

HPIC 2006

Las Vegas, NV

October 23 – 25, 2006

Paris Hotel – Bordeaux Meeting Room

MONDAY, OCT. 23, 2006, MORNING SESSION – 8:00 A.M.

Session Chair – Kevin Reaves,

The meeting began with attendees giving a general introduction and their laboratory affiliation.

National Laboratories represented were:

Argonne National Laboratory (ANL)
Brookhaven National Lab (BNL)
DOE NNSA/NSO Nevada Test Site (NTS)
Idaho National Laboratory (INL)
Lawrence Berkeley National Laboratory (LBNL)
Lawrence Livermore National Laboratory (LLNL)
Los Alamos National Laboratory (LANL)

Oak Ridge National Laboratory (ORNL)
Pacific Northwest National Laboratory (PNNL)
Sandia National Laboratories (SNL)
Savannah River Site (SRS)
Thomas Jefferson National Accelerator Facility (JLAB)
Y-12 National Security Complex (BWXT-Y12)

Following introductions, Kevin Reaves opened the meeting with a question to all attendees about methods of measuring cold neutrons. He reported that while NIST measures cold neutrons they (NIST) have not performed any studies. Kevin reported that most of the measuring techniques related to cold neutron measurements involve scattering and not dosimetry measurements. There was some discussion of methodology with more discussion to happen at a later time.

Topical Area – Calibration Facility Operations

- **Testing Activities and Homeland Security Instrument Update (Peter Chiaro (ORNL))**
Peter Chiaro presented information about ORNL's Environmental Effects Laboratory Instrument Testing Program status. He presented updated information about instrumentation tested for homeland security applications. An update on International Electrotechnical Commission Standards was also presented. Chiaro reported that ANSI N323C is in the final ballot stage.
- **SRS NVLAP Accreditation Status (Fred Ogden, SRS)**
Fred Ogden described some of the processes involved in the accreditation of SRS through the NVLAP Accreditation Program at NIST. He also gave a brief description of the audit team visit, the number and type of nonconformities noted and their resolution. The two-day audit involved three NVLAP representatives. SRS expects to receive their NVLAP accreditation by the end of November 2006.
- **Failure Analysis of PNNL's Cobalt-60 Source (Jim Rolph, PNNL)**
Jim Rolph presented updated information on the failure of a Cobalt-60 source used at PNNL in their HEF System. The investigation and analysis of the source failure indicated that impact on the source caused by system design was the cause of failure. The system has been modified to substantially reduce the force of impact on the source and to reinforce the source capsule. A "lessons learned" for all facilities from the investigation and clean up is that double encapsulated sources are not indestructible and source transport systems should be designed to result in essentially no impact force on the source.
- **Neutron Flight Capsule Failure (Byron Christiansen, INL)**
Byron Christiansen reported on the failure of the neutron flight capsule in the Low Scatter Irradiator at Idaho National Laboratory. The system has seven sources in a below-grade shield which are transferred by compressed air thru an aluminum tube and held in the expose position by a suction cup and vacuum. Damage to the source capsule fins was sustained due to misalignment of the flight tube and lack of sufficient range of adjustment for the transfer. There was no contamination since the source capsule did

not rupture. Changes have been made to the transport tube and system enhancements are anticipated which will reduce the sensitivity of the flow adjustment and add flow controls and solenoids.

- **Contaminated Source Installed in Gamma Beam Irradiator (GBI) at Savannah River Site (Fred Ogden, SRS)**

Fred Ogden presented information on the difficulties encountered while replacing a source in the GBI at Savannah River Site. After the successful installation of a new Cobalt-60 source, a routine survey of the shipping cask revealed contamination on the container. The GBI suction cup had contamination and the system was determined to be contaminated. The GBI was removed, decontaminated, and reinstalled. The new source was removed, and shipped to Southwest Research Institute (SWRI) for decontamination and testing. SWRI reported contamination in areas other than the exterior. The source was re-installed in the GBI system and the calibration of the new Cobalt beam was completed. The system was out of service for about three months. Additional safeguards have been put into place for all future purchases from the manufacturer of this source to prevent additional incidents. Ogden noted that many of the issues encountered could not have been prevented although they did significantly impact the effort.

- **Brookhaven National Laboratory Calibration Information System (Paul Zahra, BNL)**

Paul Zahra described the Calibration Information System in use at BNL. Using Fluke's MET/TRACK Calibration Management Software, BNL tracks 1670 items including standards and M&TE and maintains 1230 items. Zahra reported on the broad range of the software capabilities which includes asset management; calibration event history; auto storage of calibration events, procedures, data sheets and data via Manual METCAL PM/Repair history; Location/Ownership history; traceability history; report generation (bundled); ODBC connectivity for use with other applications (i.e., Excel). Additional capabilities can be purchased and implemented without additional programming. There are many Pros and Cons when analyzing in-house software and commercial software. Off-the-shelf software allows small labs to manage assets while maintaining compliance with little or no IT support. However work processes must be tailored to the software and new capabilities usually require a full upgrade and can be somewhat cost prohibitive when new hardware has to be purchased to allow full utilization of the upgraded software.

MONDAY, OCT. 23, 2006, AFTERNOON SESSION – 1:30 P.M.

Session Chair – Fred Ogden

- **Neutron Calibration Activities in Argentina (Peter Chiaro, ORNL)**

Peter Chiaro presented updates and photos on the progress at the Neutron Calibration Laboratory at the Centro Atómico Ezeiza in Argentina. A team from the USA, lead by Chiaro with support from LANL, traveled to Argentina in September 2006 and successfully performed a characterization on the Neutron Calibration Laboratory. Chiaro reported that measurements were made using LANL's Rotating Neutron Spectrometer (ROSPEC) neutron spectrometer and Thermo Smart Wide Energy Neutron Detection Instrument (SWENDI) neutron dose rate instrument. The measurements will be used to develop a model of the neutron field using a Monte Carlo program.

- **Results of HPIC Measurement Assurance Program (Fred Ogden, SRS)**

Fred Ogden briefed the committee attendees on the progress of the HPIC Measurement Assurance Program (MAP). Benefits of the HPIC MAP include:

- Provides an informal and confidential method for participating laboratories to evaluate instrument calibration accuracy;
- HPIC laboratories have direct input into future comparisons and/or methods; and
- Use of the results is determined by each laboratory.

Ten laboratories participated in the HPIC MAP evaluation of the RO20. Results obtained were coded to protect the identity of the participants. Ogden reported that data will be sent to NIST and when a value is received it will be shared with the committee. There was much discussion within the group with a general consensus to keep everything simple. Instruments suggested for the next evaluation include the Bicon MicroREM (gamma) and the REM-500 (Neutron).

Ogden asked if there was interest in a beta comparison with TLDs. There is interest and a common point of comparison will be agreed upon.

- **Neutron Calibration: Factors That Can Potentially Impact Instrument Performance (Richard Olsher, LANL)**

Richard Olsher presented information on some of the factors that will impact the performance of an instrument and the ensuing test results. He pointed out that there is understanding that in the real world you have to operate within some type of shielded area and must work around those factors. Olsher described several ways to work around the factors and noted that while the old method is to match the calibration field to the operating environment this is not always the optimum method. Several instruments were mentioned as examples with each requiring a different technique for working around the unique differences of such instruments when performing calibrations.

- **Thermo NRD Rem Meter Upgrade Project (David Seagraves, LANL)**

David Seagraves opened his presentation by reminding the attendees present of the discussion at HPIC 2005 on soaking or drifting effect and possible solutions. The NRD Rem Meter Upgrade Project had three goals to be met: 1) Improve sensitivity of stock NRD; 2) Reduce counter tube drift (soaking effect) in neutron fields; and 3) Investigate performance of He-3 counter tube replacements for stock BF₃ counter tubes. An energy response and a drift study was performed using NFIA (Bare Cf-252, D₂O Mod. Cf-252, and AmBe-241) with 5 minute runs. The LANL study concluded that drift is ~5% at <100 mrem/h and 10%-15% >100 mrem/h but is not an issue for typical field surveys (~5% effect). The study further concluded that similar results have previously been observed for stock NRD w/BF₃ detectors, sensitivity has been increased by about a factor of 4 with no penalty in cost, and stable operation is possible at reasonable bias voltage. Future efforts will include field testing of the NRD-He Rem Meter and conversion of NRD inventory as budget permits.

This information prompted a general discussion on the drift and the cause of the drift. Since the instrument is not drifting up (over responding) at low dose rate there is no problem. A question was posed to look at older tubes. Seagraves said they looked at old and new and saw the same drift. Initially they thought it was a problem with the gas but now suspect it is because the insulator is building up a charge. They have considered requesting prints of the construction for the tubes but suspect that is proprietary information and will be difficult to obtain, if at all.

- **ASP-2S/NRD Implementation at Savannah River Site (Fred Ogden, SRS)**

Fred Ogden reported that the ASP-2S/NRD is to replace the Eberline ASP1/NRD manufactured by Thermo Electron currently in use at SRS. The ASP1 instruments are no longer manufactured and older models are not supported or maintained by Thermo. The ASP-2S1 has been modified specifically for SRS. The instrument has a ratemeter mode, integrate mode, and scaler mode and costs about \$795 each. The software program (for the ASP-2S1) looks just like the E600 program but will not work with the E600. There are many benefits to using the new instrument such as ease of fielding with no specific training required and the ability to change batteries in the field. SRS currently has 25 of the instruments and plans to purchase an additional 50. (A general discussion was had among the attendees on the settings of the instruments as to method to set, count rate, etc. and the benefit of no operational issues with the instrument and they do not require any specific training.)

TUESDAY, OCT. 24, 2006, MORNING SESSION

Session Chair – Fred Ogden

- **DOE O414.1C Safety Software Guide Implementing 10CFR830 Subpart A (Byron Christiansen, INL)**

Byron Christiansen reported that DOE O414.1C has implemented significant changes to Software Quality Assurance (SQA). Some of those changes include: 1) Safety software established as specific category of software; 2) Identification of Safety Software definitions, responsibilities and requirements; and 3) Federal staff with SQA responsibilities must be qualified according to DOE-STD-1172. Christiansen briefed the attendees on the types of safety software as defined by the DOE Safety Software Guide and the main requirements for compliance. He shared some important lessons learned which included: 1) Software procurement specifications should specify details of software

requirements, not just catalog data; 2) Formal procedures for software problem reporting and corrective actions for software errors and failures need to be maintained and rigorously implemented; and 3) Appropriate software control and configuration management is essential for safe use of the software. Christiansen reported that these mandates are direct from DOE.

- **PNNL's Perspective on DOE G414.1-4 Safety Software Guide (Jim Rolph, PNNL)**
Jim Rolph presented PNNL's perspective on DOE G414.1-4 Safety Software Guide as it applies to portable survey instruments. The Defense Nuclear Facilities Safety Board Technical Report 25, Quality Assurance for Safety-Related Software at DOE Defense Nuclear Facilities was the driver behind the changes to DOE G414.1-4. In addition to the changes previously outlined, Rolph noted that the changes include all types of software (custom, acquired, configurable, utility calculation, and commercial design and analysis software) and applies to new and existing software. As a result of the changes and subsequent review and analysis of the PNNL process, software that meets all the following criteria: 1) an integral part of firmware or equipment, 2) all software maintenance is performed by the vendor, 3) the software is verified as an integral part of the system, and 4) cannot be modified by PNNL is exempt from the new mandates. PNNL will review all software based on the new mandates along with their implementation plan and determine if it falls within DOE G414.1-4 or is exempt.
- **Testing of the Framework Scientific ABC-1260 Bubble Counter and High-Flux SDD (Richard Olsher, LANL)**
Richard Olsher presented information on an ABC-1260 Bubble Counter and High-Flux Superheated Drop Detector (SDD). Some of the advantages of the SDD include: 1) absolutely no gamma sensitivity (at RT), 2) excellent energy response, and 3) much more sensitive than an EPD or TLD. The disadvantages include: 1) it is highly temperature dependent, and 2) has a limited lifetime. The droplets are suspended in a Freon-like medium and the amount of material in the vial determines the sensitivity. If the temperature is raised the material sensitivity changes but returns to its previous state when the temperature returns to normal. A "High-Flux" SDD is being tested which has a longer half-life. The Yale High-Flux SDD is a collaborative effort and requires changing about one time per week based on LANL tests and parameters. Future work will include an enhanced dynamic range and testing a Yale High Flux SDD with a reduced droplet size.
- **ABC Bubble Detector (Dan Dotson, J-Lab)**
Dan Dotson reported on testing the ABC Bubble Detector system for use as a boundary neutron monitoring system at J-Lab. Other bubble detector systems were tested but were not suitable for J-Lab. Since the EUT is in the field, it is very difficult to maintain stable background over a 24-hour period. The units cost about \$3,600 each and a recommendation will be made for J-Lab to place the units strategically around their perimeter and incorporate the data into their environmental impact statement for each monthly, quarterly and annual report. J-Lab is also considering installation of a wireless system.
- **2006 Calibration Overview for the LSI Neutron Sources (Fred Ogden, SRS)**
Fred Ogden discussed a perplexing problem of increase in uncertainty in their LSI neutron sources. Measurements were taken with an E-600 which had been calibrated by NIST. Ogden provided slides of a timeline and calibration values for several measurements. Previously, SRS and LANL had differing opinions about the analysis of measurement results and had agreed to disagree by HPIC 2005. A general discussion among attendees began regarding the method for taking readings. LANL readings made at SRS were taken on the side through the poly. SRS had taken readings through the band. This may have been the cause of the difference in the CF. A consensus was that the determining factor is the reference point and orientation of the NRD.
- **Progress Report on the HFM-8 and IMPULSE Upgrade Projects (William Martinez, LANL)**
William Martinez presented a progress report on testing of the Eberline HFM-8 Hand and Foot Monitor with Air Proportional Probes. This was an update from Robert Murphy's report at HPIC 2005. LANL has 96 of 176 units installed out in the field. The units are working well but tend to become microphonic due to user abuse.

Martinez then presented information on the Integrated Minicomputer Pulse System (IMPULSE) Upgrade. IMPULSE was developed because efficiency could not be met with gas proportional detectors and a desire to use a DEC computer to minimize human error. Built in 1976, IMPULSE consisted of 128 detectors housed in two electronic racks of 64 detectors each. Currently, 70 of the detectors are still operational. The upgrade will consist of replacing the old obsolete electronics with the Ludlum Model 4304-LANL, replacing the old PMT's, ZnS and divider networks with new ones, and replacing the DEC computer with a standard desktop computer. The upgraded system uses RS-232 technology and will be automated through computer software.

- **Radiation Instrument Issues (Ken Callahan, SNL)**

Ken Callahan reported on known issues with several instruments. The E600 S/N 2948 to 3608 hybrid board is problematic for developing high voltage which causes a drift in the thresholds. The 380 Probes appear to have a manufacturing problem. The information shared prompted a group discussion about the specific changes to the 380 Probe PMT and the effect on the overall probe. Callahan then presented issues with the plateauing and drifting of the AMS-4. He reported that the RO20 has "out-of-box" deficiencies and that the PCM2 Safety kit/upgrade was released, the CPU upgrade failed to include BIOS software as well as other issues. The RoHS Directive is eliminating heavy metal-type components and Europe is going toward lead-free soldering. One known issue is heating a circuit beyond the design limit. Applying lead solder (high heat) to circuits designed for lead-free solder is causing cross contamination. Due diligence should be paid to the age on chemicals. Since cans deteriorate, it is recommended that users buy smallest amount possible rather than in bulk.

- **AEA Source Activity Discrepancy (Fred Ogden, SRS)**

Fred Ogden presented information on the discrepancies discovered on AEA (now QSA Global) Source Activity. SRS instituted a new verification program in 2002, purchased 160 new sources, and upon receipt all sources were labeled with their Effective Source Activity (ESA) dpm value, original assay date, and calibration due date of two years. In February 2004, a need arose to test some of the sources from the field. Two Am-241 sources failed by an average 5.5%. Eighty Am-241 sources in storage and with the same assay date were checked and found to be 5% low in surface emission rate. The problem was that the manufacturer had a flaw in their processes and has since promised to correct the QA used for calibrations. The other sources purchased from AEA (Cs-137, Pu-239, Tc-99, Cl-36) were all within the original certification.

- **Proposed Revision to 10CFR835 Limits for Sr/Y-90 Contamination (Fred Ogden, SRS)**

Fred Ogden reported that a revision to 10CFR835 is coming out soon and will implement the DOE guidance as given in RCTP 96-02 (i.e. 3 levels for Sr/Y-90). While the changes required will be difficult and costly to implement, there does not appear to be any real savings of hazard/dosage to workers. SRS has requested that DOE re-evaluate the need for the three-tiered system of contamination values for Sr-90 and to use the same groupings as used in ANSI STD N13.12. Ogden ended his presentation with a question to the attendees about the need or desire for a HPIC position paper on this subject.

There was much discussion by the group at large as to the benefits of a HPIC position paper. Fred Ogden would be willing to lead the effort but would require unanimity within the group. A final decision will be made via e-mail vote at a later date.

TUESDAY, OCT. 24, 2006, AFTERNOON SESSION

Session Chair – Dan Dotson

- **Present Tritium Monitoring System (Dan Dotson, J-Lab)**

Dan Dotson presented information on the Tritium Monitoring System at J-Lab which was developed over a six-year period. He reported that the current system has a fixed location, requires backup safety systems, and requires AC power source. Technical Associates collaborated with J-Lab to develop an effective system while preserving the environment.

- **Trirad 1 (Dan Dotson, J-Lab)**
Dan Dotson presented information on the Trirad 1. This is a portable radiation detection system for liquids that allows samples to be analyzed on site instead of sending to a laboratory. The system is user programmable with LED alarms when count rate trip point and/or total count rate trip points have been reached as well as when the system is collecting data.
- **Radiation Generating Devices – Lessons Learned (Kevin Reaves, ORNL)**
Kevin Reaves reported on an incident at ORNL that evolved into a “Lessons Learned” for users of radiation generating devices. The problem arose due to wording in manufacturer literature. When reading manufacturer-supplied literature, the user must be sure that the terms used match the meaning of the terms commonly used in the laboratory. This was the root of the problem reported by Reaves. An official lessons learned with more details will be issued in the near future.
- **Open Discussion – ION Chamber-based Instruments– HPIC at Large**
The committee discussed issues with an NRD instrument in a room which read about ½ mrem/h. The instrument was not supposed to be able to take measurements at that rate and the information was misread. It should have been background. Speculation is that it was a fault with the instrument having an elevated background and there was no problem with the room. General consensus was that a different instrument should have been used for making the measurements.

The committee discussed the “pros” and “cons” of creating a list of desired specifications for these instruments. The committee agreed to create a list for specification and Fred Ogden volunteered to begin the effort. Manufacturers will be invited for next year and invited to come in and present their ideas or models on new Ion chambers. Peter Chiaro volunteered to provide a list of possible manufacturers for dissemination to the committee. Ogden will start the process by sending an e-mail requesting comments and input but the committee agreed that all members need to participate in the effort.

WEDNESDAY, OCT. 25, 2006, MORNING SESSION

Session Chair – Kevin Reaves

- **Some Applications of Poisson Statistics in the Calibration on Health Physics Instrumentation (Alan Justus, LANL)**
Alan Justus presented information on applications of Poisson statistics in the calibration of health physics instrumentation as they relate to alpha alarm set-point determination for Hand and Shoe (H&S) monitor and alpha continuous air monitor (CAM) alarm set-point determinations. Poisson-based methods have been presented for the determination of alarm levels and associated detection limits. These methods relied on the results of several computer-aided Poisson-based numerical techniques. Failing to use Poisson statistics for statistical calculations in the low-count realm (i.e., alpha or neutron instrumentation): 1) Will result in much larger false alarm probabilities; and 2) Reported detection probabilities will typically be unrealistically low.
- **Open Discussion for comments, concerns, questions, etc. from previous presentations (Kevin Reaves, ORNL)**
The committee was invited to discuss any issues, concerns, and/or questions from presentations made at this (or earlier) meetings. The HPIC MAP was discussed and the committee agreed that instruments will be circulated. The instrument response can be checked against different energies. Whatever test equipment each lab has will be used for the EUT. The committee agreed that orientation used for calibration will be included with the instrument when it is sent to the corresponding lab for test. The committee then discussed issues with several different instruments. The vendor list for HPIC 2007 was discussed by the committee. A general invitation will be issued to manufacturers to present demonstrations and make a presentation. Any can come to the vendor day demonstration area but only the first 12 to respond will be included for presentations. Tritium will be included next year if companies can be located and respond.

An issue with PCMs was discussed. The committee learned that MDB boards in PCM2s and HFMs will no longer be manufactured. (Thermo’s MDB boards.) INTEL will not manufacture the chip

anymore. It is still in stock but must be purchased in quantities of 150. Cost is ~\$18/ea. The number of boards that Thermo has in stock is unknown. This affects the boards Thermo makes for a variety of instruments. The committee also learned that AP-IIs by SAIC are no longer being manufactured. The committee discussed problems writing a procedure on NIST traceability for neutrons. NIST applies correction factors to neutron fluence to arrive dose. This was from an older document and a new one may be available now. Full documents are available on-line. A source can be sent to NIST for calibration for a traceable emission rate. If an instrument is also sent, the traceability for dose rate is included. Consensus is to send the instrument to NIST.

- **State of HPIC Business (Kathy Johnson, ORNL)**

Kathy Johnson presented a financial report on the status of funding. She discussed some of the issues that were encountered in planning HPIC 2006 and presented options for HPIC 2007. After discussion, the committee decided to keep the finances as/is at ORNL.

- **DOE and HPIC Activities (Peter Chiaro, ORNL)**

Peter Chiaro presented information on approaching DOE for support for HPIC efforts. The committee discussed the idea and a vote will be taken at a later date. The issue will be determined by having one vote per laboratory. All laboratories will confer, agree on a vote, then send an e-mail to the Steering Committee.

- **Future HPIC Topics – Open Discussion**

The Session Chair called for ideas from the group at large for topics for HPIC 2007. Some of the suggested topics (and presenter) were:

- Tritium Monitoring (Kevin Reaves)
- Vendor Day (All)
- Ion Chamber Specifications (Fred Ogden)
- Comparison of iCAM (Radaslov Radev)
- HPIC MAP (Fred Ogden and other participants)
- Cold/Sub-Thermal Neutrons (Kevin Reaves)
- Relating Range/Calibration/Orientation to an instrument (TBD)

The committee agreed that all would try to note ideas throughout the coming year and have presentations for HPIC 2007.

- **Election of New Steering Committee Members**

Fred Ogden reported to the attendees that two members of the steering committee were rotating off this year and would need to be replaced. Kevin Reaves and Marsha Beekman (absent) were thanked for a job well done and for serving. The committee unanimously elected Jim Bland and Jim Rolph as their replacements.

- **Next Meeting Location and Date**

The committee discussed locations and tentative dates for HPIC 2007. Possible locations agreed upon by the committee at large are: Savannah, GA, Santa Fe, NM, New Orleans, LA, Orlando, FL, South Miami Beach, FL, and Nashville, TN. The tentative date for the next meeting is November 13, 14, 15, & 16 (1/2 day), 2007 which includes one additional day for vendor presentations and demonstrations.

- **Administrative Support for HPIC 2007**

Committee agreed that Kathy Johnson would assist and attend the next meeting. Excess funds would be used to help with travel costs.

There were no other items for business or discussion and the meeting adjourned at Noon.