LA-UR-23-26085

Los Alamos NATIONAL LABORATORY

Memorandum

Nuclear Criticality Safety Program

To: Dr. Angela Chambers, Nuclear Criticality Safety Program Manager, National Nuclear Security Administration / NA-ESH
From: Joetta Goda, NEN-2, MS B228
Phone: 505-667-2812
Date: June 26, 2023

Subject: Report on Foreign Travel to Lausanne, Switzerland for participation in the 17th International Symposium on Reactor Dosimetry (ISRD-17)

Meeting Details

Attendees on behalf of NCSP from LANL

Nicholas Whitman

Meeting Title

17th International Symposium on Reactor Dosimetry (ISRD-17)

Meeting Location

SwissTech Conference Center, Ecole Polytechnic Federale Lausanne (EPFL) Campus, Lausanne, Switzerland

Meeting Dates

May 22 – 26, 2023

Meeting Objective

The *International Symposium on Reactor Dosimetry* is held approximately every three years and serves as a forum for those involved in reactor dosimetry, including researchers, manufacturers, and includes representatives from industry, utilities, and regulatory agencies. The meeting is co-sponsored by ASTM and the *European Working Group for Reactor Dosimetry* (EWGRD).

Purpose of Travel

The attendee from Los Alamos National Laboratory traveled from the U.S. to Switzerland to attend the singular ISRD session in person at the EPFL campus in Lausanne, Switzerland.

Nicholas Whitman presented work on Godiva-IV supporting IER-153, or the Prompt Fission Uranium Neutron Spectrum (PFUNS) experiment. The work presented was on the neutron spectral adjustment process used to characterize the central cavity of Godiva-IV with 15 IRDFF-II reactions in preparation for the PFUNS experiment workflow.

Meeting Benefits to the NCSP

The conference allowed attendees to gather information related to the reactor dosimetry expertise area that is needed for future experiments and for the PFUNS experiment. The conference also allowed a forum that fosters collaboration between attendees.

Meeting Summary

The meeting focused on reactor dosimetry, but presentations ranged from numerical methods, power reactor surveillance and monitoring, decommissioning, research and test reactor dosimetry, novel detector designs, etc. On Tuesday and Thursday, there were topical workshops based on reactor dosimetry benchmarks; some discussion of uncertainty and SINBAD benchmarks came up. Nicholas Whitman notified the workshop participants of the SINBAD benchmark incentives discussed during the April SINBAD meetings in Paris to increase/improve uncertainty guide, similar to ICSBEP benchmarks. It seemed the reactor dosimetry community benefits most from shielding type benchmarks, but better uncertainty quantification is needed.

Tu/Th Workshop summaries:

Reactor Surveillance, Monitoring, Plant Life Management:

- Niobium with low Tantalum impurities supply chain issues
- Difficult to find Aluminum alloys for dosimetry, important for self-shielding
- From U.K. perspective, skills are lacking related to reactor dosimetry, need investment in this area
- Importance of the epithermal reactions, CEA working and looking into this area (this may be relevant for epithermal spectrum experiments upcoming at NCERC)
- Potential interest in reactor dosimetry related to decommissioning process for U.K., Germany working in this area seemingly at the moment
- Demand survey for high purity Niobium foils will be circulated (may be relevant to our activities at NCERC). Large push to reduce uncertainties for Nb foils as fast fluence monitor > ~3 MeV, relevant for many NCERC applications

Experimental Techniques, Benchmarks, and Inter-comparisons

- SINBAD benchmarks, quality, and reinvigoration of the handbook
- Shielding benchmarks facility is needed, may be worth exploring options for NCERC shielding benchmarks with international community if desired
- Next ISRD interested in more SINBAD exposure/research – may be worth submitting some of the Godiva IV shielding benchmark work
- Need to transfer knowledge to younger community – question still stands on best way to accomplish this
- Inter-comparison of Niobium dosimetry for fast fluence monitors, standards lacking specific details which result in differences among community – can NCERC help accomplish this at all? Last one was performed at ATR, but foils have been waiting to be shipped for a few years
- Supply of certified dosimetry materials lacking, aluminum alloys especially
- Is the community ready to field reactor dosimetry in advanced reactor concepts? Questions are still outstanding regarding this

Dosimetry in Test Reactors, Accelerators, and Fusion

- Importance of knowledge transmission between generations of workers and facilities
- Desire to generate a primer going beyond measurements to uncertainty quantification and further

- Need to identify new techniques related to advanced reactor concepts, perhaps new dosimetry candidates needed, dosimetry often afterthought

Calculational Methods, Nuclear Data, Uncertainties, and Adjustments

- Making common, non-proprietary benchmarks (non-criticality safety) are of need to the community. NCERC should be supporting this with future shielding benchmarks
- There is a large desire for another round-robin dosimetry exercise, going back to previous workshop summaries. If it supports similar goals, NCERC may be able to help in the future with this
- Deficiencies regarding ENDF/B-VIII.0 Iron-56 data were mentioned, generally speaking JEFF library has similar issues. Godiva IV work seemingly shows similar trend. This issue was mentioned in the NCERC futures meetings. Can NCERC assist?
- Gamma data remains a significant nuclear data need, can NCERC help if problems are more concretely defined

From these meetings, NCERC can be of assistance in advancing the community's needs, but the priorities need to be established as related to future NCERC experiments and research. It is suggested to examine what community needs also serve NCERC needs.

The next meeting was announced and will take place in Charleston, South Carolina, USA in May of 2025. More Los Alamos participants will be encouraged to attend due to reduced burden of international travel.

Side Meetings

Nicholas Whitman met with Mariya Brovchenko of IRSN to discuss dosimetry related to IER-296 TeX-MOX. Discussions ensued regarding workflow, dosimetry selection, and assumptions for the predictive modeling. Nicholas Whitman also met with colleagues from other DOE laboratories to further knowledge in neutron spectral adjustment/unfolding. Discussions of mcACE ensued; the code provides a way to determine true uncertainty more holistically in the *a priori* neutron spectrum by iteratively perturbing/sampling nuclear data within its existing uncertainties. Computationally, however, the method is expensive. A code called SAILS that is a spectral adjustment research code written in Python, which is nearly identical to what would be an iterative version of STAYSL_PNNL, will be obtained from colleagues at Idaho National Laboratory for further inter-code comparison and verification. Nicholas Whitman met with Danielle Redhouse, who is an expert in reactor dosimetry at Sandia National Laboratories. Danielle gave suggestions for future work. Discussions with Pat Griffin, lab fellow at Sandia National Laboratories regarding ASTM standards, and shape of adjustment vs. energy in Godiva IV work presented.

Attachment(s): Block program for the symposium/conference

Copy: Doug Bowen, ORNL, bowendg@ornl.gov
John Miller, SNL, millerj@sandia.gov
Marsha Henley, ORNL, henleym@ornl.gov
Johnna Marlow, LANL, jmarlow@lanl.gov

ISRD-17: BLOCK PROGRAMME

	Saturday 20th May	Sunday 21st May	Monday 22nd May	Tuesday 23rd May	Wednesday 24th May	Thursday 25th May	Friday 26th May
Morning			Opening and Keynote Speakers	Oral 4: Calculational Methods	Oral 5: Nuclear Data, Uncertainties and Adjustment	Oral 7: Experimental Techniques, Measurements and Monitoring	Oral 8: Reactor Surveillance, Plant Life Management and
			BREAK	BREAK	BREAK	BREAK	BREAK
			Oral 1: Reactor Surveillance, Plant Life Management and Decommissioning	Workshop Session A 1. Reactor Surveillance, Monitoring and Plant Life Management 2. Experimental Techniques, Benchmarks and Intercomparisons	Sponsor Presentation by Swiss Nuclear Oral 6: Benchmarks and Intercomparisons	Workshop Session B 3. Dosimetry in Test Reactors, Accelerators and Fusion 4. Calculational Methods, Nuclear Data and Adjustments	Workshop Summaries and Closing Address
			LUNCH	LUNCH	ADJOURN	LUNCH	ADJOURN
Afternoon		Registration, Starling Hotel	Oral 2: Experimental Techniques, Measurements and Monitoring	Poster Session 1 / Flash Talks • Nuclear Data, Uncertainties and Adjustments • Calculational Methods • Experimental Techniques *Refreshments provided*		Poster Session 2 / Flash Talks • Reactor Surveillance, Plant Life Management & Decommissioning • Dosimetry in Test and Research Reactors, Including Accelerators and Fusion • Benchmarks and Inter-comparisons *Refreshments provided*	
	Campus Orientation		BREAK Oral 3: Dosimetry in Test and Research Reactors		Social Event and Banquet Olympic Museum, Lausanne		
Evening		Welcome Apero Drinks & Buffet, Starling Hotel	ASTM and EWGRD Committees			Joint Meeting of ASTM and EWGRD Committees	