

American Nuclear Society

Advances in Nuclear Nonproliferation Technology & Policy Conference

Bridging the Gaps in Nuclear Nonproliferation

25-30 September 2016

La Fonda Hotel, Santa Fe, NM, USA

Program Booklet



Organized for the American Nuclear Society by the Nuclear Nonproliferation Policy Division, Isotopes and Radiation Division, and ANS Trinity Section Copyright © 2016, American Nuclear Society

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ISBN: 978-0-89448-731-6 ANS Order No: 700408

This program booklet can also be found at:

http://nnp.ans.org/program/final-program/

or http://bit.ly/2bic4Yj

in PDF and 3DIssue (eMagazine) formats



The conference hashtag is #ANTPC2016

The conference WiFi password is fall2016

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About ANS



The American Nuclear Society is committed to nuclear professionals and the nuclear industry. In addition to providing forums where professionals meet, ANS offers education, publications, outreach and more. Please read below and make sure to explore our website at http://www.ans.org/ to learn about all we have to offer.

HISTORY

ANS continues to be a professional, not-for-profit organization of scientists, engineers, and other professionals devoted to the peaceful applications of nuclear science and technology. Its 10,500+ members (in 46 countries) represent over 1,600 corporations and come from diverse technical disciplines ranging from physics and nuclear safety to operations and power, and from across the full spectrum of the national and international enterprise, including government, academia, research laboratories, and private industry. Making it all succeed are a Board of Directors, 21 standing committees, 18 professional divisions (and one technical group), 54 local sections (including 7 overseas and one affiliated society), 34 student sections, 24 plant branches, liaison agreements with some 30 non-U.S. nuclear societies (and one organization), and a headquarters staff of approximately 50 people.

Vision: ANS will be the recognized credible advocate for advancing and promoting nuclear science and technology.

Mission: ANS provides its members with opportunities for professional development and serves the nuclear community by creating a forum for sharing information and advancements in technology, and by engaging the public and policymakers through communication outreach.

Purpose: The core purpose of ANS is to promote the awareness and understanding of the application of nuclear science and technology.

Not a Member? Join ANS!

If you are interested in taking advantage of the member rate, join ANS as a National Member at <u>https://secure.ans.org/join/</u>. Once you complete the member application, you can immediately register at the lower member fee. You must be an ANS National Member before you can register at the member rate. Questions regarding member benefits can be directed to <u>members@ans.org</u> or (800) 323-3044.

Conference Outline

About the Advances in Nuclear Nonproliferation Technology and Policy Conference

This is the second topical meeting of the Nuclear Nonproliferation Policy Division and the Isotopes and Radiation Division focusing on the intersection of nonproliferation technology and policy implementation. This conference seeks to build upon previous ANS topical conferences held on nuclear fuel cycle technology, facility safeguards, and nonproliferation technology development. The goal of this topical is to stimulate conversation among nuclear science researchers, facilities operators, and policymakers, with an agenda that will include sessions on current trends in nuclear material and fuel cycle technology developments as they relate to safeguards, treaty verification, and broader nonproliferation policy. These technical sessions, combined with engaging panels, will provide a venue for discussions on the intersecting policy and technical needs in nuclear nonproliferation.

Plenary Session

- Charles McMillan, Director, Los Alamos National Laboratory
- Hans Blix, former Director General of the International Atomic Energy Agency, and former Executive Chairman of the United Nations Monitoring, Verification and Inspection Commission (UNMOVIC)

Eight Technical Tracks with Multiple Sessions

Technical Tour (3 stops)

Six Featured Panel Discussions

- Next Generation Challenges: University Consortia in Nonproliferation Education
- Iran Deal: One Year Later
- Strategic Trade Controls
- 2016 Nuclear Security Summit
- Lessons from the First 50 Years of Safeguards for the Next Half Century
- Nonproliferation Challenges in Space / Defense Technology

Three Workshops

- Social Media for Nonproliferation
- MCNP[®]6 Correlated Fission Capabilities and the MCNP Associated Packages: Intrinsic Source Calculator, MCNPTools, and DRiFT
- Uncertainty Quantification for Nondestructive Assay

Conference Organizing Committee



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Andrew Nicholson (ORNL) UQ Workshop



Avneet Sood (LANL) MCNP Workshop



Madison Andrews (LANL), International Liaison & MCNP Workshop

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Sponsors and Exhibitors

Sponsors:



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Exhibitors:

Los Alamos National Laboratory

http://www.lanl.gov/

Oak Ridge National Laboratory

https://www.ornl.gov/

Y-12 National Security Complex

http://www.y12.doe.gov/



Pajarito Scientific Corporation

http://www.pajaritoscientific.com/

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Date	Times	Comments
Sun 25 Sep	12:00-14:00	Setup
Mon 26 Sep	10:00-16:00	Open
	18:00-20:00	Open during Poster Session
Tue 27 Sep	10:00-16:00	Open
Wed 28 Sep	10:00-12:00	Open
	12:00-14:00	Teardown

All Exhibits are located in the Mezzanine

Information for speakers:

- All speakers must register for either one (1) day or for the full meeting. If you wish to attend additional activities or have a guest, you will need to register for those as well.
- Please report to your Session Chair, in the room assigned for your session (as listed in the Official Program) to meet your Chair and upload your presentation. If you have not already done so, please provide him/her with brief biographical information. All morning session speakers should report at 7:40; all afternoon session speakers at 13:10.
- Please cooperate with your Session Chair and limit your presentation to the time indicated in the Official Program. This time includes a five-minute discussion period following your formal presentation.
- Please do not ask the Session Chair to reschedule your paper within the session. Many attendees schedule their attendance at various sessions in accordance with the times listed in the Official Program.
- Technical Session Room AV Setup: All rooms will have an LCD projector, screen, wireless microphone, wireless slide advancer/laser pointer, and a laptop. LCD projectors will project a resolution of 1024x768.

Registration:

Located in the New Mexico Portal just behind La Plazuela Restaurant off the main lobby on Sunday 25 September from 12:00 to 18:30. Located in the Mezzanine on Monday 26 September through Wednesday 28 September from 7:00 to 10:30 and 13:00 to 15:30. Located in the Mezzanine on Thursday 29 September from 7:00 to 9:00.

The meeting **Office** is located in the Stiha Room from 12:00 Sunday 25 September through 14:00 Wednesday 28 September. General business services for meeting registrants are available through the hotel business center.

A **Message Board** is located near the Registration Tables.

La Fonda offers free **WiFi connectivity** for meeting attendees. The WiFi password for the meeting dates is: fall2016

Student Program information is inserted in the student registration packet.

There are many cultural, historic and natural areas to experience in and around Santa Fe. The La Fonda concierge desk will be pleased to assist you in planning any outside activities.

Conference Overview

Sunday	13:00-17:00	Social Media Workshop
25 Sep	18:30-20:30	Hosted Reception
Monday	8:00-10:00	Plenary
26 Sep	10:00-10:20	Break/snacks (compliments of Canberra)
	10:20-12:00	Sessions (x3)
	12:00-13:30	Lunch (on your own)
	13:30-15:10	Sessions (x3)
	15:10-15:30	Break
	15:30-17:00	Sessions (x3)
	18:00-20:00	Poster Session / Exhibits with refreshments
Tuesday	8:00-10:00	Sessions (x3)
27 Sep	10:00-10:20	Break
	10:20-12:00	Sessions (x3)
	12:00-13:30	Hosted lunch with speaker Alan Carr, LANL Historian
	13:30-15:10	Sessions (x3)
	15:10-15:30	Break
	15:30-17:00	Sessions (x3)
Wednesday	8:00-10:00	Sessions (x3)
28 Sep	10:00-10:20	Break
	10:20-12:00	Sessions (x3)
	12:00-13:30	Hosted lunch (boxed lunches)
	13:00-17:30	MCNP [®] Workshop
	13:30-17:00	UQ Workshop
Thursday	8:00-13:00	Technical Tour (includes lunch)
29 Sep	8:00-10:00	UQ Workshop
	10:00-10:20	Break
	10:20-12:00	UQ Workshop
	12:00-13:30	Lunch (on your own)
	13:30-15:10	UQ Workshop
	15:10-15:30	Break
	15:30-17:00	UQ Workshop
Friday	8:00-10:00	UQ Workshop
30 Sep	10:00-10:20	Break
	10:20-12:00	UQ Workshop

Technical Tour

Los Alamos—Where Discoveries are Made!

The ANS Nonproliferation Topical organizers have arranged three tour stops in Los Alamos and at the Laboratory.

The tour is scheduled for Thursday 29 September from 8:00-13:00. **Meet in the La Fonda lobby at 7:45**. Lunch is included in the tour.

The Los Alamos Neutron Science Center (LANSCE) proton linear accelerator has served the nation since 1972 by providing an experimental research facility to support the Department of Energy and other users.





The Nonproliferation and National Security Center Nondestructive Assay Training Area is dedicated to teaching measurement techniques and technologies to a wide range of users.

The Bradbury Science Museum, located in downtown Los Alamos, hosts approximately 40 interactive exhibits on the Manhattan Project and current LANL research efforts.



Plenary Speaker

Dr. Charles McMillan

Director, Los Alamos National Laboratory and President, Los Alamos National Security, LLC



Dr. McMillan became Director of LANL and President of LANS, LLC in June 2011. Los Alamos's mission on behalf of the US Department of Energy is to maintain the safety, reliability, and effectiveness of the US nuclear deterrent. Los Alamos uses leading-edge science and innovation to solve some of the world's hardest problems in national security, energy security, and environmental challenges. With an annual operating budget of ~\$2.1 billion, Los Alamos employs roughly 10,000 people, and occupies a 36-square-mile site that includes some of the most specialized scientific equipment and supporting infrastructure in the world.

Since his appointment, McMillan has guided Los Alamos to high levels of mission execution during a period of shrinking federal budgets. He has signed five annual letter reports to the President and Congress certifying the Los Alamos-designed weapons in the nation's nuclear weapons stockpile. Under McMillan's leadership, Los Alamos debuted novel systems to provide exponential improvements in data-gathering for subcritical nuclear tests, and played a vital role in the B-61 mod 12 Life Extension Project (LEP).

Before becoming Laboratory Director, McMillan served as the Principal Associate Director for Weapons Programs, responsible for the science, technology, engineering, and infrastructure enabling the Laboratory to fulfill its nuclear deterrent mission. McMillan directed research that supported the technical analysis necessary to ensure stockpile safety, security, and effectiveness. This included small-scale materials experiments through fully integrated hydrotests that provided essential modeling and simulation data necessary for validation in the absence of full-scale nuclear testing.

He has 30 years of scientific and leadership experience in weapons science, stockpile certification, experimental physics, and computational science. He began as an experimental physicist at LLNL in 1983 where he held research and management positions for 20 years.

McMillan holds a doctorate in physics from MIT and a bachelor's in mathematics and physics from Washington Adventist University. He has earned two DOE Awards of Excellence for his work in developing an innovative holographic tool that enhances the ability of scientists to predict nuclear performance. He is a frequent speaker on the vital role of national laboratories for the nation, and the importance of science, technology, engineering, and mathematics (STEM) education in cultivating the talent to carry out that role for the nation in the future.

McMillan resides in Los Alamos, NM with his wife Janet, with whom he raised three children.

Plenary Speaker



Dr. Hans Blix former Director General, IAEA, and former Executive Chairman, UNMOVIC

Dr. Hans Blix of Sweden, IAEA Director General from 1981 to 1997, guided the Agency through the Chernobyl disaster, revelations of a clandestine nuclear weapons programme in Iraq and the DPRK's safeguards violations. Under his direction, the framework for strengthened safeguards was established, and the international legal regime for nuclear energy was bolstered.

Hans Martin Blix was born in Uppsala, Sweden, on 28 June 1928. He studied at the University of Uppsala and at Columbia University, receiving his Ph.D. from Cambridge University. In 1959, he became Doctor of Laws at the Stockholm University, and in 1960, was appointed Associate Professor in International Law.

From 1963 to 1976, Dr. Blix was Head of Department at the Ministry for Foreign Affairs in Sweden and served as Legal Adviser on International Law. From 1961 until 1981, he was a member of Sweden's delegation to the United Nations General Assembly, while from 1962 to 1978 he was a member of the Swedish delegation to the Conference on Disarmament in Geneva. In 1976, he became Under-Secretary of State at the Ministry for Foreign Affairs, in charge of international development cooperation. He was appointed Minister for Foreign Affairs in October 1978, serving in that position until 1979.

Following his tenure as IAEA Director General, Dr. Blix was named Executive Chairman of the United Nations Monitoring, Verification and Inspection Commission (UNMOVIC) by United Nations Secretary-General Kofi Annan. He served in that position from January 2000 until June 2003.

Next-Generation Challenges: University Consortia in Nonproliferation Education

Monday, 26 September 2016, 13:30-15:10, Lumpkins Ballroom South

Session organizers: Shaheen Dewji (ORNL) Rian Bahran (LANL)

Session Chair:

Jeffrey Favorite (LANL)

Panel members:

Sara Pozzi (U. Michigan) John Mattingly (North Carolina State Univ.) Bethany Goldblum (UC – Berkeley)

The National Nuclear Security Administration's (NNSA) Office of Defense Nuclear Nonproliferation Research and Development has established three large University-led multiinstitution consortia for cutting edge multi-disciplinary research and development, education and training in nuclear nonproliferation. The three consortia include the Nuclear Science and Security Consortium (NSSC) led by University of California at Berkeley, the Consortium for Verification Technology (CVT) led by the University of Michigan, and the Consortium for Nonproliferation Enabling Capabilities (CNEC) led by North Carolina State University. This panel will highlight the makeup and mission of each consortium and provide progress updates on some of the technical accomplishments to date.

Iran Deal: One Year Later

Tuesday, 27 September 2016, 08:00-10:00, Lumpkins Ballroom South

Session organizer:

Mohammad Homayounvash (FIU)

Session chair:

Mohammad Homayounvash (FIU)

Panel members:

Mahdi Sarram (Energy Sec. Consulting) Mohiaddin Messbahi (FIU) Chris Kessler (NorthRaven Consulting) Joe Pilat (LANL)

The Joint Comprehensive Plan of Action (JCPOA), commonly known as the Iran nuclear deal and concluded on July 14, 2015, in Vienna between Iran and the five permanent members of the United Na-



tions Security Council, constitutes a monumental rarity in the history of counter-proliferation in that it incentivized Tehran to accept a transparency-for-desecuritization deal through patient application of coercive diplomacy. The panel will address and unpack the long-term implications of the Iran deal from domestic, regional, and international perspectives by utilizing varying historical, normative, theological, and power-politics lenses. The panelists will offer fresh analytical frameworks and historical insight on the JCPOA's impact on the international nonproliferation regime—in terms of enhancing or curtailing the diffusion and embeddedness of its norms—and whether it will persuade or dissuade future nuclear aspirants in the Middle East and beyond.

includes 18834 The Iran Procurement Channel – Is the Experiment Going to Work?, J. Christian Kessler, NorthRaven Consulting LLC

Strategic Trade Controls

Tuesday, 27 September 2016, 10:20-12:00, Lumpkins Ballroom South

Session organizer: Jessica White-Horton (ORNL) Session chair: Margaret Harding (DOE/NNSA) Panel members: Kevin Whattam (PNNL) Gretchen Hund (PNNL) Shannon Barna (GE) Allen A. DiPalma (U. Pittsburgh)

Controlling transfers of relevant materials, equipment, and technology is a critical element of nuclear nonproliferation. Attempts to acquire or develop nuclear weapons has included international procurement of goods and services. Private industry and university research, not the government, are the first line of defense in preventing these transfers. With each advance in technology, the challenges to manage the flow of information and commodities become greater. To more thoroughly address the challenge, the full supply chain needs to become a focal point. This broader focus is referred to as "supply chain security" – the concept of controlling and securing sensitive goods and information not only when in an organization's possession and when delivered to a customer, but when transferred to suppliers as well as subsidiaries.

2016 Nuclear Security Summit

Tuesday, 27 September 2016, 13:30-15:10, Lumpkins Ballroom South

Session organizers:

Gene Carpenter (NRC) Steve Nesbit (Duke Energy)

Session chair:

Frank Niels von Hippel (Princeton)

Panel members:

Morris Hassler (Y-12) Caroline Jorant (Nuclear-21.Net / SDRI) Howard Hall (Univ. Tennessee-Knoxville) Nina Rosenberg (LANL)

The mission of the Nuclear Nonproliferation Policy Division (NNPD) is to promote the peaceful use of nuclear technology while simultaneously preventing the diversion and misuse of



nuclear material and technology through appropriate safeguards and security and the promotion of nuclear nonproliferation policies. To achieve this mission, NNPD seeks to become a recognized technical resource on nuclear nonproliferation, safeguards, and security issues and serve as the integration and coordination body for nuclear nonproliferation activities for the American Nuclear Society including participation at the third series of the Nuclear Security Summit held in Washington DC this year. This panel will provide a recap of this summit and will look ahead at the future of nuclear security in the context of this event.

Lessons from the First 50 Years of Safeguards for the Next Half Century

Wednesday, 28 September 2016, 08:00-10:00, Lumpkins Ballroom South

Session organizers: Alexis Trahan (LANL) Rian Bahran (LANL)

Session chair: Rebecca Stevens (LANL)

Panel members:

Joe Pilat (LANL) Doug Reilly (LANL, Retired) Johnna Marlow (LANL) Howard Menlove (LANL)



2016 marks the 50th anniversary of the foundation of the U.S. safeguards program. The field emerged in recognition of the need to monitor and secure nuclear materials that could be diverted away from peaceful uses. Throughout the past 50 years, the nuclear nonproliferation landscape has changed and evolved significantly. The past 50 years have seen eras of extensive arms testing, comprehensive treaties and agreements, and occasionally, clandestine programs. But throughout it all, safeguards technologies and instrumentation have been key components in support of the International Atomic Energy Agency and the mission of a peaceful world with nuclear power. The panelists will share insights they have gained through their careers in safeguards with a focus on how we can look at the events of the last 50 years to help shape the outcome of the next 50.

Nonproliferation Challenges in Space / Defense Technology

Wednesday, 28 September 2016, 10:20-12:00, Lumpkins Ballroom South

Session organizers: Chris Robinson (Y-12)

Session chair: Patrick McClure (LANL)

Panel members:



Patrick McClure (LANL) Frank Sage (Director WSPR, US Army White Sands Missile Range) Mike Houts (NASA Marshall Space Flight Center) Ray Juzaitis (President and CEO, NSTec, Retired) Alice Caponiti (DOE NE)

Nuclear fission systems provide enormous advantages to space and defense power and propulsion systems. With renewed interest in both space-nuclear power/propulsion and special purpose military systems, discussions continue regarding use of highly enriched uranium (HEU) versus low-enriched uranium (LEU) fuel. The fuel decision for these highpower systems is the single most important parameter for achieving the low "specific mass" (*i.e.*, kg/kWe) and neutron flux density required. This panel is intended to bring together policy makers, technical/ reactor design experts, program leads, and end-users



for an open discussion on the technical challenges and ability to meet design / performance specifications versus domestic/ international nuclear nonproliferation polices.

Workshop—Social Media

From social networking to personal broadcasting to crowdtasking, social data is seemingly everywhere. The potential application of social media data and technologies vary significantly depending on the specific nonproliferation treaty or objective and the information generation/gathering approach. This workshop will focus on three social data approaches:



Societal observation - collection and analysis of data produced by the public that would be available regardless of the intended enduse, for internal expert analysis.



Societal mobilization - collection and analysis of data produced by the public as the result of a request for information, analysis, or opinion.



Communication and networking - the use of social media platforms for communication and networking surrounding nonproliferation topic areas.

Topics will include:

- Challenges and considerations for using social media for nuclear nonproliferation verification and outreach
- Discussions of case studies and real-world applications
- Policy perspectives and interest
- Technical demonstrations

Program schedule on next page Recommended workshop attire is business casual



WORKSHOP:

Social Media for Nuclear Nonproliferation

13:00-17:00 25 September 2016 La Fonda on the Plaza Hotel Santa Fe, NM, USA

> For questions, contact: Zoe Gastelum, <u>zgastel@sandia.gov</u>

Held in association with Advances in Nuclear Nonproliferation Technology & Policy Conference <u>http://nnp.ans.org/</u>



September 25-30, 2016 • Santa Fe, NM

Workshop—Social Media

Technical Program

Plenary Session, 13:00 – 13:15, New Mexico Room Welcome: Zoe Gastelum, Workshop Chair (SNL)				
13:15 – 14:45 Keynote Discussion: Three Perspectives on Social Media for Nuclear Nonproliferation Panel: Michael J. Henry, PNNL; Daniel Wurmser, US DOS; Sean Morrell, INL				
14:45 –	15:00 — Break with Light Ref	reshments		
В	reak-Out Sessions and Discuss	sion		
Ballen Board Room	New Mexico Room	Exchange Room		
15:00 – 16:45 Societal Observation	15:00 – 16:45 Societal Mobilization	15:00 – 16:45 Communication and		
Moderators: Michael Henry (PNNL) /. Geoff Fairchild (LANL)	Moderators: Daniel Wurm- ser (US DOS) / Karl Horak (SNL, retired)	<i>Networking</i> Moderators: Sean Morrell (INL) / Valerie Finch (PNNL)		
Panel members: Geoffrey Fairchild (LANL), James Kornell (Special Technologies Laboratory), Michael Barletta (IAEA), Julie Starnes (Recorded Future)	Panel members: Karl Horak (SNL, retired), Christy Ruggiero (LANL), Kari Sentz (LANL), Catherine Dill (James Mar- tin Center for Nonprolifera- tion Studies)	Panel members: Lovely Umayam (The Stim- son Center), Valerie Finch (PNNL), Darrick Hurst (SNL), Brian Davis and Heyward Drummond (Tableau)		
Plenary session, 16:45 – 17:00, New Mexico Room Closing Remarks: Zoe Gastelum (SNL)				

Session Information

Societal observation

Societal observation refers to passive ingestion and analysis of data from social media sources that could be used to support nonproliferation verification activities by relevant agencies such as the International Atomic Energy Agency or the Comprehensive Test Ban Treaty Organization. It includes data that would be present on social media platforms regardless of the end-users' objectives, and could include broad monitoring of sentiment, event detection, or more focused analysis of a specific location or community.

Societal mobilization

Societal mobilization refers to virtually surveying a community to contribute to a nonproliferation objective, and could include, for example, wide distribution of sensor platforms from which data is collected and shared over social media, expert user groups collaborating on "flash verification" topics, or confidence building measures undertaken by states to provide additional transparency as part of their nonproliferation assurances.

Communication and networking

Communication and networking refers to the use of social media platforms for user communication and networking. It could include forming communities of interest surrounding nonproliferation topic areas, sharing research and publications, or broadcasting news, opinions, or other information of interest to a community of users.

Workshop—MCNP®

Demonstrating MCNP[®] Correlated Fission Capabilities and MCNP Associated Packages: Intrinsic Source Constructor, MCNPTools, and DRiFT (Detector Response Function Toolkit)

This workshop^{**} will consist of several parts, with presentations on nonproliferation-relevant code capabilities under development at Los Alamos National Laboratory. Attendees will be provided with examples and documentation, and instructors will remain after code demonstrations to work with attendees on their specific simulation interests. Neither computers nor access to MCNP will be provided; however, participants may bring their own laptops to the workshop.

Workshop Schedule

- 13:00-13:30: Introduction to Workshop A. Sood, XCP-3
- 13:30-14:00: Using MCNP for Nonproliferation Applica tions G. E. McMath, NEN-5
- 4:15-15:00: Intrinsic Source Constructor (ISC) and MCNPTools - C. J. Solomon, XCP-3
- 15:15-16:00: MCNP: Simulating Correlated Data in Fission Events - M. E. Rising, XCP-3
- 16:15-17:00: DRiFT: A Detector Response Function Toolkit for MCNP Output - *M. T. Andrews and C. R. Bates, XCP-3*
- 17:00-18:00: Discussion and Addressing Attendees' Specific Simulation Interests

See next page for session descriptions Workshop contact: A. Sood, LANL, XCP-3: <u>sooda@lanl.gov</u>



WORKSHOP:

MCNP[®] *

13:00-18:00 28 September 2016 La Fonda on the Plaza Hotel Santa Fe, NM, USA



* MCNP and Monte Carlo N-Particle are registered trademarks owned by Los Alamos National Security, LLC, manager and operator of Los Alamos National Laboratory.

** XCP-3 (Monte Carlo Methods, Codes, and Applications Group) is supporting this event, held in association with Advances in Nuclear Nonproliferation Technology & Policy Conference, <u>http://nnp.ans.org/</u>



Workshop—MCNP®

Session descriptions

All presentations will be in Lumpkins Ballroom North

13:00-13:30: Introduction to Workshop

This portion of the workshop will provide a general introduction and purpose of the workshop. We will showcase examples of how MCNP is used at LANL and some of the reasons behind our recent developments.

13:30–14:00: Using MCNP for Nonproliferation Applications (Optional)

This portion of the workshop is recommended for those who are unfamiliar with MCNP Version 6. We will introduce MCNP basics including how to set up a simple MCNP input deck. Examples will focus on non-proliferation relevant simulations.

14:15–15:00: Intrinsic Source Constructor (ISC) and MCNPTools Description

MCNPTools is a software package to process and manipulate MCNP outputs, specifically mctal, meshtal, and ptrac files. The package provides object oriented access to the files through C++, Python, and Perl interfaces. Additionally, some standalone binary utilities are packaged that perform operations on the files.

The Intrinsic Source Constructor (ISC) is a package to compute source description given a radioactive material composition. The package includes the libisc, a library that can be built and linked into other tools in C++ or python, and misc, a standalone binary specifically for generating SDEF source specifications for MCNP.

15:15–16:00: MCNP: Simulating Correlated Data in Fission Events

In the upcoming release of MCNP Version 6.2, the LANL general-purpose Monte Carlo particle transport code, several fission multiplicity event generators have been implemented due to the need within the nuclear nonproliferation and global security communities for a predictive capability to model signatures of special nuclear materials (SNM). This workshop will introduce the fission multiplicity models, discuss how to best use the models within MCNP, and provide several examples of how the models have been compared to experimental measurements of SNM.

16:15–17:00: DRIFT: A Detector Response Function Toolkit for MCNP Output

DRiFT is a user-friendly Detector Response Function Toolkit under development at LANL. It is intended to post-process MCNP particle tracking (PTRAC) output and create realistic scintillator, semiconductor, and gas detector spectra. This workshop will describe how to use DRiFT with emphasis on organic scintillator simulations. DRiFT capabilities include the ability to couple varying scintillator materials and PMT models, and the generation of pulse shape discrimination and energy spectrum plots. Scintillator dependent resolution effects are reproduced via the inclusion of variances in photon yield and transport, and PMT shot and gain noise.

17:00–18:00: Open discussion

Discussion and addressing attendees' specific simulation interests.

Workshop—UQ



Attendees of the Uncertainty Quantification (UQ) for Non-Destructive Assay (NDA) Workshop will have the opportunity to:

• Interface with internationally renowned experts and program managers

• Submit a paper for publication in the proceedings of the Advances in Nuclear Nonproliferation Technology & Policy Conference

• Participate in drafting a set of best practices in NDA

Workshop attendees are invited to submit a paper and present their work regarding:

- · Uncertainty in measurement
 - Gamma-ray, neutron and calorimetric NDA measurements
 - Reliability and best measurement practices
- · Uncertainty in Modeling and Mathematical methods
 - · Uncertainties in transport codes
 - Bayesian methods
 - · Uncertainty in software emulators
 - · Performance and benchmarks

Who will attend:

- National Laboratories
- Industry
- Universities
- International Organizations
- Program Managers
- Safeguards Inspectors

Andrew Nicholson Workshop Co-chair <u>nicholsonad@ornl.gov</u> (+01) 865-241-4343

Andrea Favalli Workshop Co-chair

<u>afavalli@lanl.gov</u> (+01) 505-667-1429



WORKSHOP:

Uncertainty Quantification for Non-Destructive Assay

28-30 September 2016 La Fonda on the Plaza Hotel Santa Fe, NM, USA

Program schedule on next page

Held in association with Advances in Nuclear Nonproliferation Technology & Policy Conference, <u>http://nnp.ans.org/</u>



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Workshop—UQ

Program Schedule

Wednesday, 28 Sep 2016

New Mexico Room

13:30-14:10	UQ Workshop: Introductions and Welcome
14:10-14:30	Break (in room)
14:30-17:00	UQ Workshop: Uncertainty Quantification for Nondestructive Assay I

Thursday, 29 Sep 2016

New Mexico Room

JQ Workshop: Uncertainty Quantification for Nondestructive Assay II		
Break (in room)		
JQ Workshop: Uncertainty Quantification for Nondestructive Assay III	Stiha Room	
Lunch (on your own)		
JQ Workshop Breakout I	UQ Workshop Breakout II	
Break (in room)		
JQ Workshop Breakout I	UQ Workshop Breakout II	
	IQ Workshop: Uncertainty Auantification for Nondestructive Assay II Break (in room) IQ Workshop: Uncertainty Auantification for Nondestructive Assay III Lunch (on your JQ Workshop Breakout I Break (in r	

Friday, 30 Sep 2016

	New Mexico Room	Stiha Room
8:00-10:00	UQ Workshop Breakout I	UQ Workshop Breakout II
10:00-10:20	Break (in room)	
10:20-12:00	UQ Workshop Summary and Closeout	

Breakout Sessions

- 1. Uncertainty in Measurement
 - a) Gamma-ray measurements
 - b) Neutron measurements
 - c) Calorimetric measurements
 - d) Reliability and best practices
- 2. Uncertainty in Modeling and Mathematical Methods
 - a) Uncertainties in transport codes
 - b) Bayesian methods
 - c) Software emulators
 - d) Performance and benchmarks

Technical Program Outline

Room 1—Lumpkins Ballroom North

Room 2—Lumpkins Ballroom South

Room 3—New Mexico Room

Room 4-Mezzanine

Room 5—Stiha Room

Room 6—Ballen Board Room

Room 7—Exchange Room

Room 8—La Terraza

Events	Day	Room	Time
Plenary			
Opening Remarks and Plenary Session Speakers	Mon	1,2	8:00
Workshops	Day	Room	Time
Social Media for Nuclear Nonproliferation			
Welcome and Plenary	Sun	3	13:00
Breakout Sessions: I—Societal Observations; II—Societal Mobili- zation; III—Communication and Networking	Sun	3,6,7	14:45
Summary and Close-out	Sun	3	16:30
MCNP®			
MCNP® (see pg 22-23 for schedule)	Wed	1	13:00
Uncertainty Quantification			
Welcome and Introductions	Wed	2	13:30
Uncertainty Quantification for Nondestructive Assay I	Wed	2	14:30
Uncertainty Quantification for Nondestructive Assay II	Thu	3	8:00
Uncertainty Quantification for Nondestructive Assay III	Thu	3	10:20
Breakout Sessions I and II	Thu	3,5	13:30
Breakout Sessions I and II	Fri	3,5	8:00
Summary and Close-out	Fri	3	10:20
Other Events	Day	Room	Time
Poster Session / Exhibitors	Mon	4	18:00
Exhibitors (Sun 14:00—Wed 12:00)	Su-W	4	All
Student Social (see student registration packet insert)	Tue	TBA	TBA
Tours (meet in La Fonda lobby at 7:45)	Thu		8:00

Technical Program Outline, cont'd

Room 1—Lumpkins Ballroom North Room 2—Lumpkins Ballroom South Room 3—New Mexico Room

Room 4—Mezzanine

Room 5—Stiha Room Room 6—Ballen Board Room Room 7—Exchange Room Room 8—La Terraza

Special Sessions—Panel Discussions	Day	Room	Time
Next Generation Challenges: University Consortia in Nonprolifer- ation	Mon	2	12:00
Iran Deal: 1 Year Later	Tue	2	8:00
Nonproliferation Policy, Concepts and Approaches: Strategic Trade Controls	Tue	2	10:20
2016 Nuclear Security Summit	Tue	2	13:30
Lessons from the First 50 Years of Safeguards for the Next Half- Century	Wed	2	8:00
Nonproliferation Challenges in Space / Defense Technology	Wed	2	10:20
Tracks / Sessions	Day	Room	Time
Mathematical Methods in Nonproliferation:			
Validation and Verification Methods	Mon	1	10:20
Statistical Methods in Nonproliferation I	Wed	3	8:00
Statistical Methods in Nonproliferation II	Wed	3	10:20
Nuclear Material Control and Accountability:			
Nondestructive Assay Methods I	Mon	1	13:30
Nondestructive Assay Methods II	Mon	1	15:30
Destructive Analysis Methods & General Radiation Detection Applications	Tue	2	15:30
Nuclear Materials and the Fuel Cycle:			
Weapons Materials Minimization	Mon	2	10:20
Advanced Fuel Cycles	Tue	1	8:00
Challenges in Enrichment Verification and Spent Nuclear Fuel Verification and Storage	Wed	1	8:00

Technical Program Outline, cont'd

Room 1—Lumpkins Ballroom North

Room 2—Lumpkins Ballroom South

Room 3—New Mexico Room

Room 4—Mezzanine

Room 5—Stiha Room Room 6—Ballen Board Room Room 7—Exchange Room Room 8—La Terraza

Track / Session (cont'd)	Day	Room	Time
Nonproliferation Policy, Concepts, and Approaches			
Open Source Information Analysis for Nonproliferation Verification	Mon	3	10:20
Proliferation Resistance and Risk Assessment	Mon	3	13:30
Treaty Verification Regimes, State-Level Concepts and Fuel Cycle Analysis	Mon	3	15:30
Special Session: Next Generation Challenges			
University Consortia in Nonproliferation Education I	Mon	2	15:30
University Consortia in Nonproliferation Education II	Tue	3	8:00
University Consortia in Nonproliferation Education III	Tue	3	10:20
Nuclear Nonproliferation and Safeguards Simulation and Modeling			
Application of Codes I	Tue	1	13:30
Enhancements to Nuclear Data	Tue	1	15:30
Application of Codes II	Wed	1	10:20
Nonproliferation Education and Training			
Nonproliferation Education and Training I	Tue	3	13:30
Nonproliferation Education and Training II	Tue	3	15:30
Critical and Subcritical Experiments			
Critical and Subcritical Experiments	Tue	1	10:20
Meals and Refreshments	Day	Room	Time

Hosted Reception	Sun	8	18:30
Refreshments with Posters and Exhibits	Mon	4	18:00
Hosted Lunches	Tu,W	8	12:00
Coffee/tea with light snacks (courtesy of Canberra)	Mon	4	10:00
Coffee with morning breaks	Tu,W	4	10:00
Coffee with afternoon breaks	M-W	4	15:10

Technical Program

Sunday, 25 September 2016

SUNDAY PM

13:00-17:00 Social Media for Nuclear Nonproliferation Workshop Welcome and Closeout: New Mexico Room Breakout Session 1: New Mexico Room Breakout Session 2: Ballen Board Room Breakout Session 3: Exchange Room See details on pages 20-21

Monday, 26 September 2016

MONDAY AM - I

Plenary Session

Monday, 26 September 2016, 8:00-10:00, Lumpkins Ballroom

Session Organizers: Mohammad Homayounvash (FIU), Nancy Jo Nicholas (LANL), Heather Dion (LANL), Pratap Sadasivan (LANL), Shaheen Dewji (ORNL)

- Session Chairs: Nancy Jo Nicholas (LANL), Heather Dion (LANL), Pratap Sadasivan (LANL)
- 8:00 Plenary speakers: Dr. Charles McMillan (Director, LANL) and Dr. Hans Blix (former Director General, IAEA)

MONDAY AM - II

Track/Session: Mathematical Methods in Nonproliferation: Validation and Verification Methods

Monday, 26 September 2016, 10:20-12:00, Lumpkins Ballroom North Session Organizer: Rian Bahran (LANL) Session Chairs: Steve Skutnik (UTK), Stacey Eaton (LANL)

- 10:20 18841 Nonproliferation Modeling and Simulation Training at Virginia Tech, *Alireza Haghighat, Virginia Tech*
- 10:40 18641 Enabling Comparative Neutron Measurements of Spent Fuel Assemblies for Nonproliferation Purposes, *Babatunde John Adigun, LANL; Stephen J. Tobin, LANL; Holly R. Trellue, LANL; Michael Lorne Fensin, LANL; Michael Lynn Fugate, LANL; Garrett Dean, LANL; James R. Tutt, LANL; James K. Sprinkle, LANL*

- 11:00 18840 Analysis of RAPID Accuracy for Spent Fuel Pool with Variable Burnups and Cooling Times, *Alireza Haghighat, Virginia Tech; Nathan Roskoff, Virginia Tech; Valerio Mascolino, Virginia Tech*
- 11:20 18842 External SNF Cask Dose Calculation Using RAPID, Alireza Haghighat, Virginia Tech; Valerio Mascolino, Virginia Tech; Nathan J. Roskoff, Virginia Tech
- 11:40 18855 Neutronic Analysis of the CHANDLER Anti-neutrino Detector, *Alireza* Haghighat, Virginia Tech; William J. Walters, Virginia Tech

Track/Session: Nuclear Materials and the Fuel Cycle: Weapons Materials Minimization Monday, 26 September 2016, 10:20-12:00, Lumpkins Ballroom South Session Organizer: Morris Hassler (Y-12) Session Chair: Morris Hassler (Y-12)

- 10:20 18709 Real Progress Reducing Highly Enriched Uranium, *Gary A. Person, Y-12 National Security Complex*
- 10:40 18793 Efforts to Reduce the Use of Highly Enriched Uranium at Y-12, *Lloyd J. Jollay, Y-12 National Security Complex; Hollie Longmire, Y-12; Brent Wilhoit, Y-12*
- 11:00 18799 SRS Enriched Uranium Disposition Mission, Virginia E. Magoulas, SRNL
- 11:20 18390 Banning the Production of Highly Enriched Uranium (HEU), *Frank Niels von Hippel, Princeton Univ.*

Track/Session: Nonproliferation Policy, Concepts, and Approaches: Open Source Information Analysis for Nonproliferation Verification Monday, 26 September 2016, 10:20-12:00, New Mexico Room Session Organizers: Yana Feldman (LLNL), Zoe Gastelum (SNL) Session Chairs: Yana Feldman (LLNL), Zoe Gastelum (SNL)

- 10:20 18821 A Systems Thinking Approach to Open Source Analysis in Support of Nuclear Non-Proliferation, *Guido Renda, EC Joint Research Centre; Giacomo Giovanni Mariano Cojazzi, EC Joint Research Centre; Lance Kyungwoo Kim, EC Joint Research Centre*
- 10:40 18625 Integrating Multimedia Information in Nuclear Safeguards, *Michael Barletta*, *IAEA; Marcy Fowler, IAEA; Jennah Khaled, IAEA*
- 11:00 18872 Feasibility of Using Social Media Analysis for International Safeguards Applications, Amanda Sayre, PNNL; Andrew Kurzrok, PNNL; Eric Bell, PNNL; Eury Gallegos, PNNL; Court Corley, PNNL; John Schweighardt, PNNL
- 11:20 18875 Visualization and Analysis System for Discovery of Strategic Trade Patterns and Anomalies, *Peter M. Heine, ANL; Julie Carrera, ANL; Michael J. North, ANL*

MONDAY PM - I

Track/Session: Nuclear Material Control and Accountability: Nondestructive Assay Methods I

Monday, 26 September 2016, 13:30-15:10, Lumpkins Ballroom North Session Organizers: Shaheen Dewji (ORNL), Andrea Favalli (LANL) Session Chairs: Andrea Favalli (LANL), Alexis Trahan (LANL)

- 13:30 18831 Generalized Quantification of Trace-level Fissile Material Mixtures via Shortlived Delayed Gamma Spectroscopy, *Steve Eugene Skutnik, U. Tennessee; Justin R. Knowles, U. Tennessee*
- 13:50 18720 High Resolution X-ray (hiRX): New Instrument for Nondestructive Assay, Kathryn G McIntosh, LANL; George J. Havrilla, LANL; Robert F. Gilmore, SRNL; Michael K. Holland, SRNL
- 14:10 18768 FEPE Calibration of a HPGe Detector Using Radioactive Sphere Source, *Mahmoud Ibrahim Abbas, Alexandria Univ.*
- 14:30 18627 High-throughput Micro-analytical Sample Generation and Analysis of Process Salts, *Cari Launiere, ANL; Joseph Savina, ANL; Candido Pereira, ANL*
- 14:50 18820 Determination of the Irradiation History of Americium/Beryllium Reactor Startup Sources Using Gamma Spectroscopy, *Anthony Nettleton, LANL; Alex Feldman, LANL*

Special Session: Next Generation Challenges: University Consortia in Nonproliferation Education - PANEL

Monday, 26 September 2016, 13:30-15:10, Lumpkins Ballroom South Session Organizers: Shaheen Dewji (ORNL), Rian Bahran (LANL) Session Chair: Jeffrey Favorite (LANL) Panel members:

- Sara Pozzi (U. Mich.)
- John Mattingly (North Carolina State Univ.)
- Bethany Goldblum (UC-Berkeley)

See details on page 14

Track/Session: Nonproliferation Policy, Concepts, and Approaches: Proliferation Resistance and Risk Assessment

Monday, 26 September 2016, 13:30-15:10, New Mexico Room Session Organizers: Bob Bari (BNL), Jessica White-Horton (ORNL) Session Chairs: Jill Cooley (Y-12), Giacomo Cojazzi (JRC)

13:30 18835 Proliferation Resistance Redux, Joseph F. Pilat, LANL

13:50 18770 Reducing Proliferation Risk Scenarios towards more Sustainable Nuclear Energy Systems, *Luc G.G. Van Den Durpel, Nuclear-21.Net; Caroline Jorant, SDRI*

- 14:10 18833 The GIF Proliferation Resistance and Physical Protection (PR&PP) Evaluation Methodology: Status and Outlook, *Giacomo Giovanni Mariano Cojazzi; European Commission, Joint Research Centre; Guido Renda, EC Joint Research Centre; Robert A. Bari, BNL; Jeremy J. Whitlock, Canadian Nuclear Laboratories; Per F. Peterson, UC Berkeley; Ike U. Therios, ANL; Jean Cazalet, Commissariat à l'énergie atomique et aux énergies alternatives, France, On behalf of GIF PRPPWG, Generation IV International Forum*
- 14:30 18862 Developing a Verification Regime for Direct Disposal of Excess Plutonium, *Edwin S. Lyman, Union of Concerned Scientists*
- 14:50 18863 Macri and the Changing Landscape of Argentine Non-Nuclear Proliferation Policy in a Post-Kirchner Era, *A. Rey Villanueva; U. Texas San Antonio*

MONDAY PM - II

Track/Session: Nuclear Material Control and Accountability: Nondestructive Assay Methods II Monday, 26 September 2016, 15:30-17:50, Lumpkins Ballroom North Session Organizers: Shaheen Dewji (ORNL), Andrea Favalli (LANL) Session Chairs: Alicia Swift (Y-12), Rob Hayes (NCSU)

- 15:30 18825 Laser-Driven Neutron Source for Detection of Nuclear Material, Andrea Favalli, LANL
- 15:50 18725 Next Generation Pulsed Portable Neutron Generators for Nondestructive Assay, Charles K. Gary, Adelphi Technology, Inc.; David L. Williams, Adelphi Technology, Inc.; Allan X. Chen, Adelphi Technology, Inc.
- 16:10 18766 Data Fusion for a Vision-Radiological System: Calibration Algorithm Response to Gammas vs. Neutrons, *Kelsey Stadnikia, U. Florida; Allan Martin, U. Florida; Phillip Riley, U. Florida; Kristofer Henderson, U. Florida; Sanjeev Koppal, U. Florida; Andreas Enqvist, U. Florida*
- 16:30 18705 Towards Stand-Off Nuclear Reactor Monitoring Using Neutron Detection, Bryan van der Ende, Canadian Nuclear Laboratories; Liqian Li, Canadian Nuclear Laboratories; Bhaskar Sur, Canadian Nuclear Laboratories
- 16:50 19306 Multiplicity Expressions for Fissile Mass Estimation in a Fast Neutron Detection System, Tony Heong Shick Shin, U. Michigan Ann Arbor; Michael Y. Hua, U. Michigan Ann Arbor; Angela Di Fulvio, U. Michigan Ann Arbor; David L. Chichester, INL; Shaun D. Clarke, U. Michigan Ann Arbor; Sara A. Pozzi, U. Michigan Ann Arbor
- 17:10 18719 Liquid Scintillator-Based Fast Neutron Coincidence Counter for Fresh Nuclear Fuel Measurements, *Tae Hoon Lee, IAEA; Alice Tomanin, European Commission; Jonathan Beaumont, IAEA*

17:30 18771 Characterization of a LiF/ZnS-based Neutron Multiplicity Counter, Sean Stave, PNNL; R. Spencer Behling, PNNL; Mary Bliss, PNNL; Christian C. Cowles, PNNL; Richard Kouzes, PNNL; Vladislav Kukharev, PNNL; Azaree Lintereur, U. Utah; Sean Robinson, PNNL; Edward Siciliano, PNNL; Patrick Valdez, PNNL

Track/Session: Special Session: Next Generation Challenges: University Consortia in Nonproliferation Education I

Monday, 26 September 2016, 15:30-17:10, Lumpkins Ballroom South Session Organizers: Shaheen Dewji (ORNL), Rian Bahran (LANL) Session Chairs: Bethany Goldblum (UC-Berkeley), Rian Bahran (LANL)

- 15:30 18857 Quantifying Correlations between International Relations and Nuclear Proliferation Status, Nathaniel Mahowald, Nuclear Science and Security Consortium; Bethany L. Goldblum, Nuclear Science and Security Consortium; Thomas Hickey, Nuclear Science and Security Consortium; James Kornell, National Security Technologies, LLC, Special Technologies Laboratory
- 15:50 18898 Detection of Radiation Signatures in Urban Environment, *Razvan Stefanescu, North Carolina State Univ.; Kathleen Schmidt, North Carolina State Univ.; Jason M. Hite, North Carolina State Univ.; Ralph Smith, North Carolina State Univ.; John Kelly Mattingly, North Carolina State Univ.*
- 16:10 18780 Developing Intelligent Non-proliferation Enabling Capabilities: Very-Short-Term Prediction of Background Radiation in Radioactive Source Search Using Relevance Vector Regression, *Miltiadis Alamaniotis, Purdue Univ.; Chan K. Choi, Purdue Univ.; Lefteri Tsoukalas, Purdue Univ.*
- 16:30 18797 Online Diversion Detection in Nuclear Fuel Cycles via Multimodal Observations, *Yasin Yılmaz, U. Michigan; Elizabeth Hou, U. Michigan; Alfred Hero, U. Michigan*
- 16:50 18778 Diversion Detection in Partially Observed Nuclear Fuel Cycle Networks, *Elizabeth Hou, U. Michigan; Yasin Yılmaz, U. Michigan/Department of EECS; Alfred O. Hero, U. Michigan/Department of EECS*

Track/Session: Nonproliferation Policy, Concepts, and Approaches: Treaty Verification Regimes, State-Level Concepts and Fuel Cycle Analysis Monday, 26 September 2016, 15:30-17:50, New Mexico Room Session Organizers: Bob Borrelli (U. Idaho), Jill Cooley (Y-12), Martin Williamson (Y-12) Session Chairs: Bob Borrelli (U. Idaho), Jill Cooley (Y-12)

- 15:30 18854 Global Nuclear Non-Proliferation Regime: Nuclear Security Summit 2016 Action Plan in Support of the United Nations, *Sarah Shirazyan, Stanford Law School*
- 15:50 18702 Objectives-Based International Safeguards, Bruce W. Moran, CNS/Y-12
- 16:10 18919 Improving the Implementation of Safeguards and Security in Nuclear Facility Design and Construction, *Carolynn Scherer, LANL; Eric Rauch, LANL; James Sprinkle, LANL*

- 16:30 18838 Fixed Plant Analysis of Iran's Post-JCPOA Implementation Breakout Potential, *Benjamin R. Thomas, U. Virginia; Houston G. Wood, U. Virginia*
- 16:50 18798 Use of Modeling Simulation to Evaluate/Contrast Regulatory Effectiveness, *Philip Wade Gibbs, ORNL; Jack Calavuzzi, Texas A&M Univ.*
- 17:10 19155 A New Model for Nuclear Proliferation, Roy J. Peterson, U. Colorado Boulder
- 17:30 18743 Non-Proliferation for Advanced Reactors: Political and Social Aspects, *Romney B. Duffey, DSM Associates, Inc.; Gerald E. Clark, UK*

MONDAY PM – POSTER SESSION

Posters/Refreshments

Monday, 26 September 2016, 18:00-20:00, Mezzanine Session Organizers: Alicia Swift (Y-12), Mateusz Monterial (U. Michigan) Session Chairs: Alicia Swift (Y-12), Mateusz Monterial (U. Michigan) See details on page 46

Tuesday, 27 September 2016

TUESDAY AM - I

Track/Session: Nuclear Materials and the Fuel Cycle: Advanced Fuel Cycles Tuesday, 27 September 2016, 8:00-10:00, Lumpkins Ballroom North Session Organizer: Andrew Worrall (ORNL) Session Chair: Andrew Worrall (ORNL)

- 8:00 18652 Proliferation Resistance Evaluation of an Advanced Fuel Cycle Employing High Temperature Gas Cooled Reactors, *Takeshi Aoki, Nuclear Security Science & Policy Institute, Texas A&M Univ.; Hiroshi Sagara, Tokyo Institute of Technology; Sunil S. Chirayath, Nuclear Security Science & Policy Institute, Texas A&M Univ.*
- 8:20 **18769** The Proliferation Resistance of a Nuclear Fuel Cycle Based on Pyrochemical Processing of Pressurized Water Reactor Spent Fuel, *Jungmin Kang, NRDC; Thomas Cochran, Natural Resources Defense Council; Matthew McKinzie, Natural Resources Defense Council*
- 8:40 18848 Preliminary Safeguards Assessment for the Pebble-Bed Fluoride High-Temperature Reactor (PB-FHR) Concept, *James Jay Disser, INL; Edward D. Arthur, U. New Mexico; Janine Lambert, INL*
- 9:00 18866 Defining a Research Agenda for Advanced Fuel Cycle Safeguards: A Focus on Thorium, *Louise G. Worrall, ORNL; George F. Flanagan, ORNL; David E. Holcomb, ORNL; Donald Kovacic, ORNL; Andrew Worrall, ORNL*

9:20 18860 Analysis on Plutonium Production In Fast Breeder Reactor (FBR) Cycle Based on Transuranium Fuel Loading, *Sidik Permana, Bandung Institute of Technology; Zaki Suud, Bandung Institute of Technology; Ismail Ismail, Nuclear Energy Requiatory, Indonesia; Mitsutoshi Suzuki, Japan Atomic Energy Agency; Masaki Saito, Tokyo Institute of Technology*

Special Session: Iran Deal: One Year Later - PANEL Tuesday, 27 September 2016, 8:00-10:00, Lumpkins Ballroom South Session Organizer: Mohammad Homayounvash (FIU) Session Chair: Mohammad Homayounvash (FIU) Panel Members:

- Mahdi Sarram (Energy Sec. Consulting)
- Mohiaddin Messbahi (FIU)
- Chris Kessler (NorthRaven Consulting)
- Joe Pilat (LANL)

See details on page 15

Track/Session: Special Session: Next Generation Challenges: University Consortia in Nonproliferation Education II

Tuesday, 27 September 2016, 8:00-10:00, New Mexico Room Session Organizers: Shaheen Dewji (ORNL), Rian Bahran (LANL) Session Chairs: Sara Pozzi (U. Mich), Bernie Kirk (Nuc Info Services)

- 8:00 18777 What Is the Strategic Utility of Reactor-Grade Plutonium?, *Robert Reardon, North Carolina State Univ.; John Kelly Mattingly, North Carolina State Univ.*
- 8:20 18650 Proof of Principle Simulation of a Handheld Neutron Scatter Camera, *Marc L. Ruch, U. Michigan; Peter Marleau, SNL; Sara A. Pozzi, U. Michigan*
- 8:40 18714 Assessing Impact of Monoenergetic Photon Sources on Nonproliferation Applications, *Cameron A. Miller, U. Michigan; Bernhard Ludewigt, LBNL; Brian J. Quiter, LBNL; Sara A. Pozzi, U. Michigan; Cameron Guy Robinson Geddes, LBNL*
- 9:00 18784 Spectroscopy of Femtosecond Laser-Produced Plasmas for Nuclear Forensics and Verification, *Kyle C. Hartig, Pennsylvania State Univ.; Igor Jovanovic, U. Michigan*
- 9:20 18792 Warhead Verification with NRF, Areg Danagoulian, MIT; Jayson R. Vavrek, MIT; R. Scott Kemp, MIT; Ruaridh R. Macdonald, MIT

TUESDAY AM - II

Track/Session: Critical and Subcritical Experiments Tuesday, 27 September 2016, 10:20-12:00, Lumpkins Ballroom North Session Organizer: Rian Bahran (LANL) Session Chairs: David Hayes (LANL), Bill Myers (LANL)

- 10:20 18885 Integral Experiments at the US National Criticality Experiments Research Center (NCERC), David K. Hayes, LANL; William L. Myers, LANL; Joetta M. Goda, LANL; Rene G. Sanchez, LANL; Travis J. Grove, LANL; Joeson D. Hutchinson, LANL; Theresa E. Cutler, LANL; John A. Bounds, LANL; George E. McKenzie, U. Illinois; Derek Dinwiddie, LANL; Rian M. Bahran, LANL; Robert C. Little, LANL; Avneet Sood, LANL; Morgan C. White, LANL; Robert W. Margevicius, LANL
- 10:40 18830 Sub-Critical Multiplication Experiments & Simulations: Overview and Recent Advances, Jesson D. Hutchinson, LANL; Rian M. Bahran, LANL; Clell J. Solomon, LANL; Avneet Sood, LANL; Theresa E. Cutler, LANL; Mark Smith-Nelson, LANL; Derek Dinwiddie, LANL
- 11:00 18843 Joint US-Japan Research Collaboration on Critical Assembly Experiments, Joetta M. Goda, LANL; John A. Bounds, LANL; Theresa E. Cutler, LANL; Travis J. Grove, LANL; Jesson D. Hutchinson, LANL; David K. Hayes, LANL; Michael R. James, LANL; George E. McKenzie, LANL; Rene G. Sanchez, LANL; Masahiro Fukushima, Japan Atomic Energy Agency; Hiroki Iwamoto, Japan Atomic Energy Agency (JAEA); Akito Oizumi, Japan Atomic Energy Agency; Kazufumi Tsujimoto, Japan Atomic Energy Agency (JAEA)
- 11:20 18884 Material Control & Accountability in a Critical Experiment, *Rene G. Sanchez, LANL; Theresa E. Cutler, LANL; Travis J. Grove, LANL; John A. Bounds, LANL; Jesson D. Hutchinson, LANL; David K. Hayes, LANL*

Nonproliferation Policy, Concepts, and Approaches: Strategic Trade Controls - PANEL

Tuesday, 27 September 2016, 10:20-12:00, Lumpkins Ballroom South Session Organizer: Jessica White-Horton (ORNL) Session Chair: Margaret Harding (DOE/NNSA) Panel members:

- Kevin Whattam (PNNL)
- Gretchen Hund (PNNL)
- Shannon Barna (GE)
- Allen A. DiPalma (U. Pittsburgh)

See details on page 16

Track/Session: Special Session: Next Generation Challenges: University Consortia in Nonproliferation Education III

Tuesday, 27 September 2016, 10:20-12:00, New Mexico Room Session Organizers: Shaheen Dewji (ORNL), Rian Bahran (LANL) Session Chairs: John Mattingly (NCSU), Shaheen Dewji (ORNL)

- 10:20 18849 Informational Sensing for Nonproliferation, James Kornell, Special Technologies Lab/NSTec; Bethany Goldblum, UC Berkeley; Zoe N. Gastelum, SNL
- 10:40 18701 The 2015 US-ROK Nuclear Cooperation Agreement: Creative Compromises?, William Alfred Boettcher, North Carolina State Univ.
- 11:00 18721 Social Media Analytics for Event Detection and Enrichment, *Alyson Wilson, North Carolina State Univ.; Jordan Bakerman, North Carolina State Univ.; Karl Pazdernik, North Carolina State Univ.*
- 11:20 18782 Alternate Nuclear Proliferation Pathways in the Age of Non-State Actors, James Bevins, UC-Berkeley; Bethany L. Goldblum, Nuclear Policy Working Group, Nuclear Science and Security Consortium, UC-Berkeley; Tom Hickey, Nuclear Policy Working Group, Nuclear Science and Security Consortium, UC-Berkeley; Elie Katzenson, Nuclear Policy Working Group, Nuclear Science and Security Consortium, UC-Berkeley; James C. Kendrick, Nuclear Policy Working Group, Nuclear Science and Security Consortium, UC-Berkeley; Rebecca Krentz-Wee, Nuclear Policy Working Group, Nuclear Science and Security Consortium, UC-Berkeley; Sarah Laderman, Nuclear Policy Working Group, Nuclear Science and Security Consortium, UC-Berkeley; Yubing Tian, Nuclear Policy Working Group, Nuclear Science and Security Consortium, UC-Berkeley; Collin Ting, Nuclear Policy Working Group, Nuclear Science and Security Consortium, UC-Berkeley; Alexa J. Wehsener, Nuclear Policy Working Group, Nuclear Science and Security Consortium, UC-Berkeley

TUESDAY PM - I

Track/Session: Nuclear Nonproliferation and Safeguards Simulation and Modeling: Application of Codes I

Tuesday, 27 September 2016, 13:30-15:10, Lumpkins Ballroom North Session Organizers: Madison Andrews (LANL), Cameron Bates (LANL) Session Chairs: Cameron Bates (LANL), Erik Shores (LANL)

- 13:30 17982 Application of Automated Weight Window Generation Techniques to Modeling the Detection of Shielded Nuclear Material, *Joel A. Kulesza, U. Michigan; Brian C. Kiedrowski, U. Michigan; Edward W. Larsen, U. Michigan*
- 13:50 19101 Predicted Radiation Output from Plutonium and Uranium Oxide, *Erik F. Shores, LANL*
- 14:10 18610 Generating Reactor Simulations for Nuclear Nonproliferation, *Patrick Jaffke, LANL*

14:30 18828 Delayed Positron Capability in MCNP®6, James R. Tutt, LANL; Gregg W. McKinney, LANL; Trevor Wilcox, LANL

Special Session: 2016 Nuclear Security Summit - PANEL Tuesday, 27 September 2016, 13:30-15:10, Lumpkins Ballroom South Session Organizers: Gene Carpenter (NRC), Steve Nesbit (Duke Energy) Session Chair: Frank Niels von Hippel (Princeton) Panel members:

- Morris Hassler (Y-12)
- Caroline Jorant (Nuclear-21.Net / SDRI)
- Howard Hall (U. Tennessee Knoxville)
- Nina Rosenberg (LANL)

See details on page 17

Track/Session: Nonproliferation Education and Training I Tuesday, 27 September 2016, 13:30-15:10, New Mexico Room Session Organizers: Bernadette Kirk (Kirk Nuc Info), Lisa Marshall (NCSU), Don Kovacic (ORNL), Hanna Hale Savo (ORNL), Sean Morrell (INL)

Session Chairs: Bernadette Kirk (Kirk Nuc Info), Sean Morrell (INL)

- 13:30 18729 LLNL's Support to DOE/NNSA's Next Generation Safeguards Initiative in the Area of International Safeguards Education and Training, *George Anzelon, LLNL; Yana Feldman, LLNL*
- 13:50 18871 Idaho National Laboratory Human Capital Development Program, *Amanda Rynes, INL*
- 14:10 18796 The Nonproliferation Portal, Amanda Rynes, INL; Sean Morrell, INL; Catherine Snow, Sno Consulting LCC
- 14:30 18911 International Nuclear Safeguards Human Capital Development at Sandia National Laboratories, *Risa Haddal, SNL*

TUESDAY PM - II

Track/Session: Nuclear Nonproliferation and Safeguards Simulation and Modeling: Enhancements to Nuclear Data Tuesday, 27 September 2016, 15:30-17:30, Lumpkins Ballroom North Session Organizers: Cathy Romano (ORNL) Session Chair: Cathy Romano (ORNL)

15:30 18401 TENDL-2015: Delivering Both Completeness and Robustness, Jean-Christophe C. Sublet, United Kingdom Atomic Energy Authority (UKAEA); A.J. Koning, IAEA (Austria); D. Rochman, PSI (Switzerland); M. Fleming, UKAEA; M. Gilbert, UKAEA

- 15:50 18726 Nuclear Data for Calculation of Nuclear Reactors Antineutrino Spectrum, Alejandro A. Sonzogni, BNL; E.A. McCutchan, National Nuclear Data Center, BNL; T.D. Johnson, National Nuclear Data Center, BNL
- 16:10 18827 ²³⁵U(n_{th},f) Product Data Measurements with Correlated A, KE, and Z with the UNM-SPIDER Spectrometer, *Adam Hecht, U. New Mexico*
- 16:30 18874 Correlated Fission Multiplicity Model Verification Efforts in MCNP®6, *Michael E. Rising, LANL*
- 16:50 18832 Systematic Approach to Nuclear Data Uncertainty Quantification for Nuclear Security Applications, Ian C. Gauld, ORNL; Stephen Croft, ORNL; Marco T. Pigni, ORNL; Andrew Nicholson, ORNL; Mark L. Williams, ORNL, Vladimir Mozin, LLNL; C. M. Mattoon, LLNL; Ramona Vogt, LLNL and UC Davis; Jac Caggiano, LLNL; Martyn T. Swinhoe, LANL
- 17:10 18890 Update on the Nuclear Data Working Group, Catherine E. Romano, ORNL

Track/Session: Nuclear Material Control and Accountability: Destructive Analysis Methods and General Radiation Detection Applications Tuesday, 27 September 2016, 15:30-17:50, Lumpkins Ballroom South Session Organizers: Rob Hayes (NCSU), Michael Fassbender (LANL) Session Chair: Michael Fassbender (LANL)

- 15:30 18869 Detecting Misuse of Aqueous Reprocessing Systems with the Multi-Isotope Process Monitor, *Jamie Baalis Coble, U. Tennessee Knoxville; Nathan T. Shoman, U. Tennessee Knoxville; David Meier, PNNL*
- 15:50 18712 Characterization and Comparison of New-Generation Silicon Photomultipliers, *Marc Wonders, Pennsylvania State Univ.; Marek Flaska, Pennsylvania State Univ.*
- 16:10 18697 Imaging Spent Fuel Casks Using Cosmic Ray Muons, *Christopher Morris,* LANL; Daniel Poulson, LANL and U. New Mexico; J. Matthew Durham, LANL; Elena Guardincerri, LANL; Deborah Morley, LANL; Kenie Plaud-Ramos, LANL; Jeffrey Bacon, LANL; Adam Hecht, U. New Mexico
- 16:30 18635 Neptunium-236 Production for Nuclear Forensic Reference Materials, Steven A. Goldberg, DOE/NNSA; J. Morrison, DHS/National Technical Nuclear Forensics Center; R. Essex, NIST/Radioactivity Group; D. Phillips, DOE/ Isotopes Program; D. Mackney, AFTAC; K. P. Carney, INL; S. Jerome, LANL; M. E. Fassbender, LANL; S. P. Lamont, LANL; M. Meiring Nortier, LANL
- 16:50 18878 Advances in Mass Spectrometry for Environmental Safeguards, Anthony D. Pollington, LANL; Stephen P. Lamont, LANL; Robert E. Steiner, LANL; William S. Kinman, LANL
- 17:10 18921 Production of ²³⁶Np and ²³⁶Pu for Isotope Dilution Mass Spectrometry, *Michael E. Fassbender, LANL*
- 17:30 18879 Training for Environmental Safeguards Sample Analysis, *Stephen P. Lamont, LANL; Robert E. Steiner, LANL; William Kinman, LANL*

Track/Session: Nonproliferation Education and Training II Tuesday, 27 September 2016, 15:30-17:30, New Mexico Room Session Organizers: Bernadette Kirk (Kirk Nuc Info), Lisa Marshall (NCSU), Don Kovacic (ORNL), Hanna Hale Savo (ORNL), Sean Morrell (INL)

Session Chairs: Lisa Marshall (NCSU), Don Kovacic (ORNL)

- 15:30 18864 Ten years of Nuclear Security Education, Research and Training at Texas A&M University, Sunil Sunny Chirayath, Nuclear Security Science & Policy Institute; Craig M. Marianno, Texas A&M Univ.; Claudio A. Gariazzo, Texas A&M Univ.; Paul Nelson, Texas A&M Univ.; David R. Boyle, Texas A&M Univ.; Kelley H. Ragusa, Texas A&M Univ.
- 15:50 18812 Nonproliferation Education and Outreach, *Howard L. Hall, U. Tennessee; John D. Auxier, U. Tennessee; Joseph R. Stainback, U. Tennessee; Natacha Peter-Stein, U. Tennessee; Hedy Ghoname, U. Tennessee; Natalie M. Rice, U. Tennessee*
- 16:10 18217 The Master of International Policy Program at the University of Georgia, *Sara Kutchesfahani, CITS/UGA*
- 16:30 18847 Strengthening International Safeguards Implementation Through Engagement and Training, *Donald Kovacic, ORNL; Hannah R. Hale, U. Tennessee-Knoxville*
- 16:50 18779 Focusing NMA&C Training on the precise group of practitioners, *Alejandro Jaime Vidaurre-Henry, Japan Atomic Energy Agency*
- 17:10 18922 The China Center of Excellence on Nuclear Security, *Johnna B. Marlow, LANL; Nancy S. Peterson, DOE/NNSA NA-211*

Wednesday, 28 September 2016

WEDNESDAY AM - I

Track/Session: Nuclear Materials and the Fuel Cycle: Challenges in Enrichment Verification and Spent Nuclear Fuel Verification and Storage Wednesday, 28 September 2016, 8:00-10:00, Lumpkins Ballroom North Session Organizers: Jianwei Hu (ORNL), Eric Smith (PNNL) Session Chair: Jianwei Hu (ORNL)

- 8:00 18687 Opportunities for Improving the Effectiveness and Efficiency of International Atomic Energy Agency Safeguards at Large-Scale Gas Centrifuge Enrichment Plants, *Mark E. Walker, Princeton Univ.; Robert J. Goldston, Princeton Univ.*
- 8:20 18722 Acoustic Techniques for Density and Mass Flow in Enrichment Plants, Glen A. Warren, PNNL; Kayte M. Denslow, PNNL; Morris Good, PNNL; Michael S. Hughes, PNN; A. Mark Jones, PNNL; Gianluca Longoni, PNNL; Traci Moran, PNNL; Pradeep Ramuhalli, PNNL; Surajit Roy, PNNL; Eric Smith, PNNL

- 8:40 19041 Energy-Resolved Neutron Imaging for Interrogation of Nuclear Materials, Adrian S. Losko, UC Berkeley; Sven C. Vogel, LANL; Mark Andrew Bourke, LANL; Andrea Favalli, LANL; Anton S Tremsin, UC Berkeley; Stewart Voit, LANL; Kenneth J. McClellan, LANL
- 9:00 18788 High-Fidelity Modeling of Spent Fuel Assemblies for Advanced NDA Instrument Testings, *Jianwei Hu, ORNL*
- 9:20 18673 On Developing a Nuclear Material Accountancy and Control Approach for Fukushima Daiichi Fuel Debris, *Cynthia Heinberg, Japan Atomic Energy Agency; Kelichiro Hori, Japan Atomic Energy Agency*
- 9:40 18728 Qualification of Centrifugal Tensioned Metastable Fluid Detector (CTMFD) Sensors for γ-β Blind Functionality in Spent Nuclear Fuel Reprocessing Facilities, *Jeffrey Alex Webster, Purdue Univ.; Delia Perez-Nunez, Texas A&M Univ.; Rusi Taleyarkhan, Purdue Univ.*

Special Session: Lessons from the First 50 Years of Safeguards for the Next Half Century - PANEL

Wednesday, 28 September 2016, 8:00-10:00, Lumpkins Ballroom South Session Organizers: Alexis Trahan (LANL), Rian Bahran (LANL) Session Chair: Rebecca Stevens (LANL) Panel members:

- Joe Pilat (LANL)
- Doug Reilly (Retired)
- Johnna Marlow (LANL)
- Howard Menlove (LANL)

See details on page 18

Track/Session: Mathematical Methods in Nonproliferation: Statistical Methods in Nonproliferation I

Wednesday, 28 September 2016, 8:00-10:00, New Mexico Room Session Organizer: Ken Jarman (PNNL)

Session Chairs: Ken Jarman (PNNL), Joshua Carmichael (LANL)

- 8:00 **17529** Superposition Analysis of Normalized Gaussians (SANG), *Robert B. Hayes, North Carolina State Univ.*
- 8:20 18892 Monte Carlo and Deterministic Solutions of the Forward Master Equation for Random Neutron Populations, *Patrick F. O'Rourke, U. New Mexico; Anil K. Prinja, U. New Mexico*
- 8:40 18742 Correlation Effects in Uncertainty Calculations Involving Atom (or Weight) Percent Isotopic Abundances, *Kattathu Joseph Mathew, LANL; Mariam Thomas, LANL*
- 9:00 **18806** Using reproducibility to test the correctness of GUM based uncertainty quantification, *Stephen J. Walsh, IAEA; Alexander Venzin, IAEA; Dariusz Wegrzynek, AGH U. Science and Technology, Faculty of Physics and Applied Computer Science; Catherine Mansoux, IAEA*

Track/Session: Nuclear Nonproliferation and Safeguards Simulation and Modeling: Application of Codes II

Wednesday, 28 September 2016, 10:20-12:00, Lumpkins Ballroom North Session Organizers: Madison Andrews (LANL), Cameron Bates (LANL) Session Chairs: Madison Andrews (LANL), Avneet Sood (LANL)

- 10:20 18776 Simulation and Optimization of Systems of Nuclear Safeguards, Nicolas Shugart, Colorado School of Mines; Benjamin Johnson, Colorado School of Mines; Jeffrey C. King, Colorado School of Mines; Alexandra Newman, Colorado School of Mines
- 10:40 18810 Improved Transport Modeling to Support Post-detonation Nuclear Forensics, *Thomas E. Cartledge, Defense Threat Reduction Agency*
- 11:00 18853 Integration of the LLNL Fission Library/FREYA package into MCNP®6, *Jerome M. Verbeke, LLNL; Mike E. Rising, LANL; Ramona Vogt, LLNL*
- 11:20 18876 Source Localization Using a Single Volume Scatter Camera Made of Pillars of Plastic Scintillator, *Kyle Weinfurther, North Carolina State Univ.; John Kelly Mattingly, North Carolina State Univ.; Erik Brubaker, SNL; John Steele, SNL*
- 11:40 17074 An MCNP[®]6 Assessment of the Source Reconstruction Capability using EPR, TL and OSL, *Robert B. Hayes, North Carolina State Univ.*

Nuclear Materials and the Fuel Cycle V: Nonproliferation Challenges in Space / Defense Technology - PANEL Wednesday, 28 September 2016, 10:20-12:00, Lumpkins Ballroom South Session Organizer: Chris Robinson (Y-12) Session Chair: Patrick McClure (LANL) Panel members: Patrick McClure (LANL) Frank Sage (Director WSPR, US Army White Sands Missile Range)

- Mike Houts (NASA Marshall Space Flight Center)
- Ray Juzaitis (ret., President and CEO, NSTec) Alice Caponiti (DOE NE)

See details on page 19

Track/Session: Mathematical Methods in Nonproliferation: Statistical Methods in Nonproliferation II Wednesday, 28 September 2016, 10:20-12:00, New Mexico Room Session Organizer: Ken Jarman (PNNL) Session Chairs: Ken Jarman (PNNL), Joshua Carmichael (LANL)

10:20 18755 Combining Inspection and Unattended Monitoring: Statistical Analysis of Timely Detection, *Kenneth Dean Jarman, PNNL; L. Eric Smith, PNNL*

- 10:40 18669 Validation and Uncertainty Quantification of Hyper-Spectral Image Modeling, Dave W. Engel, PNNL: PNNL; Tom Reichardt, SNL; Tom Kulp, SNL; Ricky Sommers, SNL; Karen Krafcik, SNL
- 11:00 18870 Material Detection in Hyperspectral Imagery in Support of Nuclear Nonproliferation, *James Theiler, LANL; Amanda Ziemann, LANL*
- 11:20 18678 Pattern Recognition in Studies that Inject Synthetic Signals into Real Background, *Thomas L. Burr, LANL; Stephen Croft, ORNL; Ken Dean Jarman, PNNL*

WEDNESDAY PM

- 13:00-17:00 Workshop: MCNP*6 Correlated Fission Capabilities and the MCNP Associated Packages: Intrinsic Source Calculator, MCNPTools, and DRiFT: Lumpkins Ballroom North
- 13:30 Workshop: Uncertainty Quantification for Nondestructive Assay Welcome and Introductions: New Mexico Room

Special Session: Workshop (Invited): Uncertainty Quantification for Nondestructive Assay I

Wednesday, 28 September 2016, 14:30-17:00, New Mexico Room

- Session Organizers: Stephen Croft (ORNL), Andrew Nicholson (ORNL), Andrea Favalli (LANL)
- Session Chairs: Stephen Croft (ORNL), Andrew Nicholson (ORNL), Andrea Favalli (LANL), Ram Venkataraman (ORNL)
- 14:30 18645 A New Approach to Estimate Uncertainty in Waste Characterization, *Biagio Zaffora, CERN; Matteo Magistris, CERN; Gilbert Saporta, CEDRIC-CNAM*
- 15:00 18657 Second-Order Adjoint Sensitivity Analysis Methodology (2nd-ASAM) Applied to Quantification of Non-Gaussian Uncertainties in a Nonlinear Heat Conduction Benchmark, *Dan Gabriel Cacuci, U. South Carolina Columbia*
- 15:30 18694 Uncertainty Quantification in Human Reliability Modeling for Security Screening Operations, *Bryan Stanfill, PNNL; Robert Brigantic, PNNL; Casey Perkins, PNNL; Eva Brayfindley, North Carolina State Univ.*
- 16:00 18845 Monte Carlo Uncertainty Quantification for an Unattended Enrichment Monitor, *Kenneth Dean Jarman, PNNL; L. Eric Smith, PNNL; Richard Wittman, PNNL; Mital Zalavadia, PNNL*
- 16:30 Invited speaker Plutonium Mass Determination by Neutron Counting, Brian Weaver, LANL

THURSDAY AM - I

Special Session: Workshop (Invited): Uncertainty Quantification for Nondestructive Assav II	
Thursday, 29 September 2016, 8:00-10:00, New Mexico Room	
Session Organizers: Stephen Croft (ORNL), Andrew Nicholson (ORNL), Andrea Favalli	
Session Chairs: Stephen Croft (ORNL), Andrew Nicholson (ORNL), Andrea Favalli (LANL), Ram Venkataraman (ORNL)	
3:00 18861 Uncertainty Quantification with the Event-by-Event Fission Model FREYA, Andrew Nicholson, ORNL; Ramona Vogt, LLNL and UC Davis; Jorgen Randrup, LBNL; Ian C. Gauld, ORNL; Stephen Croft, ORNL	
3:15 18882 Representing the Uncertainty Structure of the Factorial Moments of ²⁵² Cf and ^{238, 240, 242} Pu, <i>Stephen Croft, ORNL; Andrew Nicholson, ORNL; Daniela Henzlova, LANL; Andrea Favalli, LANL</i>	
8:30 18867 Total Measurement Uncertainty Error Budget for a Tomographic Gamma Scanner, <i>John M. Kirkpatrick, Canberra Industries, Inc.</i>	
9:00 18883 Nuclear Data Uncertainty Quantification - a Practical Example for Nuclear Material Measurements, <i>Martyn T. Swinhoe, LANL; Caleb M. Mattoon, LLNL;</i> <i>Stephen Croft, ORNL; Ian C. Gauld, ORNL; Andrew Nicholson, ORNL; Vladi-</i> <i>mir Mozin, LLNL</i>	
9:30 18899 Testing for the Poisson Distribution in Neutron Counting, Andriy Berlizov,	

- IAEA; Thomas L. Burr, IAEA; Stephen Croft, ORNL; Andrew Nicholson, ORNL; Agatha Walczak-Typke, IAEA
- 8:00-13:00 Tours (lunch included) Meet in La Fonda lobby at 7:45

Thursday am - II

Special Session: Workshop (Invited): Uncertainty Quantification for Nondestructive Assay III

Thursday, 29 September 2016, 10:20-12:00, New Mexico Room

Session Organizers: Stephen Croft (ORNL), Andrew Nicholson (ORNL), Andrea Favalli (LANL)

Session Chairs: Stephen Croft (ORNL), Andrew Nicholson (ORNL), Andrea Favalli (LANL), Ram Venkataraman (ORNL)

10:20 18904 Revisiting Nuclear Fission Data for Nonproliferation Applications, *Patrick M. Talou, LANL*

10:50	Invited speaker	Uncertainty Quantification Implementation in FRAM, Duc Vo, LANL
11:20	Invited speaker	Using an Inverse Monte Carlo Method to Determine Measure- ment Uncertainties, <i>Douglas C. Rodriguez, Japan Atomic</i> <i>Energy Agency</i>
11:40	Invited speaker	Uncertainties in Coded-Aperture Imaging, <i>Klaus P. Ziock, ORNL</i>

THURSDAY PM

13:30-17:30 UQ workshop breakout 1: New Mexico Room

UQ workshop breakout 2: Stiha Room

Friday, 30 September 2016

FRIDAY AM

8:00-10:00 UQ workshop breakout 1: New Mexico Room

UQ workshop breakout 2: Stiha Room

10:20-12:00 UQ workshop summary and closeout: New Mexico Room

Poster Session, Mon 26 Sep 2016

Posters/Refreshments

Monday, 26 September 2016, 18:00-20:00, Mezzanine Session Organizers: Alicia Swift (Y-12), Mateusz Monterial (U. Michigan) Session Chairs: Alicia Swift (Y-12), Mateusz Monterial (U. Michigan)

- 18:00 18432 Towards Transparency and Broader Safeguards Conclusion: an Analysis of Kingdom of Saudi Arabia (KSA) Proposed Nuclear Power Program, *Thaqal Alhuzaymi, Missouri Univ. Science & Technology; Alajo Ayodeji Babatunde, Missouri Univ. Science & Technology*
 - 18754 Determination of Am-241 in Weapons-grade Plutonium for Chronometry Applications, *Michael Duncan Yoho, LANL; Donivan R. Porterfield, LANL; Jung Rim, LANL; Dylan J. Klundt, LANL*
 - 18795 Monte Carlo Simulations of a Physical Cryptographic Warhead Verification Protocol Using Nuclear Resonance Fluorescence, *Jayson Vavrek, MIT; Areg Danagoulian, MIT; Eleanor Immerman, MIT; R. Scott Kemp, MIT; Richard C. Lanza, MIT; Ruaridh R. Macdonald, MIT; Bari Osmanov, MIT*
 - 18839 After Cooperative Threat Reduction: The Future of US-Russia Nuclear Security Engagement, *Eamonn Seth Wilson, LANL*
 - 19257 AmBe Neutron Transmission Through a Beryllium Sphere, John C. Stooksbury, Georgia Institute of Technology; Nolan E. Hertel, Georgia Institute of Technology
 - 18886 Implementation of the Integral Nonproliferation Introductory Teaching and Learning (INITIAL) Module in Nuclear Engineering Programs across the US, *Alexis C. Trahan, LANL; Rian M. Bahran, LANL*
 - 19609 Cyber-Security Experimentation Platform for Instrumentation and Control Systems in a Nuclear Reactor, *Chris Reynolds, U. Tulsa; Charles Bales, U. Tulsa; Will Nichols, U. Tulsa; Casey Strong, U. Tulsa; John Chandler Hale, U. Tulsa; Mauricio Papa, U. Tulsa; Peter Hawrylak, U. Tulsa*

Nearby Food Options

La Fonda (Conference Hotel)

<u>La Plazuela Restaurant</u> (authentic New Mexican cuisine) <u>La Fiesta Lounge</u> (New Mexican lunch buffet, casual regional cuisine) <u>Bell Tower Bar</u> (light lunch and dinner)

Food Suggestions Nearby La Fonda

Burgers

Santa Fe Bite (one of the best burger places in NM) 311 Old Santa Fe Trail, Santa Fe, NM 87501 - 0.2 mile away

Pizza

<u>Upper Crust Pizza</u> (one of the best Pizza places in NM) 329 Old Santa Fe Trail, Santa Fe, NM 87501 - 0.3 mile away

<u>Draft Station</u> (best nearby for Pizza and Draft Beer combo) 60 East San Francisco Street, Santa Fe, NM 87501 - 0.1 mile away

New Mexican

<u>Café Pasqual's</u> 121 Don Gaspar Ave, Santa Fe, NM 87501 – 0.1 mile away

<u>Tia Sophia's</u> (Breakfast and Lunch only) 210 W San Francisco St, Santa Fe, NM 87501 – 0.2 mile away

<u>Blue Corn Café and Brewery</u> 133 West Water Street, Santa Fe, NM 87501 - 0.2 mile away

<u>The Shed</u> (Very popular – reservations recommended) 113 ½ E Palace Ave, Santa Fe, NM 87501 – 0.1 mile away

Other

<u>Cowgirl</u>

319 South Guadalupe, Santa Fe, NM 87501 – 0.5 mile away

Sushi Land East 60 E San Francisco St, Santa Fe, NM 87501 - 0.1 mile away

La Boca (Spanish small plates)

72 W Marcy St, Santa Fe, NM 87501 - 0.1 mile away

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otember 2016	Ехсрание Воош		Social Media Workshop: Breakout II: Communication and Networking			New Mexico Room		nberra) - Mezzanine	Nonproliferation Policy, Concepts, and Approaches: Open Source Information Analysis for Nonproliferation Verification		Nonproliferation Policy, Concepts, and Approaches: Proliferation Resistance and Risk Assessment		Nonproliferation Policy, Concepts, and Approaches: Treaty Verification Regimes, State-Level Concepts and Fuel Cycle Analysis	Mezzanine
ice: 25-26 Sep	Ballen Board Room		Social Media Workshop: Breakout II: Societal Mobilization		Hosted Reception - La Terraza	Lumpkins Ballroom South	JARY	/tea and light snacks (compliments of Cai	Nuclear Materials and the Fuel Cycle: Weapons Materials Minimization	Lunch (on your own)	Special Session: Next Generation Challenges: University Consortia in Nonproliferation Education - Panel	Break with coffee/tea - Mezzanine	Special Session: Next Generation Challenges: University Consortia in Nonproliferation Education I	ession & Exhibitors (with Refreshments) -
edule at-a-glan	Sep 2016 New Mexico Room	Social Media for Nuclear Nonproliferation Workshop: Welcome and Plenary Brask with onfleafhaa fin mom)	Social Media Workshop: Breakout I: Societal Observation	Social Media for Nuclear Nonproliferation Workshop: Summary and Close-out		Sep 2016 Lumpkins Ballroom North	PLEN	Break with coffee/	Mathematical Methods in Nonproliferation: Validation and Verification Methods		Nuclear Material Control and Accountability: Nondestructive Assay Methods I		Nuclear Material Control and Accountability: Nondestructive Assay Methods II	Poster Se
Sch	Sunday, 25 S	13:00 - 14:30 14:30 - 14:45	14:45 - 16:30	16:30 - 17:00	18:30 - 20:30	Monday, 26 (8:00 - 10:00	10:00 - 10:20	10:20 - 12:00	12:00 - 13:30	13:30 - 15:10	15:10 - 15:30	15:30 - 17:00	18:00 - 20:00

Schedule at-a-glance: 27 September 2016

Tuesday, 27 Sep 2016

New Mexico Room	Special Session: Next Generation Challenges: University Consortia in Nonproliferation Education II		Special Session: Next Generation Challenges: University Consortia in		Nonproliferation Education and Training I		Nonproliferation Education and Training II	ackets for information)
Lumpkins Ballroom South	Special Session: Iran Deal: 1 Year Later - Panel	Break with coffee/tea - Mezzanine	Nonproliferation Policy, Concepts, and Approaches: Strategic Trade Controls -	Panel h - La Terraza - with speaker, Alan Carr, Lo	Special Session: 2016 Nuclear Security Summit - Panel	Break with coffee/tea - Mezzanine	Nuclear Material Control and Accountability: Destructive Analysis Methods and General Radiation Detection Applications	cial Event (see insert in student registration pa
Lumpkins Ballroom North	Nuclear Materials and the Fuel Cycle: Advanced Fuel Cycles		Critical and Subcritical Experiments	Hosted Lunc	Nuclear Nonproliferation and Safeguards Simulation and Modeling: Application of Codes I		Nuclear Nonproliferation and Safeguards Simulation and Modeling: Enhancements to Nuclear Data	Student Program Soc
	8:00 - 10:00	10:00 - 10:20	10:20 - 12:00	12:00 - 13:30	13:30 - 15:10	15:10 - 15:30	15:30 - 17:00	

Schedule at-a-glance: 28 September 2016

Wednesday, 28 Sep 2016

	New Mexico Room	Mathematical Methods in Nonproliferation: Statistical Methods in Nonproliferation I			Mathematical Methods in Nonproliferation:	Statistical Methods in Nonproliferation II			UQ Workshop: Introductions and	Welcome	(14:10) Break with coffee/tea (in room)	(14:30) Special Session: Workshop:	Uncertainty Quantification for	Nondestructive Assay I
	Lumpkins Ballroom South	Special Session: Lessons from the First 50 Years of Safeguards for the Next Half	Century - Panel	Break with coffee/tea - Mezzanine	Nuclear Materials and the Fuel Cycle V:	Nonproliferation Challenges in Space /	Defense Technology - Panel	Hosted Lunch (boxed lunches) - La Terraz						
	Lumpkins Ballroom North	Nuclear Materials and the Fuel Cycle: Challenges in Enrichment Verification and	Spent Nuclear Fuel Vernication and Storage		Nuclear Nonproliferation and Safeguards	Simulation and Modeling: Application of	Codes II		(13:00) MCNP Workshop		Break with coffee/tea (in room)	MCNP Workshop		
(manage and a second a se		8:00 - 10:00		10:00 - 10:20	10:20 - 12:00			12:00 - 13:30	13:30 - 15:10		15:10 - 15:30	15:30 - 17:00		

Schedule at-a-glance: 29-30 September 2016

Thursday, 29 Sep 2016

Stiha Room	Tours (including lunch)	meet in La Fonda lobby at 7:45					UQ Workshop Breakout II	fee/tea (in rooms)	UQ Workshop Breakout II	
New Mexico Room	Special Session: Workshop: Uncertainty	Quantification for Nondestructive Assay II	Break with coffee/tea (in room)	Special Session: Workshop: Uncertainty	Quantification for Nondestructive Assay III	Lunch (on your own)	UQ Workshop Breakout I	Break with cof	UQ Workshop Breakout I	
	8:00 - 10:00		10:00 - 10:20	10:20 - 12:00		12:00 - 13:30	13:30 - 15:10	15:10 - 15:30	15:30 - 17:00	

Friday, 30 Sep 2016

Roon	
Mexico	reakout I
New	Vorkshop B
	۷Q
	0:00

Stiha Room

UQ Workshop Breakout II

 8:00 - 10:00
 UQ Workshop Breakout I

 10:00 - 10:20
 Break with coffee/tea (in room)

 10:20 - 12:00
 UQ Workshop Summary and Closeout

Venue Map



Notes

Notes