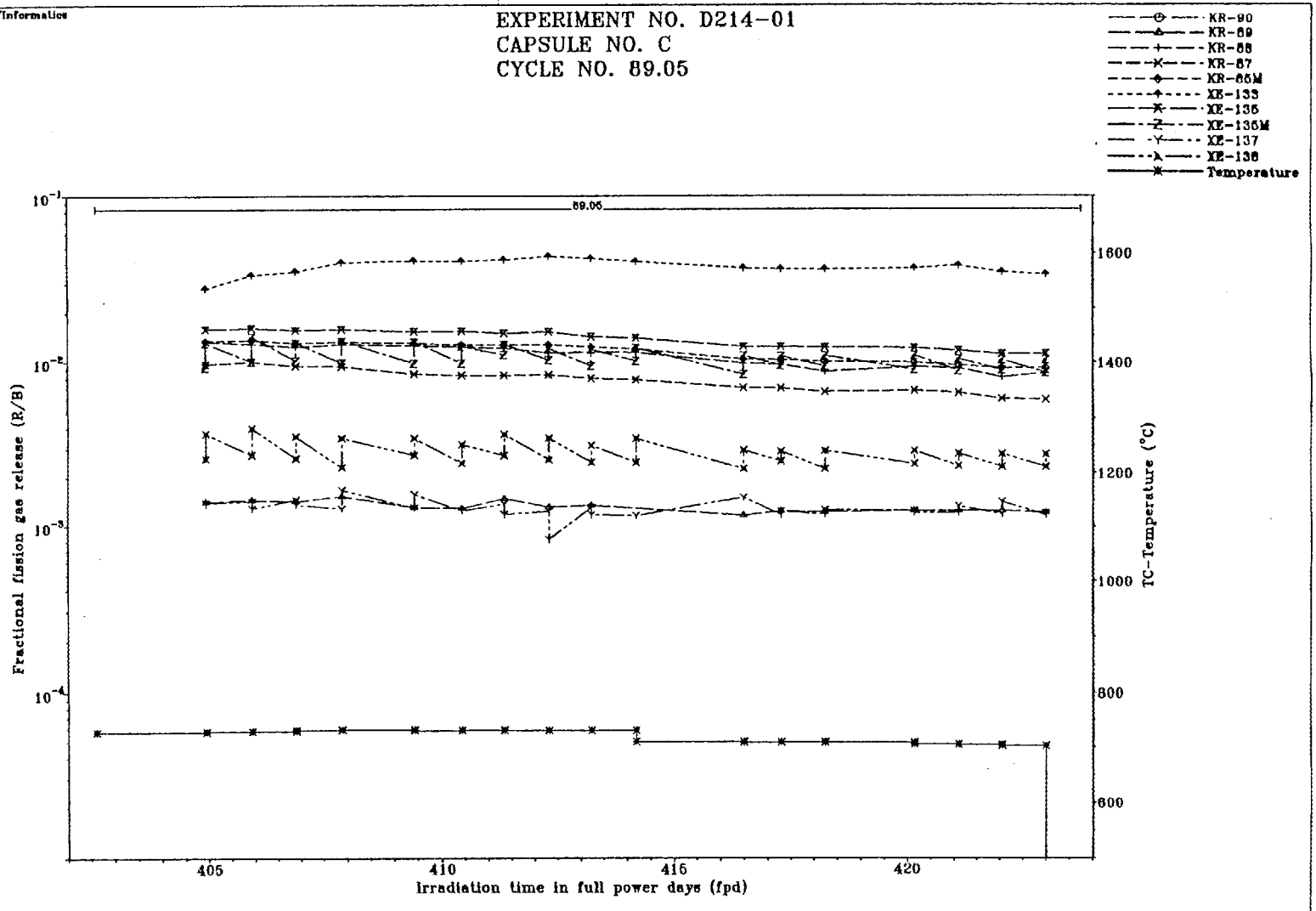

Fig. 6.4.59. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

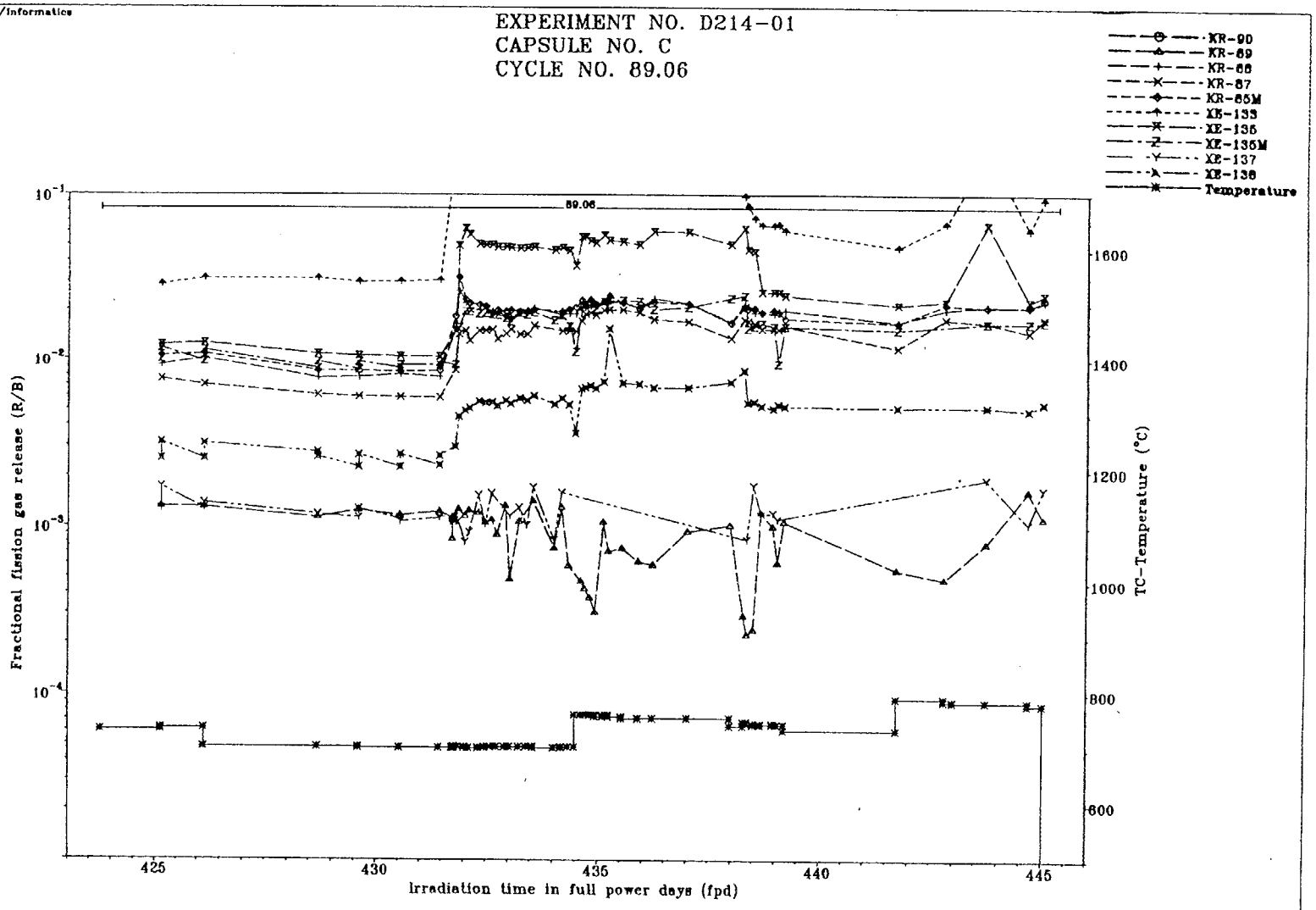

Fig. 6.4.60. Fractional fission gas release (R/B) and fuel thermocouple temperature vs time. (8.9% of power)
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Table 6.4.61. Water-vapor injection data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle	Injection No.	Start d.mo; time	End d.mo; time	Duration (h)	Inlet P°_{H2O} (Pa)	Outlet P_{H2O} (Pa)	Delay (h)	Delay (mmol)
87.05	1	16.06; 1030	16.06; 1630	6	45	18.3	4.5	0.37
87.05	2	20.06; 1226	24.06; 1130	95	18	10.4	8.0	0.26
87.09	3	02.11; 1000	10.11; 1000	192	45	3.5	4.5	0.37
87.10	4	23.11; 1115	27.11; 1000	95	90	30.3	2.3	0.38
88.01	5	11.01; 1015	15.01; 1010	96	90	65.7	2.8	0.46
88.05	6	09.06; 1008	09.06; 1018	168	132	110.9	3.0	0.72
88.06	7	28.06; 0900	04.07; 0001	135	136	117.	1.75	0.44
88.07	8	14.09; 0943	19.09; 0943	120	122	109.4	3.8	0.85
88.08	9	10.10; 1100	18.10; 1100	192	118	103.	3.5	0.76
88.09	10	31.10; 1040	10.11; 1145	241	130.5	125.5; 113	3.1	0.74
88.10	11	28.11; 1100	05.12; 1350	172	123.	53.	4.5	1.0
89.01	12	23.01; 1000	31.01; 1000	192	112.	106.; 98	5.0	1.0
89.02	13	20.02; 0940	24.10; 0940	96	250.	220	2.6	1.2
89.04	14	08.05; 0853	12.05; 0853	96	550.	520	1.78	1.8
89.06	15	26.06; 0818	03.07; 1018	170.5	1060.	1040	1.1	2.4
89.06	16	10.07; 0900	10.07; 2400	15	250.	220.	3.1	1.5

Injection No. = water-vapor injection number
d.mo. time = day.month; clock time
P°_{H2O} = inlet pressure of water vapor
P_{H2O} = outlet pressure of water vapor
delay (h) = time of injectin - time of appearance of water-vapor in the outlet gas
delay (mmol) = quality of water-vapor retained by fuel element prior to appearance of water-vapor in the outlet gas

6.5 GAS COMPOSITION

The gas composition of the effluent gas is reported in the following tables. The species CO, CO_2, H_2, N_2, and CH_4 were measured by GC. In the tables, the concentration of these species was determined in terms of the ppmv. For each measurement, the cycle, day, and time are given. For capsules 1 and 2, in which no water-vapor was added, the gas composition measurements reflect the level of impurities; these results are presented in Tables 6.5.1 through 6.5.4. For capsule 3, in which there was extensive addition of water vapor, the gas composition measurements reflect the reactions of water vapor with the carbonaceous material in the fuel element and the interaction of water vapor with the UO_2 and UC_2 in the kernel. The gas composition data for capsule 3 are presented in Tables 6.5.5 through 6.5.19. The notes to all preceding tables are summarized in Table 6.5.20.

The neon content of the helium purge gas is important for the possible effects the addition may have on particle failure and change in the fission gas release of particles with exposed kernels. The neon content was monitored at one location past which the effluent gas from all three capsules flowed. It is therefore necessary to analyze the temperature profiles and the measurements of the fractional neon content of the effluent gas to obtain the neon content of the purge gas passing through specific capsules. This will be reported in the documentation of the analysis.

Table 6.5.1. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 1, CYCLES 87.03, 87.05, 87.09, AND 87.10

			Concentration of Effluent Gases (ppmv)				
cycle	date	time	CO	CO_2	H_2	N_2	CH_4
87.03	7.04	Bef St	0	0	0	0	0
	09.04	5MW	3.7	3.5	Ne	5	2.3
	10.04	45MW	25	4	Ne	3	22
	14.04	1518	0		Ne	4	0
	16.04	1535	1		5	3	0
	23.04	0932	1		Ne	2	
	28.04	1012	1	0	5	2	0
	30.04	1927	1	0	Ne	3	0
	04.05	0908	1	0	Ne	1	0.5
87.05	03.06	0658	0	0	Ne	8	0
	0806	0839	0	0	Ne	20	0
87.09	22.10	1052				2.5	
	28.10		0	0.4	Ne	40	0
	29.10		0	0	2.4	2	0
	04.11	1235	0	0	2.2	1.3	0
	05.11	1014	0	0	2.2	2	0
	08.11		0	0	0	2	0
	12.11	0930	0	0	2	3.6	0
87.10	20.11	0931	0	0	1.4	0.5	0
	23.11	1056	0	0	1.5	1	0
	25.11	1452	0	0	3.2	1	0
	27.11	0455	0	0	0.9	0	0

Table 6.5.2. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 1, CYCLES 88.09 to 89.06

			Concentration of Effluent Gases (ppmv)			
cycle	date	time	CO	CO_2	H_2	N_2
88.09	31.10	0900	1.7	0	6	18
	01.11	1013	1.4	0	4	20
	04.11	0930	1.5	0.4	3	19.8
	11.11	0938	2.1	1.7	6.9	32
	13.11	1131	3.1	2.9	4	31.4
	15.11	1022	4.5	5.1	3.1	30.7
	16.11	1000	5.5	5.9	3.3	31.6
	17.11	0921	5.7	5.3	3.6	35.5
88.10	22.11	1509	3.3	1.6	12	2.2
	25.11	0855	2	0.5	Ne	1.0
	01.12	1000	2			
	02.12	0947	0.8		Ne	0.5
	04.12	1754	tr		Ne	0.5
	07.12	0827	tr		Ne	0.5
	09.12	0942	tr		Ne	0.5
88.11	16.12	0952	0.5	0	Ne	1
	19.12	1416	0.5	0	Ne	1
	23.12	1410	1.2	tr	1.7	0.5
	27.12	1026	1.3	0	2.3	0.5
	30.12	1120	tr	0	1.6	0.2
	03.01	1016	tr	0	2	0.2
89.01	17.01	0938	1.3	tr	2.5	0.8
	23.01	1106	tr	tr	11	3.6
	25.01	1452	tr	tr	4	1.4
	30.01	1010	tr	tr	3.3	2
	06.02	0940	0.3	tr	1.6	

Table 6.5.2. (continued)

CAPSULE 1, CYCLES 88.09 TO 89.06

			Concentration of Effluent Gases (ppmv)			
cycle	date	time	CO	CO_2	H_2	N_2
89.02	10.02	1010	3.0	2.3	4.5	1.8
	16.02	0834	1.8	tr	2.0	1.0
	20.02	0846	1.0	0.5	2.1	3.0
	23.02	0841	0		2.3	2.0
	28.02	1106	0.5	0	2.3	0.5
	30.02	1542	tr	tr	2.5	1
89.04	28.04	1418			3.5	26
	02.05	0843	tr		3.4	28
	05.05	0912	tr		2.8	29
89.05	24.05	1330	0	0	1.0	30
	29.05	0940	tr	0	1.9	47
	01.06	0918	tr	0	1.8	23
	05.06	0902	tr	0	2.1	25
	08.06	0935	tr	0	1.7	28
	13.06	0835	tr	0	1.8	17
89.06	19.06	0936	tr	0	1.9	30.2
	23.06	0912	0	0	2.2	20
	27.06	0930		0	0	3

Table 6.5.3. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 2, CYCLES 87.03, 87.05, 87.09 and 87.10

			Concentration of Effluent Gases (ppmv)					
cycle	date	time	CO	CO_2	H_2	N_2	CH_4	
87.03	07.04	Bef St	0	0	0	2	0	
	09.04	5MW	5	2	Ne	3	5	
		15MW	12		Ne	Ne	Ne	12
		45MW	7		Ne	Ne	0	
	14.14	1609				3		
	28.04	1123	1	0	6	1	1	
	30.04		1	0	Ne	12	1	
	02.05	1851	1	0	Ne	2	1	
	04.05		1	0	Ne	1	1	
87.05	03.06		0	0	0	8	0	
	08.06	0907	0	0	3	20	0	
87.09	22.10	1151	0	0	0	1.8	0	
	28.10	1113	0	0	0	4	0	
	29.10	1107	0	0	0	4	0	
	30.10	1021	0	0	1	0.5	0	
	04.11	2158	0	0	5.4		0	
	05.11	1258	0	0	0.9	1	0	
	11.11	1220	0	0	1.7	49	0	
	12.11	1051	0	0	0.8	1	0	
87.10	23.11	1041	0	0	1.1	0.5	0	
	24.11	1545	0	0	3.2	2.4	0	
	25.11	1418	0	0	3.1	4.6	0	

Table 6.5.4. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 2, CYCLES 88.09 TO 89.05

			Concentration of Effluent Gases (ppmv)			
cycle	date	time	CO	CO_2	H_2	N_2
88.90	31.10	0920	2.0	0	5.7	18.1
	01.11	1003	2.9	0	8	19.6
	04.11	0946	2.6	0	3.3	19.9
	11.11	1010	2.9	0.5	4.8	32.
	13.11	1152	2.4	1.1	4.6	31.7
	15.11	1012	4.1	2.3	4.4	31.5
	16.11	0950	4.2	2.4	3.2	31.4
	17.11	0909	4.3	3.5	4.2	35.9
88.10	22.11	1458	4.7	1.6	2	2.5
	25.11	0906		0.5	Ne	1.3
	01.12	1010	4.7			
	02.12	0936	4		Ne	0.5
	04.12	1827	2.7		Ne	0.5
	07.12	0827	TR		Ne	0.5
	09.12	0953	3		Ne	0.5
88.11	16.12	1003	2	0	Ne	2
	19.12	1426	2	0	Ne	1
	23.12	1451	2.4	tr	1.9	0.9
	27.12	1036	2.3	0	2	1.2
	30.12	1152	1.9	0	2	10.
	03.01	1026	1.9	0	2	0.8
89.02	20.02	0856	1.3	tr	1.7	20
89.04	02.05	0902	tr		2.8	26
89.05	26.05	0846	0.5	0	4	19
	29.05	0905	1.7	0	1.7	30
	01.06	0918				

Table 6.5.5. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 87.03

cycle	date	time	H_2O-vapor Injection Press. (Pa)	start	stop	Concentration of Effluent Gases (ppmv) CO	CO_2	H_2	N_2	CH_4
87.03	24.04					1.0	6.0	Ne		0.5
	27.04					2.0		Ne		0.5
	28.04					1.0				0.5
	01.05					1.0				
	01.05	11.14				2.0				
	04.05	19.58						Ne	2.0	

Table 6.5.6. Gas compositon data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 87.05

Water-vapor injection No. 1; Duration 6 h

	H_2O-vapor Injection Press.					Concentration of Effluent Gases (ppmv)				
cycle	date	time	(Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
87.05	14.06	1904						Ne (25)		
	16.06	1016				2.4	0.4	Ne		
		1030	45	xxxx						
		1034				2.4	0.4			
		1045				2.4	10.1			
		1139				3.6	6.7			
		1150				3.6	8.4			
		1159				3.6	5.8			
		1212				3.6	11.7			
		1246				2.4	42.1			
		1306				3.6	29.5			
		1603				8.6	27.8			
		1630			xxxx	9.6	24.8			

Water-vapor injection No. 2; Duration 95 h

			H_2O-vapor Injection Press.			Concentration of Effluent Gases (ppmv)				
cycle	date	time	(Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
87.05	20.06	0907				0	0	0	0	0
	20.06	1226	18	xxxx						
	22.06	1426					3.4	16.3		
		1443					3.4	16.3		
		1605					1.7			
	23.06	1131					10.3	Ne (18.8)		
		1155					6.9	Ne (75)		
	24.06	1048					4.8	Ne (50)		
		1112					7.2	Ne (69)		
		1130			xxxx					
	25.06	1505					2.4	NE (88)		

Table 6.5.7. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 87.09

Water-vapor injection No.3 ; Duration 192 h

			H_2O-vapor Injection			Concentration of Effluent Gases (ppmv)				
cycle	date	time	Press. (Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
87.09	28.10	1129				1.5	1.0	Ne (47)		
		14.15				2.9	0.5	Ne	6.5	
	3010	1148				0	0	1.5	2	
	02.11	0931				0	0	1	2.1	
	02.11	1000	45	xxxx						
		1115				0	0	1	1.6	0
		1323				6.7	26	45	4	0
		1425				8.9	27	54	4	0
		1714				11.0	30	68	4	0
		2153				13	30	80	3	-
	03.11	1013				19	33	102	3	0.5
		1152				17	32	103	3	0.5
		1433				22	33	104	6	0.5
		1515				22	33	104	2	1.0
		2246				24	34	105	2	0.5
	05.11	2220				26.8	43	110	4	1.0
		2247				26.8	44	110	2	1.0
	06.11	1509				25	36.5	110	3	1.5
	08.11	1250				28.9	36	120	2	1.0
	09.11	1754				33	41	125	3	1.5
	10.11	1000			xxxx					
		1027				28	38	20	18	0.8
		1055				29	36	100	9	
		1210				16.7	19	20		0.9
		1321				11	17	80		0.8
		1446				10	8	55		0.6
		1557				8.7	6	38		0.7
		2126				5.8	3	25		0.6
	11.11	1022				3.6	1	14		0.5
		1619				0	0	1.8	0	0.0

Note: A manual peak height analysis showed the automatic "Shimadzu" integrations were accurate, except for hydrogen, which was analyzed by a multi-point calibration method.

Table 6.5.8. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 87.10

Water-vapor injection No. 4; Duration 95 h

cycle	date	time	H_2O-vapor Injection Press. (Pa)	start	stop	Concentration of Effluent Gases (ppmv) CO	CO_2	H_2	N_2	CH_4
87.10	19.11	1542				0	0	2.7	2.4	0
	23.11	0918				0	0	1.1	6	0
		1115	90	xxxx						
		1257				4.5	0	1.5	4	0
		1338				15	45	92	18	0.4
		1538				26.8	54	00	11	0.4
	24.11	0159				32	54	20	12	0.5
		0759				30	52	20	0.6	0.6
	26.11	0311				39	55	99	6.3	0.7
		0930				45	56	110	2.5	0.7
		2216				47	53	110	3.2	0.7
	27.11	0948				42	47	117		
		1000			xxxx					
		1018				45.3	51	120		0.6
		1118				24	27	102		0.6
		1355				11	10	104		0.6
	30.11	1844				0	1.4	1.4		1.2

Note: The hydrogen values are between 120 and 140 ppm. All others were "Shimadzu" integration values which were found to be accurate by peak height analysis.

Table 6.5.9. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 88.01

Water-vapor injection No. 5; Duration 96 h

cycle	date	time	H_2O-vapor Injection Press. (Pa)	start	stop	Concentration of Effluent Gases (ppmv) CO	CO_2	H_2	N_2	CH_4
88.01	11.01	1001				0	0	3	2.8	0
		1015	90	xxxx						
		1130				0	0	1.6	2.1	0
		1230				1.5	17.8	0.6	8.3	0
		1320				1.6	19.6	40	2.6	0
		1410				4.5	24.8	45	2.7	0
		1455				3	27.8	50	2.6	0
		1540				3.3	28.2	50	2.3	0
		1620				3.5	23.7	50	12	0
		1705				4.5	28.5	55	2.8	0
		1925				4.0	27.6	55	2.3	0
		2100				3.7	26.8	60	3.3	0
		2320				3.5	26.8	65	2.7	0
	12.01	0000				4.2	26.9	65	2.7	
		0145				4.6	27.6	60	5.8	0
		0320				4	26.5	60	2.9	0
		0540				3.4	26.8	65	2	0
		0800				4	25.7	65	2.4	0
		1320				4.6	26.6	70	2.2	0
		1550				2	29	70	20	0
		2350				2.4	25.7	75	2.5	0
	13.01	0125				3.9	28.7	70	2.1	0
		0245				4.7	28.9	70	2.4	0
		0700				4.5	30.1	75	2.8	0
	15.01	1000				2	10.8	50	3.7	0
		1012			xxxx					
		1015				4.3	24.9	70	16.7	0
		1055				5.5	23.3	65	15.4	0
		1220				3.9	11.8	45	2.7	0
		1340				4.2	8.0	40	1.6	0
		2015				0	1.7	19	1.6	0
	16.01	0500				1.4	1.6	15	1.6	0
		1320				1.3	1.1	13	6.7	0

Note: The "Shimadzu" automatic integration was found to be accurate for all GC peaks with the exception of hydrogen, which was found to be 50 to 100 ppm, during the injection.

Table 6.5.10. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 88.05

Water-vapor injection No. 6; Duration 168h

				H_2O-vapor Injection Press.		Concentration of Effluent Gases (ppmv)				
cycle	date	time	(Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
88.05	02.06	1008	132	xxxx						
	02.06	1612					--	49		
		1635					--	49		
	03.06	1809					15		2.4	
		1325					14			
		1345					14			
		1440				2	19			
		0359				1	19			
		0855				1	20			
	06.06	1715				2.9	19			
		1100						65		
	07.06	1006				1.7	19			
	08.06	0118				2.3	20			
		1849				2.3	18			
	09.06	0056				2.9	19		2.2	
		0907				2.9	18			
		1018			xxxx					
		1030						50		
		1045						45		
		1100						37		
		1435						32		
		1047				1.7	17			
		1118				1.2	16.6			
		1134				2.3	13.9			

Note: The CO and CO_2 peaks were analyzed by a manual peak height method, as the "Shimadzu" integrator gave apparent erroneous results. Hydrogen could not be analyzed by ordinary means due to Ne contamination. The hydrogen data were obtained by separation of the Ne and H_2 peaks by use of a mol seive column at -140°C and read out on a separate recorder.

Table 6.5.11. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 88.06

Water-vapor injection No. ; Duration 135 h.

cycle	date	time	H_2O-vapor Injection Press. (Pa)	start	stop	Concentration of Effluent Gases (ppmv) CO	CO_2	H_2	N_2	CH_4
88.06	21.06	1757				1.6	0.3			
	27.06	0913				1.1				
		1001				1.5				
	28.06	0900	136	xxxx						
		1016				0.6				
		1325					1.2			
		1738					1.5			
	29.06	0845						25		
	29.06	1544					14			
		1632					21			
		1642					22			
		2008					21			
		2037					26			
	30.06	1054					14			
		1124					21			
		1327					12			
	01.07	0859					15	25		
		0930					17			
	02.07	1951					24			
	04.07	0001			xxxx					

Note: The CO_2 data are "Shimadzu" integrations. The original strip charts could not be located; therefore, the data cannot be checked. The H_2 data were obtained by use of the special low-temperature molesieve column. The test ended by inadvertent reactor scram.

Table 6.5.12. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 88.07

Water-vapor injection No. 8; Duration 120 h

			H_2O-vapor Injection				Concentration of Effluent Gases (ppmv)				
cycle		date	Press. time	(Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
88.07	14.09	0936					2	0	Ne		
		0943	122	xxxx							
		1107					3				
		1253					4	2			
		1328					1	7			
		1429					1	8.3			
		1512					1	10			
		1814					1	14.8			
		2010					1	13.4			
	14.10	0054						15			
		0647					2	13			
		0903					1	14			
	1509	4553					1	14.4	40		
		2015					1	14.2			
	16.09	0611					1	16.5			
		0956					-	13.8			
		1420						13.9			
	17.09	0940							32		
		1149					1	13.9			
	18.09	1237					1	13.9			
	19.09	0943			xxxx						
		1026					1	12.6			
		1156						8.3			
		1426					2	5.7			
		1515					1		26		

Note: The manual peak height analysis agreed well with the "Shimadzu" intergrator; therefore, the "Shimadzu" data are used. The H_2 data were corrected using a multi-point calibration method, as the GC response for H_2 was found to be non-linear. The CO data are very approximate.

Table 6.5.13. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 88.08

Water-vapor injection No. 9; Duration 192 h

cycle	date	H_2O-vapor Injection Press. time		start	stop	Concentration of Effluent Gases (ppmv) CO	CO_2	H_2	N_2	CH_4
88.08	10.10	1100	118	xxxx				Ne		
		1447				0.8	12.5		1	
		1459				0.8	10			
		1601				0.8	13.6			
		2225				1.5	18.2	22	1	
	11.10	0903				2	19	23	1	
		1055				1.1	19.5	35	1	0.3
		1220				2	18.2	35	1	0.3
		1928				1.2	16.5	33		0.3
	12.10	0943				1.4	18	35		0.2
		0956				1.4	18.7	35	1	0.2
	13.10	0331				1.4	18.3	40	1	0.2
	14.10	1130				1.4	18	44	1	0.2
		1811				1.2	17.8	38	2.2	0.2
	15.10	0150				1.4	18.7	40	1.9	0.23
	16.10	0554				1.4	18	40		0.2
	17.10	0246				1.4	16.6	40		0.2
		0947	350							
		0949					18.5	40	2	0.25
		1002				1.5	16.8	40	1.8	0.25
		1014				1.5	17.2	42		
		1026					17.9	40		
		1038				1.2	21.6	48		1.2
		1047	118							
		1050				1.3	24.5	46		1.3
		1102				1.3	26.4	50	2.2	0.23
		1115				1.6	27.3	54		0.27
		1127				1.7	27.6	54.8		0.26
		1139				1.6	24.9	51		0.28
		1215				1.5	19.1	42.5		
		1240				1.5	19.2	42		
		1304				1.3	19.8	40		
		1328				1.3	18.7	40		
		1405				1.5	18.8	40		
		1906				1.4	17.7	40		0.17

Table 6.5.13. (continued)

CAPSULE 3, CYCLE 88.08

Water-vapor injection No. 9; Duration 192 h

cycle	date	H_2O-vapor Injection Press. time	start	stop	Concentration of Effluent Gases (ppmv) CO	CO_2	H_2	N_2	CH_4
	18.10	1100		xxxx					
		1100			1.3	18	40	2.3	0.2
		1300			1.3	12	33		
		1530			3.6	8.1	25		
		2100			3.7	5.0	20		

Note: The "Shimadzu" integrations were found to be correct, after a detailed peak height analysis. The hydrogen peaks were analyzed by the muti-point manual method. The increase in water vapor concentration indicated a 45-min delay in the formation and transport of product gases. The CO and CH_4 data are uncertain to about a factor of 0.5.

Table 6.5.14. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 88.09

Water-vapor injection No. 10; Duration 241 h

			H_2O-vapor Injection			Concentration of Effluent Gases (ppmv)				
cycle	date	time	Press (Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
88.09	31.10	1000	130.5			2.1	0	1000	3.4	1.8
		1040		xxxx						
	31.10	1217				2.0	0	1000		1.7
		1437				5.7	2.2	1000		1.7
		1739				5.3	5.7	1000	3.4	2
	01.11	0739				5.4	5.4	1000	2.8	1.8
		0953				5.5	2.7	1000	2.8	1.6
	02.11	0927				4.2	2.4	1000		1.4
	03.11	1045				5.6	4.6	1000	1.9	1.7
		1145								
		1219				2.8	4.3		16.8	0.7
		1239				2.8	4.8		16.4	0.7
		1820				2.7	6.7		16.7	0.6
		1840				2.4	7.4		17.6	0.5
	04.11	0107				2.7	7.8		17.4	0.4
		1511				2.4	18.6		21.1	0.4
		1658				2.5	17.6		21	0.37
	05.11	0145				2.7	18.0		22.3	0.32
		1111				2.2	18.5		21.3	0.3
		1725				2.3	18.4		21.5	0.3
	06.11	1000				2.6	18.3		22.5	0.3
		1955				2.6	19.7		22.1	2.24
	07.11	0145				2.4	19.2		23.1	0.23
		1135	100							
		1138				2.2	20	1000	18.5	0.31
		1158				9.3	10	1000	14.1	1.2
		1229				7.5	6.6	1000	6.9	1.2
		1713				6.0	3.7	1000	2.2	1.6
	08.11	0911				5.0	2.8	1000	2.8	1.6
		1656				5.2	3.9	1000	1.5	1.5
	09.11	0200				4.9	3.2	1000	1.6	1.6
		0913				4.0	3.6	1000	5.7	1.4
		0954				4.6	2.3	1000	1.4	1.5
		1000								
		1054				4.9	2.8	1000	4.2	1.3
		1154				4.6	0.7	1000	3.7	1.5
		1254								
		1254				3.8	0.4	1000	6.2	1.5
		1324				4.5	2.4	1000	6.3	1.5

Table 6.5.14 (continued)

CAPSULE 3, CYCLE 88.09

Water-vapor injection No. 10; Duration 241 h

cycle	date	time	H_2O-vapor Injection Press (Pa)	start	stop	Concentration of Effluent Gases (ppmv) CO	CO_2	H_2	N_2	CH_4
		1454				5.2	2.3	1000	6.3	1.4
		1625				4.5	2.0	1000	1.3	1.3
	10.11	0110				5.0	3.6	1000	1.5	1.6
		0926				5.2	2.5	1000	1.6	1.4
					xxxx					
		1150				4.4	4.1	1000	8.3	2.0
		1301				4.9	4.1	1000	1.4	1.8
		1401				3.9	0.6	1000	1.7	1.8
		2114				3.2	0	1000	1.7	2.3
	11.11	0251				2.6	0	1000	1.7	2.2
	13.11	0113				1.2	0	1000	1.3	1.5
		1145								
		1408				1.4	0.7		29.7	0.5
		1849				1.5	1.5		29.7	0.3
	14.11	0913				1.7	1.9		30.7	0.2

Note: All GC data peaks checked by manual peak height method. The "Shimadzu" integrations were accurate, except for hydrogen, which literally swamped the GC. Later, multi-point calibrations showed that the special tank labeled 0.1% H_2 was indeed 1000 ppm. The N_2 data indicate the service He was contaminated with nitrogen, or air. Checking the inlet service He showed < 2ppm oxygen. Also, the CO peaks for capsules 1 and 2 average 4 ppm; therefore, the maximum O_2 in the inlet gas was 2 ppm.

Table 6.5.15. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3 CYCLE 88.10

Water-vapor injection No. 11; Duration 172 h.

			H_2O-vapor Injection			Concentration of Effluent Gases (ppmv)				
cycle	date	time	Press. (Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
88.10	22.11	0927				3.0	1.9	21.9	1.6	0.5
		0938				3.3	2.1	21.7	1.6	0.6
		0941								
		0949				3.5	2.5	Ne	2.9	0.55
		1000				3.5	3.9	Ne+	20	0.45
		1011				37.5	15	Ne+	150	7.0
		1021				69	10	Ne	20	20.5
		1036				90	Ne	Ne	25	33
		1135				105	Ne	Ne	Ne	50
		1235				106	Ne	Ne	20	58
		1435				95	Ne	Ne	Ne	54
	23.11	0934				10	Ne	Ne	Ne	5
	25.11	0917				5	Ne	Ne	Ne	Ne
	28.11	0930				5	Ne	Ne	Ne	Ne
	29.11	1100	123	xxxx						
	30.11	0940				100	Ne	Ne	Ne	Ne
	01.12	1457				76	58	Ne	Ne	12
	02.12	1100				68	55	Ne	Ne	12
	03.12	0924				64	52	Ne	Ne	11
	04.12	1146				63	47	Ne	0.5	7.9
		1150				61	57	Ne	0.5	10.4
	05.12	2101				60	60	Ne	0.5	9.8
		1021				61.5	62.4	Ne	0.5	8.5
		1340			xxxx					
		1400				66	57	Ne		7
	06.12	0907				8		Ne	0.5	3
	07.12	1427				4		Ne		3
	08.12	0940				3		Ne	0.5	2.5
	09.12	1004				2		Ne	0.5	2
	12.12	0914				2		Ne	0.5	2

Note: Neon was added to capsule 3, starting at 22.11, 0941, to increase the fuel temperature to 1040°C. During the Ne addition, the Ne peak swamped the GC columns. Some usable quantitative data were possible by decreasing the gain and increasing the zero setting, so that the CO, N_2, and CH_4 peaks could be seen on top of the large Ne tail. The CO_2 peak eluted before the Ne and, thus, could be easily seen. The peaks were all analyzed by a manual peak height method.

Table 6.5.16. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 89.01

Water-vapor injection No. 12: Duration 192 h
Hydrogen injection No. 1: Duration 192 h

			H_2O-vapor Injection			Concentration of Effluent Gases (ppmv)				
cycle	date	time	Press. (Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
89.01	17.01	0928				0.5		2.5	1.4	
	18.01	0916				0.5		Ne	1.0	
	19.01	0905				0.5	tr	Ne	1.6	
		0915		H_2		0.5		2.4	1	
	0931	100		xxxx						
	20.01	0925		H_2O				1000	2.5	2.5
	23.01	1000	112	xxxx						
		1056				tr		1000	11.7	1.8
		1426				tr				1.7
		1436				1.4		1000	7.8	1.9
		1446				2.6	tr	1000	6.7	2.2
		1456				2.5	tr	1000	6.9	2.0
		1506				2.6	tr	1000	6.3	2.0
	24.01	0844				8.4	2.6	1000	13.7	2.6
		0854				8.2	2.5	1000	8.0	2.6
		1428				8.4	3.0	1000	3.2	2.8
	25.01	0832				7.5	2.4	1000	6.0	2.3
	26.01	0924				7.5	2.7	1000	2.7	2.0
		1521				8.8	2.7	1000	5.0	2.6
	27.01	0845			H_2	9.3	2.7	1000		2.9
		0935			xxxx					
		0950				8.6	2.8	75		2.5
		1000				7.1	7.0	55	23	1.3
		1010				4.5	8.5	54	13	1.1
		1257				4.6	17	48		1
		1307				4.6	17	47	6.3	0.7
		1350				4.0	17	51	6.2	0.9
		1640				3.0	25	45	18	0.5
		1709				2.9	23	41	7.8	0.5
		0138				2.8	23	Ne	43	0.5
	28.01	1657				3.4	24	38	6.8	0.5
		1734				3.7	24	35	2.7	0.5
		1000				2.8	23.6	36	3.3	0.4
	30.01	1414				3.5	26.4	37	2.3	0.5
	31.01	0952			H_2O	2.9	27	38	7.6	0.5
		1000			xxxx					
		1052				2.8	21	Ne	4.8	tr
		1152				3.2	16	Ne		0.5

Table 6.5.16 (continued)

CAPSULE 3, CYCLE 89.01

Water-vapor injection No. 12: Duration 192 h
Hydrogen injection No. 1: Duration 192 h

cycle	date	time	H_2O-vapor Injection Press. (Pa)	start	stop	Concentration of Effluent Gases (ppmv) CO	CO_2	H_2	N_2	CH_4
	1452					3.7	9	Ne		0.6
	1541					3.7	8	Ne		0.5
	01.02	0919				2.0	1.8	21	6	tr
	02.02	1512				0.3	0.5	14	1	tr
	03.02	0940				0.3	0.5	16	1.5	0.17

Note: The GC peaks were checked by manual peak height method; the "Shimadzu" integrations were correct, except for hydrogen, which was integrated manually.

Table 6.5.17. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 89.02

Water-vapor injection No. 13; Duration 96 h

cycle	date	time	H_2O-vapor Injection Press. (Pa)	start	stop	Concentration of Effluent Gases (ppmv) CO	CO_2	H_2	N_2	CH_4
89.02	10.02	1020				2.6	1.7	15.9	1.6	0.2
	14.02	1300								
	15.02	0844				2.6	tr	9.5	2.0	0.4
	16.02	0854				1.5	tr	8.0	1.0	0.3
	20.02	0905				0.55	tr	6.1	1.5	0.1
		0940	250	xxxx						
		1034				tr	tr	6.1	6.0	tr
		1202				2.4	5.4	17.2	6	0.2
		1212				2.4	19	70	5.1	0.35
		1222				2.9	20.8	70	4.9	0.3
		1312				3.7	26.6	70	4.3	0.3
		1547				6.1	36	70	3.0	0.3
	21.02	1135				6.4	33	70	1.7	0.37
		1459				6.1	33	70	1.9	0.5
	22.02	0912				6.2	34.5	70	2.1	0.5
		1414				6.5	34.8	70	1.6	0.4
	23.02	0851				5.5	31.2	70	1.5	0.37
		0901				5.8	31.4	70	1.4	0.39
	24.02	0900			xxxx	6.1	31.8	70	1.9	0.4
		0910				6.3	31.7	70	1.6	0.4
		0940								
		1018				5.6	29.9	70	2.2	0.4
		1048				4.3	21.4		1.9	0.3
		1118				4.6	17.3	40	1.4	0.4
		1218				8.1	16.1		1.2	0.6
		1356				10.3	12.5		1.9	0.9
		1546				8.8	8.5		1.1	1.0
	20.02	0925				1.3	tr	12	3.0	0.17
	30.06	153				1.3	tr	6	1	tr

Note: The "Shimadzu" integrations were found to be correct, except for hydrogen, which was estimated to be 70 ppm by the multi-point peak height method. Between 10.02, 1020, and 14.02, 1300, the reactor was down for two days.

Table 6.5.18. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 89.04

Water-vapor injection No. 14; Duration 96 h

			H_2O-vapor Injection			Concentration of Effluent Gases (ppmv)				
cycle	date	time	Press. (Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
89.04	01.05	1349				tr	0	4.6	26.5	0
		02.05	0925				tr	0	4.8	25.7
		0305	1337				tr	0	4.3	28
		05.05	0930					0	3.8	26
		08.05	0853	550	xxxx					
		0957				1.1	tr	4.2	31	
		1027				tr	4.5	6	17	tr
		1057				2.2	15.6	64	15	0.7
		1137				2.2	24	63	15	0.7
		1342				2.2	29	63	13	0.7
		1633				2.2	30	63	14	0.5
	09.05	0234				2.8	31	64	17	0.5
		0855				2.8	32	64	15	0.5
		1339				2.8	32.5	64	13	0.5
	10.05	0908				2.2	32	64	16	
	11.05	0946				2.8	32	64	17	0.5
		1410				2.8	32	64		0.3
	12.05	0853			xxxx					
		0959				2.8	26	55	15	0.3
		1145				3.0	16	43		0.3
		1433				5.4	12	30	14	0.7
	17.05	0911						7		

Note: The "Shimadzu" integrations were found to be in error. The above data were obtained by a manual peak height analysis. The nitrogen peaks appear high; however, no oxygen was seen in the inlet gas, and the CO peaks in capsule 1, which is swept with the same service He, were less than 1 ppm.

Table 6.5.19. Gas composition data
Source: JRC-IAM Petten, HFR Unit, The Netherlands

CAPSULE 3, CYCLE 89.06

Water-vapor injection No. 15; Duration 15 h
Water-vapor injection No. 16; Duration 15 h

			H_2O-vapor Injection			Concentration of Effluent Gases (ppmv)				
cycle	date	time	Press. (Pa)	start	stop	CO	CO_2	H_2	N_2	CH_4
89.06	22.06	0923				0	0	2	16	0
	26.06	0818	1050	xxxx						
		0925				0	7.5	54		tr
		0938				tr	17.3	100	20	2
		0958					25	80	18	1.5
		1027					25	75	15	1
		1319					25	60	13	tr
	27.06	0900					25	60	26	
		1513					25	60		
	28.06	0842					25	64		
		0852					25	64		
	29.06	0830					25	Ne		
		0925				4.4		Ne		0.6
		1125				4.4	54	Ne		0.6
		1408				4.4	51	Ne		0.6
	30.06	0837				4.4	46	Ne		1.0
		0903				4.4	47	Ne		1.0
		1502				4.4	50	Ne		1.0
	02.07	0259				4.4	47	Ne		0.6
	03.07	1048			xxxx					
		1228					19	Ne		
	04.07	0109					7			
		0931					3			
89.06	10.07	0828	250	xxxx						
		10.05				0	0	Ne	0	0
		1130					14			
		1140				tr	22.4	Ne	tr	tr
	8.11	1618				tr	43.4		tr	tr
		2350			xxxx					
		2354				tr	24		tr	tr
		2400			xxxx					

Note: The integrations were checked by manual peak height method. The manual method was judged to be more accurate.

Table 6.5.20. Summary of notes to Tables 6.5.1 through 6.5.19
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Table 6.5.X	Note	Schimadza	manual	manual method	lot temp. GC condition
1	N				
2	N				
3	Y	AEFH	CK	MPH	
4	Y	AEFH	CK	?	
5	Y	AEFH	CK	?	
6	Y	E	CK	MPH	Y.H
7	Y	(CO_2)			Y.H
8	Y	A	CK	MPC*	
9	Y	AEFH	CK	MPM	
10	Y	AEFH	CK	MPH	
11	Y			MPH	
12	Y	AEFH	CK	MPH	
13	Y	AEFH	CK	MPC	
14	Y	E		MPH	
15	N			MPH	
16	N				
17	N				
18	no				
19	no				

A = accurate
AEFH = accurate except for hydrogen
CK = a manual method was used to check the Shimadza
E = erroneous results for all species
MPC = multi-point calibration
MPH = manual peak height method
MPM = multi-point manual method
N = no note
V = used only the manual method
Y = note present
Y.H = yes for hydrogen in presence, Nc
* = used to correct non-linear response of GC to #2

6.6 REACTOR AND PROCESS DATA

The reactor start and stop dates, the cycle and cumulative power days and average cycle power are presented in Table 6.6.1. Following this, there are graphs of some of the reactor and process data according to the following order and table numbers.

Reactor and Process Data History	Figures
HFR power and control rod	6.6.1 through 6.6.3
Activity, capsule A (1)	6.6.4 through 6.6.6
Activity, capsule B (2)	6.6.7 through 6.6.8
Activity, capsule C (3)	6.6.9 through 6.6.11
Pressure, capsule A (1)	6.6.12 through 6.6.14
Pressure, capsule B (2)	6.6.15 through 6.6.17
Pressure, capsule C (3)	6.6.18 through 6.6.20
Hygrometer, capsule A (1)	6.6.21 through 6.6.23
Hygrometer, capsule B (2)	6.6.24 through 6.6.26
Hygrometer, capsule C (3)	6.6.27 through 6.6.29
Purge flow, capsule A (1)	6.6.30 through 6.6.32
Purge flow, capsule B (2)	6.6.33 through 6.6.35
Purge flow, capsule C (3)	6.6.36 through 6.6.38
SPN-1 detector, capsule A (1)	6.6.39 through 6.6.41
SPN-1 detector, capsule B (2)	6.6.42 through 6.6.44
SPN-1 detector, capsule C (3)	6.6.45
SPN-2 detector, capsule A (1)	6.6.46 through 6.6.48
SPN-2 detector, capsule B (2)	6.6.49 through 6.6.51
SPN-2 detector, capsule C (3)	6.6.52 through 6.6.54

The activity of the purge gas is in counts per sec (cps).
The ordinate scale values on the pressure history are to be divided by 100.
Note that Fig. 6.6.23 has an incorrect ordinate title; it should be Humidity in ppm.
The purge flow (Sccm) is in cm^3/min under standard conditions, i.e., at 0.1 MPa and 298 K.

Table 6.6.1. HFR cycle start and stop dates, cycle and cumulative power days, and average cycle power
Source: JRC-IAM Petten, HFR Unit, The Netherlands

Cycle	Start	End			Ave. Power
y. no	d. mo	d. mo	FPD	∑FPD	<MW>
87.03	07.04	04.05	21.27	21.27	44.1
87.05	02.06	29.06	23.65	44.92	44.1
87.09	27.10	16.11	20.03	64.95	44.1
87.10	18.11	14.12	24.63	89.58	44.1
88.01	06.01	1.02	25.76	115.34	NA
88.02	04.02	29.02	25.44	140.78	47.7
88.04	28.04	23.05	25.75	166.53	47.5
88.05	26.05	20.06	25.21	191.74	47.5
88.06	23.06	15.07	20.79	212.53	45.1
88.07	08.09	28.09	21.04	233.57	45.3
88.08	05.10	24.10	21.44	255.01	45.3
88.09	27.10	17.11	21.26	276.27	45.1
88.10	21.11	12.12	20.92	297.19	45.1
88.11	15.12	05.01	21.40	318.59	45.1
89.01	16.01	06.02	20.96	339.55	41.7
89.02	10.02	04.03	18.80	358.35	45.1
89.03	04.04	24.04	19.75	378.10	45.5
89.04	28.04	20.05	22.75	400.85	45.3
89.05	25.05	14.06	21.14	421.99	44.7
89.06	18.06	10.07	21.60	443.59	42.0

y. no = year; cycle number
d. mo = day. month
FPD = full power days
∑FPD = cumulative number of full power days
Ave. Power = average power per cycle taken from Figs. 6.6-1, 6.6-2, and 6.6.-3
NA = not available; data for cycle 88.01 not included in Fig. 6.6-2

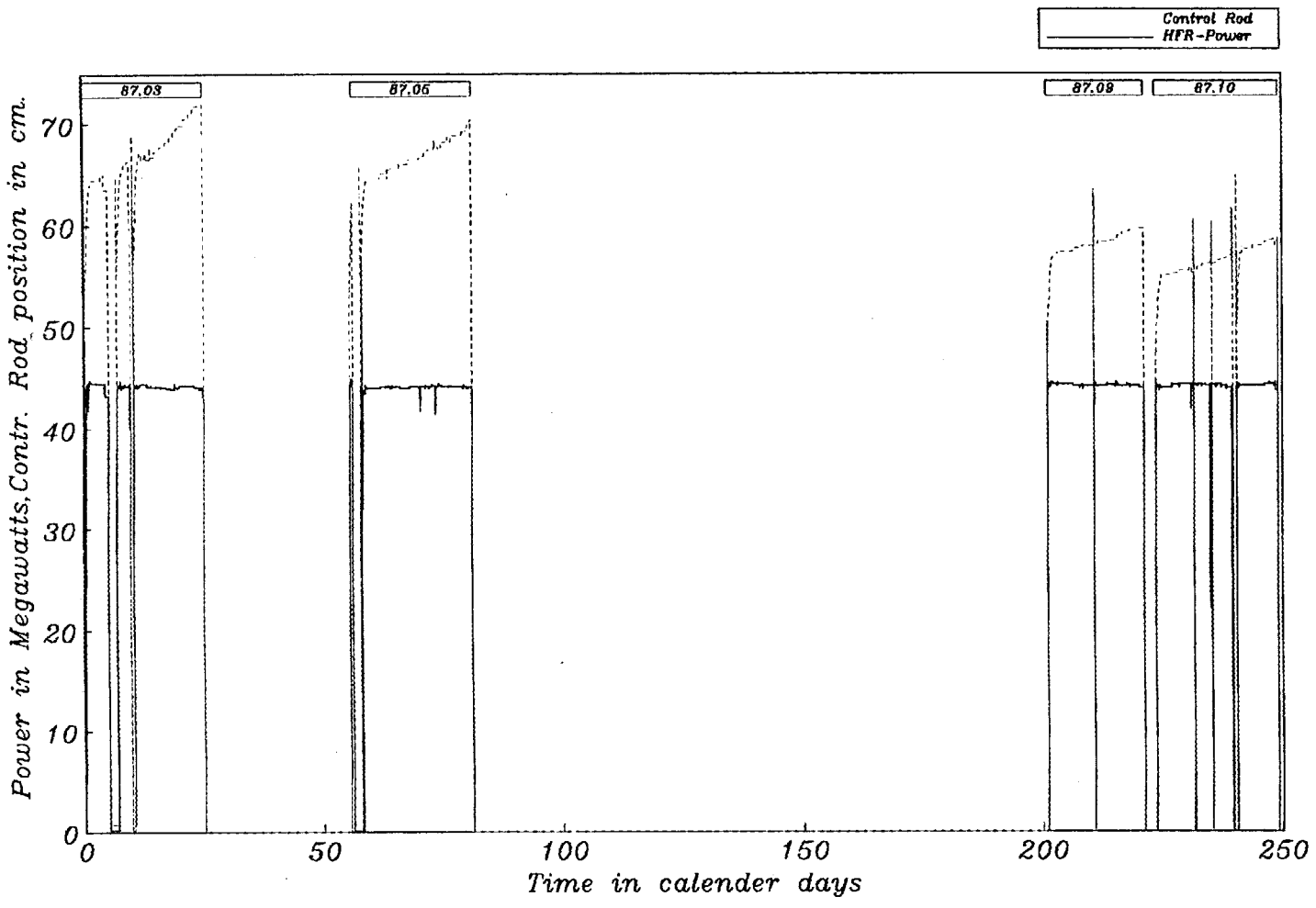

Fig. 6.6.1. HFR power and control-rod history cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

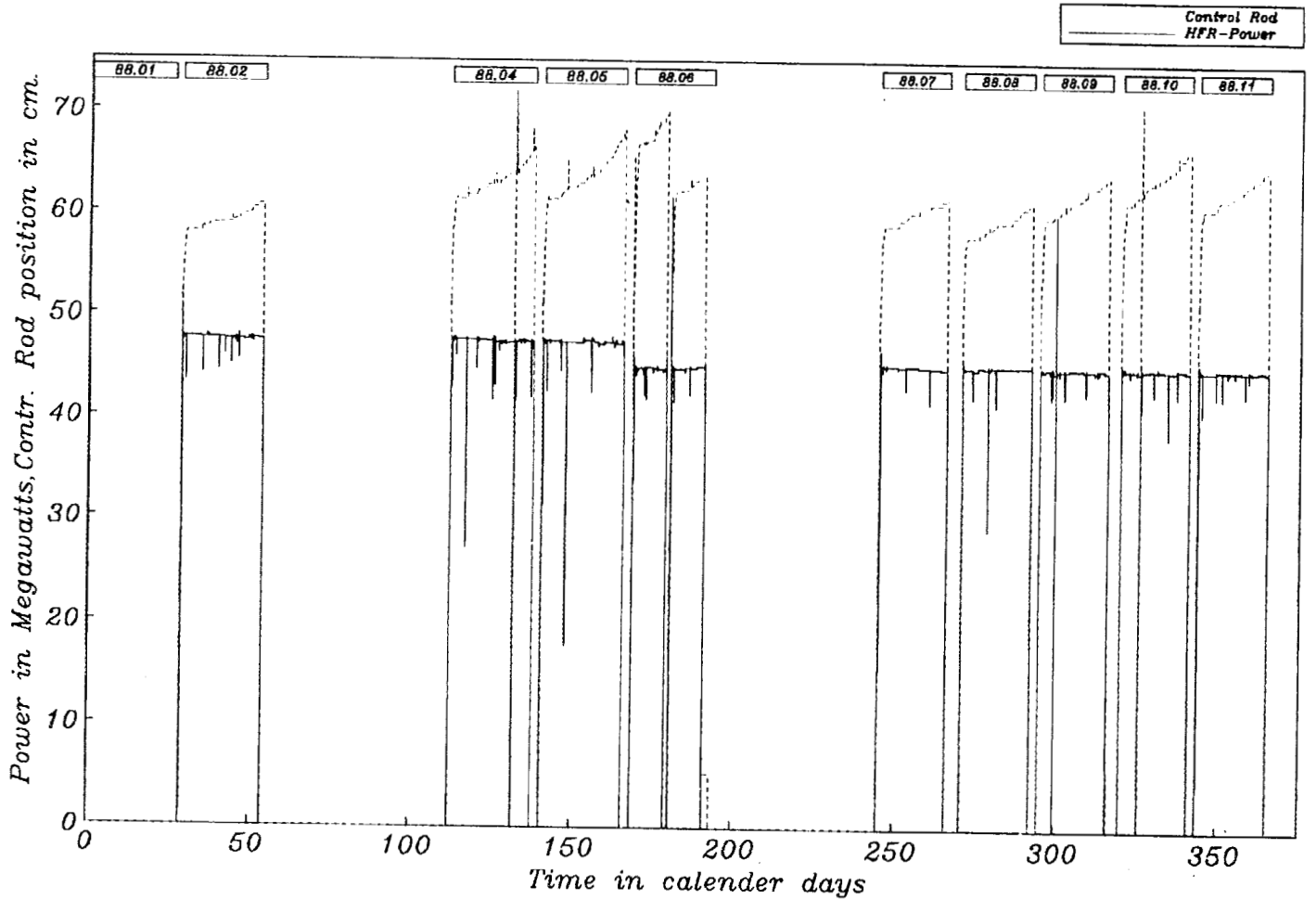

Fig. 6.6.2. HFR power and control-rod history cycles 88.10-88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

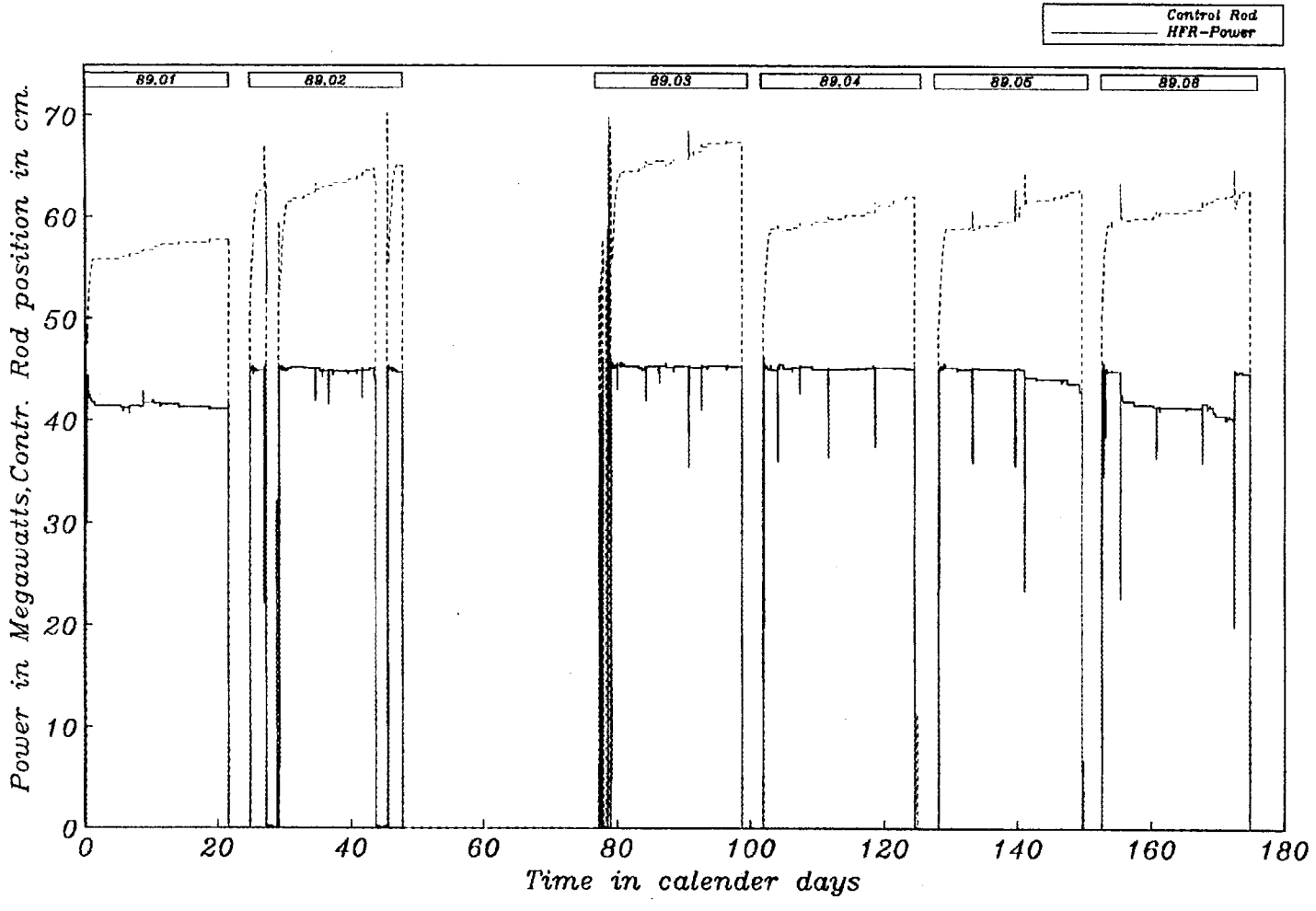

Fig. 6.6.3. HFR power and control-rod history cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

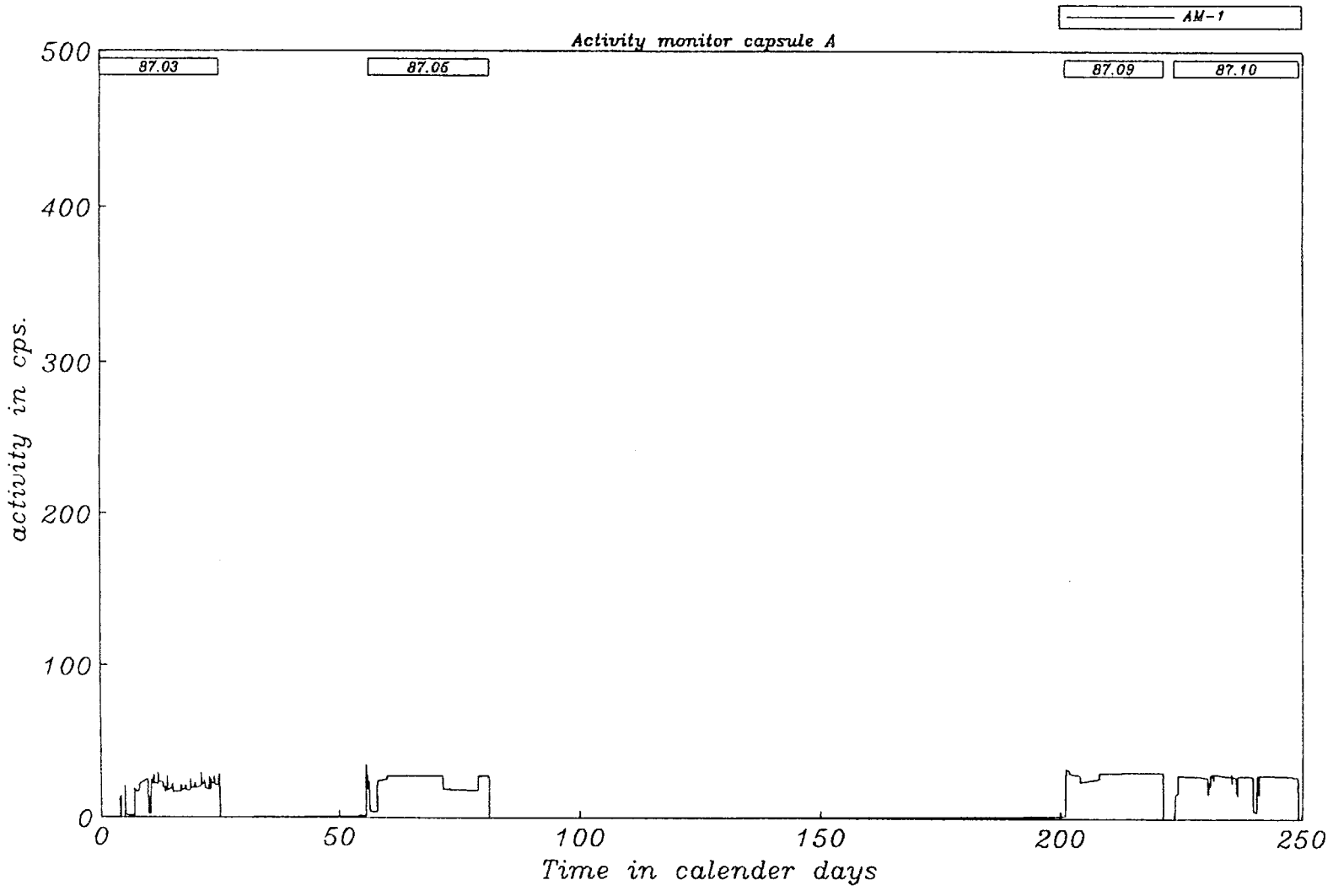

Fig. 6.6.4. Activity history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

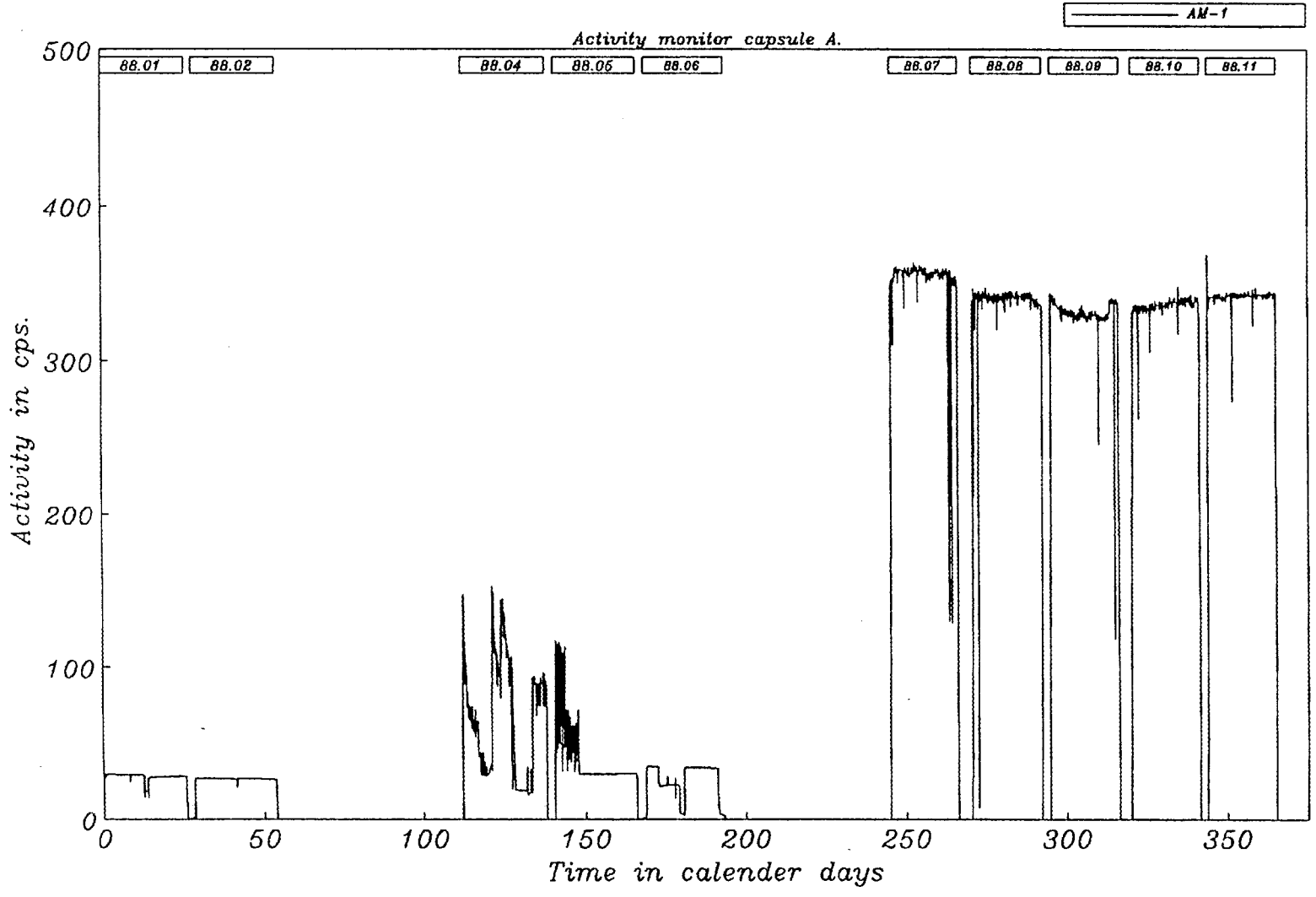

Fig. 6.6.5. Activity history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

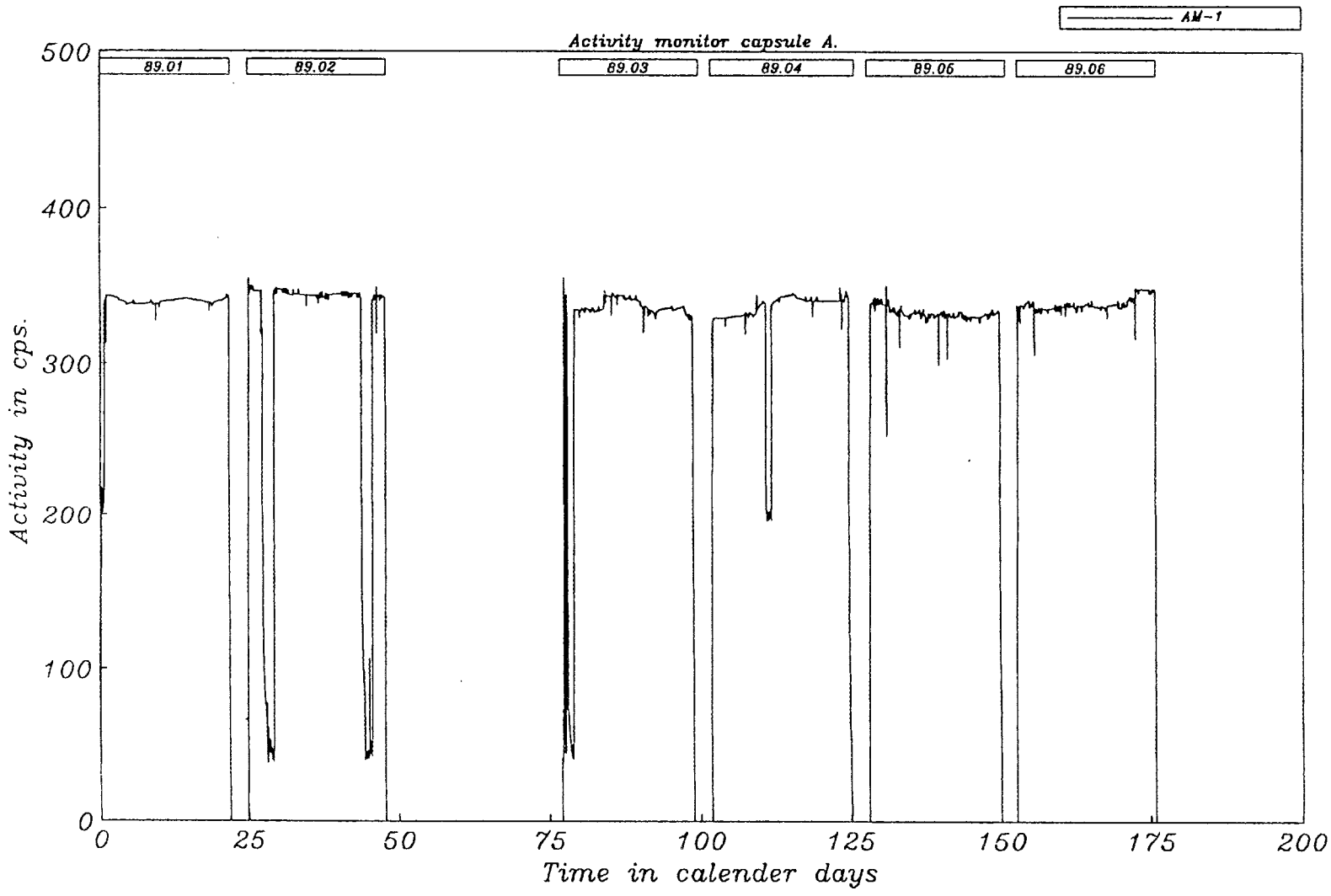

Fig. 6.6.6. Activity history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

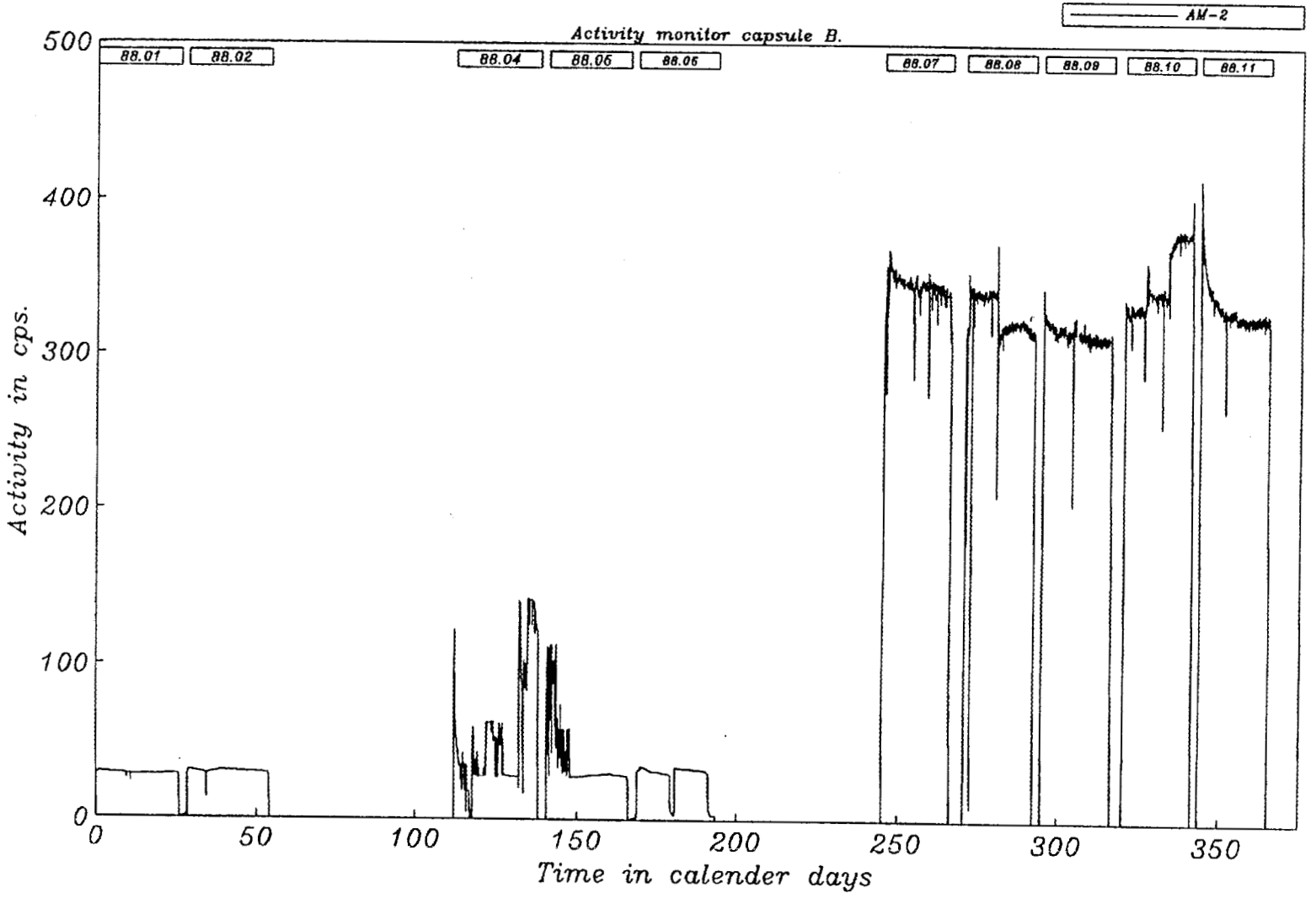

Fig. 6.6.7. Activity history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

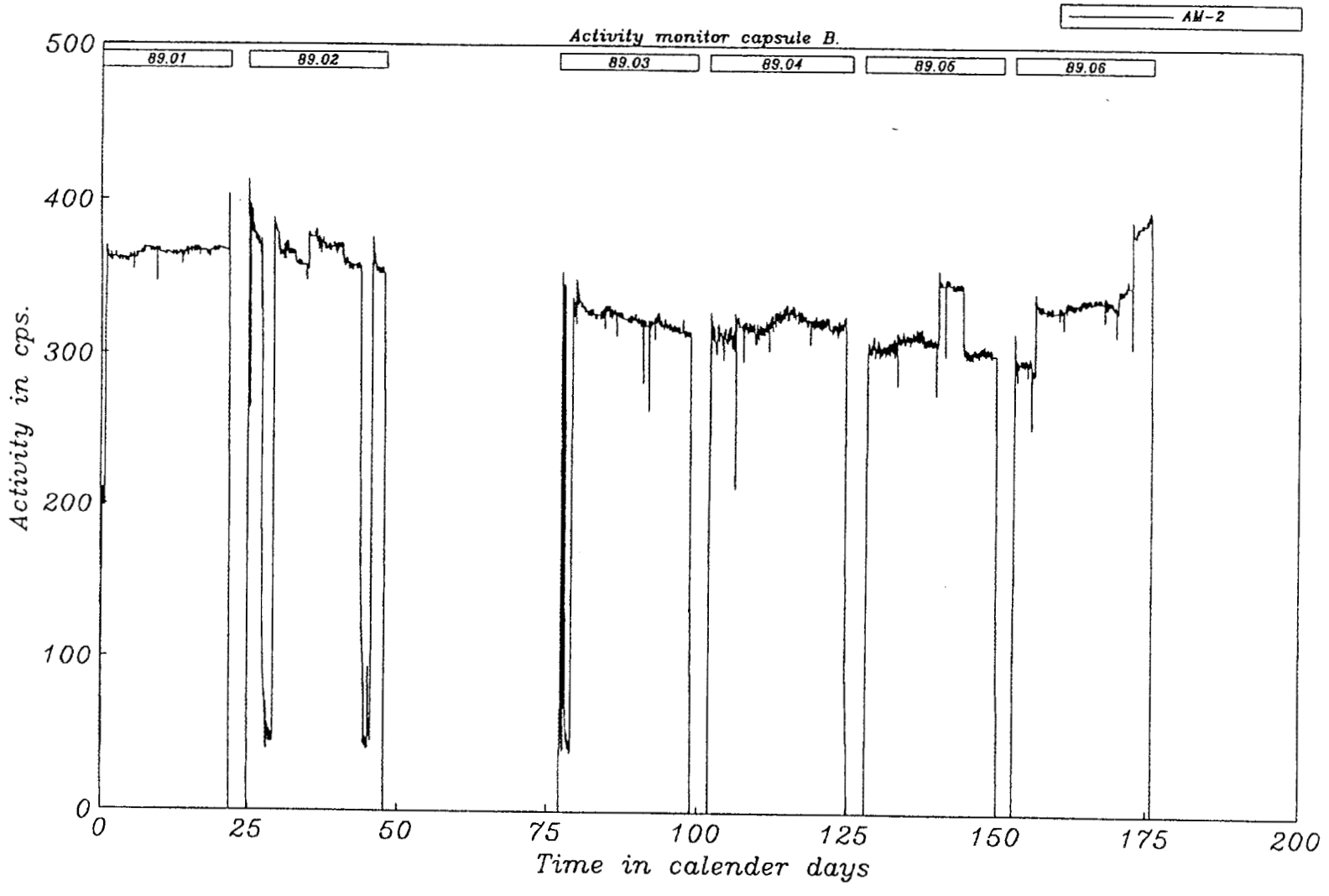

Fig. 6.6.8. Activity history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

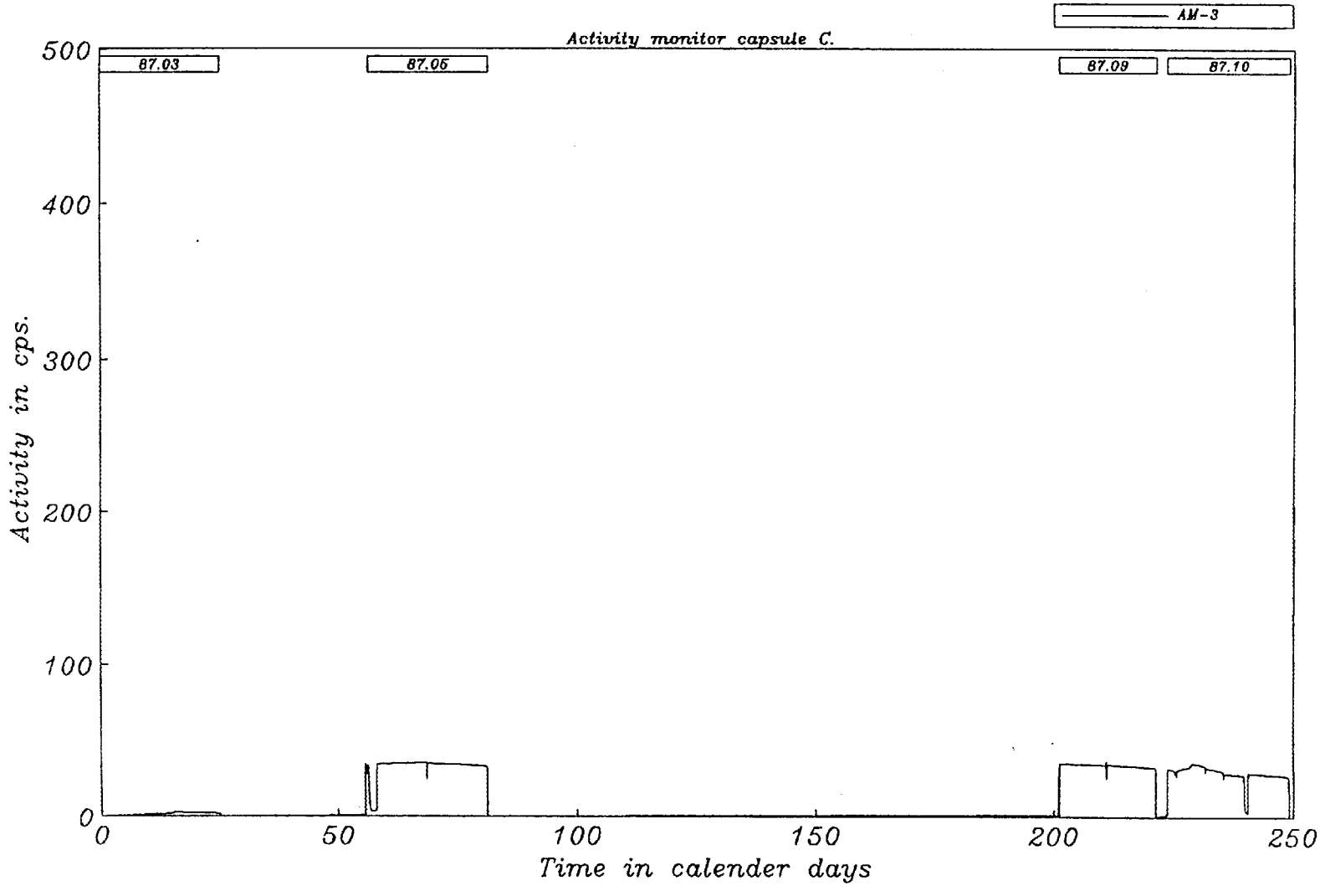

Fig. 6.6.9. Activity history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

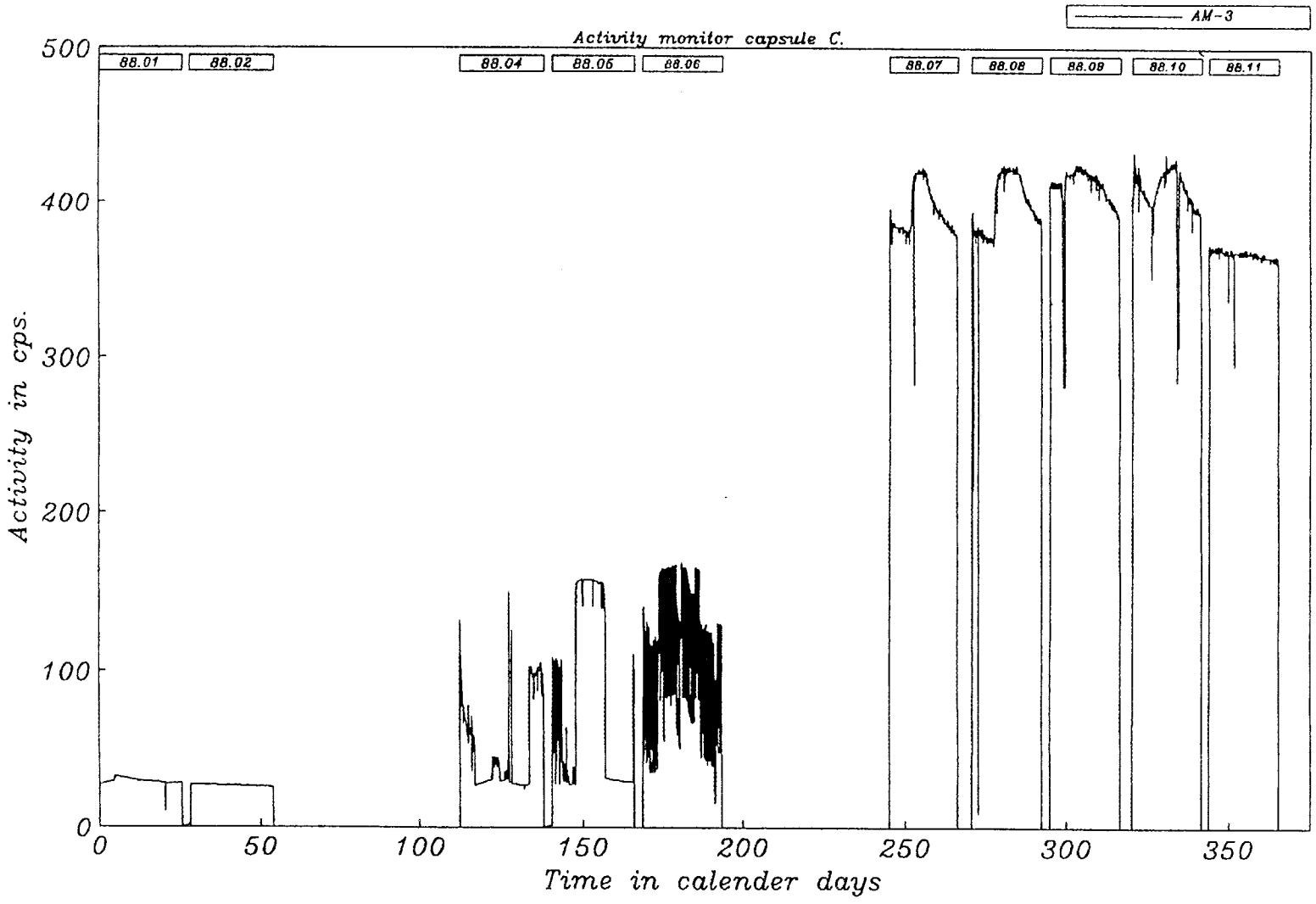

Fig. 6.6.10. Activity history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

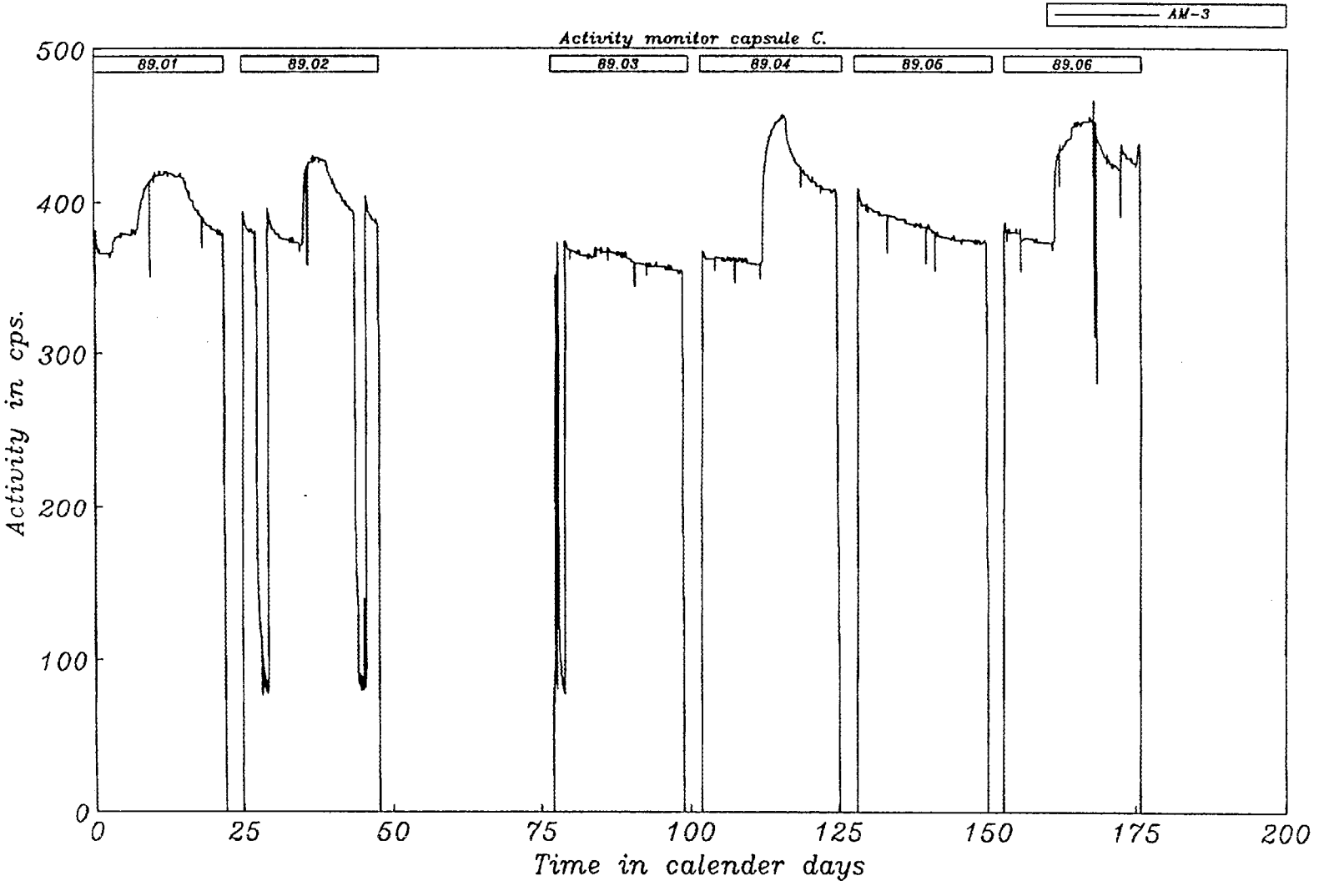

Fig. 6.6.11. Activity history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

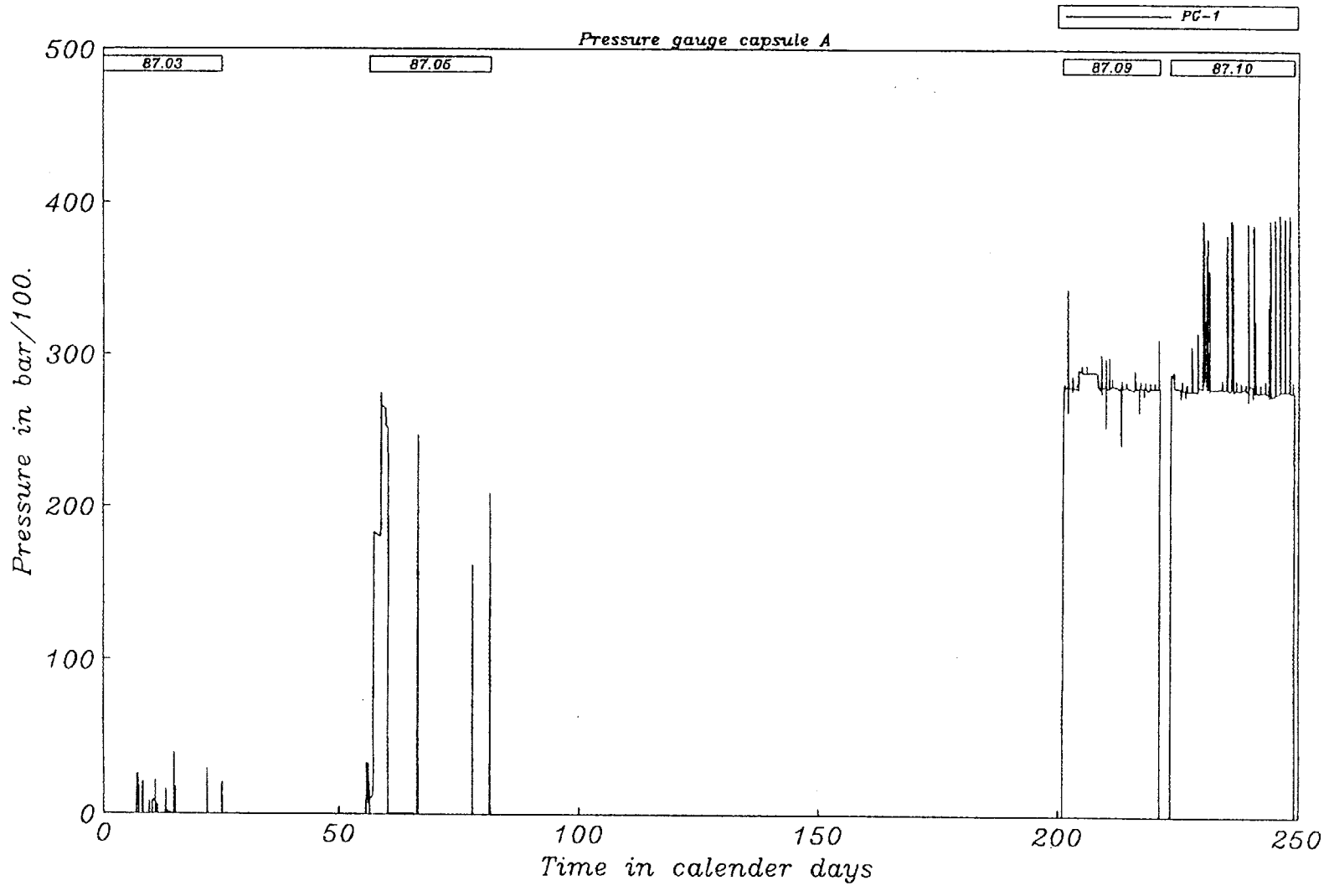

Fig. 6.6.12. Pressure history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

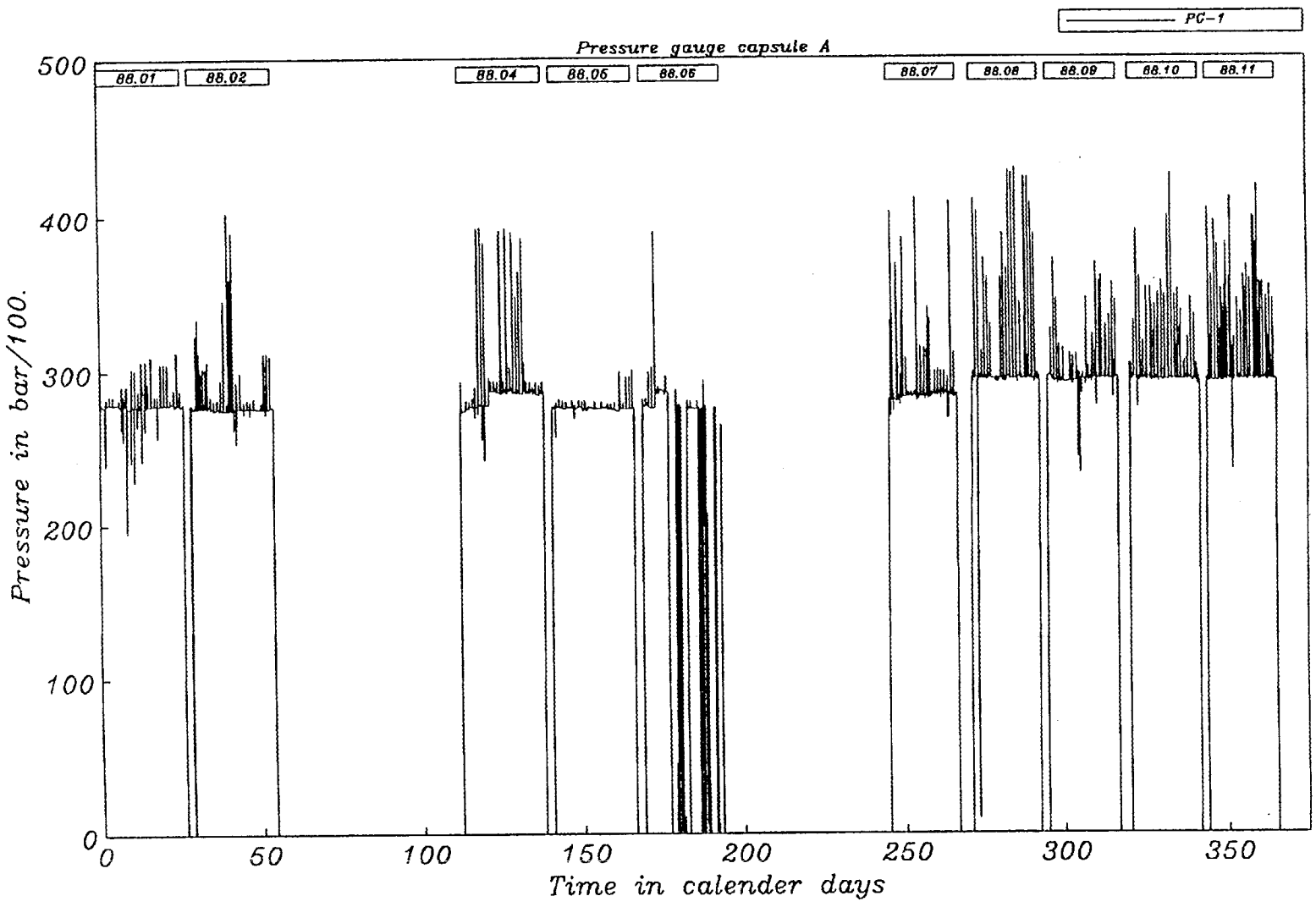

Fig. 6.6.13. Pressure history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

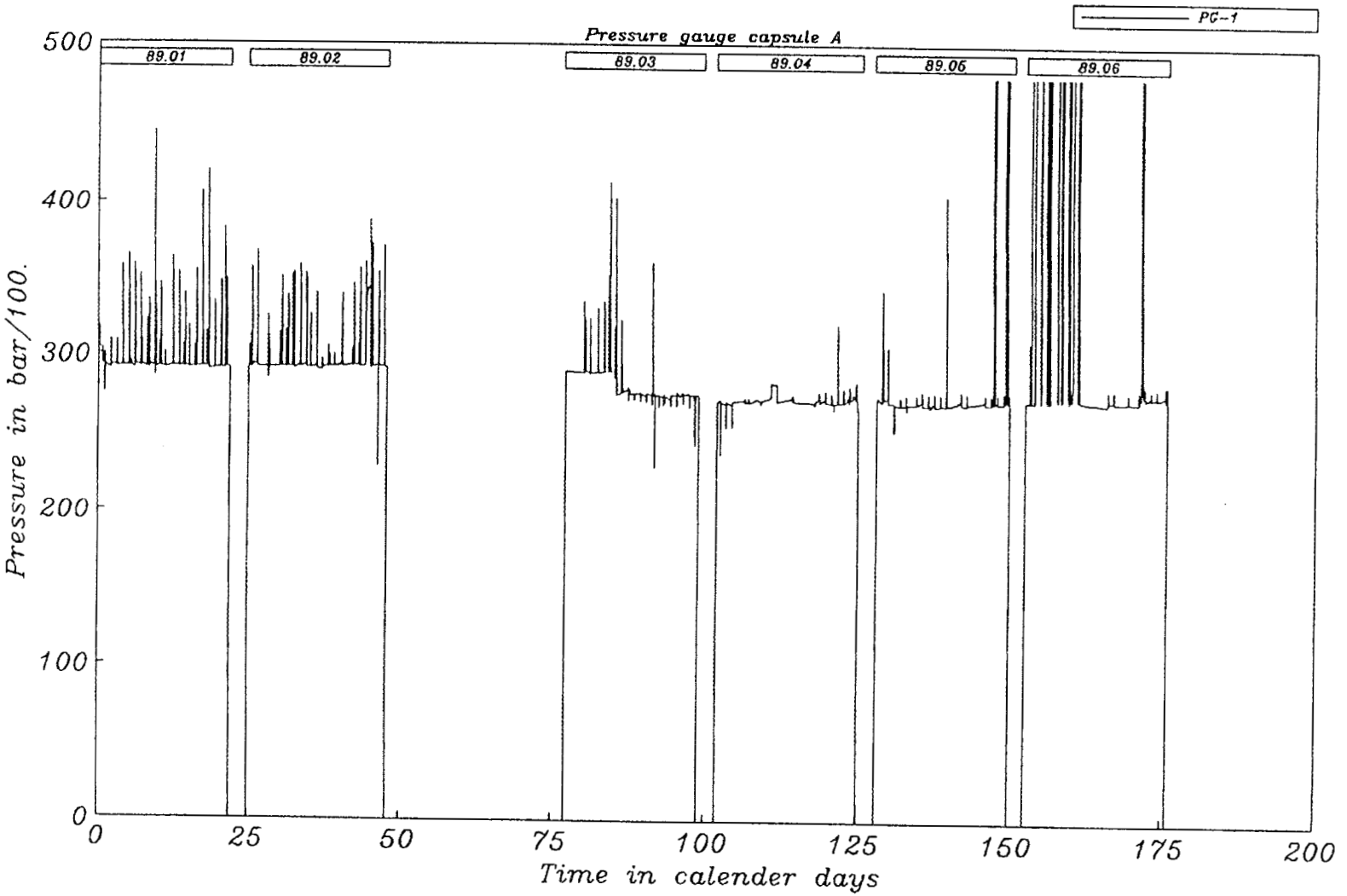

Fig. 6.6.14. Pressure history D-214 Cycles 89.01 – 88.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

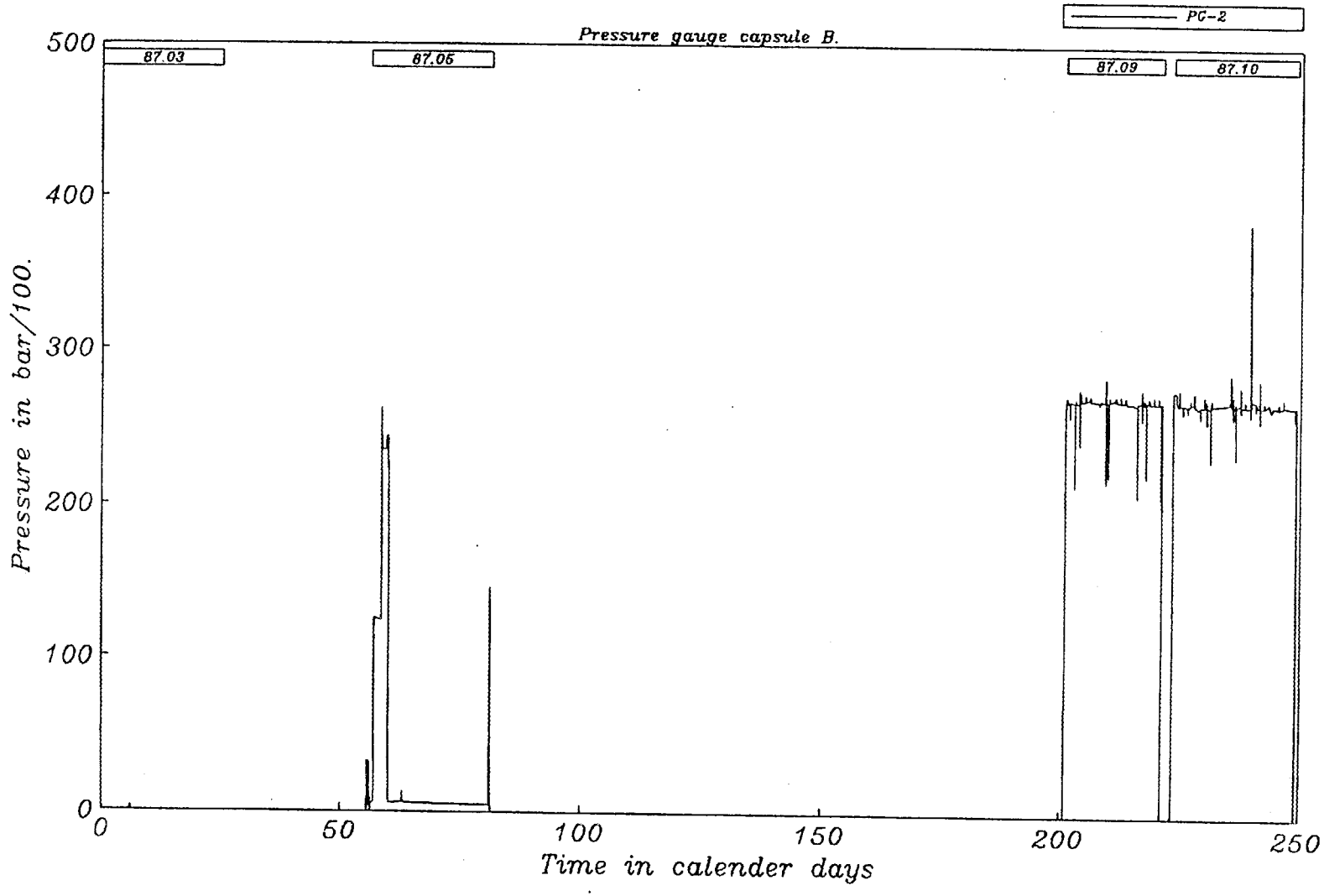

Fig. 6.6.15. Pressure history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

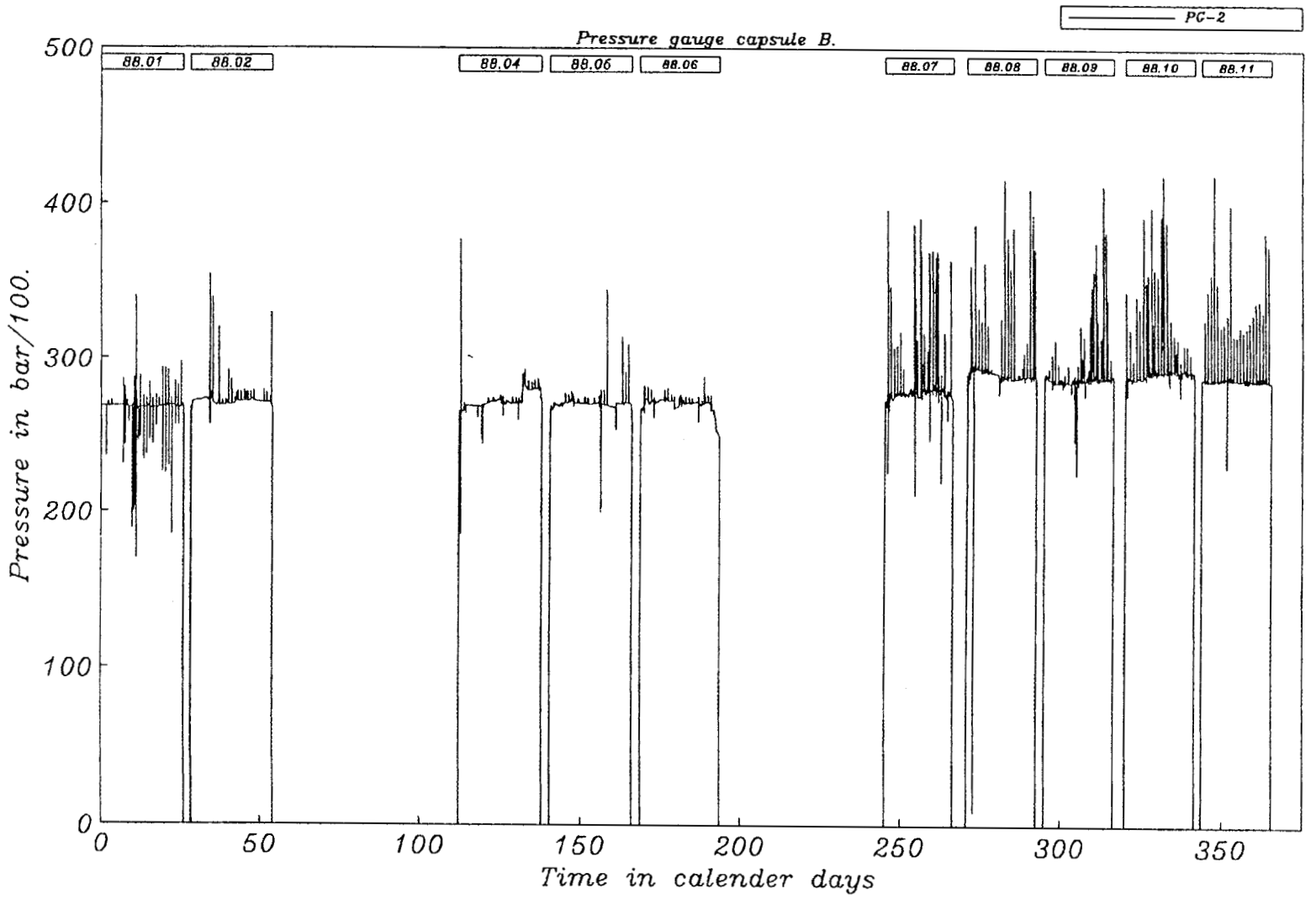

Fig. 6.6.16. Pressure history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

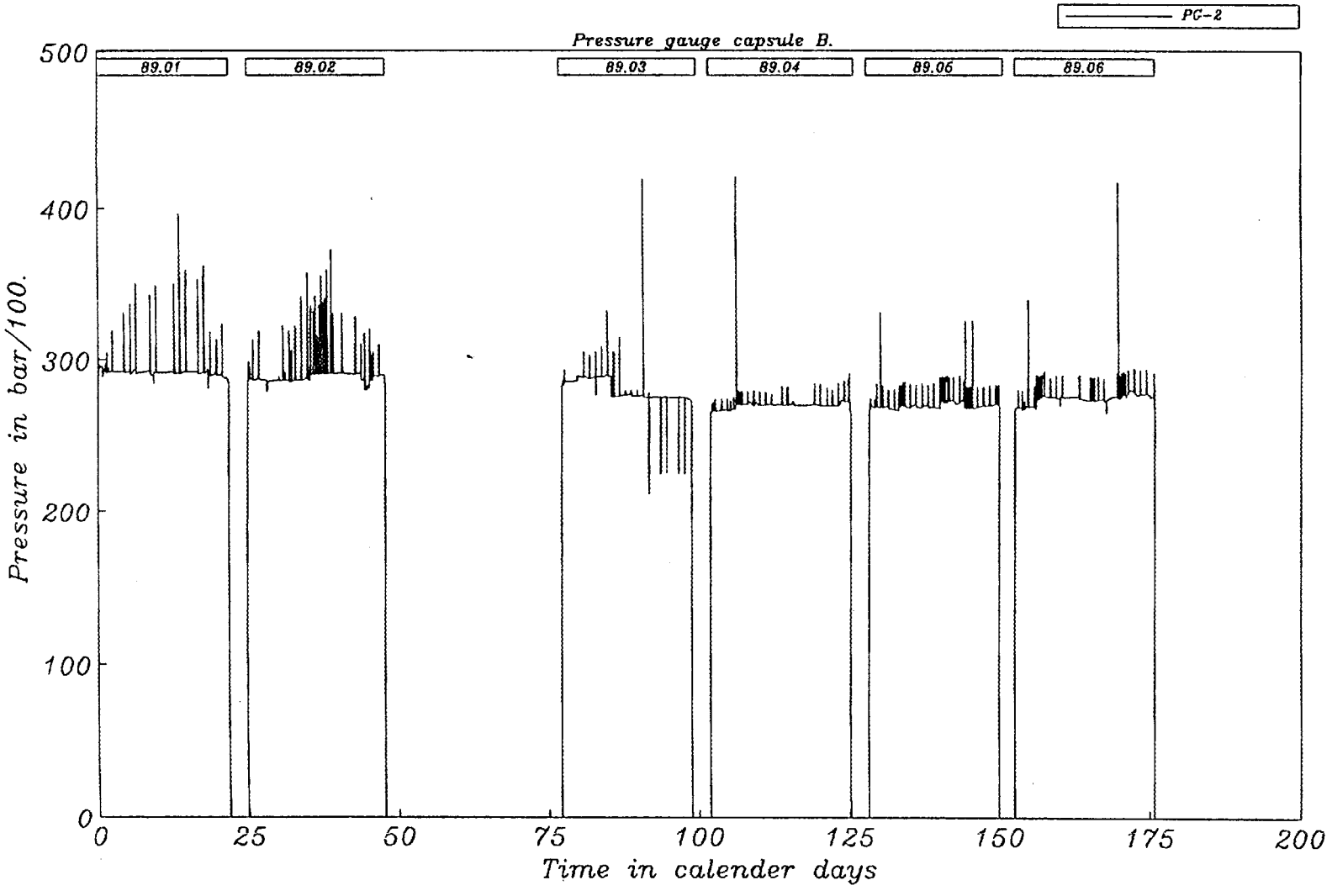

Fig. 6.6.17. Pressure history D-214 Cycles 89.01 – 89.06.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

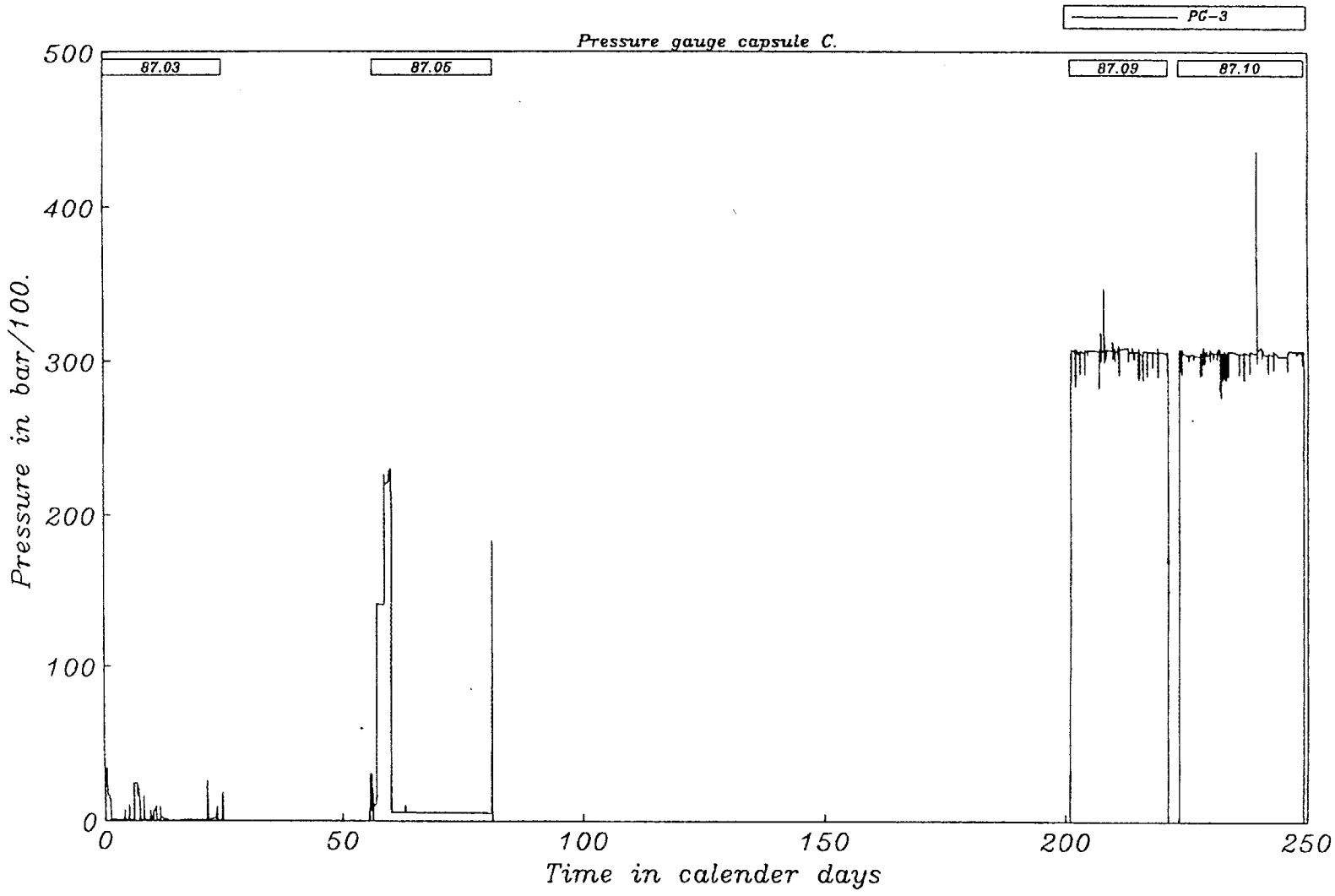

Fig. 6.6.18. Pressure history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

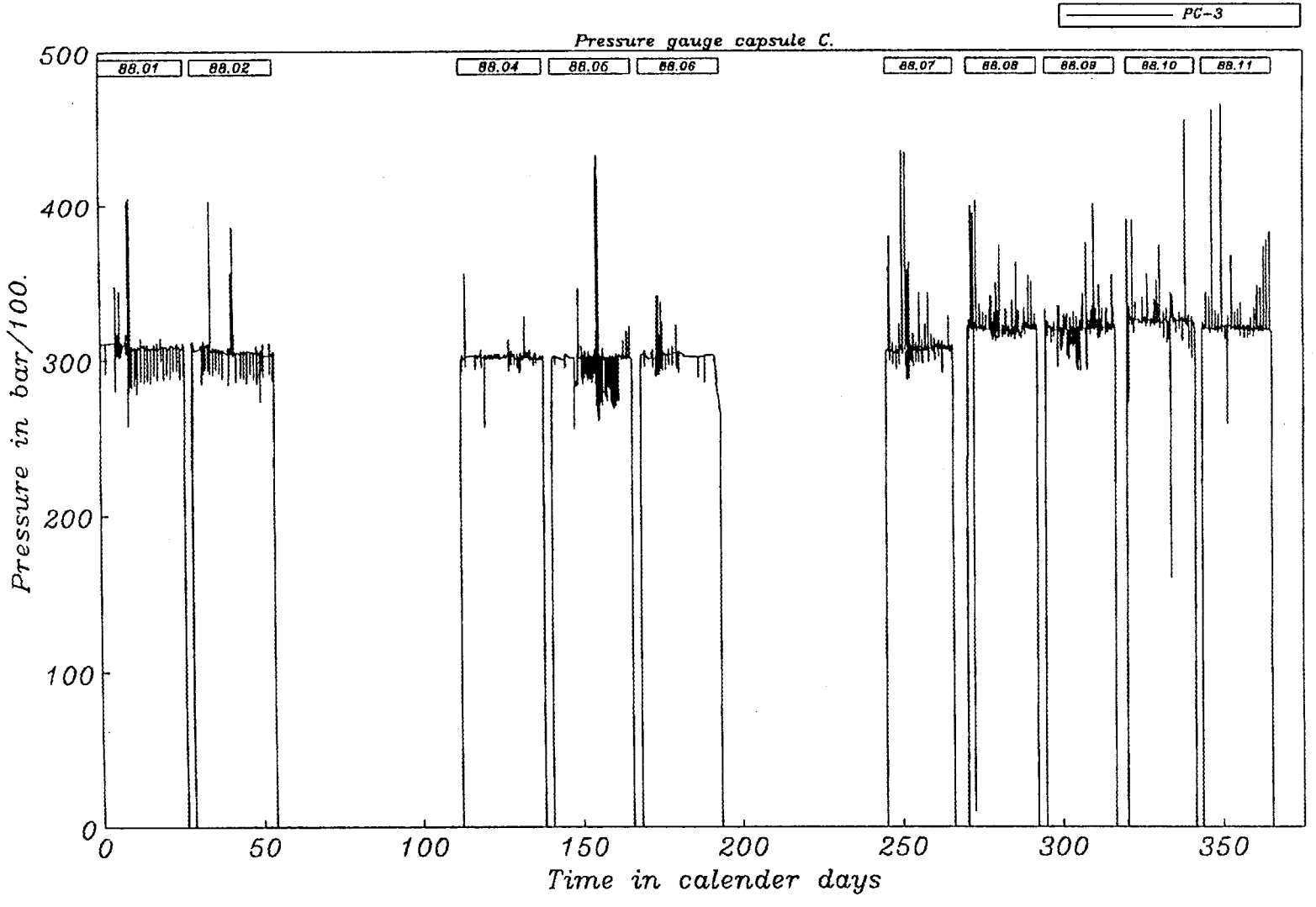

Fig. 6.6.19. Pressure history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

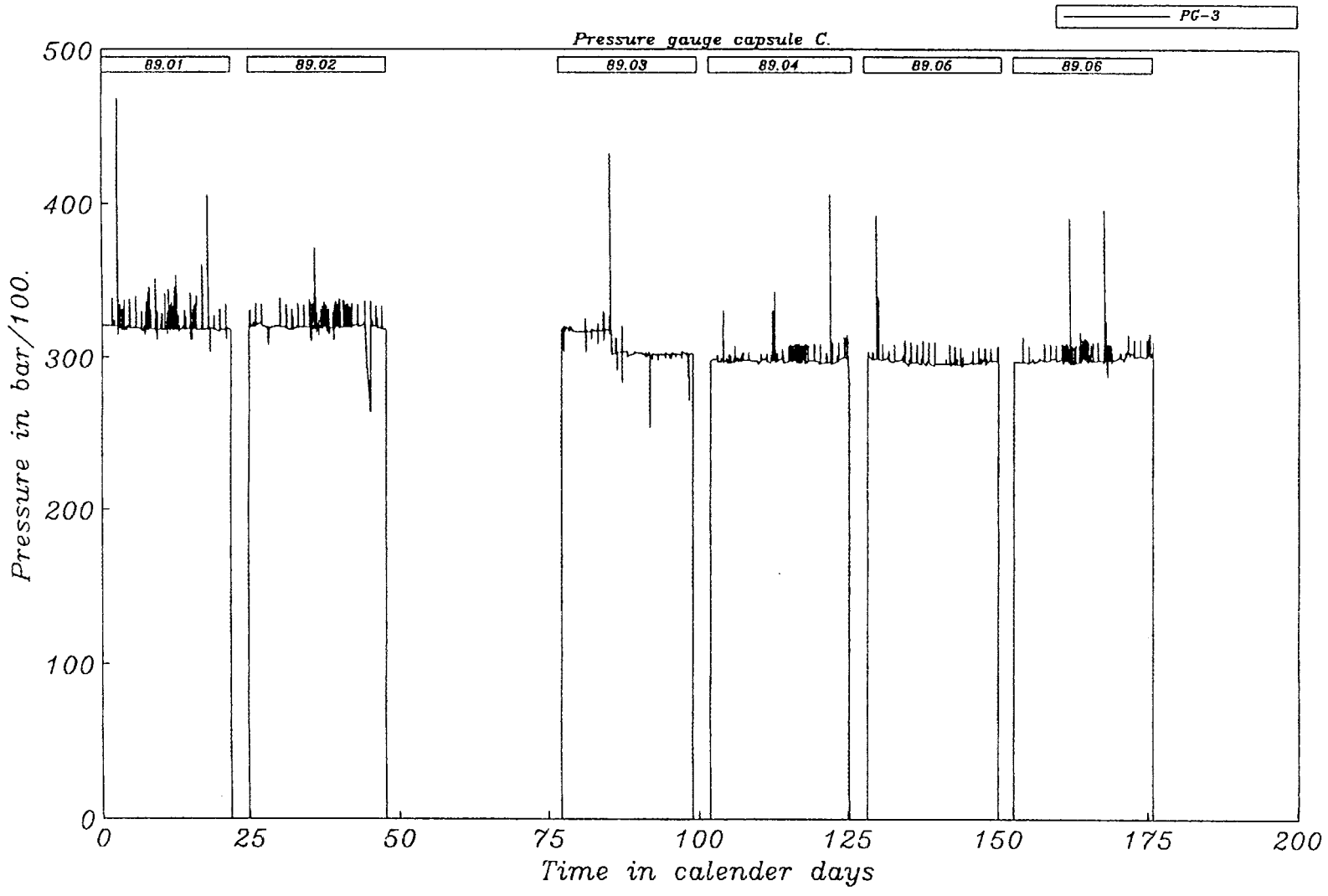

Fig. 6.6.20. Pressure history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

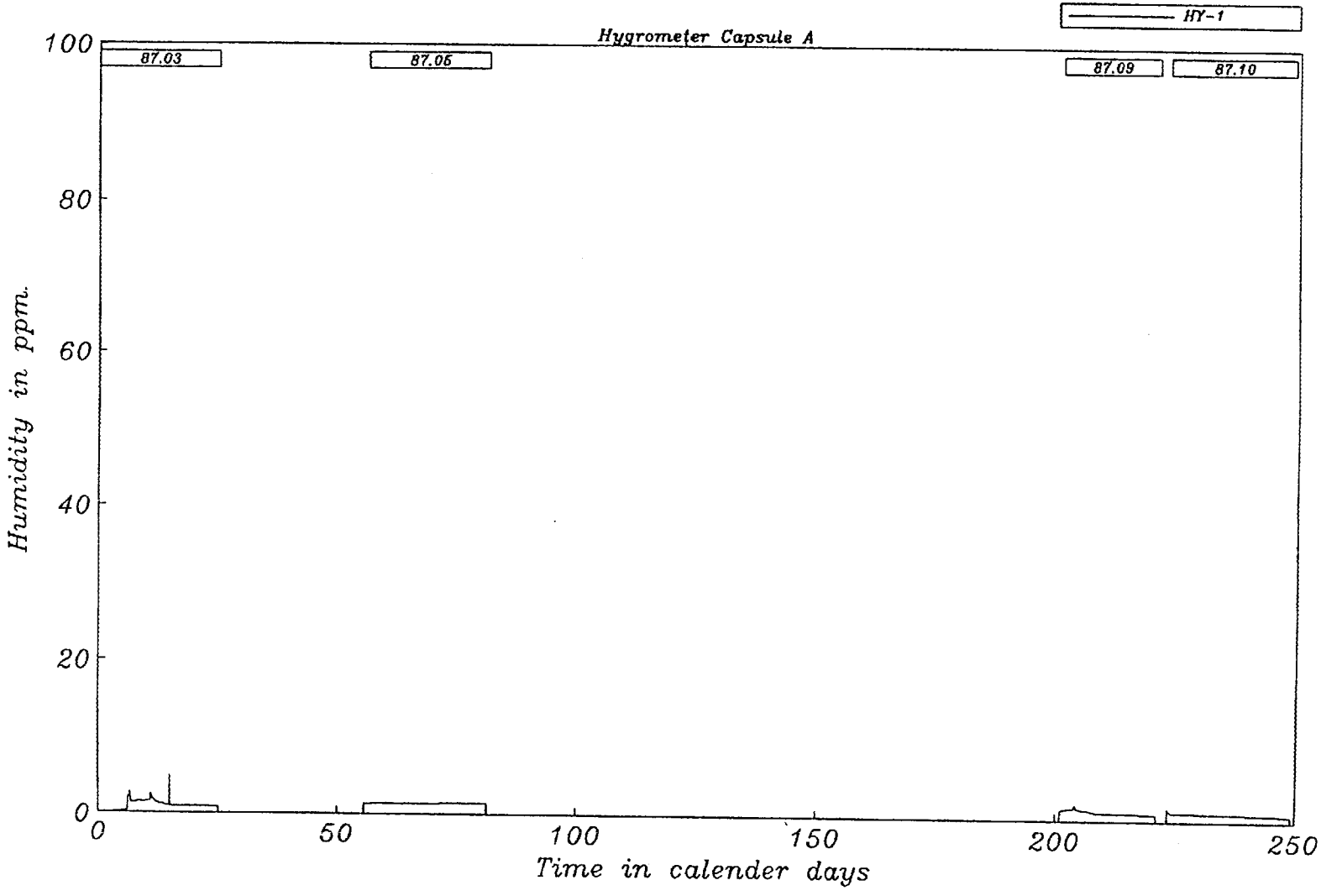

Fig. 6.6.21. Hygrometer history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

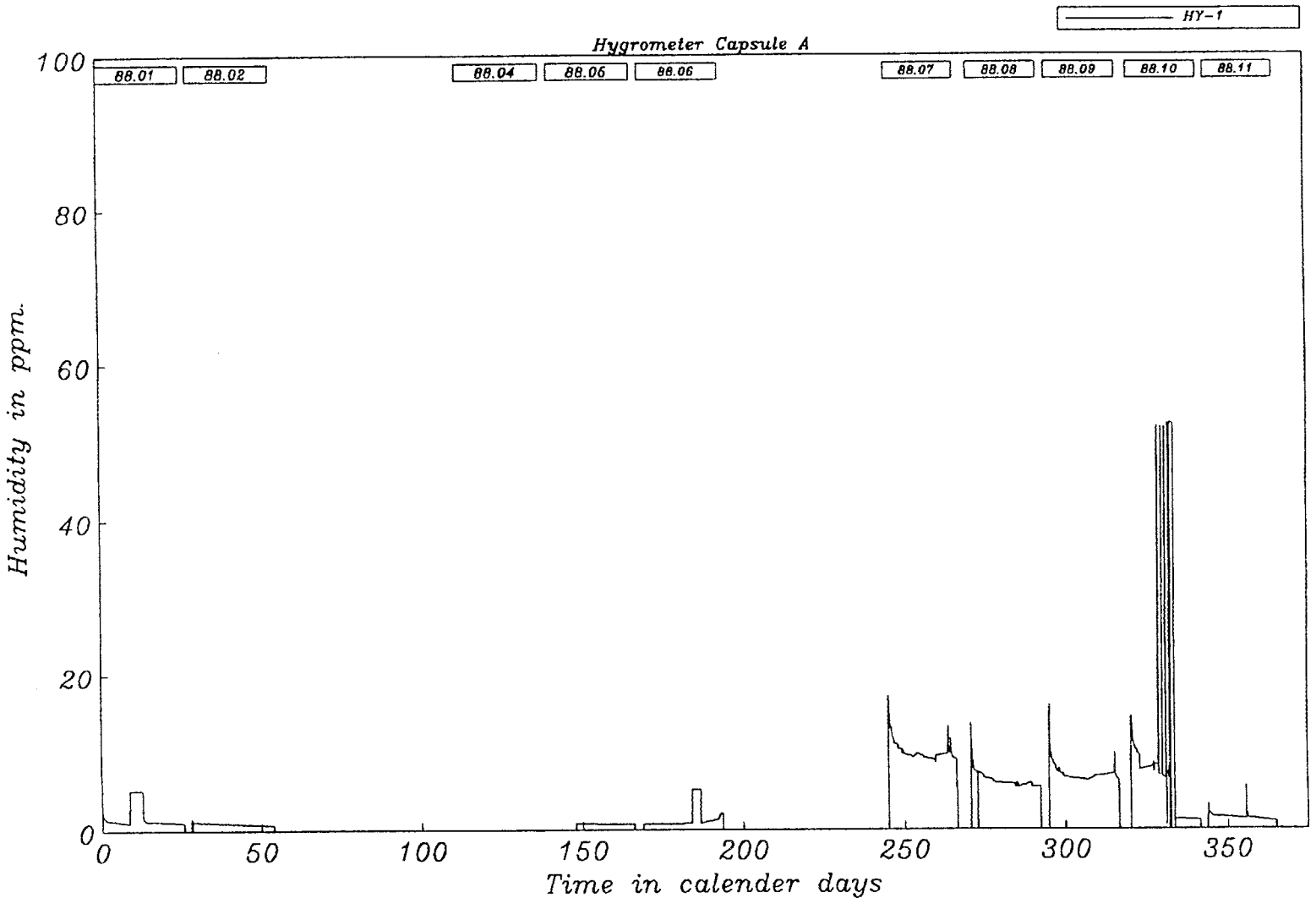

Fig. 6.6.22. Hygrometer history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

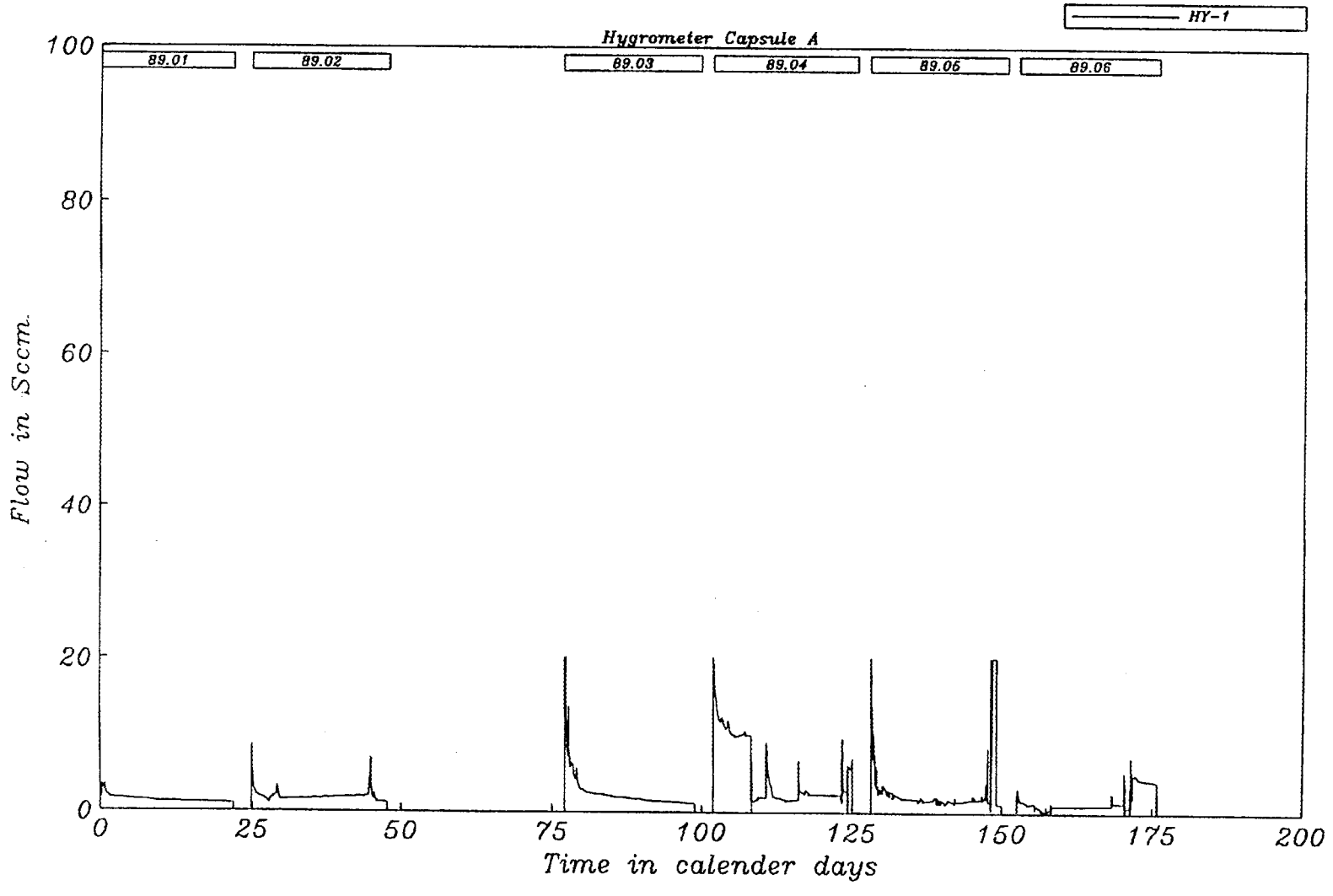

Fig. 6.6.23 Hygrometer history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

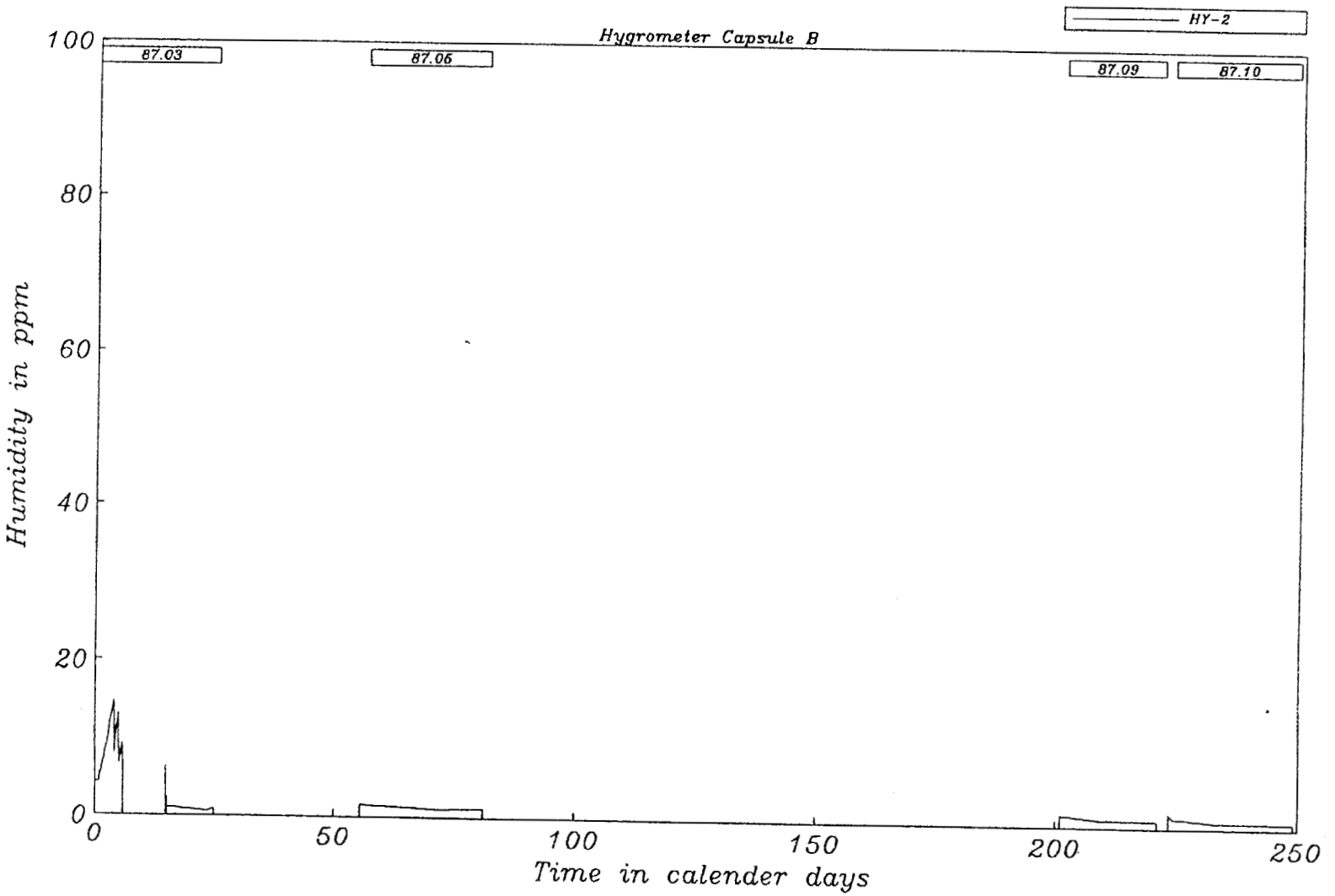

Fig. 6.6.24. Hygrometer history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

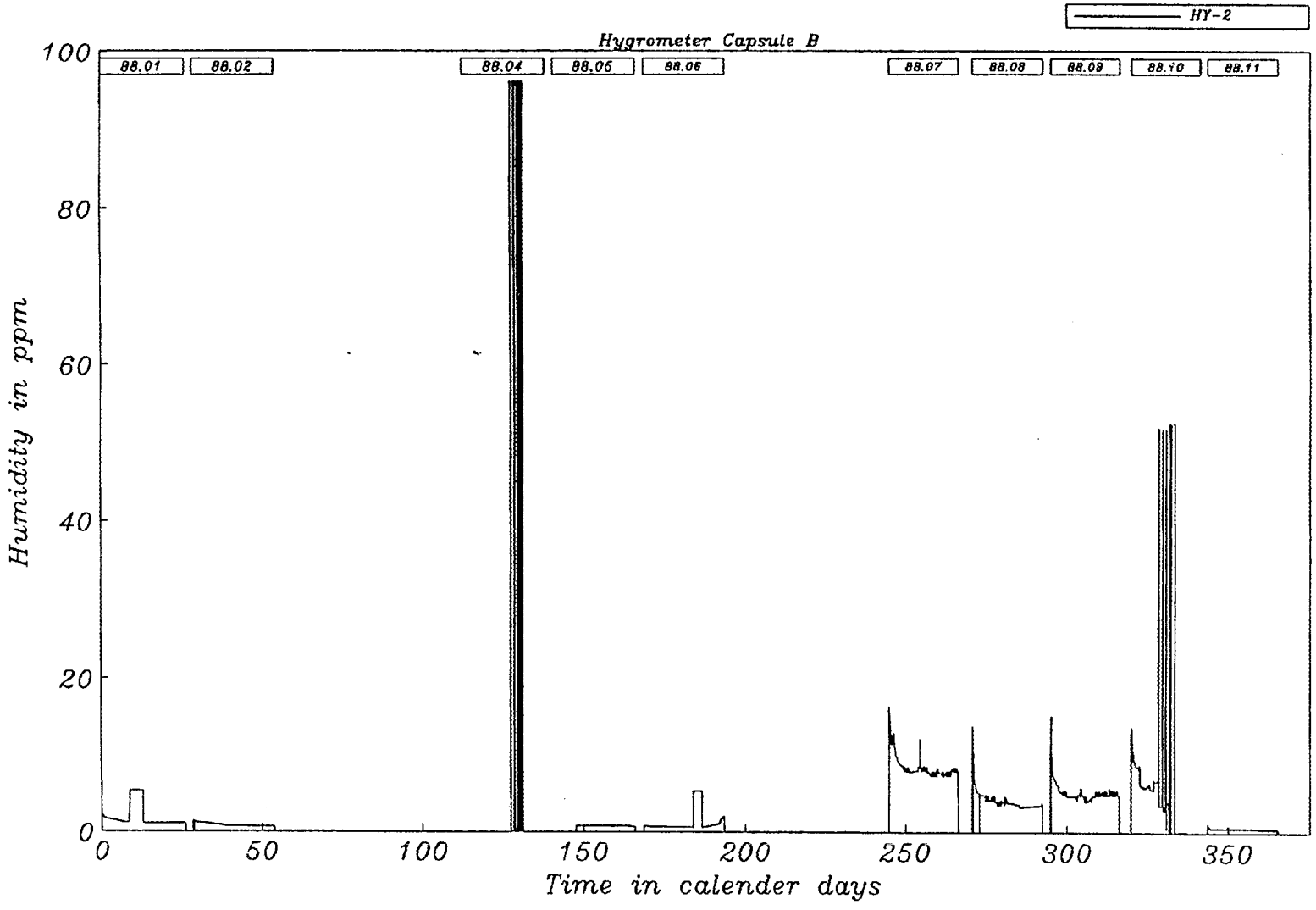

Fig. 6.6.25. Hygrometer history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

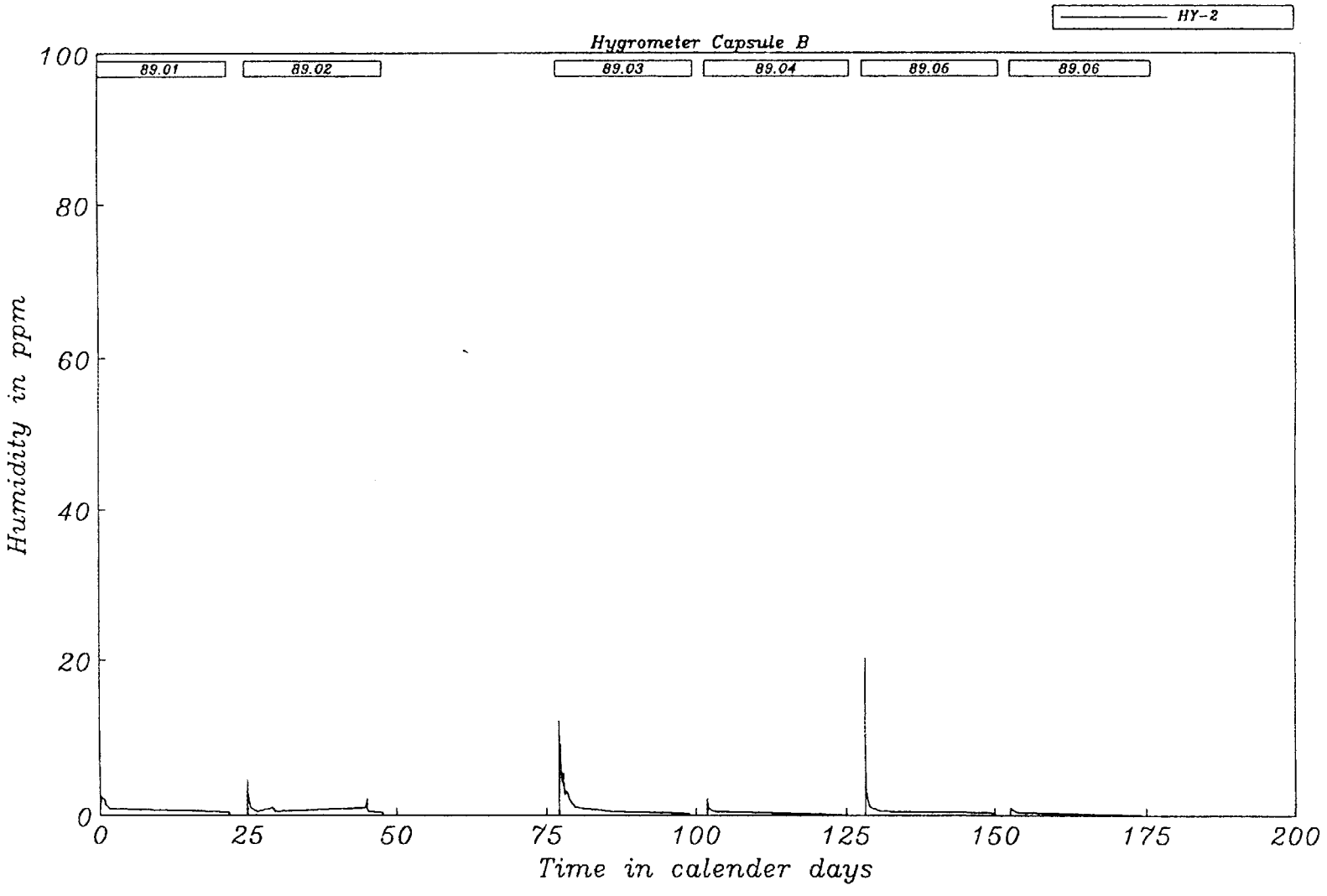

Fig. 6.6.26. Hygrometer history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

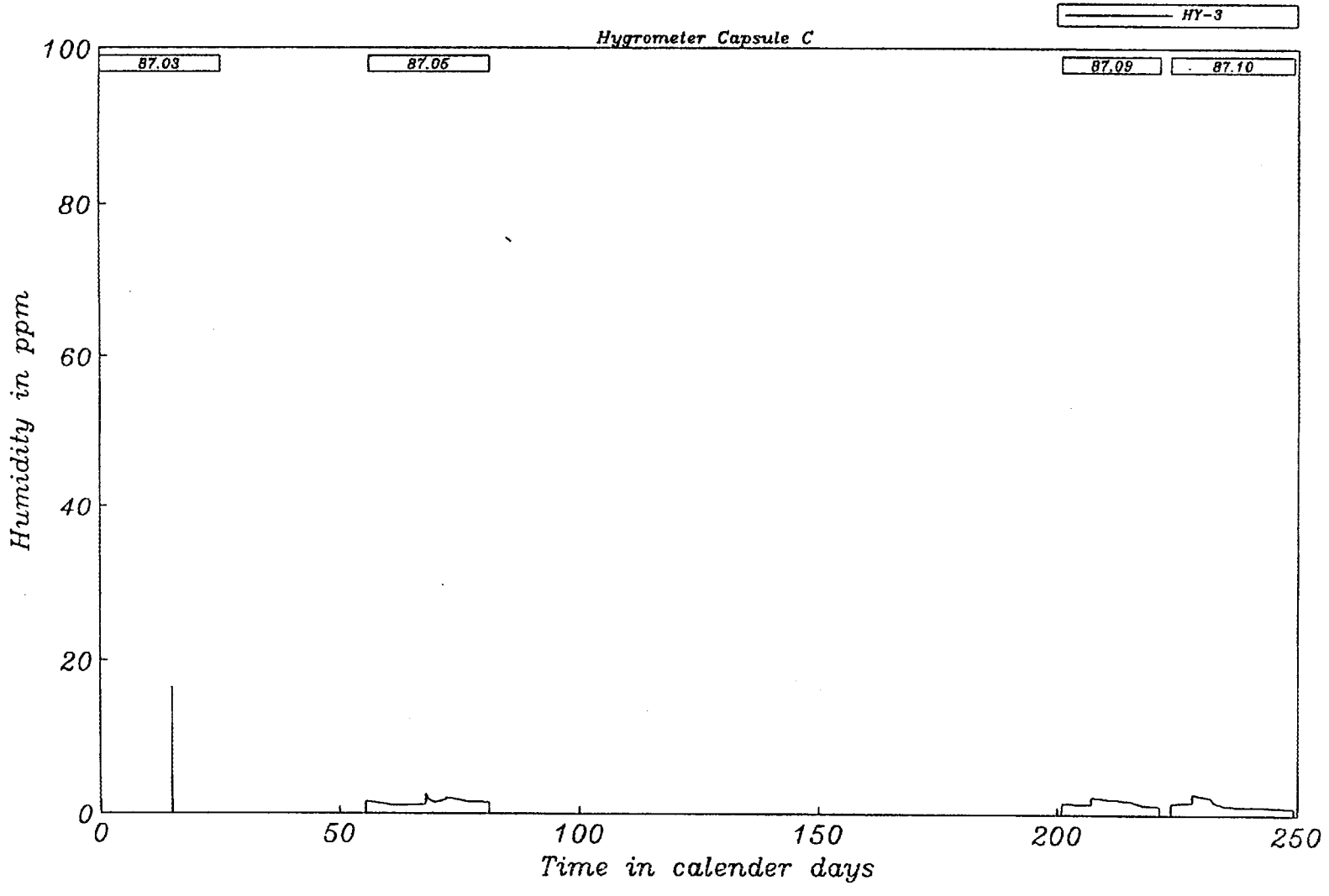

Fig. 6.6.27. Hygrometer history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

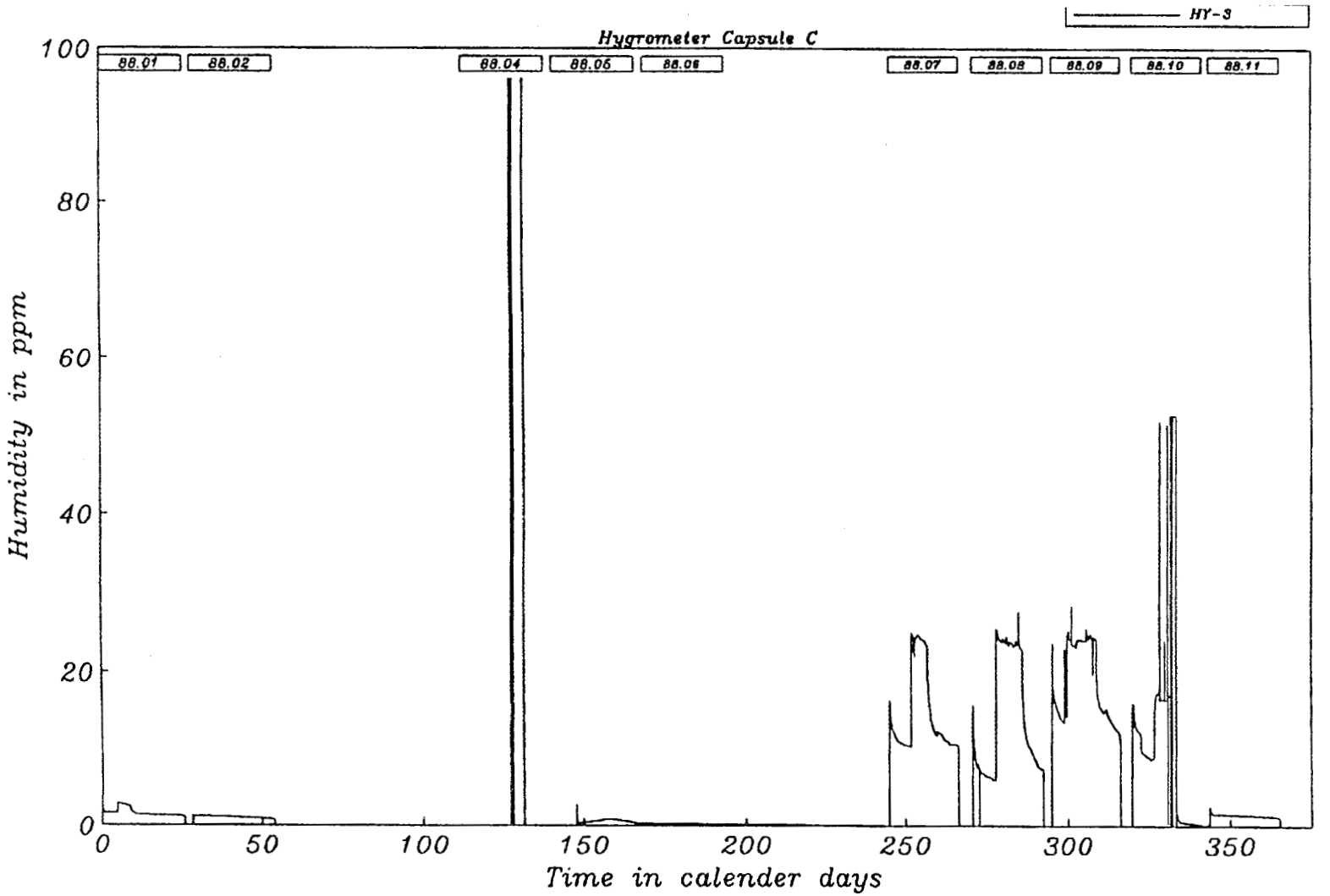

Fig. 6.6.28. Hygrometer history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

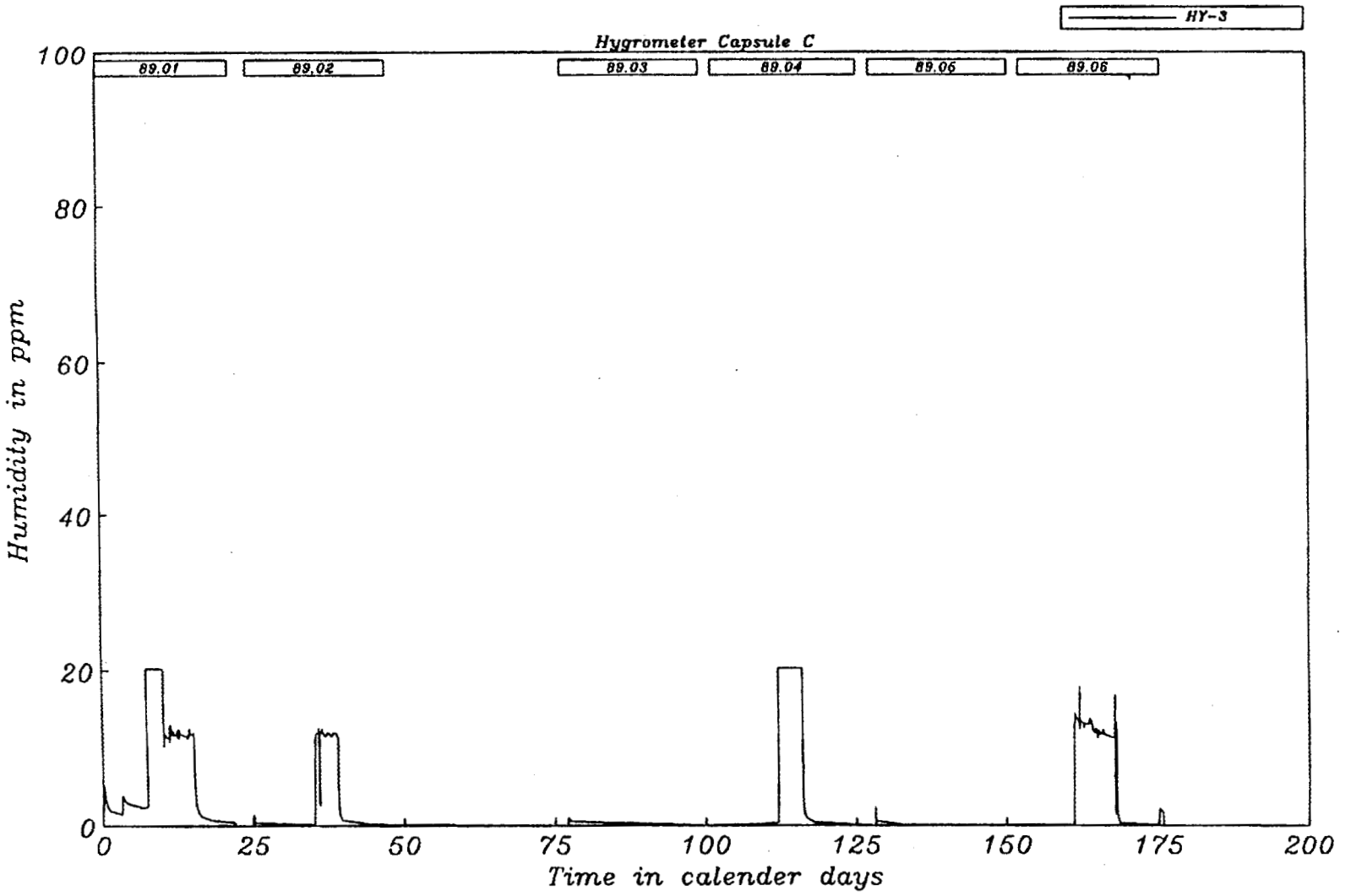

Fig. 6.6.29. Hygrometer history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

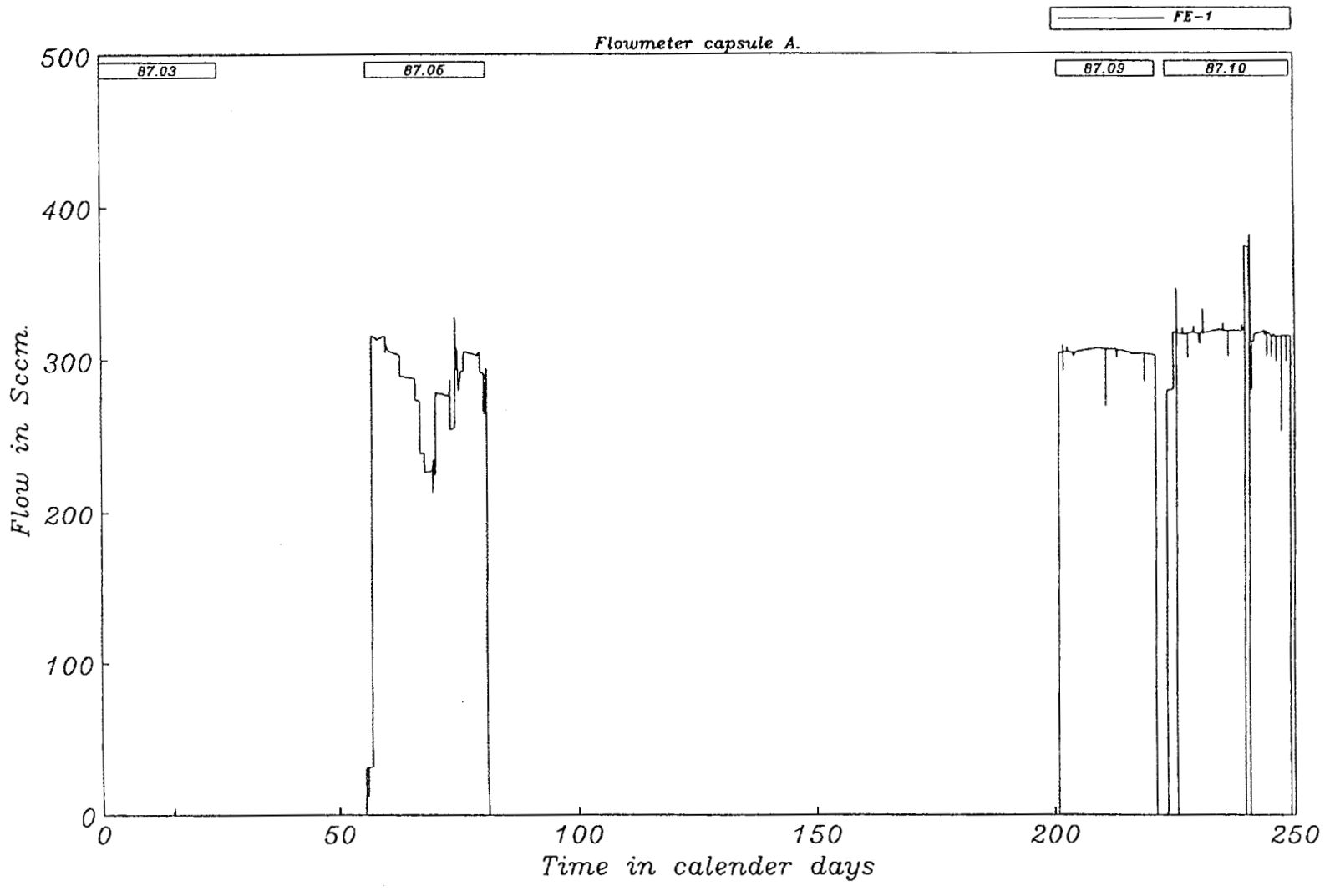

Fig. 6.6.30. Purge flow history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

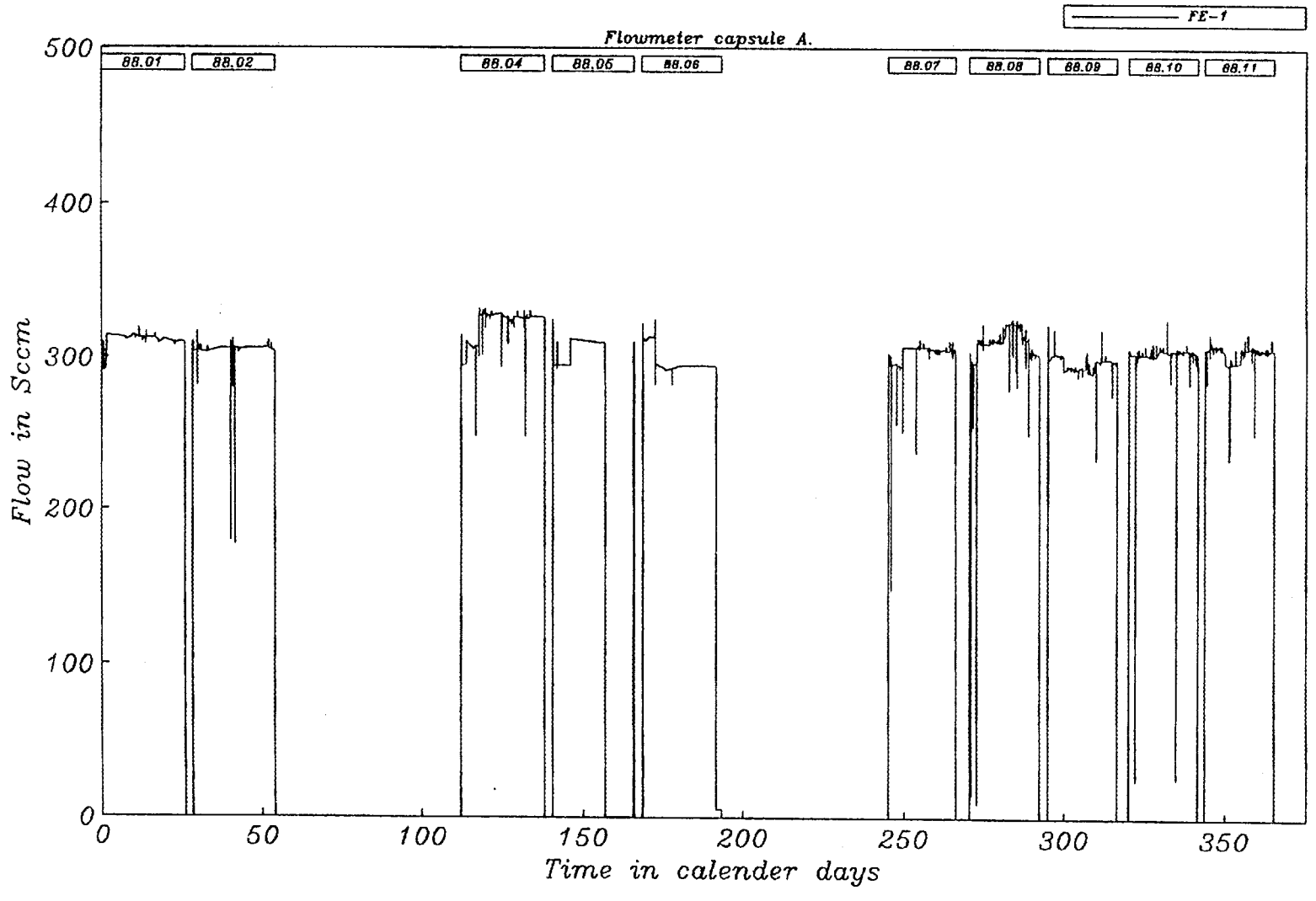

Fig. 6.6.31. Purge flow history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

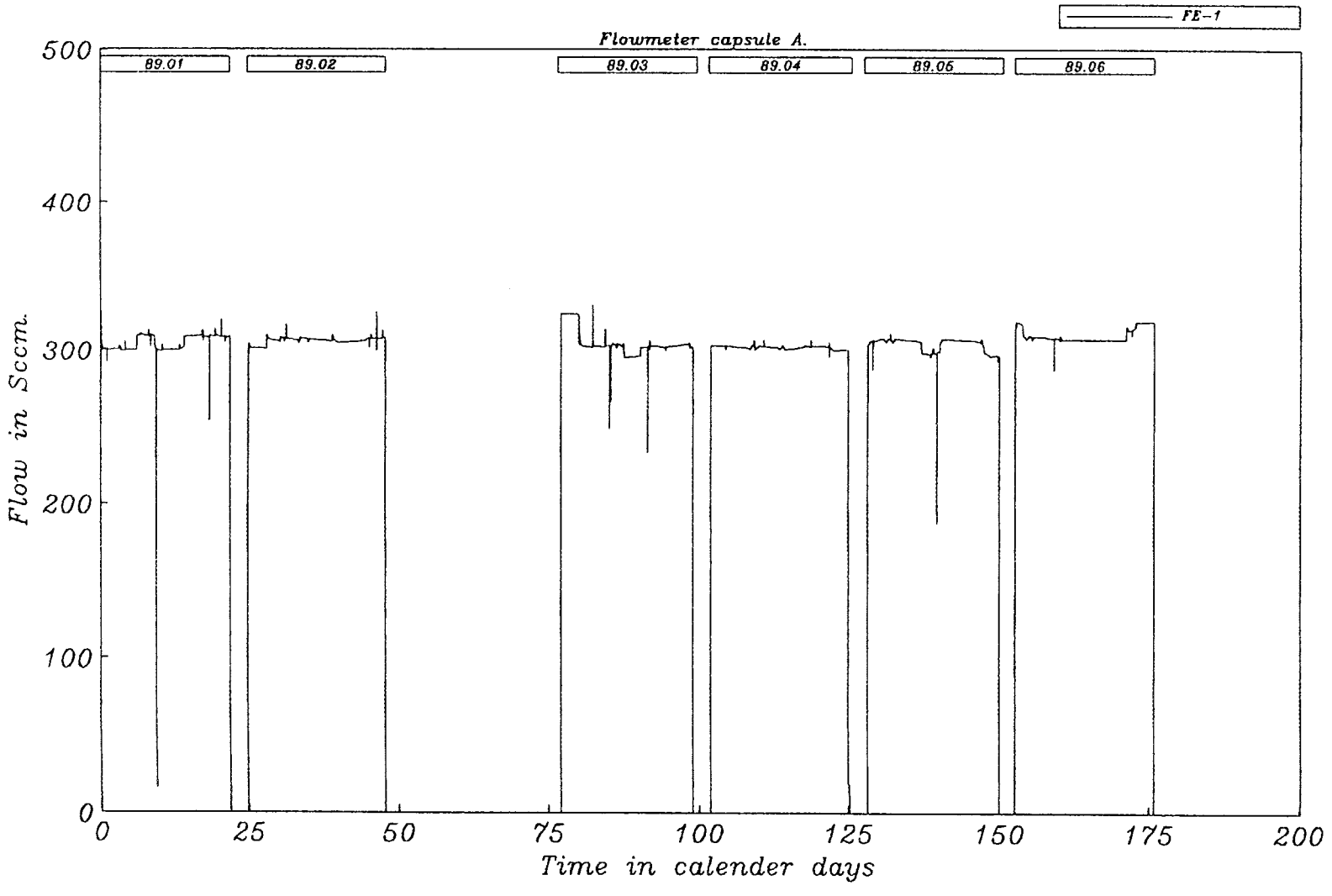

Fig. 6.6.32. Purge flow history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

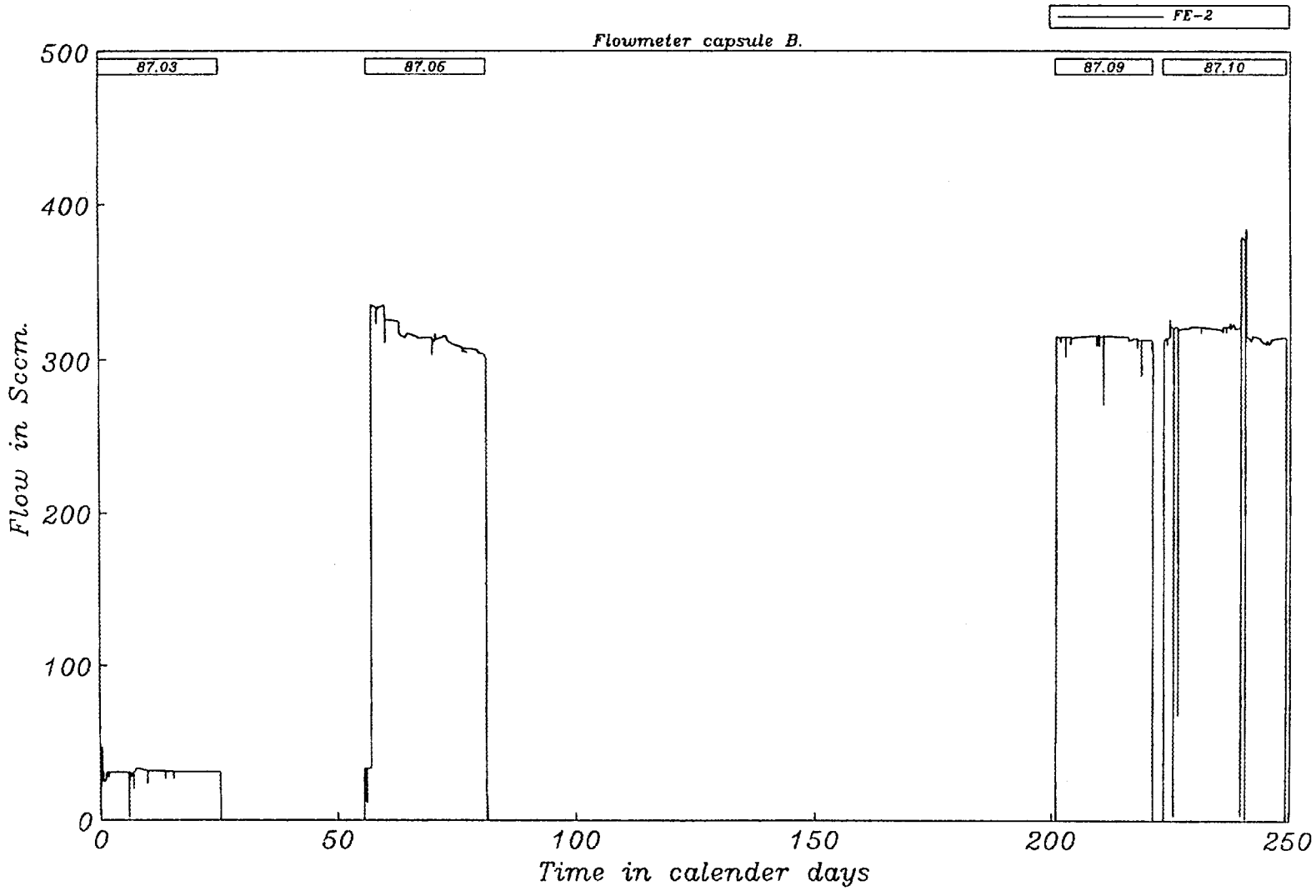

Fig. 6.6.33. Purge flow history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

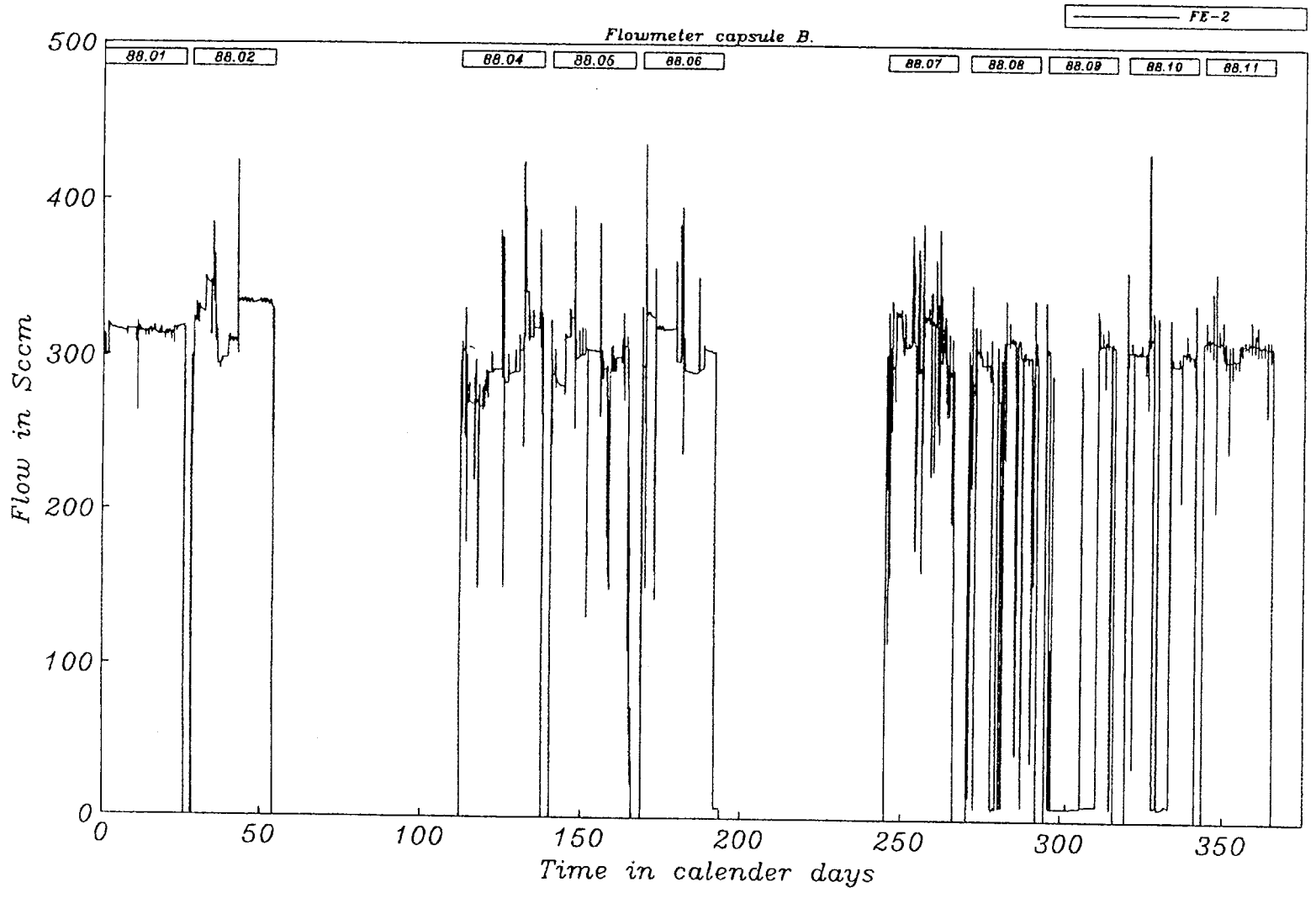

Fig. 6.6.34. Purge flow history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

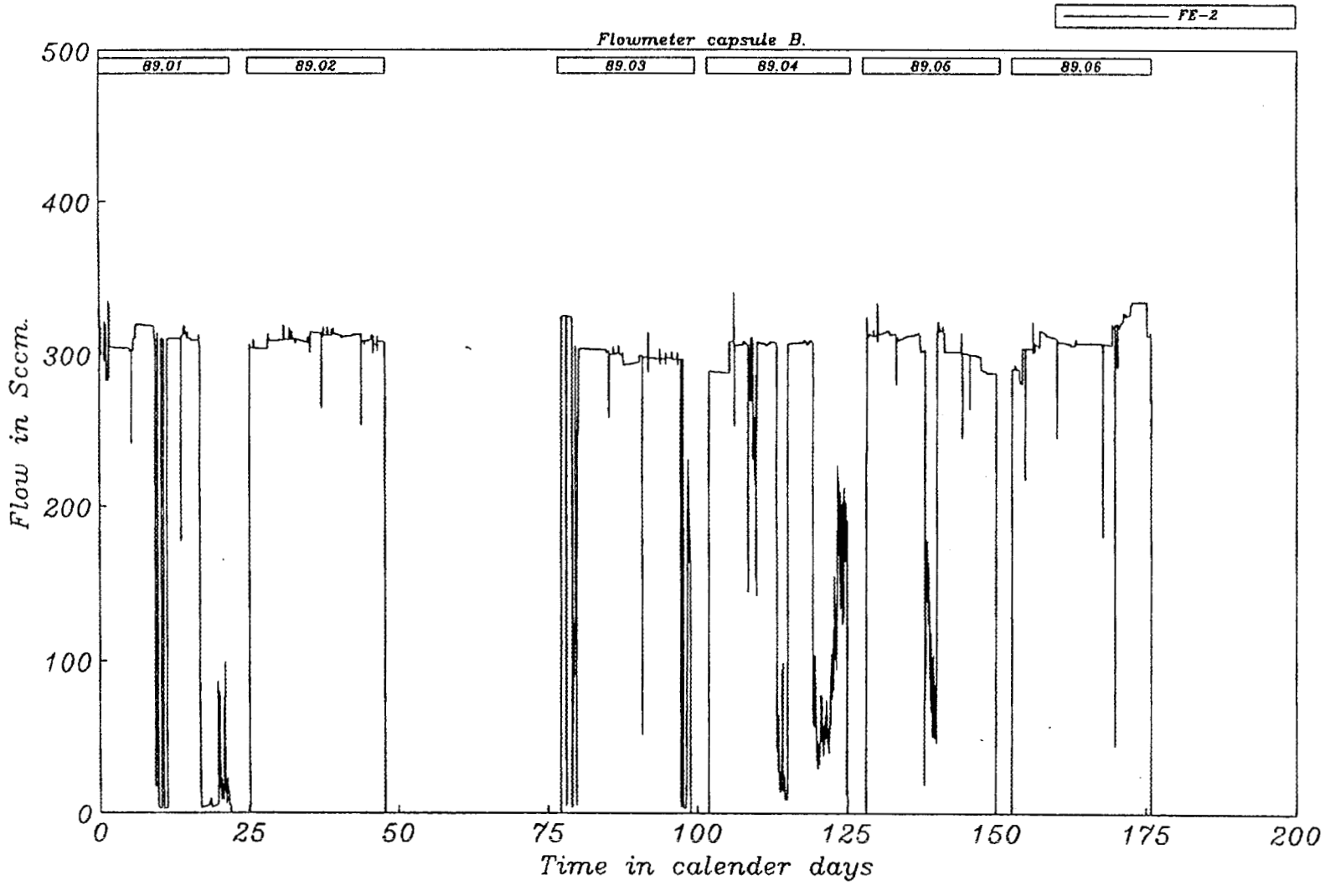

Fig. 6.6.35. Purge flow history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

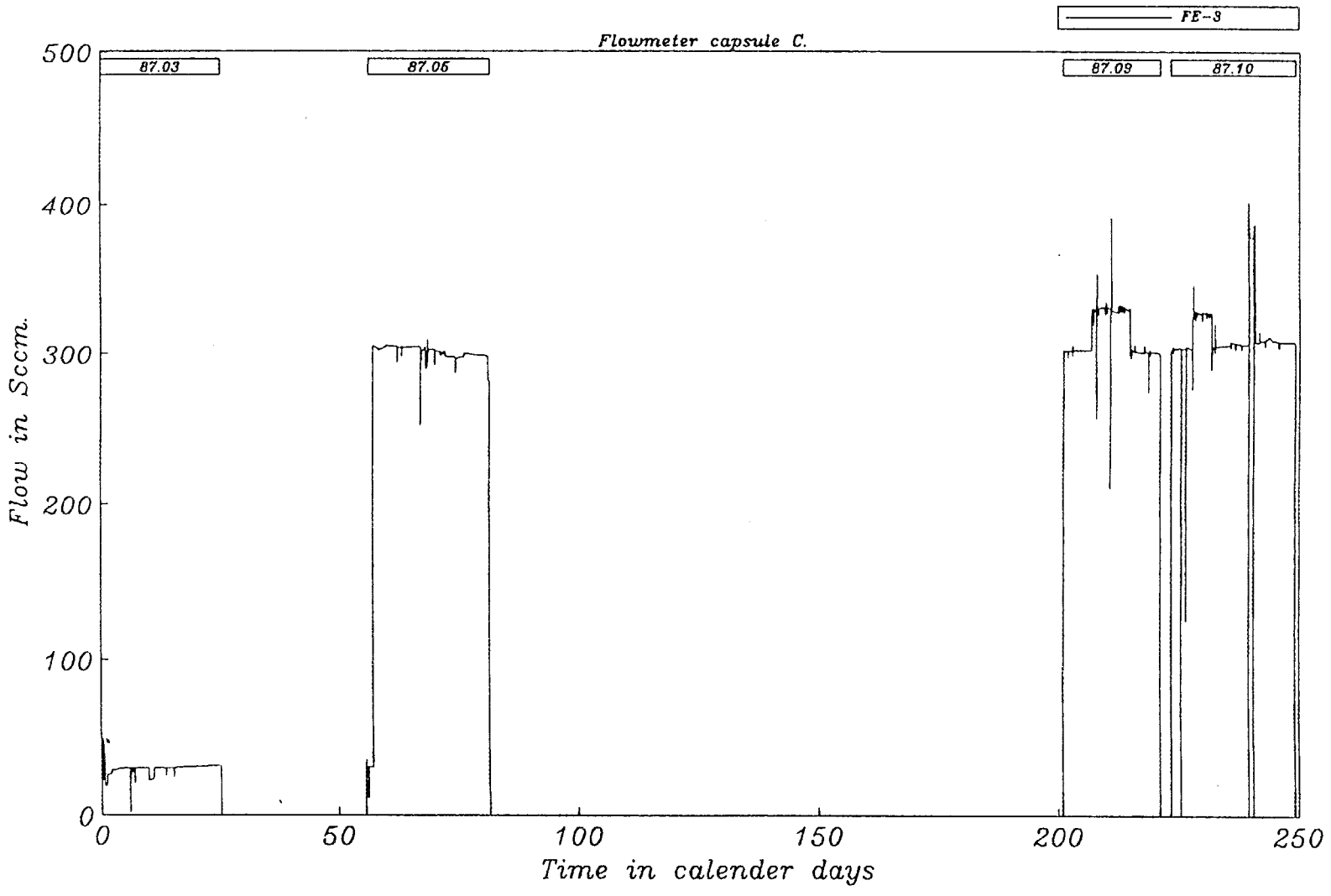

Fig. 6.6.36. Purge flow history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

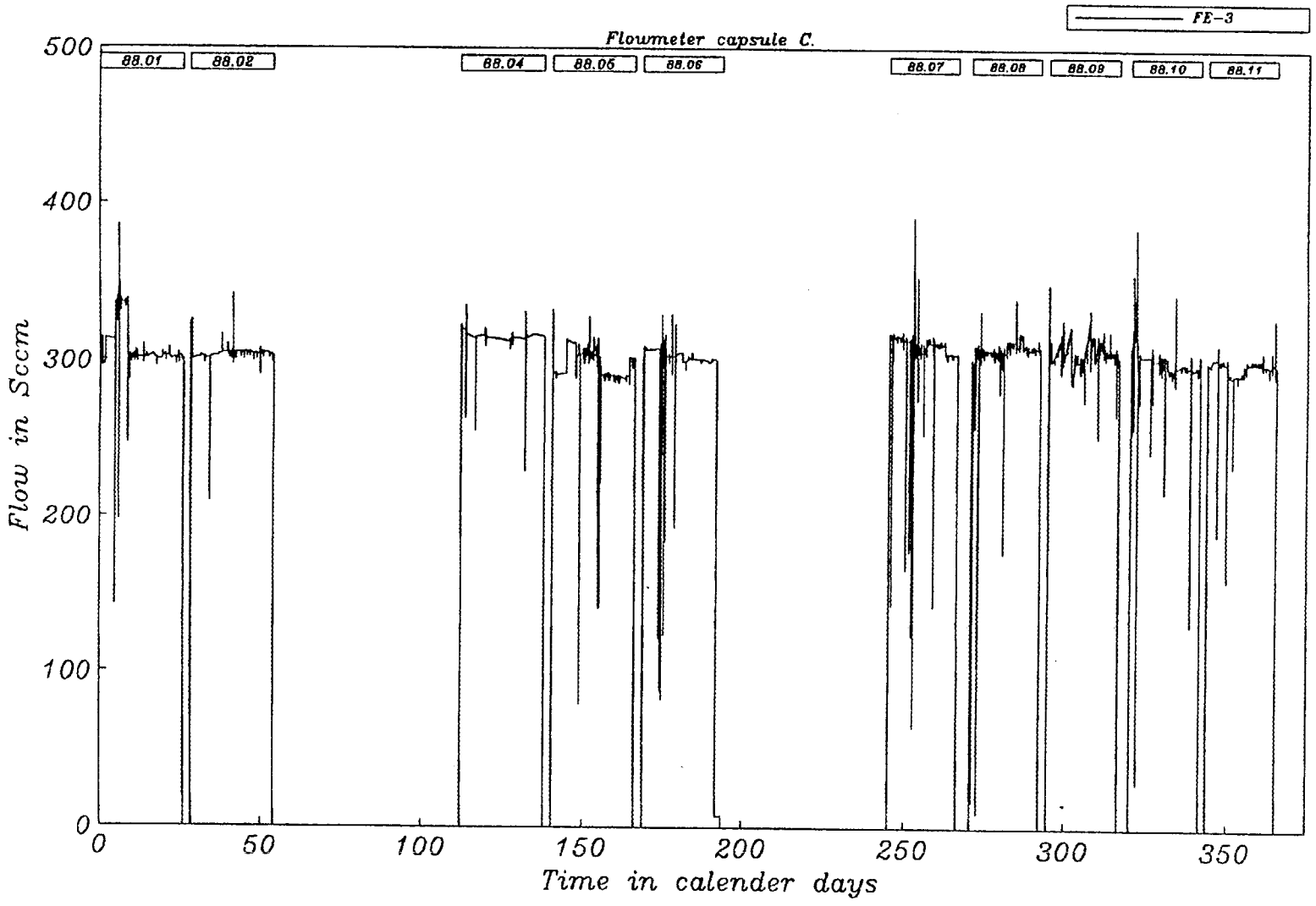

Fig. 6.6.37. Purge flow history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

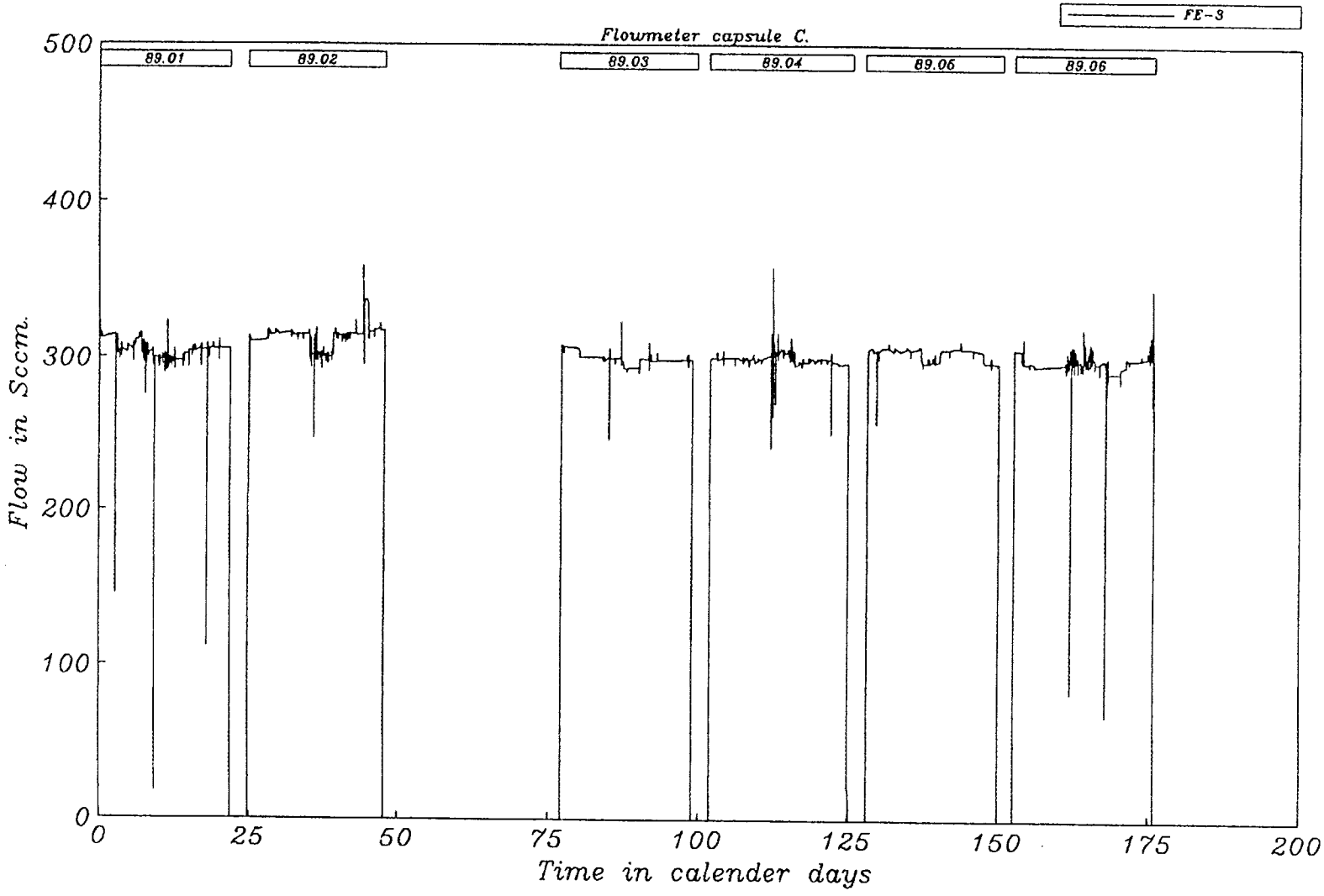

Fig. 6.6.38. Purge flow history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

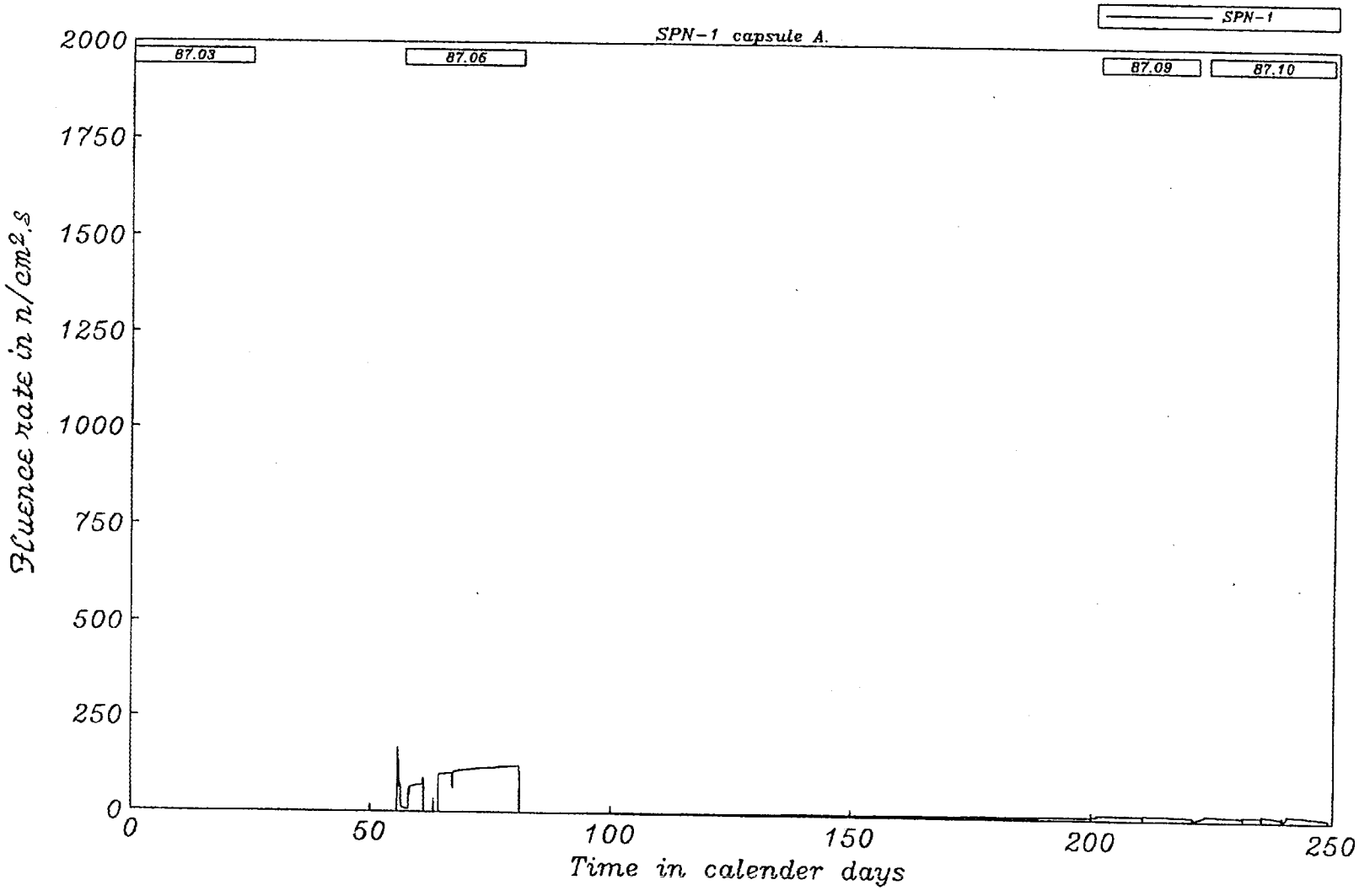

Fig. 6.6.39. SPN detector history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

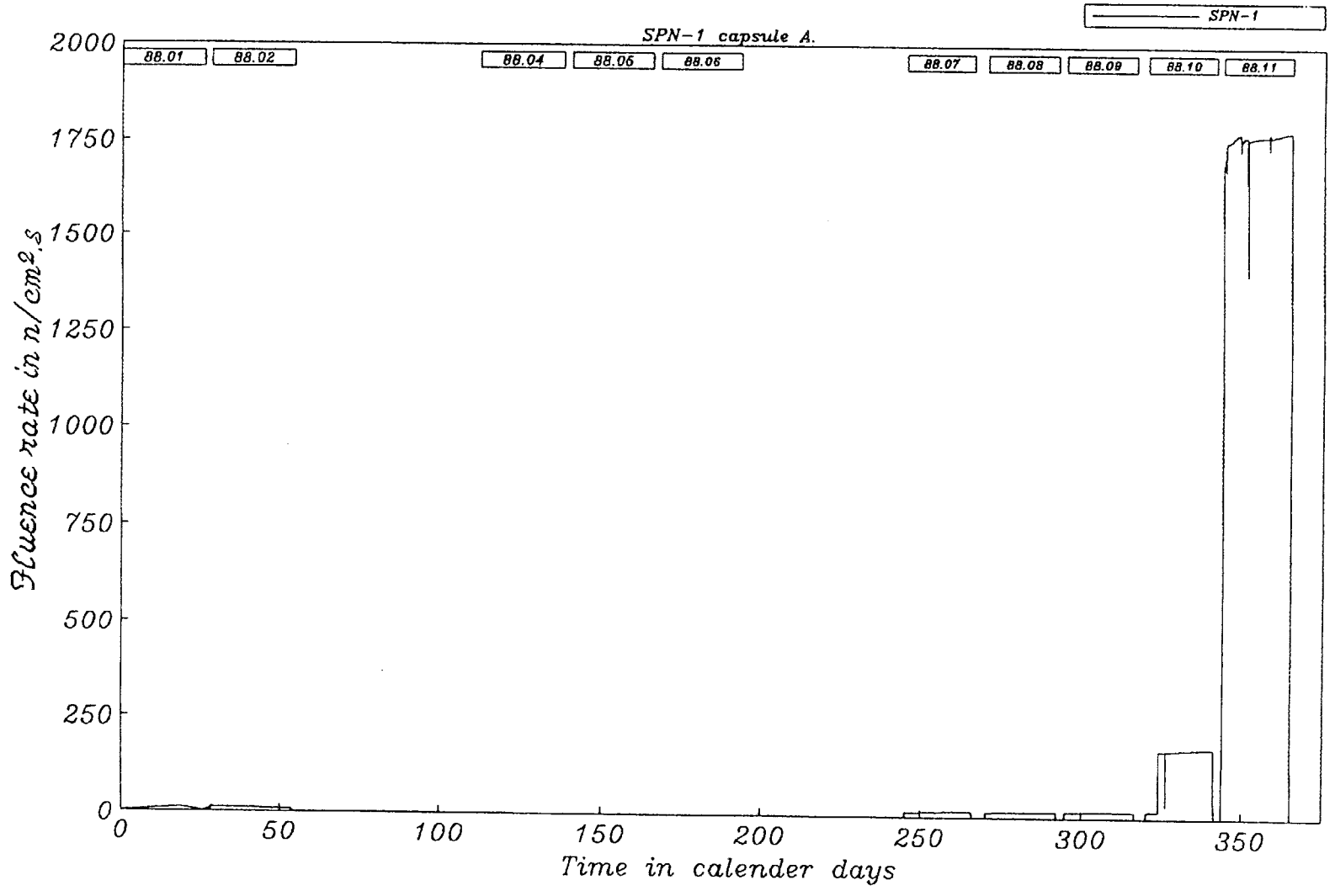

Fig. 6.6.40. SPN detector history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

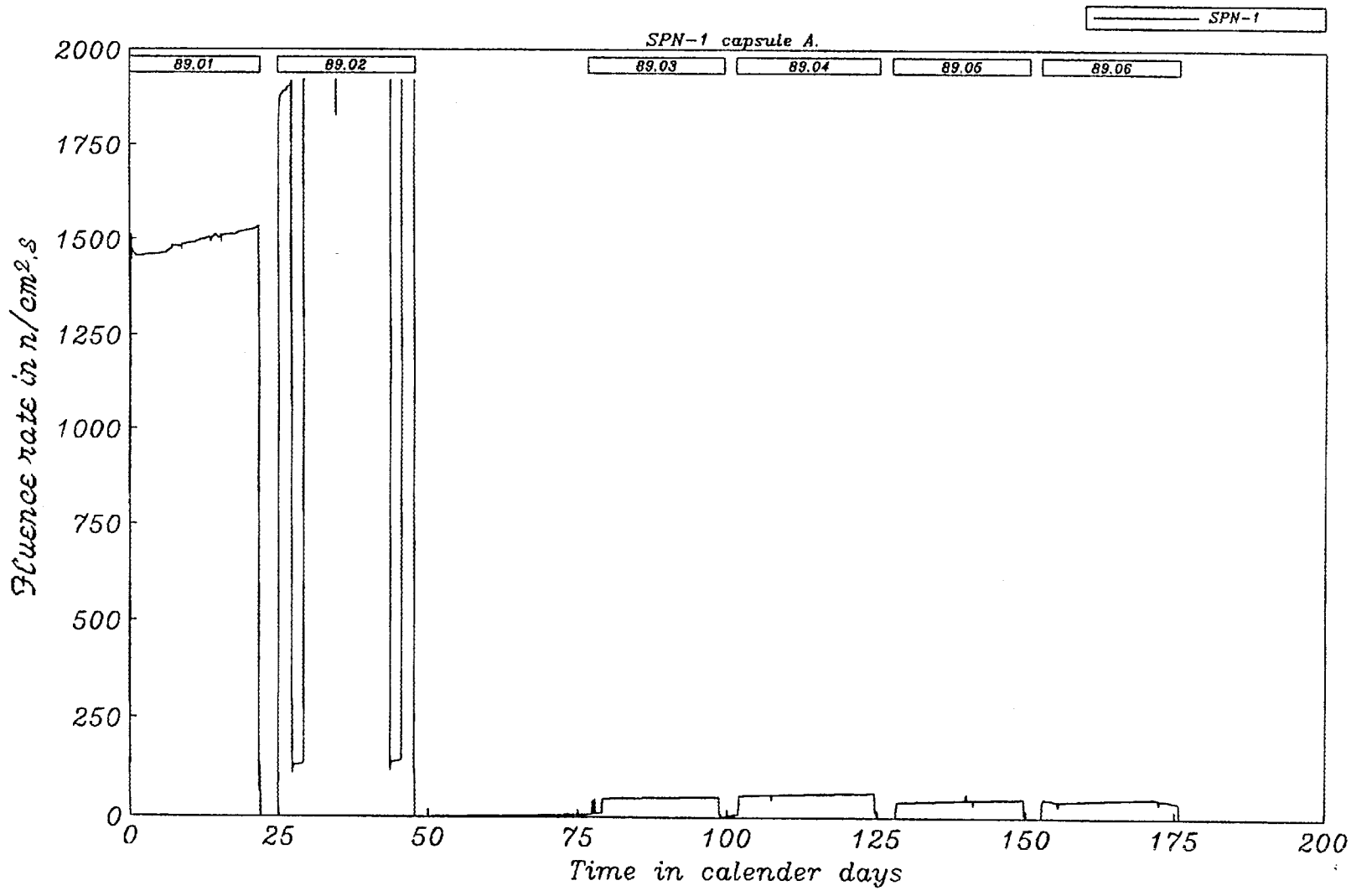

Fig. 6.6.41. SPN detector history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

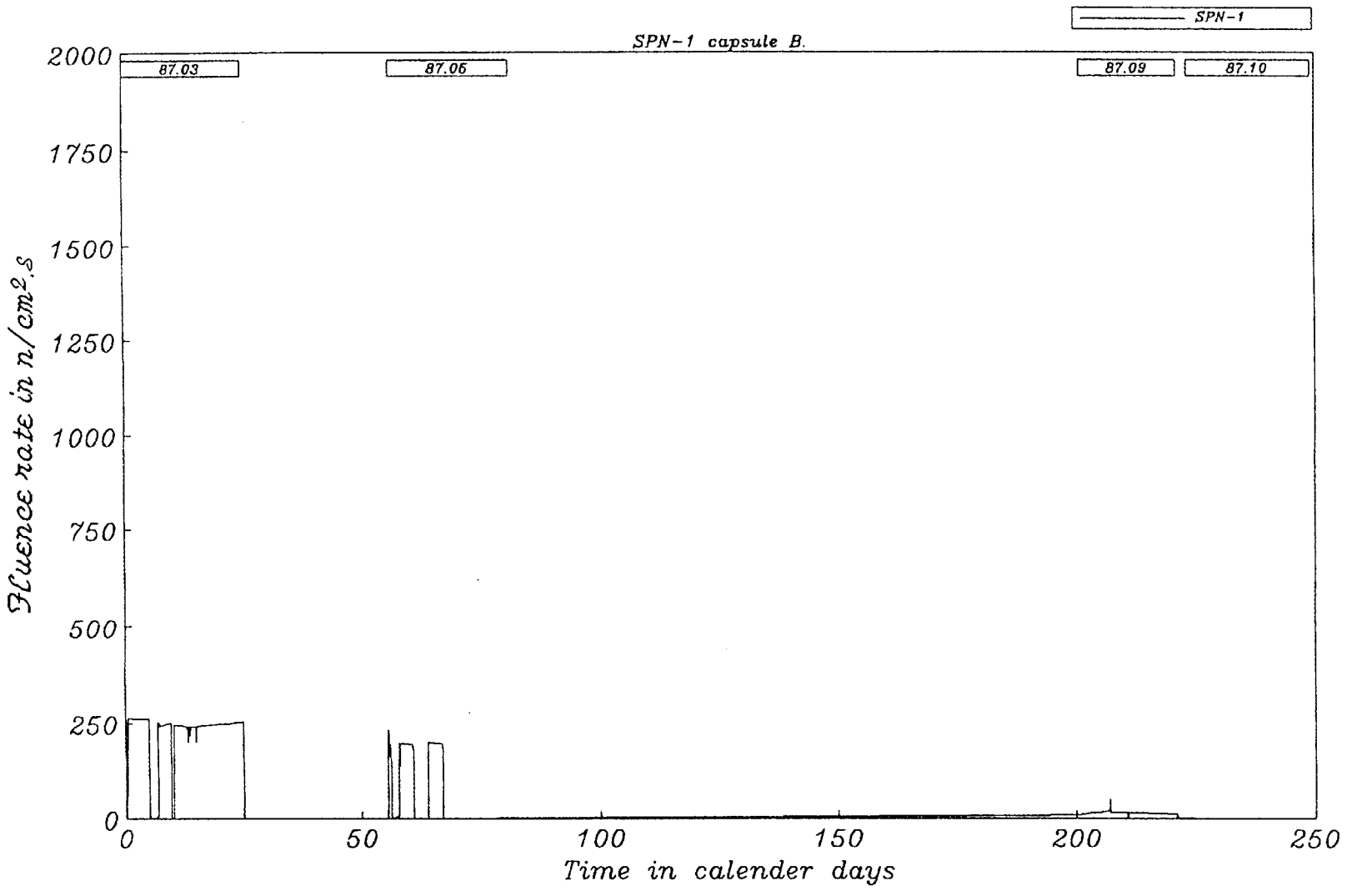

Fig. 6.6.42. SPN detector history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

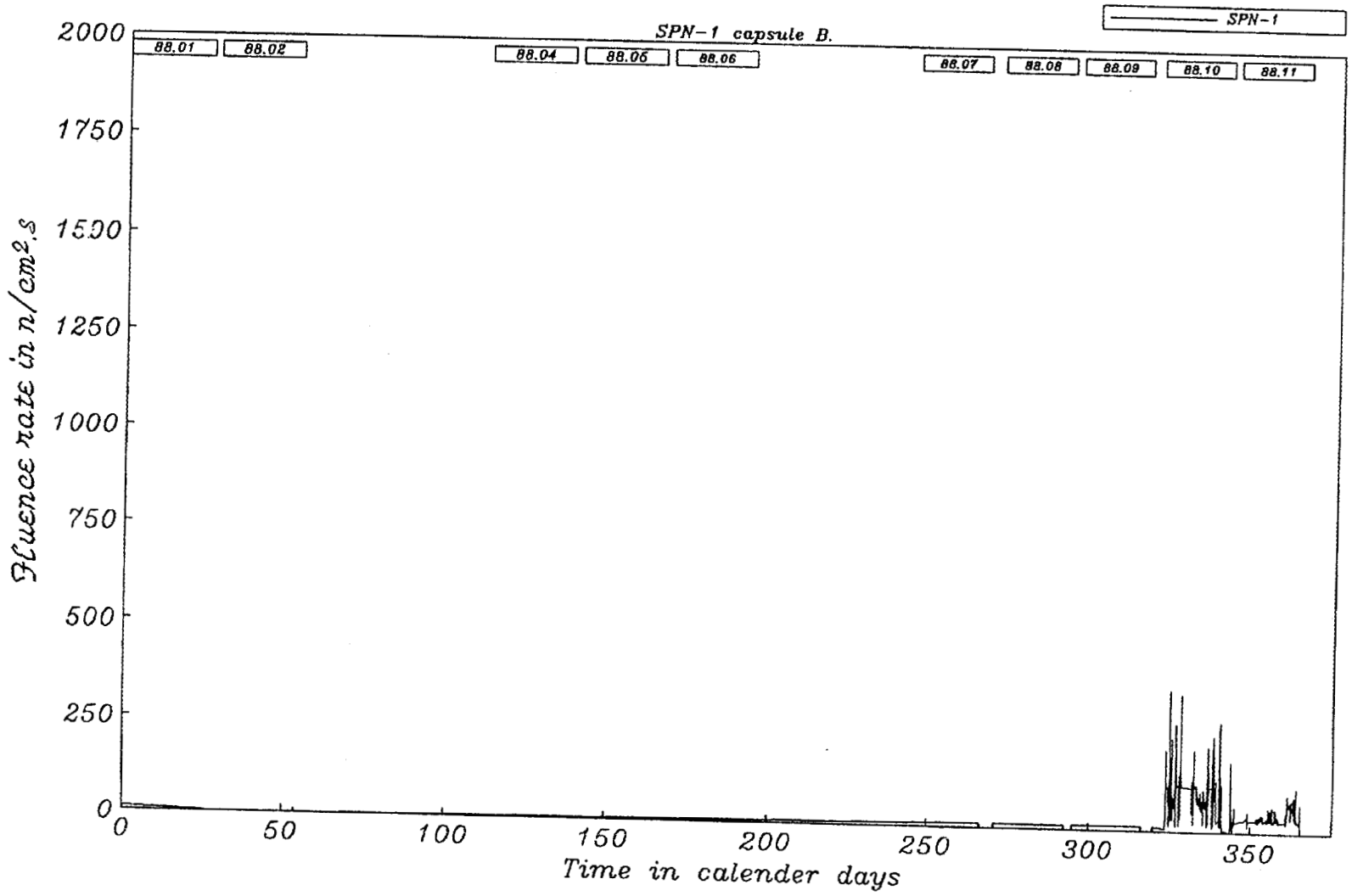

Fig. 6.6.43. SPN detector history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

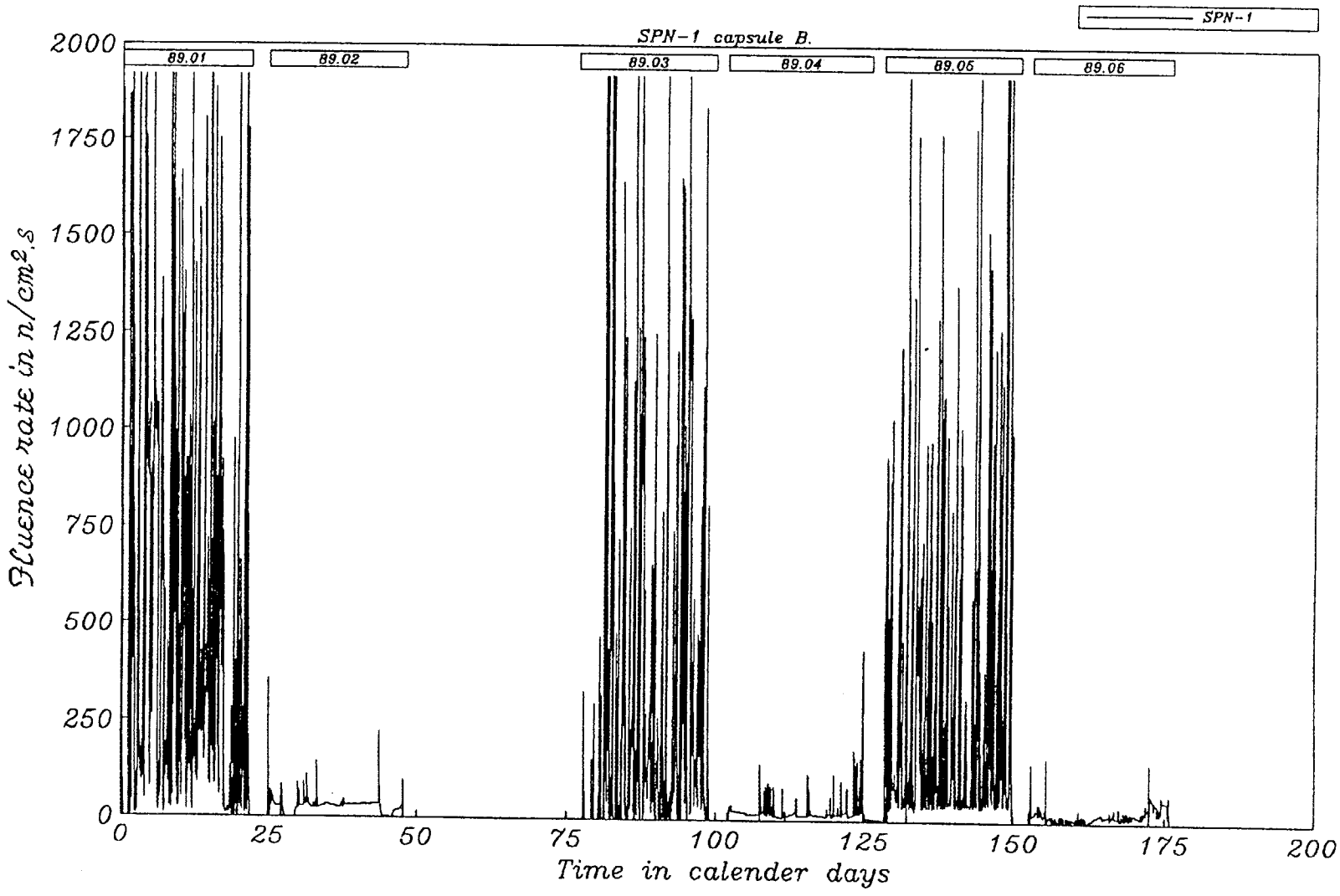

Fig. 6.6.44. SPN detector history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

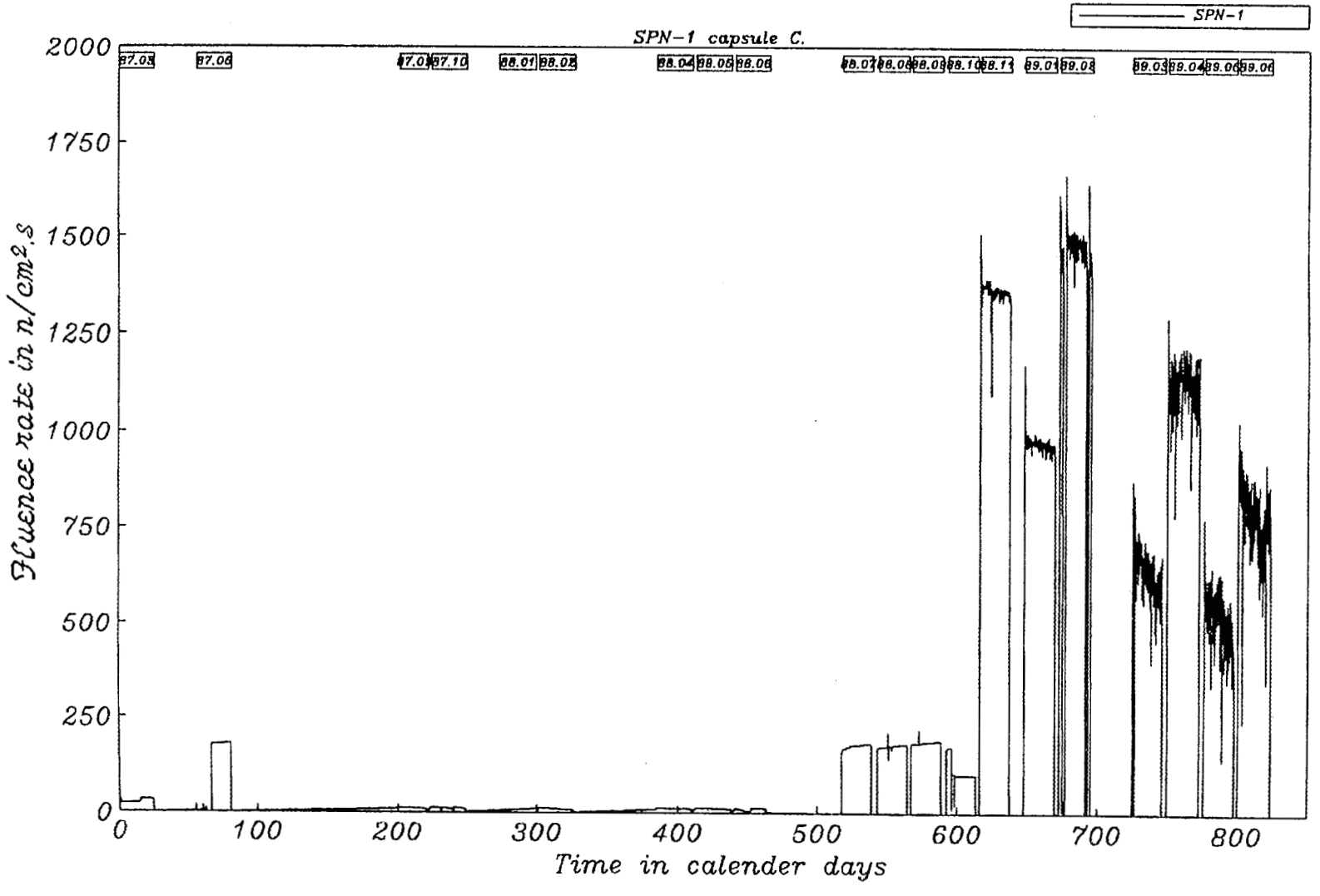

Fig. 6.6.45. SPN detector history D-214 Cycles 87.03 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

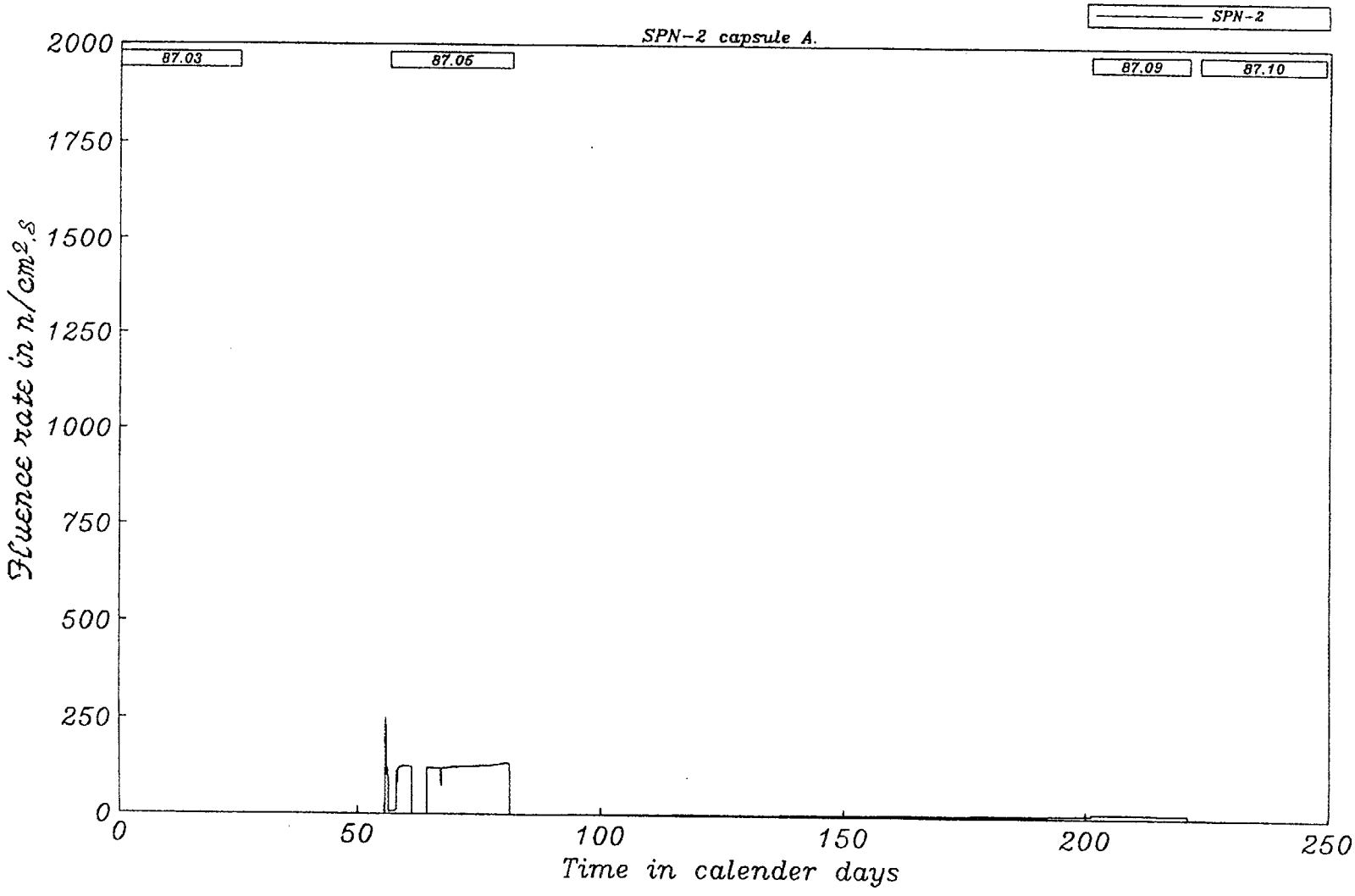

Fig. 6.6.46. SPN detector history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

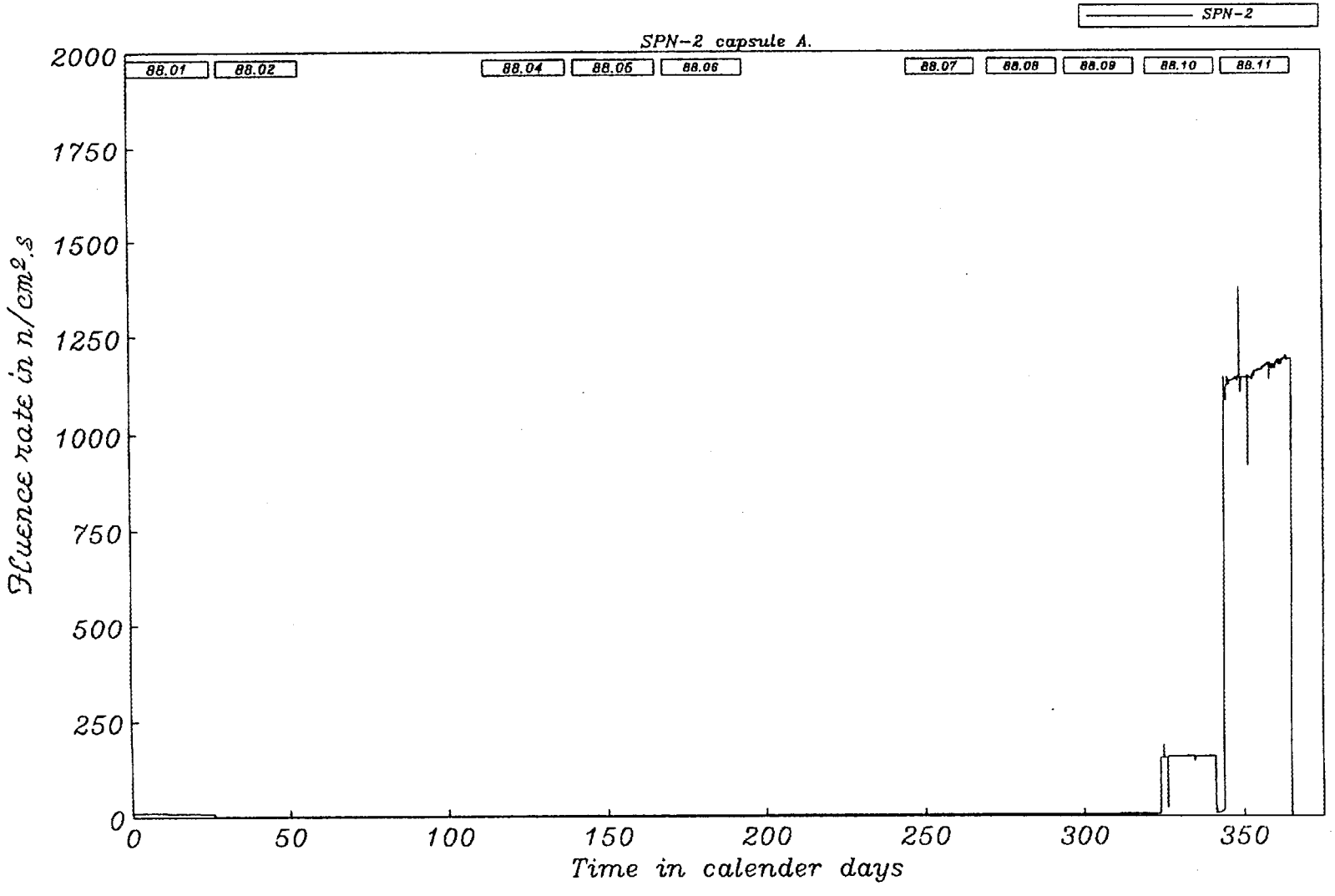

Fig. 6.6.47. SPN detector history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

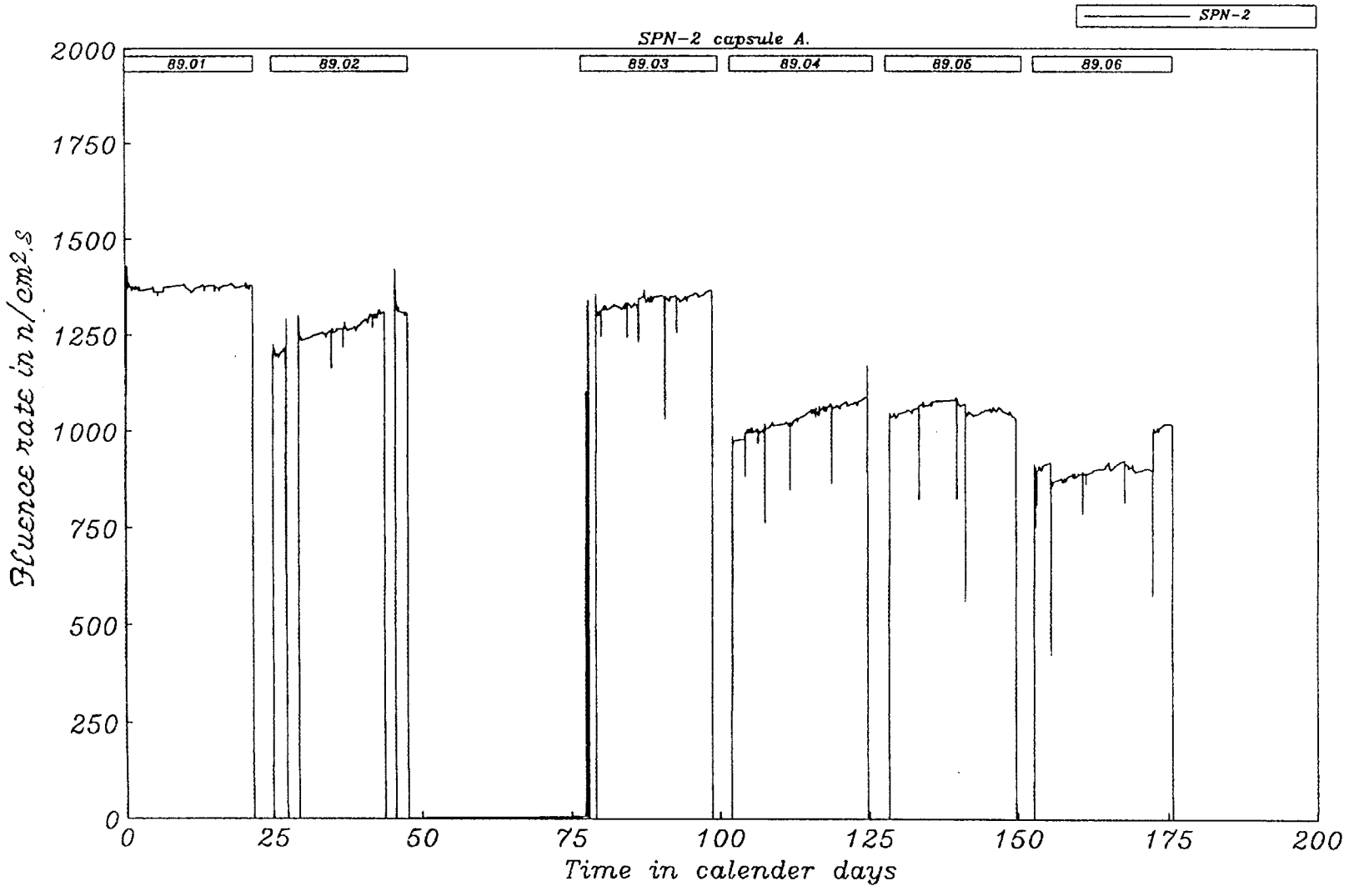

Fig. 6.6.48. SPN detector history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

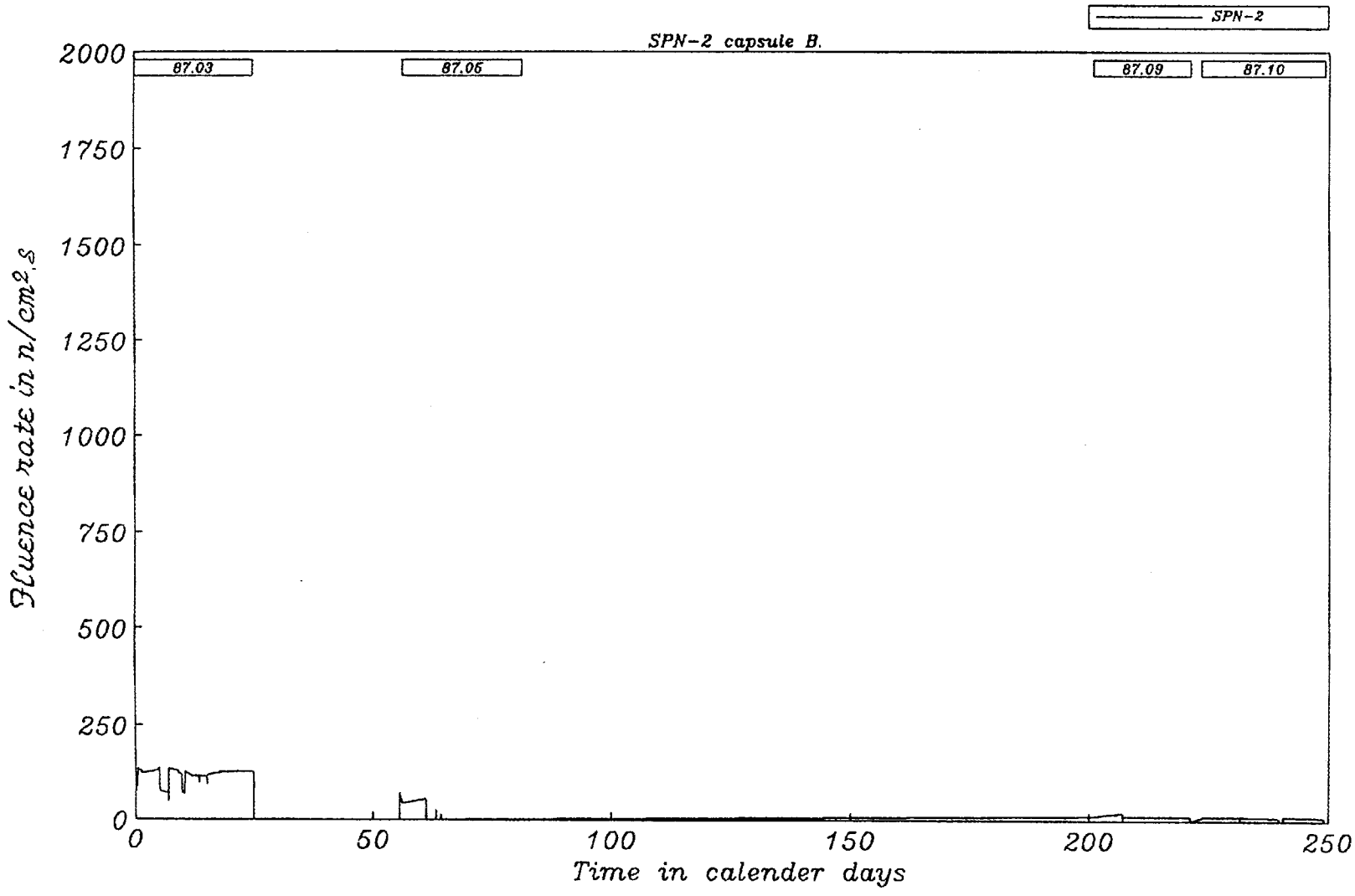

Fig. 6.6.49. SPN detector history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

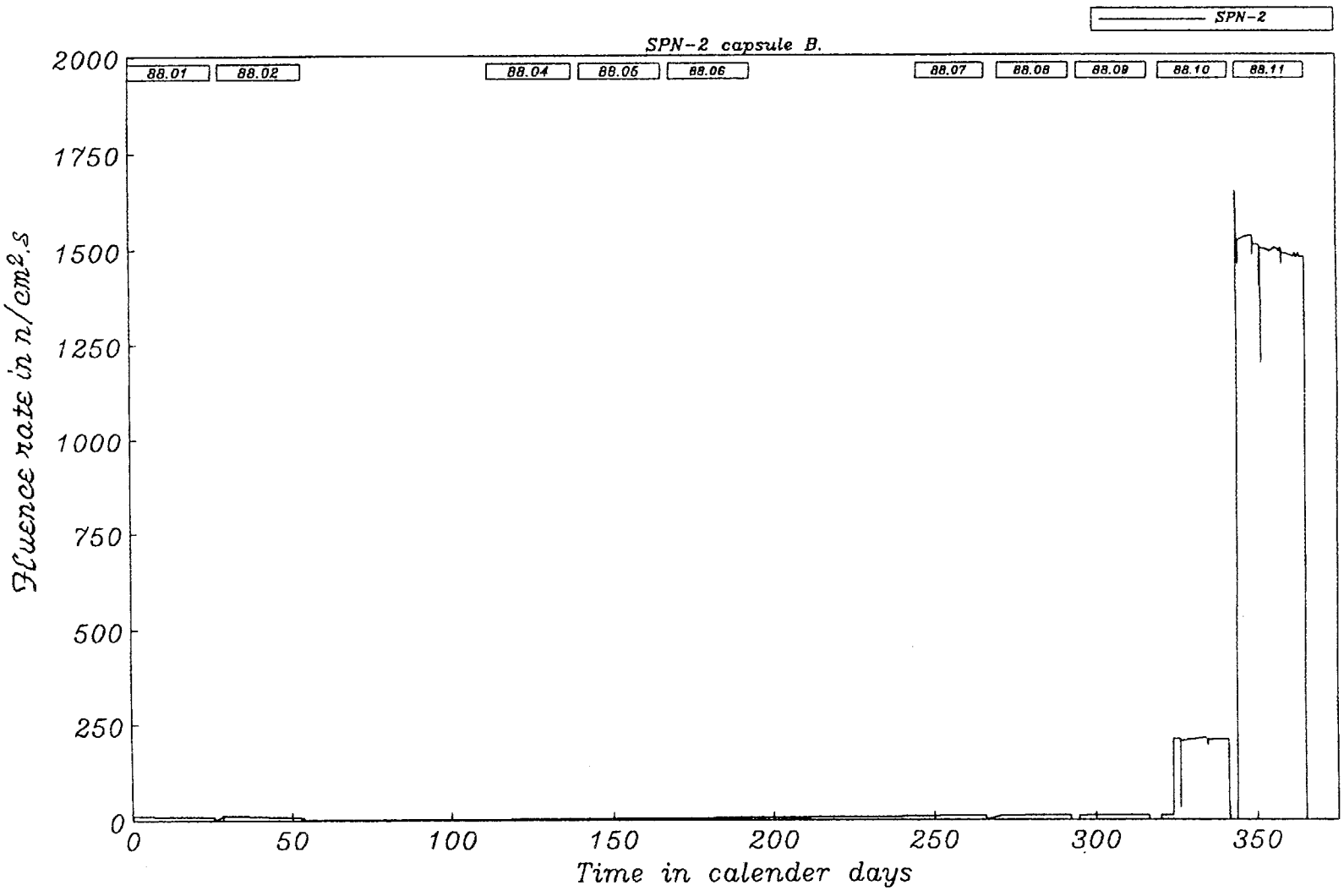

Fig. 6.6.50. SPN detector history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

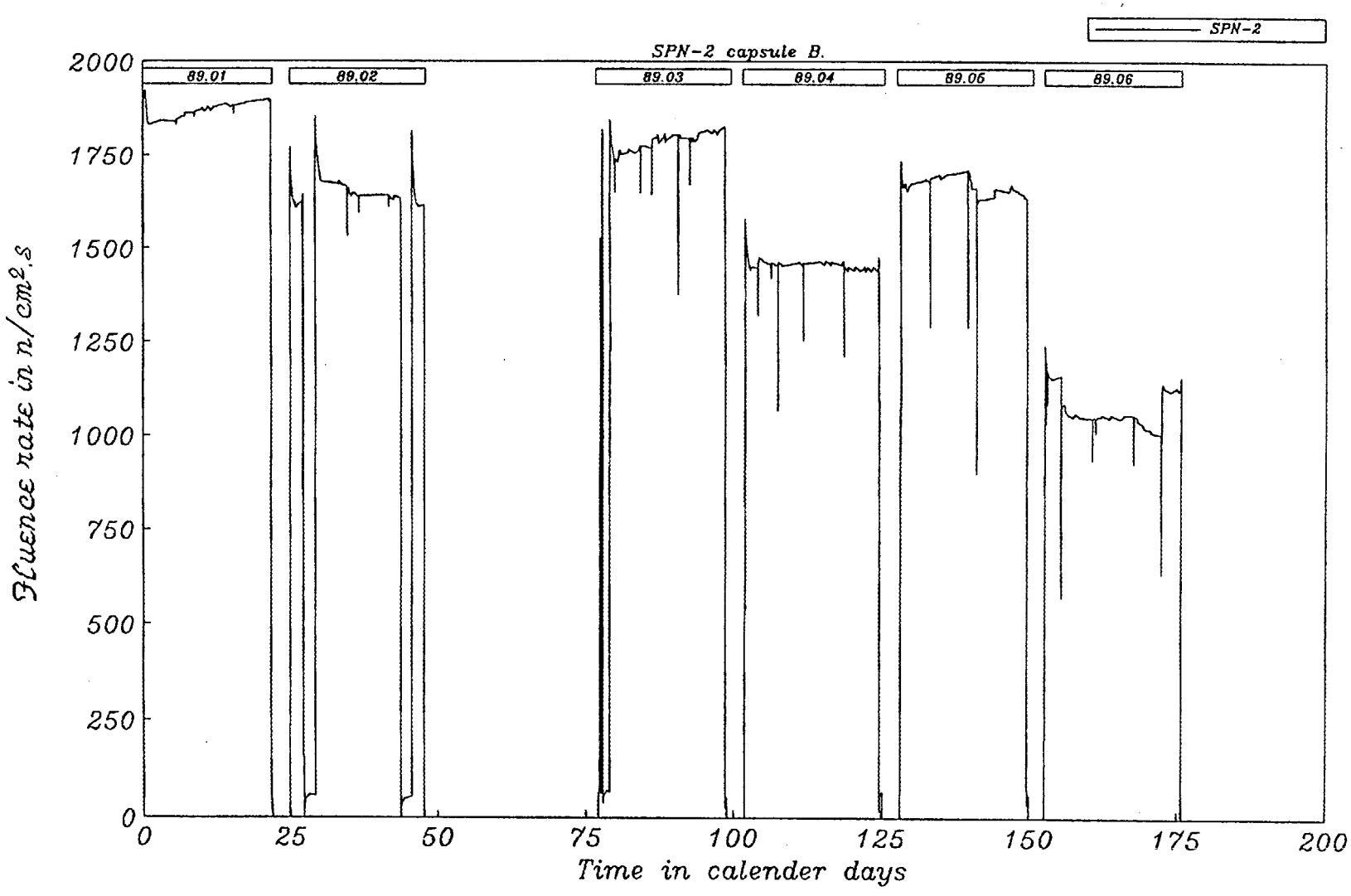

Fig. 6.6.51. SPN detector history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

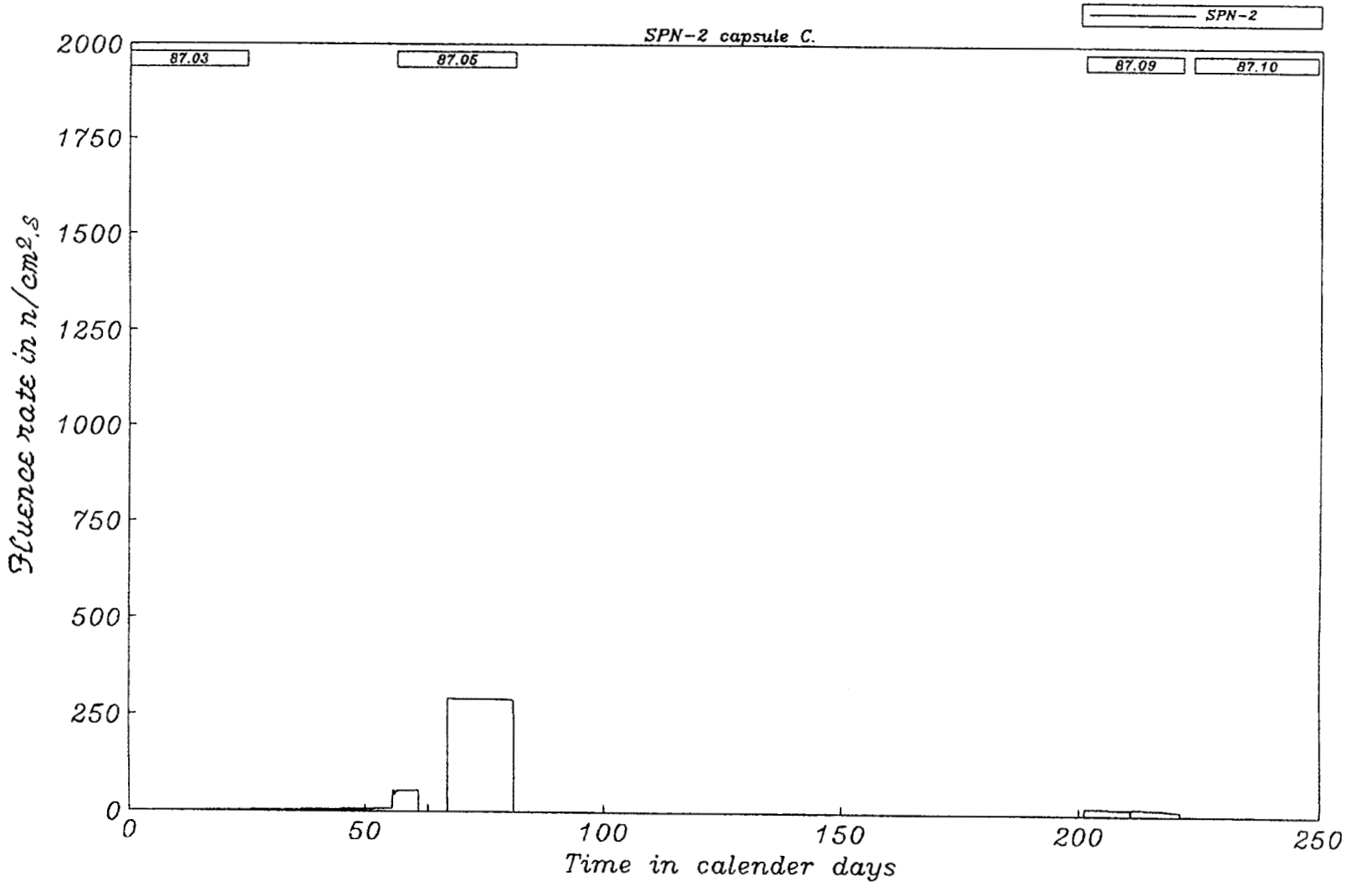

Fig. 6.6.52. SPN detector history D-214 Cycles 87.03 – 87.10
Source: JRC-IAM Petten, HFR Unit, The Netherlands

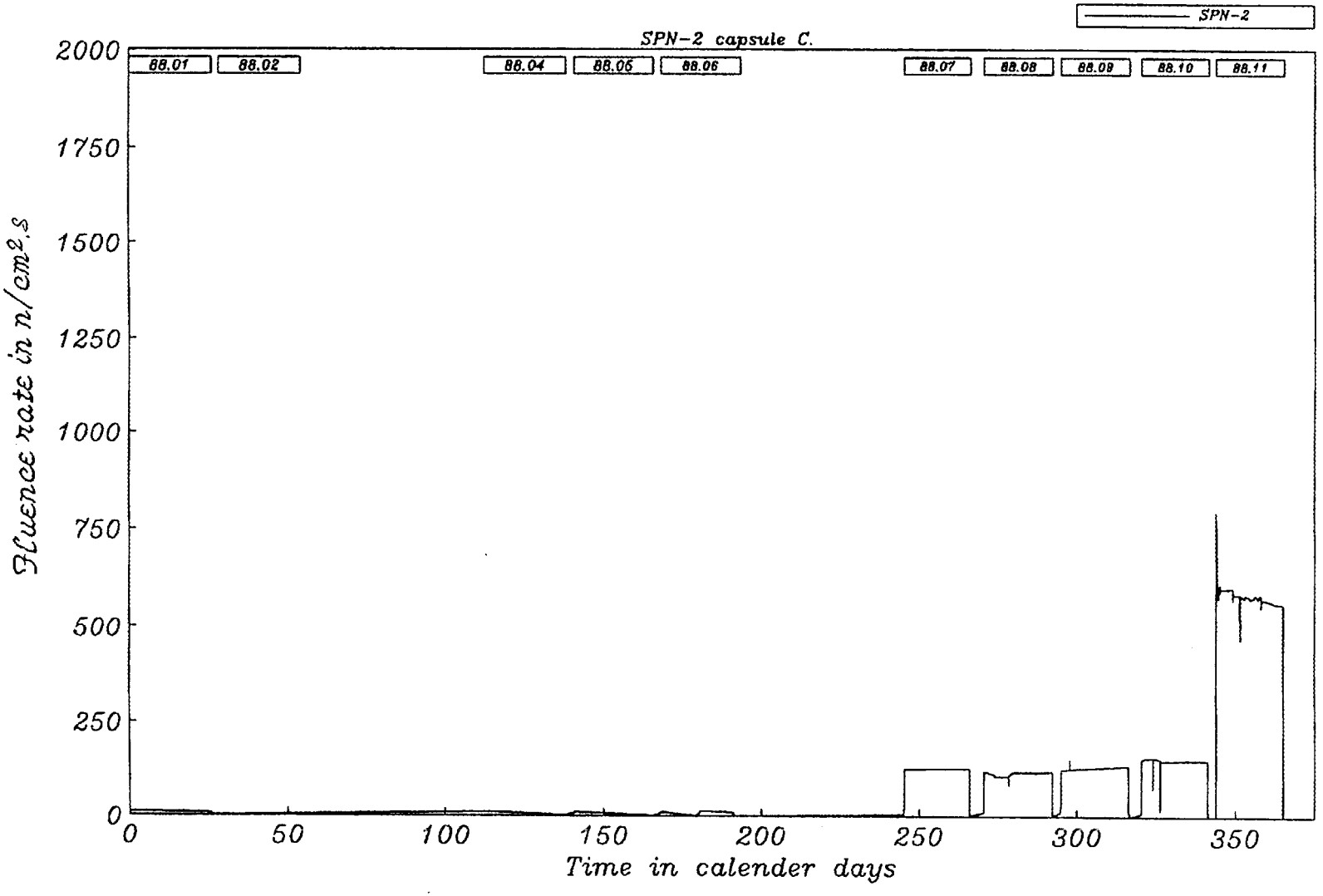

Fig. 6.6.53. SPN detector history D-214 Cycles 88.01 – 88.11
Source: JRC-IAM Petten, HFR Unit, The Netherlands

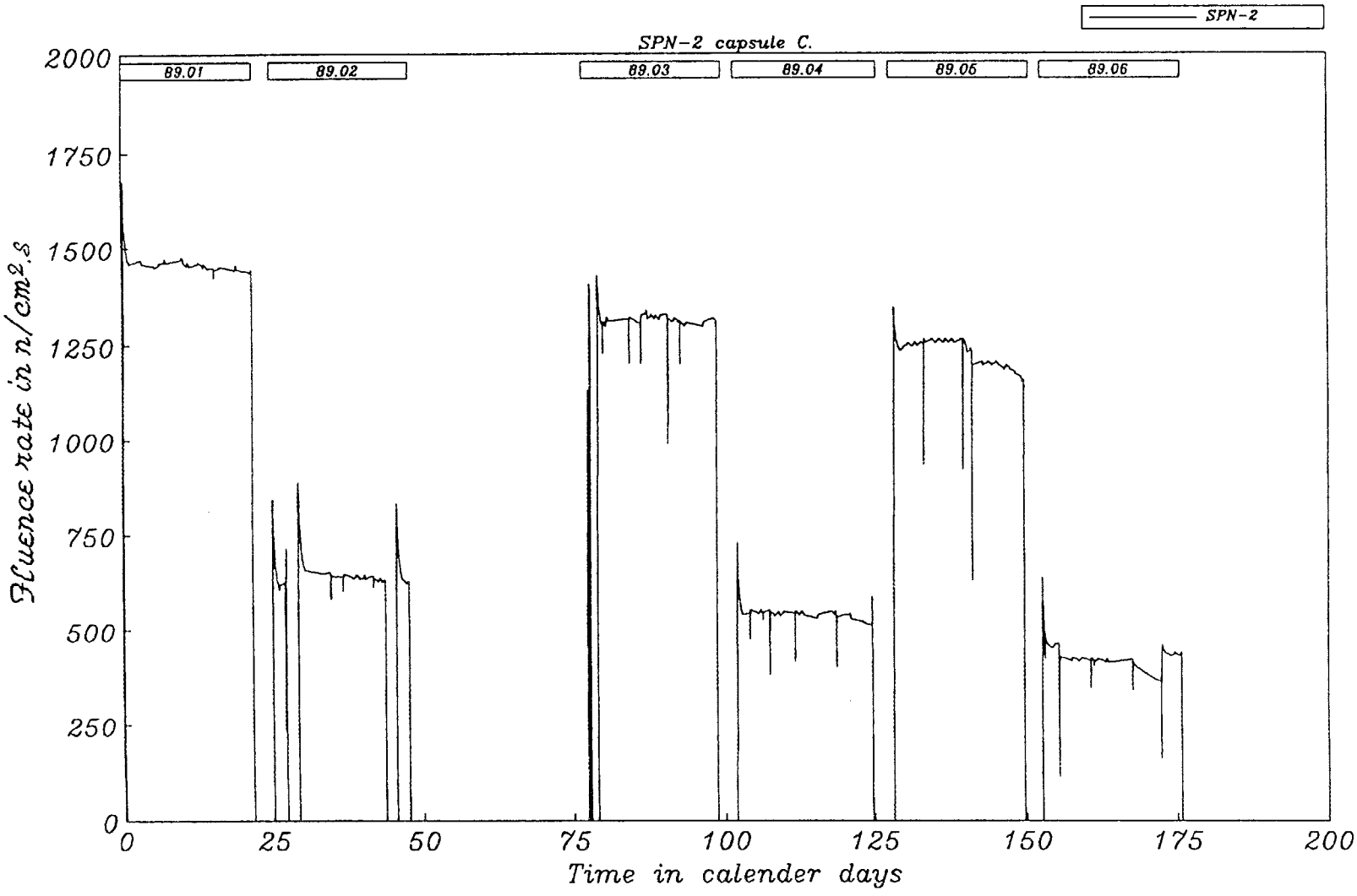

Fig. 6.6.54. SPN detector history D-214 Cycles 89.01 – 89.06
Source: JRC-IAM Petten, HFR Unit, The Netherlands

7. ACKNOWLEDGMENTS

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APPENDIX A

WATER VAPOR GENERATOR SYSTEM AND HYGROMETRY

Appendix A

WATER VAPOR GENERATOR SYSTEM AND HYGROMETRY

A.1 Water Vapor Generator

A description of the water vapor generator system and the procedure for the injection of water vapor into capsule 3 is provided here; the system underwent some changes after the start of the tests. A schematic diagram of the present water vapor generator is shown ref. 30. In brief, the inlet helium is humidified by passing a known amount of the gas through a water bubbler at room temperature and mixing that with dry gas. By knowing the flow rate entering the bubbler, the total flow rate (comprising "wet" and "dry" flows), the absolute pressures in the bubbler and at the capsule inlet, and the temperature of the bubbler, the water vapor concentration at the capsule inlet was calculated, as follows:

$$P(H_2O) = (f_3/f_1)(P_4/P_2)P_b, \tag{A.1}$$

where $P(H_2O)$ = partial pressure of water vapor (Pa),
f_3 = flow rate into the bubbler (standard cm^3/min),
f_1 = total flow rate (standard cm^3/min),
P_4 = absolute pressure at the capsule inlet (Pa),
P_2 = absolute pressure in the bubbler (Pa),
P_b = vapor pressure of water (Pa) at the bubbler temperature, obtained from the standard hygrometric tables.

The flows rated f_1 and f_3 were measured with calibrated mass flow meters. The pressures P_2 and P_4 were measured with calibrated gauges. The water temperature was measured with a laboratory thermometer strapped to the side of the bubbler. The thermometer was calibrated by immersion in an ice bath.

A.2 Hygrometry

The Sweeploop system utilized Panametrics Company aluminum oxide sensors. These sensors consist of an aluminum strip which is anodized to produce a porous oxide layer. A thin, porous metal coating is then evaporated onto the oxide layer, forming an aluminum oxide capacitor. Water vapor diffuses rapidly through the outer layer and adsorbs on the porous oxide, changing its electrical impedance. The magnitude of the impedance is proportional to the amount of water adsorbed, which is, in turn, a function of the water vapor concentration in the gas phase. Such cells have very fast response times and provide measurements over a wide range, from a dewpoint of -110 to +20°C. However, the sensors may decalibrate with time and therefore, for quantitative measurements must be recalibrated frequently. This can be done by sending the cells to the Panametrics Company, or, preferably by an in situ method, as described in Sect. A.3; see ref. 15 for further information.

In the Sweeploop system, there were a total of 8 hygrometer sensors (designated 5, 5-1 through 5-5, 1-1, and 1-4) and 2 Panametrics control units (systems 1 and 5). In system 5, sensor 5-1 monitored the inlet He, and sensor 5-2 monitored the inlet Ne to all capsules. Hygrometers 5-3 through 5-5 monitored the outlet streams of capsules 1, 2, and 3, respectively. In system 1, sensor 1-1 monitored the gas flowing to the sampling station. Sensor 1-4 was located in the water vapor generator along with sensor 5, whose millivolt signal was fed into the trend recorders and to the DACOS data acquisition system. These latter two hygrometers monitored the inlet water vapor of capsule 3 during the water vapor injection experiments and have received special attention, as will be explained. Both sensors 1-4 and 5 were calibrated in September 1988 by the Panametrics Company in The Netherlands. These sensors were found to have drifted considerably since their original purchase. Sensor 1-4, for example, was reading low by a factor of three. This meant that the water vapor concentrations in the first five water vapor injection tests were higher than originally thought. A correction factor of three has been applied to those data, after being justified by an analysis. After reinstallation in the water vapor generator, the sensors continued to drift. However, sensor 5 has been a bit more stable since the calibration in September 1988. Both hygrometers have since been frequently calibrated in situ by methods described in the next section.

The outlet hygrometer in capsule 3 is sensor 5-5. It is also known to read substantially low. Because it was in the radioactive portion of the system, it could not be removed for recalibration. Rather, the outlet water vapor concentration was calculated by subtracting from the inlet water vapor concentration the amount of water vapor consumed by reaction with the graphite body, (as measured by the quantity $2CO_2 + CO$). Sensor 5-5, therefore, was used as a relative monitor much like the inlet relative monitor, sensor 5-1.

A.3 Calibration of Hygrometers

The Panametrics hygrometers have been calibrated using three methods. First, by the Panametrics method as mentioned above. Second, by an in situ method developed at Petten, and third, by use of an auxiliary dewpoint hygrometer, the General Eastern Instruments, GEI, Model M1. This latter calibration was performed a number of times using two different MI-1 instruments.

The in situ method uses the water vapor generator system. If flow rates, pressures, and bubbler temperature are known, then the water vapor concentration can be calculated with confidence. In this method, the moisture generator itself is the primary means of knowing the water vapor concentration. Therefore, the Panametric sensors were calibrated virtually daily during every injection test. Alternatively, between reactor cycles, the small water bubbler, one of the two in the water-vapor generator system, was used for additional calibrations. The small bubbler was first immersed in an ice bath Dewar and allowed to equilibrate overnight. Then by passing the entire flow through the bubbler at 0° C, a single-point calibration was effected at 602.8 Pa without having to rely on knowledge of the flow rates but assuming the pressures in the bubbler and the hygrometer were identical. Next, the pressure at the hygrometer, P_4, was adjusted to a value lower than that at the bubbler, P_2, and additional data points were obtained down to about 300 Pa. Finally, by mixing the wet and dry flows, f_3 and f_1, calibration points down to about 10 Pa could be obtained.

The third method, involving the GEI Model M1 dewpoint hygrometer, was used after the fifth moisture injection test in HFR cycle 88.05 to check on the calibration of the Panametrics sensors. At the same time, a mass flow meter was installed in the bubbler line which allowed the water vapor concentration to be calculated. The conclusion of the work with the M1 was that the flow calculation method is accurate, and the Panametrics cells were initially low by a factor of three. The Panametrics cells were then sent to the factory representative in Holland for recalibration. They were found to be low by about 10°C, which is a factor of three in the 100 Pa range. The recalibrated cells were placed back into service prior to cycle 88.07. The company representing Panametrics uses a flow mixing device similar to that used for the capsule 3 injections; by flow mixing, they claimed to know the true water vapor concentration to within 5%. The reference water vapor concentration is measured by a GEI Model M1. Finally, a new model M1 was permanently installed in the Sweeploop, after cycle 89.03. During the last three cycles of operation, this instrument was used extensively to check on the water bubbler method as well as to recalibrate the Panametrics cells. These final calibrations corroborated the early calibrations. In Fig. A.1, a comparison is shown of the GEI M1 response with the calculated water vapor content based on the flow mixing/calculation method. These data show that the latter method is accurate. It may be stated that the water vapor concentrations in all the injection experiments after cycle 88.05 were known to be within 10%. The uncertainty of the water vapor concentration in the first five injection tests is estimated to be 20 to 30%.

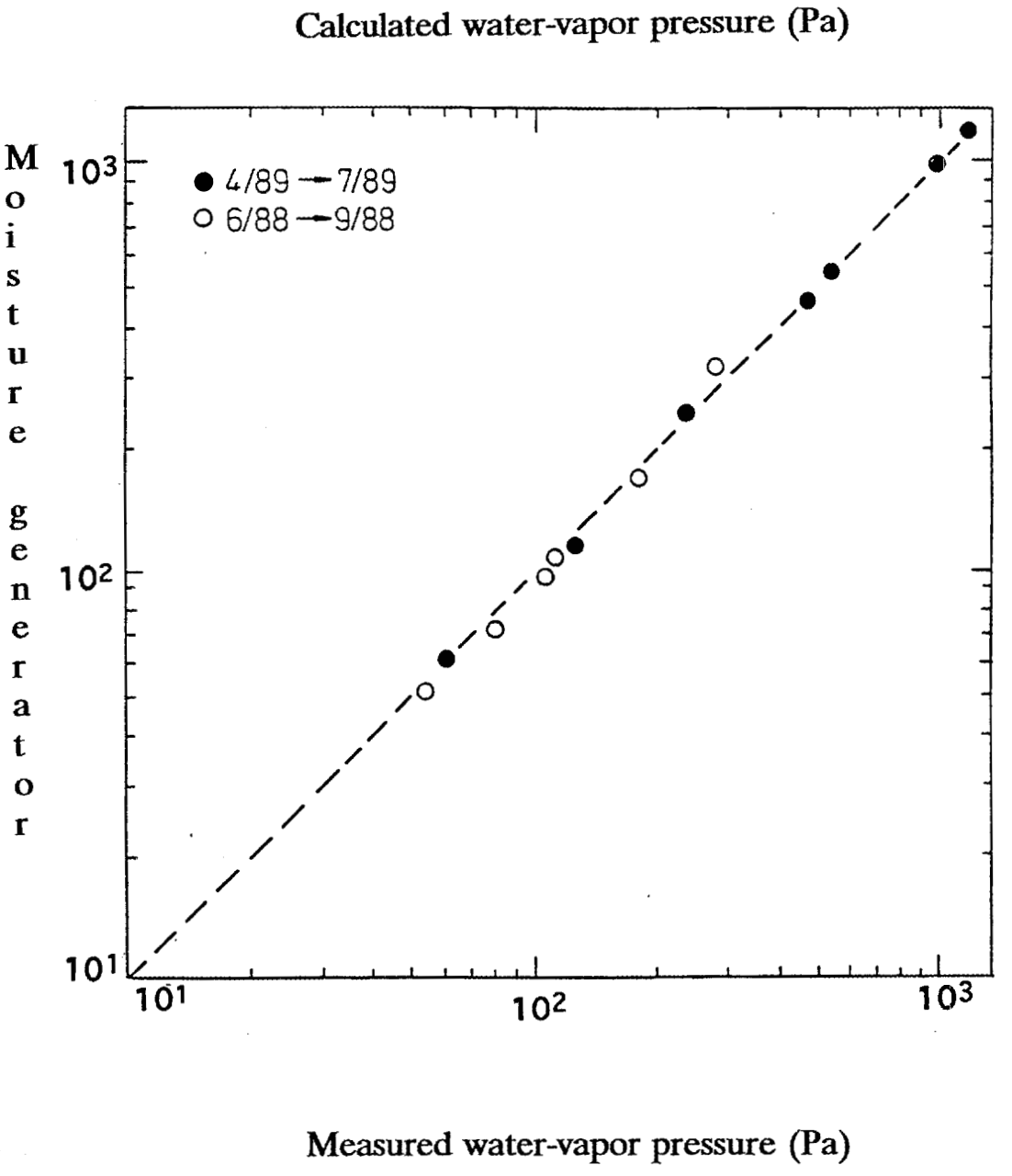

Fig. A.1. Comparison of the calculated and measured (M1-1) water vapor pressures.
Source: JRC-IAM Petten, HFR Unit, The Netherlands

APPENDIX B

GAS CHROMATOGRAPHY

Appendix B

GAS CHROMATOGRAPHY

B.1 Instrumentation and Use

The gas chromatograph (GC) was used to monitor the compositions of the inlet and outlet gases of all capsules for trace impurities and, in capsule 3, for the reaction products of the hydrolysis of the carbonaceous material in the fuel elements. The GC used at Petten is a model TBT, manufactured by L'aire Liquide/Orthodyne in France. It utilizes an He ionization detector and delay columns of porapak Q at 50°C, and molecular sieves at a temperature of 75°C. In addition, there is a molecular sieve column which is cooled with liquid nitrogen. This column is used at -140°C for the measurement of H_2 whenever there is Ne contamination. Also, whenever Ne is added to a capsule for temperature adjustment, the GC measurements are affected. This is because at the considerable concentrations of Ne used, 20 to 100%, the huge Ne peak virtually wipes out the other peaks. This problem has been alleviated by operation of the TBT at reduced gain and at increased zero set point, such that the Ne peak, which is negative, was nearly on scale. This way, the other peaks, with the exception of H_2, could be seen as small peaks on the "tail" of the Ne peak and were adequately quantified. The columns were protected from excessive moisture during the injection tests by a bed of magnesium perchlorate in the sample line. Coupled with the TBT is a Shimadzu integrator/recorder. The Shimadzu records the date and time of each sample, plots the chromatogram, integrates the peaks, and calculates the concentration in terms of parts per million by volume, ppmv, associated with each peak by comparison with stored calibration data. The sensitivity for all the above gases was about 1 ppmv. GC peaks smaller than 1 ppmv were resolved but with reduced accuracy. In the concentration range of 1 to 100 ppmv, the accuracy and repeatability were within about 10%.

For normal capsule operation, with no special tests, GC samples were obtained once per shift per capsule. During water vapor injections in capsule 3, sampling was more frequent; sometimes the instrument was placed on automatic, in which sampling was as often as every 10 min. Normally, during moisture injections, the GC was placed on automatic sampling during the initial or ending phases of the tests, or at other times when conditions are being adjusted. In between these special periods, sampling of capsule 3 was performed between 1 and 4 times per shift. GC sampling usually involved two consecutive samples; the second sample was sufficiently purged. As a consequence, each GC cycle is 10 or more minutes, and about 5 min of purging is enough to ensure a representative mixture in the sample loop. Raw GC data in ppmv are listed in Tables 6.5.1 through 6.5.20.

B.2 GC Calibration

The GC was calibrated at the beginning of each reactor cycle. At this time, the Shimadzu integrator was programmed to integrate the peaks and convert their areas to ppmv. The calibration was then checked daily or sometimes more often. If the calculated ppmv of any of the standard gas peaks disagreed with the true value by more than 10%, the Shimadzu was reprogrammed to reflect the true values. Normally, a calibration was good for 3 to 6 d. Occasionally, because of changing conditions, such as flow rate, pressure, temperature, vibrations, etc., the individual GC peaks were not properly integrated by the Shimadzu. This was detected

by visual inspection of each peak and comparison of the integrated value with a hand-calculated value based on comparison of peak heights. Consequently, all Shimadzu integrations and calculations were checked daily to ensure their accuracy.

In a few cases, the Shimadzu did not integrate properly. This was discovered in cycles 89.04 and 89.06. The discrepancy was discovered by the observation that standard GC peaks of obviously the same area were recorded by the Shimadzu as having different areas. Consequently, all integrations from the first to the last cycle have been checked by the manual method of peak height analysis. When discrepancies were found, the manual peak height method was substituted for the Shimadzu integrations.

Calibrations were accomplished by injection of standard gas mixtures into the TBT sample loop at the same flow and pressure as the capsule gas sample flow. In this way, a direct comparison of the capsule gas with the standard gas is made. This type of calibration is "end to end," that is, it does not require the calibration of individual components of the GC, such as current, flows, pressures, oven temperatures, and the like. The measurements are known to be consistent from day to day by daily injection of the standard gas into the GC. More detailed information on GC calibrations is given in ref. 30.

APPENDIX C

TRANSIT TIMES

Appendix C

TRANSIT TIMES

The train through which fission gas released from the fuel must pass in order to reach the sampling station is of importance in determining the steady-state fractional release, R/B. This passage necessarily entails a delay that, in the case of radioactive gases, must be taken into account in determining the actual activity of the gas leaving the fuel.

The configuration of the gas train is important. If the gas train is tubular without significant, segmental variations in the diameter of the train, then the transit time can be represented by

$$t = V/f_r, \tag{C.1}$$

where

t	=	transit time (min),
V	=	volume of the gas train (cm^3),
f_r	=	flow rate (cm^3/min).

Viscous effects and diffusion are neglected, and the flow is laminar. If, however, there is in the gas train a large-diameter segment, a holdup volume for example, and the gas is well mixed in this volume, i.e., the concentration of a given species is homogeneous therein, a gas element in transit through the well-mixed volume will experience an increased delay different from that in a tubular segment of the same volume, and the concentration profile of sequential gas elements may be distorted. The effects of a well-mixed volume in the gas train of the HFR-B1 experiment remain to be established.

The flow rate is determined in the Sweeploop of the high-flux reactor (HFR) by an instrument that measures the mass flow rate; the detector senses the mass flow in a given time period through measurement of the thermal conductivity. However, the mass flow rate is converted by the instrument software to a volumetric flow rate assuming standard conditions for the pressure (P_o) and temperature (T_o), i.e., 0.1 MPa and 298 K. The true volumetric flow rate has to be calculated based on measurements of the pressure and temperature of the purge gas. By assuming the ideal gas law applies and by applying the operator $\partial/\partial t$ to the equation for the ideal gas, i.e.,

$$Pv = mRT/M, \tag{C.2}$$

where

P	=	pressure (MPa),
v	=	volume (m^3),
m	=	mass of the gas (kg),
R	=	the gas constant (=8.314J/(mol·K)),
T	=	temperature (K),
M	=	molecular weight of gas (kg/mol).

The volumetric flow rate, f_r, is given by

$$f_r = (\partial m/\partial t)_{P,T}\,(RT/MP) \tag{C.3}$$

where $f_r = (\partial v/\partial t)_{P,T}$.

To convert to the true flow rate, f_r, corresponding to the measured conditions of pressure and temperature, P and T, from the flow rate, f_{ro}, corresponding to the assumed standard conditions, P_o and T_o, the ratio of Eq. (C.3) for two sets of conditions is formed and leads to the expression

$$f_r = f_{ro}\,(P_oT/PT_o). \tag{C.4}$$

Assuming that Eq. (C.1) applies, the transit time is given by the relation

$$t = (V/f_{ro})(P/T)(T_o/P_o). \tag{C.5}$$

If the gas train consists of segments with variations in diameter, the Eq. (C.5) becomes

$$t = (T_o/(P_of_{ro}))\,\textstyle\sum_i (VP/T)_i, \tag{C.6}$$

where i = subscript identifying segment i.

In the equations of Sect. 4.4.1, the quantity t_1 = t of Eqs. (C.5) and (C.6).

Three values of the transit time between the capsule and the sampling station have been used or reported. In determining the R/B according to the equations of Sect. 4.4.1, a value of 5 min has been used.[30] A value of 5.4 min has been calculated according to Eq. (C.6).[30] In an experiment in which neon was added to the gas train, a value of 7.8 min was calculated[31] based on the time of arrival of the neon in the capsule, as reflected by the temperature rise, indicated by a thermocouple, and the time of arrival, as detected by the gas chromatograph, downstream. Corrections to the operating conditions during the experiment were included.
These discrepancies in the transit time remain to be resolved. The calculations were made essentially with Eq. (C.6) and included the holdup volume (i.e., the delay tank). Also, the question remains as to when the delay tank was in the gas train during irradiation and collection of fission gas samples.

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