

DOE Health Physics Instrumentation Committee Annual Meeting

November 15 – 17, 2004
Flamingo Hotel, Las Vegas

Attendees

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Meeting Minutes

Monday, November 15, 2004 - Carson City 1 Room

Morning Session Chair: Robert Murphy

Introduction and review of agenda - Robert Murphy, LANL

Went over agenda, including vendor sessions for Tuesday.

Status of facilities –

SRS – up and running

INEEL – Talked about Battelle contract. Soon to become “INL” for Idaho National Lab.

ORNL – Kevin reported that there hadn't been many changes.

Y-12 – Perry is not part of the instrument calibration program with Richard Leach being the replacement. Mentioned replacement of alpha cams

Jefferson Lab – reported on status of accelerator. Contract is up for bid.

PANTEX – still running with mostly disassembly and maintenance

NTS – nothing new except moved facility to Mercury.

WIPP – Running along.

Hanford – Jan Haan (first meeting). Looking at real time and personal air monitoring.

Alpha air monitoring appears to be an issue.

LBNL – Undergoing contract negotiations. New lab and ESH director. Advanced light source synchrotron is of most interest related to radiological hazards.

BNL – Still going through make or buy issues. No budget for their operations.

Calibration facility is still running. Hopewell calibrator software issues.

LANL – Operational health physics has never shut down. Writing technical justifications regarding safety concerns. Chris Bjork has retired.

Update on ANSI and International standards – Peter Chiaro, ORNL

Peter updated the attendees on the following standards:

DHS sponsored ANSI standards:

ANSI N42.32 - Performance Criteria for Alarming Personal Radiation Detectors for Homeland Security - published

ANSI N42.33 – Portable Radiation Detection Instrumentation for Homeland Security – published

ANSI N42.34 - Performance Criteria for Hand-held Instruments for the Detection and Identification of Radionuclides – published

ANSI N42.35 - Evaluation and Performance of Radiation Detection Portal Monitors for Use in Homeland Security – published

ANSI N42.37 – Training requirements for Homeland Security Responders using Radiation detection Instruments – under development, Chairs M. Cox and A. Boerner

ANSI N42.38 - Performance Criteria for Spectroscopy-Based Portal Monitors Used for Homeland Security – under development, Chair P. Chiaro

ANSI N42.39 – Portable Neutron Detectors for Homeland Security Applications – under development, Chair A. Thomson

ANSI N42.40 - Standard for Evaluation and Performance of High-Energy, X- and Gamma- Ray Interrogation Systems for Detection of Contraband of Concern in Homeland Security – under development, Chair D. Gilliam

- ANSI N42.41 - Standard for Evaluation and Performance of Neutron Interrogation Systems for Detection of Contraband of Concern in Homeland Security – under development, Chair D. Gilliam
- ANSI N42.42 - Data format standard for radiation detectors used for Homeland Security – under development, Chair Ed Groeber
- ANSI N42.xx - Standard for Mobile and Transportable Systems Including Cranes used for Homeland Security Applications - under development, Chair P. Chiaro

Status of applicable international (IEC) standards

- EIC 62401 - Alarming Personal Radiation Detectors (PRDs) for Border Radiation Monitoring
- EIC 62327 - Hand-held instruments for the Detection and Identification of Radionuclides and Additionally for the Indication of Ambient Dose-Equivalent Rate from Photon Radiation
- IEC 62244 - Installed Radiation Monitors for the Detection of Radioactive and Special Nuclear Materials at National Borders

At the end of his presentation Peter provided some applicable DHS testing information

Calibrating Near Background Exposure Rates (ANSI N323B) - Fred Ogden, SRS

Fred reported on calibrating near background exposure rates ($\mu\text{R/hr}$) type instruments. Went over significant factors, including coefficient of variance for low radiation fields, calibration field accuracy, and performance testing requirements to supplement those for 42.17A. There may be errors in the exposure/dose rate. Fred provided a comparison between N323A and N323B for field accuracy. Commented that we need to establish a small group to list problems with standard or at least questions for review to be sent to Mike U? Fred went over process SRS uses for calibration of their only low range instrument – Bicron Microrem. They are going to adopt a 30% tolerance for the x 0.1 scale soon. Fred will collect concerns from the HPIC about N323B to be formatted into a bulleted list. The cut off date for comments is Dec 15. Morgan mentioned the errata sheet for 323A. Fred pointed out that in the new ANSI N323B – 2003 standard there is obviously a mistake in table #4, where the conversion of the international to US units in the last row was lower by factor of 10. He also draw the attention to other mistakes in ANSI N323B. Fred is going to address the issues in a letter to ANSI Committee and asked any concerns from the HPIC members to be directed to him for incorporation in the letter.

Performance of the bubble dosimeters beyond the warranty – Radoslav Radev, LLNL

Radoslav presented information on when the bubble dosimeters become unusable and

- How many BDs are usable after the warranty expires
- How long BDs can be used
- How many (percentage) BDs are accurate after the warranty expires
- How much BDs deviate from their original calibration

The tests and experience at LLNL indicate that

- If properly stored and handled BDs can be used for 5 or more years. A simple visual check can assure the usability of the BDs
- The average accuracy of the BDs ($\pm 20\%$) can hold for 2-3 years
- The accuracy of an individual old but usable BD is not worse then $\pm 50\%$ up to 3 years
- BDs need to be calibrated with an appropriate source if higher neutron dose accuracy is needed.

Radoslav went over how the dosimeter operates including sensitivity and cost. He mentioned that the manufacturer warranty which is that optimal performance is for three months after receipt. Radoslav showed photos of leaking dosimeters. Several studies indicate that life span is related to sensitivity levels. He showed a table that compared age, sensitivity and usable percent of bubble dosimeters. In summary, dosimeters can be used well beyond their stated warranty. If properly stored and handled, they can be used for 5 or more years. The average accuracy for at least 2 years (20%). 30% accuracy can hold for 3 years. Radoslav's study is published.

Radoslav stated that some countries are using bubble dosimeters are being used as dose of record. Not so in the US. Used in pulsed fields at LLNL. Asked about how long they can be used without the cap being on since the study is mostly about re-use. Asked if life span is related to exposure. Comments about accreditation being limited since the upper range is about 3 rem whereas the typical upper range is about 5 rem.

Update on PRESILA, Dick Olsher, LANL

Dick passed out updated information sheet from LANL and a data sheet from Ludlum who calls the device a model 4241. Dick stated that there has been about 4 years of T&E information. LANL has about 20 units being field tested. Dick mentioned that their default source is Cf. For high energy (accelerator) ops, use AmBe. Asked if the E-600 is the only count rate meter. He stated that it wasn't and indicated that Ludlum says that many off the shelf can work with the unit. LANL reported that the unit is popular with technicians. He also reported that a few units have been provided to the Navy for evaluation. The calibration of the instrument is a two step process. First the adjustable discriminator is set up to reject the gamma radiation (e.g. Cs-137), then the instrument is calibrated with a neutron source. LANL uses Cf-252 source for calibrations at low dose rates and Am-Be source at higher dose rates.

Evaluation of new equipment for air monitoring and sampling – Tom Voss, LANL

Tom discussed air sampling process at LANL. Several hundred portable air samplers. Recent wiring failures indicated the need to find a replacement pump. They tested four pumps – three were from GAST with the remaining pump from "T-Squared." Tom informed us that so far tests has been conducted of pumps's weight, running amps, air pumping capacity at 2" of mercury and temperature rise. Calculations were made to determine power consumption and cost to operate. Most pumps are rotary vane type. Part of the tests involved measuring max air sampling rate for a fixed pressure drop. It appeared that the lightweight DC-type pump worked best. They concluded that the premature failure of the wiring on the portable air samplers may be due to excessive temperature rise. Tom mentioned that the next Air Monitors Users Group meeting will most likely be hosted by LANL during the third week of March 05 in the Santa Fe area.

Development of the next generation of portable instruments – Tom Voss, LANL

Tom mentioned that his presentation was based on a review of different web sites of which 8 will be used for this presentation:

- <http://www.blackcatsystems.com/GM/geiger.html> - GM tube with USB connector
- <http://www.bladewerx.com> - real-time breathing zone monitor with radon subtraction
- <http://www.canberra.com> – Radiagem has both internal detector and external connectors
- <http://www.cardinalhealth.com> – Advanced survey meter – ASM 990 series
- <http://www.ludlums.com> – large area air-proportional alpha detectors
- <http://www.overhoff.com> – Rad Ferret sealed ion chamber for beta/gamma surveys
- <http://www.saic.com> – SAIC's AP-2 and others coupled to PDAs

<http://www.tech-associates.com> – TBM-IC (vented ion chamber) combined with PDA
<http://www.thermoelectron.com> – HandECount alpha/beta sample counter with built-in PDA
Tom discussed how well the newest generation of instruments meets the desires and the requirements of the DOE users.

Progress in the development of a large volume Li6/7 neutron detector and an automated remote controlled single sphere neutron spectrum analyzer – Dan Dotson, Jefferson Lab

Dan provided a recap of last year's presentation which discussed the possible use of photodiodes as the basis of the detector that was developed. The system needed to be more sensitive than what is available on the market today (primarily He3). The crystals are mounted within Anderson-Braun type moderators. He informed the attendees on his progress of developing a neutron detector based on Li6/7 glass scintillators coupled with photodiodes. He uses large volume crystal faces 22 x 40 mm that fit into the same space of the neutron detector as the He-3 tubes. Results will be presented at the next annual meeting.

Dan also presented the new design of the neutron spectrometer with a single sphere and several liquid moderator shells that can be changed quickly and remotely. The instrument will allow the neutron spectral measurements to be made remotely either automatically or with remote control. Moderator changes take 20 seconds, however, the system is bulky (>30 lbs), requires pump to move the shell liquids in and out.

Afternoon Session Chair: Byron Christiansen

Instrumentation Application Issues at INELL – Byron Christiansen, INEEL

Byron discussed application issues including PD-3i – used as site wide primary electronic dosimeter. There was a lesson learned about a rad worker not noticing the PD-3i's dose alarm. Discussed what had happened that brought about the issuance of the lesson learned. There was discrepancy between results from dosimeters that were used. Byron went through what had happened.

Byron also informed the HPIC attendees about the upcoming name change of INEEL. Byron provided test data of significant temperature rise of their air samplers when the flow is reduced from 10 cfm to 4 cfm. He also informed us about INEEL experience with new instrumentation

- MPG wireless remote monitoring
- Breathing zone air monitor from Bladewerx
- CzT gamma spectrometer from XRF
- Canberra's iSolo sampler with real time radon subtraction
- Triathler – a H-3 liquid scintillation counter
- Electra/Delta 5 with 600 cm² probes

ISOCs characterization of the low level Gamma Well system – Fred Ogden, SRS

Fred discussed work he was asked to perform in determining the photon calibration factor and dead time for an in-house NaI detector. Fred provided background as to why they needed to characterize the C-137 gamma well. Problem arose when an attenuator was removed which meant that the distance needed to be increased. His QA check and comparison of the detector response with and without attenuator at the same exposure

levels revealed 30% discrepancy. After some initial analysis, Fred decided to look into the spectrum of the field with and without the attenuator.

Fred discussed additional tests and possible explanations for the observed discrepancy. Several HPIC members also discussed other possible explanations and offered suggestions. Much discussion followed about comparison of results between spectra collected from NaI and HPGe.

Status of the new ANSI/DHS standard for training personnel on the use of radiation instrumentation – Morgan Cox

Morgan described the status of the standard at this time. He listed the committee members. Morgan stated that the emphasis is on the use and operation of rad instrumentation specified in 42.32, 33, 34, and 35. Mentioned that NFPA-472 which is a national fire protection standard for training associated with hazards. Morgan described the contents of the document including general training requirements, awareness training, operational training, and technician training. Morgan provided a report on the latest meeting of the group which included a number of representatives from different groups within the DHS organization. They plan to get a standard by the end of 2004 and Morgan asked that the HPIC provide comments. Morgan will provide copies when requested and provided his email address, morgancx@swcp.com.

Neutron EPDs: New Developments – Dick Olsher, LANL

Dick discuss reproducibility problems with the Siemens N2 EPD. He described methodology for determining reproducibility stating that they take usually 10 readings and that $\text{mean} + \text{CV} = 68\%$ and $\text{mean} + 2\text{CV} = 95\%$. Dick presented test results for 6 Siemens N2 EPDs that showed poor sensitivity in the fast channel and hence poor reproducibility due to the small active area of the detector. Siemens N2 EPDs have limitations in the low-dose regime. Dick recommends that the Siemens N2 be calibrated for doses greater than 200 mrem and that additional reproducibility testing be done for bare and moderated Cf-252 spectrum. He also provided information on new neutron personal electronic dosimeters (EPDs)

- Saphymo Saphydose – n
- MGP DMC 2000-GN

and the upgrades on the Fuji electric NRY21 N+G EPD.

Testing and evaluation of new/upgraded designs from MGP, Saphymo, and Fuji Electric will provide more options to the radiation protection community

Closed topical discussion

- Vendor issues
- Instrument Measurement Issues

Tuesday, November 16, 2004 - Carson City 1 Room

The day was devoted to presentations by the invited instrument manufacturers. Prior to the meeting the manufacturers were given a list of technical questions and topics that HPIC members would like to hear about at the HPIC 2004:

1. Tests performed with the new/existing instrumentation at the manufacturer's facilities/labs
 - energy response tests (what sources, do they cover the entire energy region in the specs, what are the results, graphs, tables, etc.)
 - dynamic range tests (exposure, intensity) - what, how the instruments were tested, tests up to the maximum range, how did they determine the lowest range, what are the results, is the instrument liners, etc.
 - tests on ruggedness (small bangs, not necessarily drop test), how long (if the response is adequate after abuse - it is difficult to quantify how much the instruments can withstand, but we are interested what was done to evaluate response to an abused use)
 - repeatability of readings (e.g. when you approach a value coming from below and coming from above the value)
 - interchangeability of probes - do they read the same if probes are changed (e.g. for smart probes) - did they do tests for this with a statistically significant number of meters and probes
 - interchangeability of meters (for smart probes) - do the readings change if the same smart probe is used with different meters - did they do tests for this with a statistically significant number of meters and probes
2. New instrumentation –
 - technical data
 - tests performed
 - what type of radiation is the instrument intended for
 - what type of detectors are used
 - all limitations for detecting a particular radiation
 - accuracy of the readings (over the entire range, e.g. graph or table)
 - how the detectors are different from the known ones, etc.
 - comparison measurements with other similar instruments

Each manufacturer had 45 minutes for their presentation including 10 minutes for questions and answers.

Morning session Chair: Bill Schaper

Soltec and Technical Associates

Cardinal Health (former Victoreen/Innovision)

Ludlum

Canberra

Afternoon session Chair: Radoslav Radev

SAIC

Thermo Electron (former Eberline)

Berkeley Nucleonics

Hopewell Design

After the presentation the vendors set up an instrument display in Carson City 2 room. The HPIC attendees were able to have hands-on experience with the instruments and to receive additional information.

Wednesday, November 17, 2004 - Red Rock 7 Room

Morning session Chair: Dick Olsher

Opening remarks and organizational issues – Robert Murphy and Radoslav Radev

HPIC members thanked outgoing Steering Committee members, Paul Zahra and Radoslav Radev for their work.

Unanimously, HPIC elected two new Steering Committee members – Marsha Beekman (WIPP) and Kevin Reaves (ORNL), for a two year term.

HPIC voted to keep the same organizational format – Steering Committee with 4 members and 2 years term, with overlapping terms for 2 of the members and elections of two new members each year.

HPIC voted to keep the time for the HPIC meetings in early November.

HPIC decided that the Steering Committee will choose the location of the next HPIC meeting. Suggestions may be sent to the Steering Committee.

HPIC decided to send a feedback to the vendors – a general thank you letter to the vendors and a special thank you letter to Ludlum. R. Radev will send the general thank you letter to the vendors and Fred Odgen will send the special thank you letter to Ludlum.

HPIC members discussed the vendors presentations: P. Chiaro stated that Ludlum presentation this year was the best, while Thermo presentation was least informative. R. Radev stated that the list of topics and questions that was sent to the vendors contributed to more technical presentations, especially Ludlum and to some degree Canberra. F. Ogden questioned the opinion of the members for not inviting vendors, or if inviting to give them guidance and give them leeway to present their new items, otherwise they will not come.

HPIC decided to invite vendors, but give them less time, allow for set up time, allow time for questions, asked them what we want to hear in their presentations.

HPIC encouraged the members to send early (or even during the year) the titles of their future presentations and topics of discussion to the Steering Committee. F. Ogden stated that it takes a lot of effort to compile agenda without the members contribution.

Following a discussion of the HPIC web page, it was decided to archive the old instrument information and to keep only the Charter and Bylaws, Agendas, Minutes, attendees and next HPIC location with the link to the conference hotel and topics of future discussions.

Calibration of Radioactive Standards at the INEEL – Byron Christiansen, INEEL

Byron presented how low and high level gamma and neutron sources are calibrated at INEEL. ANSI 323A gives the required accuracy for neutron dose only for dose rates greater than 100 mrem/hr, however, there is no ANSI requirement for accuracy below 100 mrem/hr. The newer ANSI 323B standard does not provide information about neutron dose rate accuracy. An exchange of opinions and experience from different facilities followed. It was suggested to have a neutron calibration discussion at the next meeting.

Large Area Air Proportional Detectors – William Martinez, LANL

William presented the problems and repair cost of the current ZnS scintillation detectors for the Ludlum HFM-8 hand and foot monitors at LANL. LANL is testing a new redesigned air proportional detector from Ludlum. Preliminary testing results indicate excellent response uniformity, 15% alpha efficiency, lower background, no gamma response. Field testing is planned in the near future.

Update on HandEcount Experiences at SRS - Fred Ogden, SRS

Fred presented information on a software bug in the HandEcount (manufactured by Thermo) that causes background data to be incorrectly stored and used in the final results. SRS initiated procedure change, sent Lessons Learned to DOE Complex, examined all old data, contacted Thermo. Thermo has the replacement software available, but you need to fill out the form on the Service Bulletin. SRS will complete testing of the new software version by December 1.

Fred also informed on SRS replacement of the Thermo RMS-2 area radiation monitors with RMS-3. Currently SRS has 41 units with possible purchase of up to 200 in FY05. Testing revealed linearity problems that they are trying to solve with Thermo and will test at Richland for the high dose rate range.

Operational experience with the Eberline Alpha7 CAMs – Mike Dempsey, LANL

Mike described the characteristics of the new alpha 7L CAM, and LANL experience with the filters, flow control with critical flow venturi, dust loading, response/challenge testing with sources with holes. LANL experience shows that Alpha 7L reliably measured Pu down to 1.5 DAC-h, Alpha 7L has very good data logging capabilities, easy calibration and replacement of sampling head and filters, remote monitoring. Many small problems were identified and resolved. The issue of high number Fast Concentration (DAC) and Fast Dose (DAC-h) false alarms is being diagnosed and a new software is being developed. Alpha 7L did not alarm (slow mode) when the alarm points were exceeded during a job with fair potential for airborne release. Thermo found two software bugs and developed a fix for the problem. LANL will test the new software when the work stand down restriction is lifted. In summary, Alpha 7L CAM superbly detects Pu and is easy to operate, but the alarms problems (both false and true) need to be corrected.

LANL's New/Enhanced Capabilities at the Cal Facility – Dave Seagraves, LANL

Dave talked about the new enhanced capabilities at LANL calibration facility. The calibration facility is 3 years old and has Am-241, beta and X-ray irradiator systems. For beta exposures LANL uses only the 3 meter range; for gamma exposures LANL used 1, 2 and 3 meters. LANL uses Hopewell LabView Software to control the irradiation process.

Lessons learned from the LANL Resumption Process – Robert Murphy, LANL

Robert informed us that after the work was suspended on July 16, 2004, NNSA local office approved all aspects of the resumption process. All work activities were categorized as level 1 (little or acceptable risk), level 2 (mid-range risk), or level 3 (higher risk). Level 0 was added for essential activities. Three branches of resumption were established – personnel competency and commitment, laboratory operations review and CREM accountability. Calibration of radiation protection instruments was categorized as level 0/2. LANL calibration facility is below category 3 nuclear facility and does not require SAT training. No activities in the Health, Safety and radiation Protection (HSR) Division were categorized as level 3.

Issues on training of operational personnel in the use of radiation instrumentation – Tom Voss, LANL

Tom outlined the DOE RCT training program at LANL and discussed some of the additional training provided by the technical Support Team. The presentation included information about the trainees, class size, course developers and instructors, radiation instrumentation, scope of training, testing for qualification, comprehensive exam part I and II and re-qualification of RCTs.

Afternoon session Chair: Fred Ogden

ISO 17025 certification of a calibration facility – Dave Rodgers, LBNL

Dave informed us that LBNL is committed to get professional certification everywhere where possible and that they needed a good look at the entire calibration process. LBNL evaluated each 17025 requirements against their program and identified areas where they do a good job, where they have deficiencies, the cost and some unclear issues. Although certification of DOE calibration labs is not required, LBNL will pursue a certification.

Applications of the Csl 16 channel chip detector in mapping the SNS cavities in liquid Helium and direct substitutions for JLABs ion chamber area monitoring systems – Dan Dotson, Jefferson Labs

Dan presented his work on the development of CSI multiple detectors for monitoring X-ray and gamma field emissions at SNS RF cavity production area. The detector consists of Csl crystal and diode and can measure radiation exactly as ion chamber from background level to 10 R/hr. The Csl crystal and diodes are sold as a package for ~ \$80/piece. His tests indicated that the multiple detectors can monitor a much larger area in greater detail than a single ion chamber. Their advantages are: no high voltage, extended range and low cost.

LBNL remote real-time data acquisition and presentation system for area gamma/neutron/Xray radiation monitors – Dave Rogers, LBNL

Dave talked was about the 3rd generation of LBNL's automated collection of data from fixed radiation monitors that was introduced in 1999. LBNL has 40 years experience of telemetry of radiation data from remote locations. The current system uses Ethernet to transport the data and a database for storing, processing and displaying the data. The current upgrade provides corporate ownership of monitoring data and unlimited extensibility and scope. It is also provides powerful data tools to EH&S users and researchers. Dave demonstrated slides from numerous displays of the data.

Closed Topical Discussion

- Experience and issues with Hopewell irradiator systems
- Instrument Calibration

Addendum

Robert Murphy (LANL) made and distributed to all 2004 HPIC attendees a CD with all members' presentations