

# ORNL INSTRUMENT EVALUATION SUMMARY

## Nuclear Research Corporation (NRC) NP-2A Rem Rad

**Description:** The NRC NP-2A is a four-range portable instrument that utilizes a  $\text{BF}_3$  tube located within a polyethylene moderator to measure neutron dose-equivalent rates. The ranges are X 1 (0 - 2 mRem/hr), X 10 (0 - 20 mRem/hr), X  $10^2$  (0 - 200 mRem/hr), and X  $10^3$  (0 - 2000 mRem/hr).

**Ranges Tested:** X 1 and X 10

**Report Date:** December 19, 1995

### General Comments:

1. Readings on the X 1 range were somewhat erratic due to the level of radiation required to test the range. This was expected and considered normal unless indicated otherwise.

### RADIATION RESPONSE

**Probe Surface Sensitivity:** N/A

### ELECTRONIC and MECHANICAL REQUIREMENTS and TESTS

**Line Noise:** N/A

### INTERFERING RESPONSES TEST RESULTS

**Radio Frequency Fields:** Results were acceptable for each range tested when exposed to frequencies from 0.3 MHz to 35 MHz and at 140 MHz. Field intensity was 50 volts/meter.

**Microwave Fields:** Two of the three instruments tested were acceptable at 915 MHz and 2.45 GHz on each range. The remaining instrument went off-scale high when exposed to 915 MHz on both ranges. When exposed to the 2.45 GHz field, the results were acceptable. Field intensities were 0.4 watts/meter<sup>2</sup> (915 MHz) and 2.0 watts/meter<sup>2</sup> (2.45 GHz).

**Electric Fields:** Results were acceptable for all instruments when exposed to the electrostatic field (5000 volts/meter), and 60 and 400 Hz at 100 volts/meter. The temperature in the test area was slightly above the limit stated in the protocol document. Test results were not considered to be effected.

**Magnetic Fields:** Results were acceptable for all instruments on each range tested when exposed to 10 Gauss (10 Oersted). The temperature in the test area was slightly above the limit stated in the protocol document. Test results were not considered to be effected.

**Interfering Ionizing Radiations:** Not performed.

## **ENVIRONMENTAL FACTORS**

**Temperature:** When operated on the X 1 range, each instrument was acceptable over the temperature test range of -10 °C to 50 °C. When operated on the X 10 range, two of the three instruments tested were acceptable. The remaining instrument became erratic and went out-of-tolerance low at 0 °C. It remained low, but not erratic at -10 °C.

**Temperature Shock:** When operated on the X 1 range (0 - 2 mRem/hr), one instrument was acceptable at all temperature changes (22 to 50, 50 to 22, 22 to -10, and -10 to 22 °C). One instrument went slightly low (0.1 mRem/hr) 30 minutes after being shocked from 22 to -10°C. Its response was within tolerance at the next data collection interval 15 minutes later. The remaining instrument went out-of-tolerance high (some readings off-scale) 15 minutes after being shocked from 22 to 50 °C. Thirty minutes later its response went low (0.1 mRem/hr) and remained low for the duration at 50 °C. When shocked from 50 to 22 °C, this instrument went low (0.1 to 0.2 mRem/hr) for the duration at 22 °C. When shocked from 22 to -10 °C, its response again was low, this time 0.3 to 0.4 mRem/hr. When shocked from -10 to 22 °C, its response was initially within tolerance but eventually (30 minutes) the response went out-of-tolerance high with some readings off-scale.

When operated on the X 10 range (0 - 20 mRem/hr), one instrument was acceptable for all temperature changes. One instrument went out-of-tolerance high 30 minutes after being shocked from 22 to 50 °C. It remained high throughout the 50 °C test. This instrument was also out-of-tolerance high when shocked from 50 to 22 and -10 to 22 °C. The remaining instrument went high 15 minutes after being shocked from 22 to 50 °C. It was acceptable at 30 and 45 minutes after, but then went low at 60 minutes after. When shocked from 50 to 22 °C, the instrument went low at 30 minutes after and remained low up to 60 minutes later. When shocked from 22 to -10 °C, the instrument went low and remained low for the duration at -10 °C. When shocked from -10 to 22 °C, the instrument went high and was still high 60 minutes after.

**Humidity:** Results were acceptable for all instruments on each range tested at 40% and 95% relative humidity.

**Ambient Pressure:** Not performed.