



ESARDA Symposium 2017

European Safeguards Research & Development Association

39th Annual Meeting 15-18 May 2017, Jülich/Düsseldorf (DE)

Programme

Status as of 7 April 2017

ESARDA Symposium 2017 Committee

- Chair** Irmgard Niemeyer, ESARDA President
Forschungszentrum Jülich GmbH
- Members** Kare Axell
Swedish Radiation Safety Authority
- Alessandro Borella
Belgian Nuclear Research Centre (SCK-CEN)
- Lars Hildingsson
Swedish Radiation Safety Authority
- Rozle Jakopic
EC JRC Directorate for Nuclear Safety and Security
- Willem Janssens
EC JRC Directorate for Nuclear Safety and Security
- Peter Jansson
Uppsala University
- Francois Littmann
EC JRC Directorate for Nuclear Safety and Security
- Fausto Medici
Swiss Federal Office of Energy
- Olli Okko
STUK - Radiation and Nuclear Safety Authority
- Eileen Langegger
Atominstytut, Technische Universität Wien
- Arnold Rezniczek
UBA GmbH
- Peter Schwalbach
EC Directorate Euratom Safeguards
- Filippo Sevini
EC JRC Directorate for Nuclear Safety and Security
- Zsolt Stefánka
Hungarian Atomic Energy Authority
- Hamid Tagziria
EC JRC Directorate for Nuclear Safety and Security
- Jim Tushingham
National Nuclear Laboratory



Programme-at-a-Glance

Monday 15 May

Jülich & Düsseldorf

- 10:00-17:00 Working Groups and Committees' Meetings, Jülich
- 14:00-16:00 Steering Committee Meeting, Jülich
- 16:00-17:00 Executive Board Meeting, Jülich
- 10:00-12:00 Guided Tours, Jülich
- 14:00-16:00 Guided Tours, Jülich
- 19:00-21:30 Welcome Reception, Craft Brewery ‚Zum Schlüssel‘, Düsseldorf

Tuesday 16 May

Meliá Düsseldorf

- 09:00-12:45 Plenary
- 14:00-15:40 01 Implementation of Safeguards
- 14:00-15:40 02 Non-destructive Analysis – Gamma Measurements
- 16:00-17:40 03 International Collaboration
- 16:00-17:40 04 Geoscientific Methods
- 18:00-19:30 Joint Meeting of the ESARDA IS WG and the INMM ISD

Wednesday 17 May

Meliá Düsseldorf

- 09:00-10:40 05 Arms Control and Nuclear Disarmament Verification I
- 09:00-10:40 06 Geological Repositories
- 09:00-10:40 07 Non-destructive Analysis: Neutron I
- 11:00-12:40 08 Arms Control and Nuclear Disarmament Verification II
- 11:00-12:40 09 Destructive Analysis I
- 11:00-12:40 10 Spent Fuel Verification
- 14:00-15:40 Poster session
- 15:40-17:20 11 Training and Knowledge Management
- 15:40-17:20 12 Destructive Analysis II
- 15:40-17:20 13 Non-destructive Analysis: Tomography
- 19:00-23:00 Conference Dinner, Event Ship ‚Jules Verne‘, Düsseldorf

Thursday 18 May

Meliá Düsseldorf

- 09:00-10:40 14 Integrated Approaches
- 09:00-10:40 15 Containment & Surveillance
- 09:00-10:40 16 Non-destructive Analysis: Neutron II
- 11:00-12:40 17 Evaluation
- 11:00-12:40 18 Nuclear Security
- 11:00-12:40 Panel discussion
- 14:00-15:20 19 Process Monitoring
- 14:00-15:20 20 Statistical Methodologies
- 15:20-16:00 Closing Plenary



Monday 15 May

10:00-17:00

Working Group and Committees' Meetings, Jülich*

Working Group Meetings are open to ESARDA Parties and Individual Members, plus others who may be accepted by the relevant Working Group Chair. The following Working Groups have indicated that they intend to hold meetings on Monday, 15 May. The relevant Working Group Chair will be able to provide further details and should be contacted in advance to confirm attendance.

Group & Contact	Time	Room
Containment & Surveillance (C/S) Francois.Littmann@jrc.ec.europa.eu	10:00-17:00	
Destructive Analysis (DA) Eva.Szeles@energia.mta.hu	10:00-17:00	
Non-Destructive Analysis (NDA) Alessandro.Borella@sckcen.be	10:00-17:00	
Verification Technologies and Methodologies (VTM) Olli.Okko@stuk.fi	10:00-13:00	
Training & Knowledge Management (TKM) Sophie.Grape@physics.uu.se	tbd	
Editorial Committee Hamid.Tagziria@jrc.ec.europa.eu	tbd	
Steering Committee (SC) Filippo.Sevini@ec.europa.eu	14:00-16:00	
Executive Board (EB) Filippo.Sevini@ec.europa.eu	16:00-17:00	

** Bus transportation from Düsseldorf Airport and the Düsseldorf Meliá Hotel to Forschungszentrum Jülich and back to Düsseldorf Meliá Hotel will be provided.*

Monday 15 May

10:00-17:00

Guided Tours, Jülich*

JEN - Decommissioning of the research reactor FRJ-2 (DIDO)

10:00h-12:00h

Forschungszentrum Jülich – Highlights

10:00h-12:00h

14:00h-16:00h

IEK-6 – Nuclear Waste Management Research

10:00h-12:00h

JEN – Large Hot Cells

14:00h-16:00h

** Bus transportation from Düsseldorf Airport and the Düsseldorf Meliá Hotel to Forschungszentrum Jülich and back to Düsseldorf Meliá Hotel will be provided.*



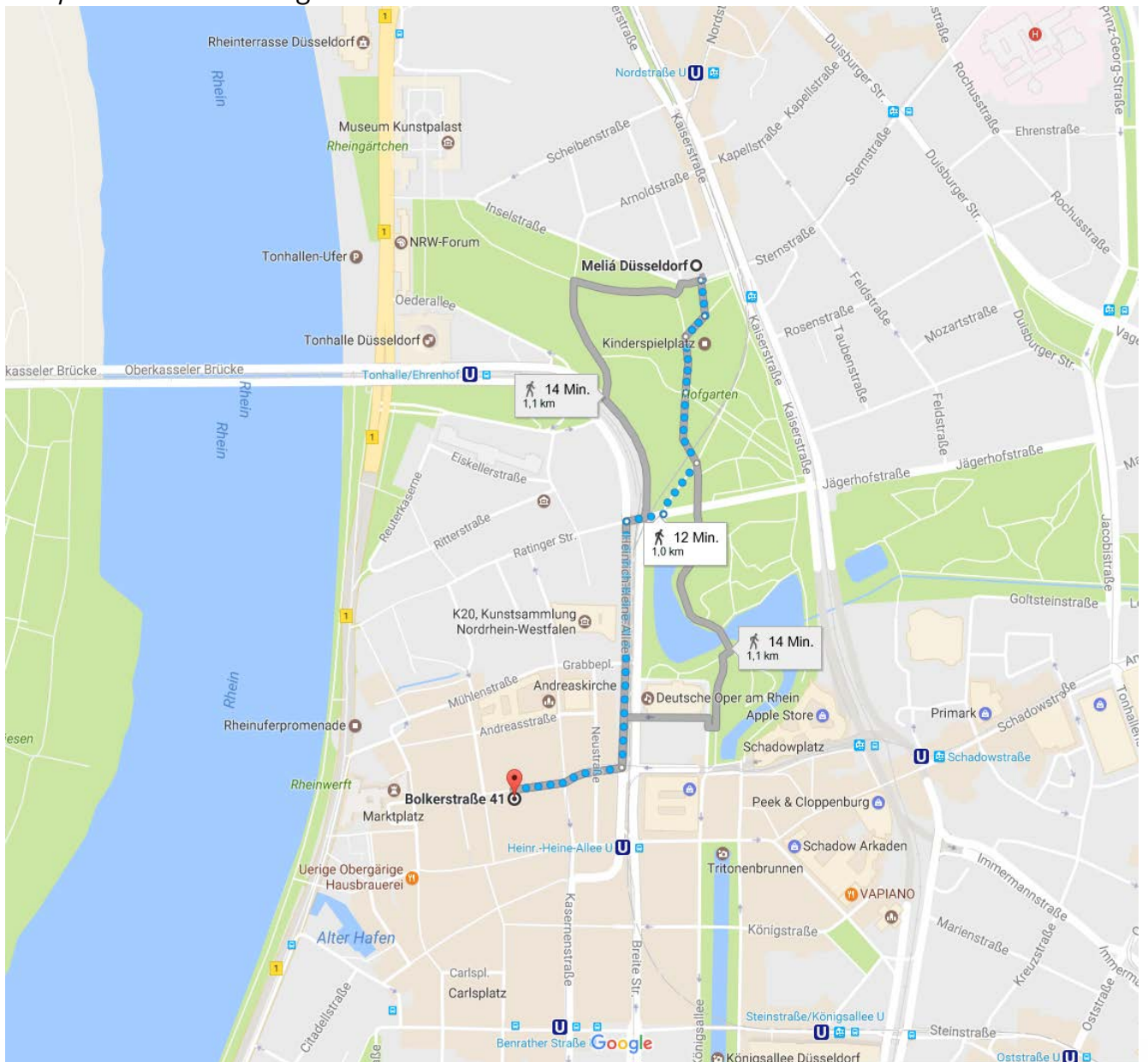
Monday 15 May, Evening

19:00-21:30

Welcome Reception

Hausbrauerei "Zum Schlüssel"
Bolkerstrasse 41-47
40213 Düsseldorf

The venue for the welcome reception for all symposiums participants is the "Zum Schlüssel", a craft brewery in the heart of Düsseldorf's historical city center. "Schlüssel Alt" is one of only four originally in-house brewed Alt-beers. No visit to Düsseldorf is complete without having seen and witnessed this institution.



Source: Google Maps



Plenary 1

Chair – I. Niemeyer

09:00 **Welcome and opening remarks**

I. Niemeyer, ESARDA President, and F. Sevini, ESARDA Secretary

Keynotes:

09:15 **Forschungszentrum Jülich**

Prof. H. Bolt, Member of the Board of Directors for Scientific Division II

09:30 **Federal Ministry of Economic Affairs and Energy**

U. Borak, Deputy Director General, International Affairs, Fossil Fuel, Nuclear Energy

09:45 **IAEA Department of Safeguards**

Dr. T. Varjoranta, Deputy Director General, Safeguards, International Atomic Energy Agency

10:00 **Euratom Safeguards Directorate**

Paul Meylemans, Directorate E - Euratom Safeguards, Directorate-General for Energy

10:15 **DG JRC Directorate G - Nuclear Safety & Security**

Dr. M. Betti, Director Nuclear Safety & Security

10:30 **Coffee break**



Plenary 2

Chair – I. Niemeyer

11:00 Institute of Nuclear Materials Management (INMM)

C. Hinderstein, INMM President

11:15 Women in Nuclear (WiN) Europe

C. Bucur, President WiN Europe

11:30 Helmholtz Programme Nuclear Waste Management, Safety and Radiation Research

Prof. D. Bosbach, Forschungszentrum Jülich GmbH, Director IEK-6, Programme Spokesperson

**11:45 Development and updating of State-level safeguards approaches:
Experience and lessons learned**

T. Renis, Director Safeguards Concepts and Planning, International Atomic Energy Agency

12:00 International Cooperation in Safeguards – the Role of Regional Networks

Craig Everton, Australian Safeguards and Non-proliferation Office (ASNO)

12:15 International Partnership for Nuclear Disarmament Verification (IPNDV)

Martin Rioux-Lefebvre, Nuclear Threat Initiative (NTI)

12:30 Discussion

12:45 Lunch break



01 Implementation of Safeguards

Chair – Peter Schwalbach, EC Directorate Euratom Safeguards

- 14:00 115 **Safeguards in Germany – Challenges and Perspectives**
K. Van Bevern¹, M. Hahn², A. Jussofie³
¹VGB PowerTech e.V., ²Preussen Elektra, ³GNS Gesellschaft für Nuklear-Service mbH
- 14:20 62 **The French Centralized Accountancy for Nuclear Materials: A Strong Contributor for Nuclear Security and Safeguards**
François Lanave
IRSN
- 14:40 93 **Risks and Opportunities for UK Operators if the UK leaves the European Atomic Energy Community as a result of Brexit**
Richard Last
Sellafield Ltd
- 15:00 69 **Euratom On Site Laboratories Refurbishments and Developments**
L. Duinslaeger¹, C.-I. Andor¹, R. Buda¹, K. Casteleyn¹, L. Commin¹, F. d'Amati¹, L. Emblico¹, T. Enright¹, M. Hild¹, J. Horta Domenech¹, A. Le Terrier¹, K. Luetzenkirchen¹, S. Mialle¹, S. Morel¹, A. Muehleisen¹, A. Nicholl¹, C. Nourry¹, D. Poublan¹, M. Ramos Pascual¹, G. Rasmussen¹, A. M. Sanchez Hernandez¹, F. Sarli¹, S. Street¹, G. Suurkuusk¹, G. Toma¹, O. Valu¹, E. Zuleger¹, P. van Belle¹, R. Carlos Marquez¹, F. Lipcsei², P. Schwalbach², S. Synetos²
¹EC JRC Directorate for Nuclear Safety and Security, ²EC Directorate Euratom Safeguards
- 15:20 30 **The Contribution of ENEA to the National Implementation of the Nuclear Safeguards**
A. Dodaro, G. Giorgiantoni, N., G. Marzo
Italian National Agency for New Technologies, Energy and Sustainable Economic Development
- 15:40 **Coffee break**

02 Non-destructive Analysis – Gamma Measurements

Chair – Anne-Laure Weber, IRSN

- 14:00 72 **Using FRAM to determine enrichment of shielded uranium by portable electrically cooled HPGe detectors**
J. Zsigrai¹, J. Bagi¹, A. Muehleisen¹, A. Berlizov²
¹EC JRC Directorate for Nuclear Safety and Security, ²International Atomic Energy Agency
- 14:20 105 **Measurement of Uranium Enrichment Standards Using High Resolution Gamma Spectrometry with High Precision and Accuracy**
R. Venkataraman, S. Croft
Oak Ridge National Laboratory
- 14:40 9 **Characterization of a 500 mm³ CdZnTe Detector for U and Pu Isotopic Composition Determination Tasks in Safeguards**
I. Meleshkovskii¹, A. Borella¹, K. Van der Meer¹, M. Bruggeman¹, N. Pauly², P.-E. Labeau¹, P. Peter Schillebeeckx³
¹Belgian Nuclear Research Centre (SCK-CEN), ²Université Libre de Bruxelles, ³EC JRC Directorate for Nuclear Safety and Security
- 15:00 15 **Measurements of Plutonium Mass and Isotopic Composition in ²³⁸PuLi Sources**
A. Rozite, H. Tagziria, S. Frison
EC JRC Directorate for Nuclear Safety and Security
- 15:20 8 **Comparative Testing of the MCA-527 and MCA-166 Mini Multi Channel Analyzers**
T. Köble¹, M. Risse¹, O. Schumann¹, S Ossowski¹, M. Jöster¹, M. Suhrke¹, M. Heinrichs², M. Dürr²
¹Fraunhofer INT, ²Forschungszentrum Jülich GmbH
- 15:40 **Coffee break**



03 International Collaboration

Chair – Willem Janssens, EC JRC Directorate for Nuclear Safety and Security

- 16:00 111 **Evolving Member State Support to the IAEA Department of Safeguards**
D. Peranteau, A. Takano
International Atomic Energy Agency
- 16:20 22 **Enhanced Cooperation among the IAEA, EC, VATESI and Ignalina NPP Operator as a Way to Effective and Efficient Verification of Spent Fuel Transfers at Ignalina NPP**
K. Gushchyn¹, I. Tsvetkov¹, G. Morris¹, J. Araujo¹, S. Rocchi¹, P. Klump², V. Segzdaite², S. Monakhov³, R. Sabas⁴
¹IAEA, ²EC Directorate Euratom Safeguards, ³Ignalina NPP, ⁴VATESI
- 16:40 95 **Swedish information sharing in the Incident and Trafficking Database (ITDB) and international co-operation to combat illicit trafficking**
E. Sundén, E. Koblet, V. Sandberg, L. van Dassen
Swedish Radiation Safety Authority
- 17:00 41 **Current Safeguards Research and Development Efforts at National Nuclear Security Administration (NNSA)**
C. Ramos¹, C. Pickett²
¹National Nuclear Security Administration, ²Oak Ridge National Laboratory
- 17:20 12 **Early Experience in Implementation of the Modified Small Quantities Protocol under the US-IAEA Caribbean Territories Safeguards Agreement (INFCIRC/366)**
D. Hanks
U.S. Nuclear Regulatory Commission
- 17:40 **Coffee break**



04 Geoscientific Methods

Chair – Olli Okko, STUK - Radiation and Nuclear Safety Authority

- 16:00 35 **Application of the CTBT On-site Inspection Geophysical Techniques for the Detection and Identification of Underground Structures**
P. Labak, G. Malich and C. Cuenca-Garcia
Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization
- 16:20 60 **Site Monitoring with Synthetic Aperture Radar Satellite Imagery**
M. Canty¹, A.A. Nielsen²
¹Jülich, ²Technical University of Denmark
- 16:40 103 **Spaceborne Optical and SAR Data Analysis for Safeguards Activities**
P. d'Angelo¹, C. Rossi¹, M. Eineder¹, J. Rutkowski²
¹German Aerospace Center (DLR), ²Forschungszentrum Jülich GmbH
- 17:00 61 **Seismic Monitoring of Final Repositories: The Contribution from Analytical Theory**
J. Altmann
Technische Universität Dortmund
- 17:20 117 **Applicability of the directional radar technology for safeguards monitoring nuclear repositories in geological formations**
C. Holst, D. Orłowsky
DMT GmbH & Co. KG



Tuesday 16 May, Evening

18:00-19:30

Joint Meeting of the ESARDA Implementation of Safeguards WG and the INMM International Safeguards Division

“20 years of the Additional Protocol” – Roundtable discussion

Co-Chairs – Fausto Medici, Swiss Federal Office of Energy, Chair ESARD Implementation of Safeguards WG

Michael Whitaker, Oak Ridge National Laboratory, Chair INMM International Safeguards Division

On the occasion of the 20th anniversary of the ‘Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards’, as laid down in INFCIRC/540(Corrected), the roundtable discussion aims at reflecting on its achievements, lessons learned, and future prospects.

Member States are kindly invited to share their views and experiences in the implementation of the Additional Protocol.

Further information on this roundtable discussion will be provided in due time.



05 Arms Control and Nuclear Disarmament Verification I

Chair – Gerald Kirchner, Carl Friedrich von Weizsäcker-Centre for Science and Peace Research (ZNF), Hamburg

- 09:00 94 **The challenges of nuclear disarmament verification**
N. Stott, A. Persbo
VERTIC
- 09:20 112 **Facilitating International Engagement in Arms Control Verification Using a Systems Approach**
M. Dreicer¹, I. Niemeyer², G. Stein³
¹Lawrence Livermore National Laboratory, ²Forschungszentrum Jülich GmbH, ³Bonn
- 09:40 29 **Military dimensions of Nuclear disarmament verification**
M. Richard
ARMIR/Global Security Network
- 10:00 57 **Why we shouldn't focus on confirming the characteristics of nuclear materials when looking to verify nuclear weapons**
K. Allen
King's College London
- 10:20 86 **Verification of Nuclear Warhead Dismantlement: Joining Dots**
M. Coxhead, R. Floyd, C. Everton
Australian Safeguards and Non-Proliferation Office
- 10:40 **Coffee break**



06 Geological Repositories

Chair – Mentor Murtezi, EC Directorate Euratom Safeguards

- 09:00 39 **Elements of a Swedish Safeguards Policy for the Spent Fuel Disposal System**
C. Andersson, G. Af Ekenstam, L. Hildingsson, R. Fagerholm
Swedish Radiation Safety Authority
- 09:20 91 **GOSSER - Geological Safeguards and Security R&D Project in Finland - How STUK prepares itself for the Final Disposal in Finland**
O. Okko, M. Moring, T. Honkamaa, E. Martikka, M. Hämäläinen
STUK - Radiation and Nuclear Safety Authority
- 09:40 88 **Geological Repositories – Safeguards Considerations for International Spent Fuel Disposal**
C. Everton
Australian Safeguards and Non-Proliferation Office
- 10:00 55 **Ultrasonic Identification Methods of Copper Canisters for Final Geological Repository**
F. Littmann¹, C. Clementi¹, L. Capineri², C. Andersson³, J. O. Stäl⁴
¹EC JRC Directorate for Nuclear Safety and Security, ²Florence University, ³Swedish Radiation Safety Authority, ⁴Swedish Nuclear Fuel and Waste Management Company (SKB)
- 10:20 114 **Management of damaged Spent Fuel**
A. Jussofie¹, M. Kaplik¹, K. van Bevern², W. Geißler³
¹GNS Gesellschaft für Nuklear-Service mbH, ²GNS Gesellschaft für Nuklear-Service mbH, ³RWE Power Aktiengesellschaft, Kraftwerk Biblis
- 10:40 **Coffee break**

07 Non-destructive Analysis: Neutron I

Chair – Peter Janssons, Uppsala University

09:00 23 **Advanced Neutron Detection Technology Rodeo**

A. Belian¹, A. Dougan¹, A. Iyengar², D. Chichester³, S. Clark⁴, S. Croft², D. Decman⁵, W. Geist⁶, P. Hausladen², H. Jianwei², R. McElroy², H. Menlove⁶, J. Newby², S. Pozzi⁴, M. Prasad⁵, J. Sanders³, T. Shin⁴, S. Thompson³, J. Verbeke⁵

¹National Nuclear Security Administration, ²Oak Ridge National Laboratory, ³Idaho National Laboratory, ⁴University of Michigan, ⁵Lawrence Livermore National Laboratory, ⁶Los Alamos National Laboratory

09:20 3 **The Optimization and Calibration of the AWCC Using 252Cf Interrogation and the Comparison with an AmLi Neutron Source**

H. Menlove, C. Rael

Los Alamos National Laboratory

09:40 28 **Field test of a full scale 3He-alternative HLNC-type counter: High Level Neutron counter – Boron (HLNB)**

D. Henzlova¹, H. Menlove¹, M. Tanigawa², Y. Mukai², H. Nakamura²

¹Los Alamos National Laboratory, ²Japan Atomic Energy Agency

10:00 53 **A Comparison of Approaches to Determine Dead Time Parameters Using a Boron-Coated-Straw High-Level Neutron Coincidence Counter**

A. Simone^{1,2}, S. Croft², A. Favalli³, J. Hayward^{1,2}

¹University of Tennessee, ²Oak Ridge National Laboratory, ³Los Alamos National Laboratory

10:20 70 **A He-3 Alternative Neutron Coincidence Counter for Nuclear Safeguards based on 6LiF:ZnS(Ag)**

H. Tagziria¹, M. Foster², M. Schear², D. Ramsden², G. Dermody²

¹EC JRC Directorate for Nuclear Safety and Security, ²Symetrica Ltd

10:40 **Coffee break**



08 Arms Control and Nuclear Disarmament Verification II

Chair – Keir Allen, AWE

- 11:00 71 **Technical Challenges within the International Partnership for Nuclear Disarmament Verification**
H. Tagziria
EC JRC Directorate for Nuclear Safety and Security
- 11:20 104 **Disposition Verification of Non-Nuclear Warhead Parts: A New Approach to Verifying Dismantlement**
L. Duckworth
Pacific Northwest National Laboratory
- 11:40 101 **An Integrated Nuclear Archaeology Approach to Reconstruct Fissile Material Production Histories**
M. Göttsche¹, B. Mouginot²
¹Princeton University, ²University of Wisconsin-Madison
- 12:00 26 **Environmental effects on MCNP output, limits of detection and the consequences for arms control**
J. Schofield
AWE
- 12:20 102 **Novel Approaches and Synergies in Biological and Chemical Arms Control**
M. Himmel
University of Hamburg
- 12:40 **Coffee break**



09 Destructive Analysis I

Chair – Jim Tushingham, National Nuclear Laboratory

- 11:00 89 **Uranium Microparticle Production - Support of IAEA's Analytical Capabilities**
A. Knott¹, R. Middendorp², E. Chinea-Cano³, L. Sangély³, M. Dürr², S. Vogt³, D. Bosbach²
¹EC JRC Directorate for Nuclear Safety and Security, ²Forschungszentrum Jülich GmbH, ³International Atomic Energy Agency
- 11:20 7 **Micro Particle Suspensions for Preparation of Reference Materials for Particle Analysis Methods in Safeguards**
R. Middendorp, M. Dürr, I. Niemeyer, D. Bosbach
Forschungszentrum Jülich GmbH
- 11:40 4 **²⁴³Am certified reference material for nuclear safeguards and security**
R. Jakopic¹, A. Fankhauser¹, Y. Aregbe¹, M. Crozet², C. Maillard², S. Richter¹, C. Rivier², D. Roudil², T. Altitzoglou¹, S. Pomme¹, M. Marouli¹, F. Tzika¹
¹EC JRC Directorate for Nuclear Safety and Security, ²Le Commissariat à l'Energie Atomique et aux Energies Alternative (CEA)
- 12:00 43 **Automated Clean Chemistry for Bulk Analysis of Environmental Swipe Samples**
B. Ticknor¹, S. Bottorff¹, K. Tevepaugh¹, D. Bostick¹, C. Hexe¹, H. Kim², P. Field²
¹Oak Ridge National Laboratory, ²Elemental Scientific Inc.
- 12:20 80 **Recent technology developments for uranium and plutonium isotopic determination from small samples**
N. Lloyd¹, P. Field², C. Hexel³
¹Thermo Fisher Scientific (Bremen) GmbH, ²Elemental Scientific Inc., ³Oak Ridge National Laboratory
- 12:40 **Lunch break**



10 Spent Fuel Verification

Chair – Stefano Vaccaro, EC Directorate Euratom Safeguards

- 11:00 6 **Investigating the Cherenkov light production due to cross-talk in closely stored nuclear fuel assemblies in wet storage**
E. Branger, S. Grape, P. Jansson, S. Jacobsson Svård
Uppsala University
- 11:20 81 **A simplified method of estimating Cherenkov light intensity from irradiated nuclear fuel**
D. Parcey¹, K. Axell²
¹Channel Systems Inc., ²Swedish Radiation Safety Authority
- 11:40 19 **Signatures from the spent fuel: simulations and interpretation of the data with neural network analysis**
A. Borella, R. Rossa, C. Turcanu
Belgian Nuclear Research Centre (SCK-CEN)
- 12:00 21 **Detection of fuel pins diversion with the self-indication neutron resonance densitometry technique**
R. Rossa¹, A. Borella¹, N. Pauly², P.-E. Labeau², K. van der Meer¹
¹Belgian Nuclear Research Centre (SCK-CEN), ²Université Libre de Bruxelles
- 12:20 85 **Laboratory Testing of Detectors and Electronics for Spent Fuel Measurements**
K. Ianakiev, M. Iliev, M. Swinhoe, D. Seagraves, A. Lafleur, M. Browne
Los Alamos National Laboratory
- 12:40 **Lunch break**



Poster Session

Chair – Irmgard Niemeyer, ESARDA President

Each author will be invited to give a 2 minutes' presentation of their poster, according to the order indicated below. The short presentation may be just oral, or may be supported by one or two electronic slides, which should be provided before the start of the session. Time keeping will be very strict. After the short presentations, the session will continue in the poster area.

Coffee will be served during the poster session.

- 2 **Illicit Trafficking of Radiokogical Materials and Terrorism**
T. Ghaté
India
- 10 **Reliability of the generic HPGe detector characterization using ISOCS™ Software for Absolute verification of fissile Material**
M. Abdelati, K. El Kourghly
Egyptian Nuclear and Radiological Regulatory Authority (ENRRA)
- 11 **Development and Validation of an MCNP model for a Broad-Energy Germanium Detector**
M. Abdelati, H. Khedr, K. El Kourghly
Egyptian Nuclear and Radiological Regulatory Authority (ENRRA)
- 14 **Radionuclides Categorization Algorithm for Application in Conventional Radiation Portal Monitors**
A. Rozite, P. Peerani, F. Rosas
EC JRC Directorate for Nuclear Safety and Security
- 20 **Safeguards and Non-proliferation in Myanmar**
K. P. P. Tun
Department of Atomic Energy, Myanmar
- 27 **Interlaboratory comparison on ²⁴³Am reference material for nuclear safeguards and security**
M. Crozet¹, D. Roudil¹, C. Bertorello¹, C. Maillard¹, C. Rivier¹, R. Jakopic², A. Fankhauser², Y. Aregbe², S. Ric², T. Altitzoglou²
¹Le Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA), ²EC JRC Directorate for Nuclear Safety and Security

- 36 **Delayed Gamma-ray Spectroscopy for Characterization of Fissile Nuclear Materials**
M. Koizumi¹, F. Rossi¹, D. C. Rodriguez¹, J. Takamine¹, M. Seya¹, T. Bogucarska², Jean-M. Crochemore², G. Varasano², K. Abbas², B. Pederson², J. Heyse², C. Paradela², W. Mondelaers², P. Schillebeeckx²
¹Japan Atomic Energy Agency, ²EC JRC Directorate for Nuclear Safety and Security
- 47 **Design of a Novel Nondestructive Portable Mobile Neutron Activation System**
M. Abdelati¹, A. Abd El Salam², S. El. Mongy¹
¹Egyptian Nuclear and Radiological Regulatory Authority (ENRRA), ²Cairo University
- 48 **In-beam active neutron interrogation technique for special nuclear materials characterization**
G. Bentoumi, F. Ali, L. Li, R. Rogge, B. Sur
Canadian Nuclear Laboratories
- 66 **Investigation of the Measurement Capabilities of an Advanced In Situ Gamma Spectrometry Services**
P. Chard, L. Bourva, B. Vendittozzi, X. Ducoux, G. Ilie, H. Jaderstrom, W. Mueller, T. Kirk, J. Singh
Mirion Technologies (Canberra)
- 68 **Evolution in HPGe detectors, when performance & reliability counts**
L. De Baerdemaeker, J. Douwen
Mirion Technologies (Canberra)
- 75 **XfuelBuilder for the Analysis of Simulations and Measurements of fresh fuel assemblies using neutron coincidence collars by nuclear inspectors**
H. Tagziria¹, M. Vescovi², P. Peerani¹, P. De-Baere³, P. Schwalbach³, S. Vaccaro³
¹EC JRC Directorate for Nuclear Safety and Security, ²iScience, ³EC Directorate Euratom Safeguards
- 77 **The Application of Gaussian Mathematics in the Verification of Arms Control Declarations**
A. Evans
AWE
- 97 **Performance evaluation of detection capabilities of plastic- and spectroscopical radiation portal monitors**
I. Krevica, J. Bagi, J. Galy, A. Knott
EC JRC Directorate for Nuclear Safety and Security
- 100 **NDA quantification of Nuclear Materials in containers**
A. Godot¹, K. Galliez¹, C. Deyglun¹, G. Jossens², C. Mathonat¹
¹KEP Nuclear, ²KTHTP

- 107 **In.situ Monitoring of Radionuclide Pollutions on Natural Water Reservoirs**
A. Sokolovs, A. Pchelintsev, A. Kail, V. Gostilo
Baltic Scientific Instruments
- 121 **Results of Illicit Trafficking Radiation Assessment Program (ITRAP+10) for
Detection Equipment in Nuclear Security**
H. Tagziria, C. Carapicco, V. Forcina, F. Raiola, P. Peerani
EC JRC Directorate for Nuclear Safety and Security
- 122 **Muon Tomography for spent nuclear fuel control**
P. Checchia
Istituto Nazionale di Fisica Nucleare (INFN)



11 Training and Knowledge Management

Chair – Sophie Grape, Uppsala University

- 15:40 5 **Nuclear Safeguards Culture: Roles and Responsibilities**
A.A. Elabd, O.A. Elhefnawy and I. Badawy
Egyptian Nuclear and Radiological Regulatory Authority (ENRRA)
- 16:00 13 **Training and Qualification Plan for U.S. Nuclear Regulatory Commission's International Safeguards Analysts**
D. Hanks
U.S. Nuclear Regulatory Commission
- 16:20 79 **Nuclear Knowledge Management System**
M. Akimova, D. Demyanuk
National Research Tomsk Polytechnic University
- 16:40 96 **EUSECTRA Training - Implementation and Practices**
J. Bagi, J. Galy, I. Krevica
EC JRC Directorate for Nuclear Safety and Security
- 17:00 109 **Education and Training on Nuclear Safeguards and Non-Proliferation in EC JRC**
K. Abbas¹, V. Berthou¹, P.I Daures², P. Peerani¹
¹EC JRC Directorate for Nuclear Safety and Security, ²EC DG DEVCO



12 Destructive Analysis II

Chair – Rozle Jakopic, EC JRC Directorate for Nuclear Safety and Security

- 15:40 73 **Certification of Ultra-High Purity Pu-244 for Safeguards Applications**
M. Fisher¹, A. Iyengar², R. Williams³
¹National Nuclear Security Administration, ²Oak Ridge National Laboratory, ³Lawrence Livermore National Laboratory
- 16:00 17 **Innovative Developments in Destructive Analysis for Safeguards**
A. Dougan¹, A. Krichinsky^{1,2}, A. Belian^{1,3}, M. Fisher^{1,4}
¹National Nuclear Security Administration, ²Oak Ridge National Laboratory, ³Los Alamos National Laboratory, ⁴Pacific Northwest National Laboratory
- 16:20 52 **Towards novel field-deployable instrumentation for UF₆ enrichment assay – an overview of existing and emerging technologies**
G. Chan, R. Russo
Lawrence Berkeley National Laboratory
- 16:40 37 **Alternative nuclear certified reference materials for safeguards and industry**
Y. Aregbe, N. Banik, J. Bauwens, R. Buda, R. Bujak, R. Carlos Marquez, K. Casteleyn, L. Duinslaeger, C. Hennessy, R. Jakopic, F. Kehoe, A. M. Sánchez Hernández, K. Toth, P. van Belle, E. Zuleger
EC JRC Directorate for Nuclear Safety and Security
- 17:00 65 **Nuclear Material Characterisation for Transport and Storage**
E. Zuleger, C. Brossard, H. Hein, M.I Holzhäuser, K. Lützenkirchen, L. Manfre, N. Rausch, J. Somers
EC JRC Directorate for Nuclear Safety and Security



13 Non-destructive Analysis: Tomography

Chair – Kåre Axell, Swedish Radiation Safety Authority

15:40 42 **Outcomes of the JNT 1955 Phase I Viability Study of Gamma Emission Tomography for Spent Fuel Verification**

S. Jacobsson Svård¹, L. E. Smith², T. A. White², V. Mozin³, P. Jansson¹, A. Davour¹, S. Grape¹, H. Trelle⁴, N. Deshmukh², R. S. Wittman², T. Honkamaa⁵, S. Vaccaro⁶, J. Ely⁷

¹Uppsala University, ²Pacific Northwest National Laboratory, ³Lawrence Livermore National Laboratory, ⁴Los Alamos National Laboratory, ⁵STUK - Radiation and Nuclear Safety Authority, ⁶EC Directorate Euratom Safeguards, ⁷International Atomic Energy Agency

16:00 56 **Detection of Fuel Pin Diversion via Fast Neutron Emission Tomography**

A. Iyengar¹, P. Hausladen², M. Blackston², L. Fabris², I. Gauld², J. Hu²

¹University of Tennessee, Knoxville, ²Oak Ridge National Laboratory

16:20 118 **Hybrid Gamma Emission Tomography for the Verification of Unirradiated Fuel: A Viability Study**

E. Miller¹, L. E. Smith¹, V. Mozin², R. Wittman¹, L. Campbell¹, M. Zalavadia¹, N. Deshmukh¹

¹Pacific Northwest National Laboratory, ²Lawrence Livermore National Laboratory

16:40 40 **Cosmic-ray muon tomography for safeguards applications**

G. Yang¹, T. Clackson¹, D. Ireland¹, D. Mahon¹, R. Al Jebali¹, S. Lumsden¹, C. Neilan¹, R. Kaiser¹, C. Shearer², M. Ryan²

¹Glasgow University, ²National Nuclear Laboratory

17:00 51 **Ultrasonic tomography as safety and safeguards instrumentation**

D. Sednev, Y. Salchak, A. Lider, I. Bolotina

National Research Tomsk Polytechnic University



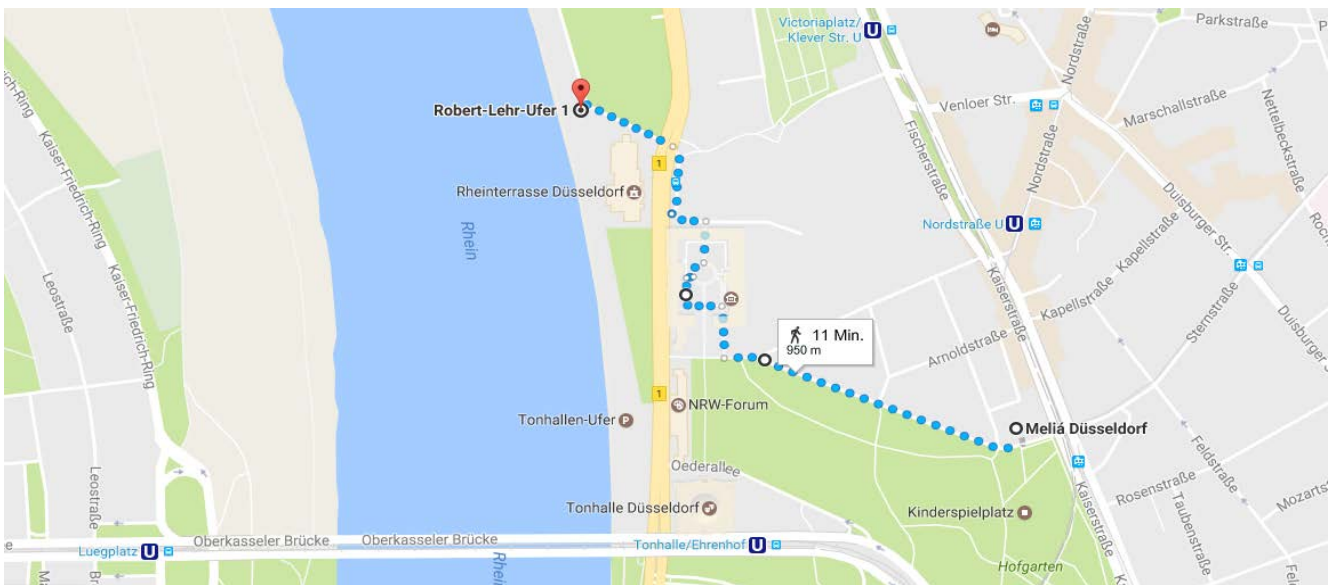
Wednesday 17 May, Evening

18:30-22:30
(departure at 19:00,
back at pier at 22:00)

Conference Dinner
Event Ship 'Jules Verne'

Robert Lehr Ufer
Pier 3
<http://julesverne-schiff.de/>

Experience the flair of the Rhenish metropolis and its attractions between 'Altstad' and 'Medien Hafen' on a magnificent panoramic dinner cruise on Wednesday, 17 May 2017. Enjoy a festive atmosphere including a specialty buffet, drinks and music against the backdrop of Düsseldorf's panorama as we float along the numerous attractions along the banks of the Rhine river.



Source: Google Maps



14 Integrated Approaches

Chair – Andreas Meyering, URENCO Deutschland GmbH

- 09:00 78 **Possibility of Implementation Concept 3S Synergy at Nuclear Facility**
P. Pushenko, D. Sednev
National Research Tomsk Polytechnic University
- 09:20 54 **An Integrated 3S Model for Safeguards for International Transport of Spent Nuclear Fuel**
M. Thomas, A. Williams, K. Jones, D. Osborn, E. Kalanina, B. Cohn, M. J. Parks, A. Mohagheghi
Sandia National Laboratories
- 09:40 119 **The JRC Advanced Safeguards Measurement, Monitoring and Modelling Laboratory**
C. Bergonzi, L. Dechamp, F. Littmann, G. Mercurio, P. Richir, E. Wolfart, W. Janssens
EC JRC Directorate for Nuclear Safety and Security
- 10:00 124 **The forward-problem approach in Safeguards verification: directly comparing simulated and measured observables**
S. Vaccaro¹, I. Gauld², M. Vescovi³, H. Tagziria⁴, A. Smejkal¹, P. Schwalbach¹
¹EC Directorate Euratom Safeguards, ²Oak Ridge National Laboratory, ³iScience, ⁴EC JRC Directorate for Nuclear Safety and Security
- 10:20
- 10:40 **Coffee break**



15 Containment & Surveillance

Chair – Francois Littmann, EC JRC Directorate for Nuclear Safety and Security

- 09:00 123 **Containment and Surveillance Systems – reflections on future technology**
V. Sequeira¹, G. Bostroem¹, E. Wolfart¹, J. Pekkarinen², K. Schoop², P. Schwalbach²
¹EC JRC Directorate for Nuclear Safety and Security, ²EC Directorate Euratom Safeguards
- 09:20 38 **Sealing Systems for Casks in Spent Fuel Storage Facilities**
K. Aymanns¹, I. Niemeyer¹, A. Rezniczek², A. Jussofie³
¹Forschungszentrum Jülich GmbH, ²UBA GmbH, ³GNS Gesellschaft für Nuklear-Service mbH
- 09:40 90 **Use of ultrasonic seals system as a Containment System at Spent Fuel Storage**
L. C. Machado Da Silva, S. Fernandez Moreno
Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials (ABACC)
- 10:00 92 **The Future of Tamper Indicating Enclosures**
M. Macdougall
Pacific Northwest National Laboratory
- 10:20 49 **Energy Harvesting for Increased Safeguards Equipment Battery Life**
R. Hymel
Sandia National Laboratories
- 10:40 **Coffee break**



16 Non-destructive Analysis: Neutron II

Chair – Alessandro Borella, Belgian Nuclear Research Centre (SCK-CEN)

- 09:00 31 **Development of Active Neutron NDA Techniques for Nuclear Nonproliferation and Nuclear Security**
 Y. Toh¹, O. Akira¹, H. Tsuchiya¹, K. Furutaka¹, F. Kitatani¹, M. Komeda¹, M. Maeda¹, M. Kureta¹, M. Koizumi¹, M. Seya¹, J. Heyse², C. Paradela², W. Mondelaers², P. Schillebeeckx², T. Bogucarska², J.-M. Crochemore², G. Varasano², K. Abbas², B. Pederson²
¹Japan Atomic Energy Agency, ²EC JRC Directorate for Nuclear Safety and Security
- 09:20 16 **Comparison between simulation and experimental results for neutron flux in DDA systems**
 M. Maeda¹, M. Komeda¹, A. Ohzu¹, M. Kureta¹, Y. Toh¹, T. Bogucarska², J. M. Crochemore², G. Varasano², B. Pedersen²
¹Japan Atomic Energy Agency, ²EC JRC Directorate for Nuclear Safety and Security
- 09:40 34 **Simulation study of neutron moderator in a delayed gamma-ray measurement system using a 14 MeV D-T neutron source**
 J. Takamine, F. Rossi, D. Rodriguez, M. Koizumi, M. Seya
Integrated Support Center for Nuclear Nonproliferation and Nuclear Security, JAEA
- 10:00 83 **Field trial of KM200 Electronics in the JRC PUNITA Facility**
 K. Ianakiev¹, M. Iliev¹, M. Swinhoe¹, B. Pedersen², G. Varasano², J.-M. Crochemore², P. De Baere³, S. Vaccaro³, M. Couland³
¹Los Alamos National Laboratory, ²EC JRC Directorate for Nuclear Safety and Security, ³EC Directorate Euratom Safeguards
- 10:20 84 **Self-calibration Method for Dead Time Losses in Neutron Counting Systems**
 K. Ianakiev¹, M. Iliev¹, M. Swinhoe¹, C. Lee^{1,2}
¹Los Alamos National Laboratory, ²Korea Atomic Energy Research Institute
- 10:40 **Coffee break**

17 Evaluation

Chair – Árpád Vincze, Hungarian Atomic Energy Authority

- 11:00 110 **Digital Declaration Site Map Submissions for Additional Protocol Article 2.a.(iii)**
J. Rutkowski¹, A. Keskinen², J. Idinger², I. Niemeyer¹, A. Rezniczek³, A. Rialhe²
¹Forschungszentrum Jülich GmbH, ²International Atomic Energy Agency, ³UBA GmbH
- 11:20 113 **Evolution of verification data evaluation**
C. Norman, R. Binner, N. Peter, C. Portaux, A. Walczak-Typke, J. Wüster
International Atomic Energy Agency
- 11:40 120 **Open Source Information Analysis in Support to Non-Proliferation - A Systems Thinking Approach**
G. Renda, G. G. M. Cojazzi, L. K. Kim
EC JRC Directorate for Nuclear Safety and Security
- 12:00 50 **Brain Science and International Nuclear Safeguards: Implications from Cognitive Science and Human Factors Research on the Provision and Use of Safeguards-Relevant Information in the Field**
Z. Gastelum, L. Matzen, E. Moyer, M. St. Pierre
Sandia National Laboratories
- 12:20 106 **Indicator Chemicals for clandestine nuclear activities**
I. Schwier
University of Hamburg
- 12:40 **Lunch break**



18 Nuclear Security

Chair – Hamid Tagziria, EC JRC Directorate for Nuclear Safety and Security

- 11:00 24 **An ultra-bright, laser-driven neutron source for nuclear applications**
 M. Roth¹, V. Bagnoud², O. Deppert¹, K. Falk³, A. Favalli⁴, J. Fernandez⁴, D. Gautier⁴, D. Henzlova⁴, J. Hornung¹, M. Iliev⁴, A. Losko⁴, I. Kishon⁵, A. Kleinschmidt¹, M. Mocko⁴, S. Palaniyappan⁴, I. Pomerantz⁵, V. Schanz¹, G. Schaumann¹, M. Swinhoe⁴, A. Tebartz¹, S. Vogel⁴, F. Wagner², G. Wurden⁴
¹TU Darmstadt, ²GSI Helmholtzzentrum für Schwerionenforschung, ³Institute of Physics of the Czech Academy of Sciences, ⁴Los Alamos National Laboratory, ⁵Tel-Aviv University
- 11:20 63 **Changes to the ²⁵²Cf neutron spectrum caused by source encapsulation**
 S. Croft¹, M. Swinhoe², R. Weinmann-Smith^{2,3}, A. Enqvist³
¹Oak Ridge National Laboratory, ²Los Alamos National Laboratory, ³University of Florida
- 11:40 58 **Proof of Concept Study of a complementary Hybrid Neutron/ Gamma-ray Imaging Approach**
 S. F. Naeem¹, D. Chernikova¹, K. Axell²
¹Chalmers University of Technology, ²Swedish Radiation Safety Authority
- 12:00 98 **SNM Detection by Fission Signatures Induced by a Low-energy Neutron Source**
 A. Ocherashvili¹, G. Varasano², E. Roesgen², A. Beck¹, J.-M. Crochemore², T. Bogucarska², B. Pedersen²
¹Nuclear Research Center Negev, ²EC JRC Directorate for Nuclear Safety and Security
- 12:20 99 **Field-deployable LiF:ZnS neutron detectors utilising the doubles-to-singles ratio for fission source detection and identification**
 D. V. Lewis, M. Foster
 Symetrica Ltd
- 12:40 **Lunch break**

Thursday 18 May, Morning

11:00-12:40

Panel Discussion “Reflecting on ESARDA’s future strategic direction”

Chair – Elna Martikka, STUK - Radiation and Nuclear Safety Authority

In preparation of the ESARDA Reflection Group 2019, this panel discussion aims at reflecting on ESARDA’s future strategic direction and, more general, on safeguards related strategic planning, strategic partnerships and cooperation.

The panel will include representatives from ESARDA, Euratom, INMM and APSN.

Further information on this panel discussion will be provided in due time.



19 Process Monitoring

Chair – Michael Whitaker, Oak Ridge National Laboratory

- 14:00 82 **Cyber Security and the Nonproliferation Regime**
Jacob Benz
Pacific Northwest National Laboratory
- 14:20 64 **Viability of an Unattended Verification Station for UF6 Cylinders: Phase I Findings**
L. E. Smith¹, K. Miller², B. McDonald¹, J. Webster¹, M. Zalavadia¹, J. Garner³, S. Stewart³, S. Branney⁴, L. Todd¹, N. Dehsmukh¹, J. Kulisek¹, H. Nordquist², M. Swinhoe²
¹*Pacific Northwest National Laboratory*, ²*Los Alamos National Laboratory*,
³*Oak Ridge National Laboratory*, ⁴*Savannah River National Laboratory*
- 14:40 25 **Status of Safeguards R&D on pyroprocessing related facilities at KAERI**
H.-D. Kim, S.-H. Park, S.-K. Ahn, H. Seo, B.-H. Won
Korea Atomic Energy Research Institute
- 15:00 108 **Feasibility study of advanced technology for Pu with FP solution monitoring -Overview of Research Plan and Modeling for Simulation**
M. Sekine¹, T. Matsuki¹, S. Suzuki¹, M. Tanigawa¹, A. Yamanaka¹, T. Yasuda¹, K. Tsutagi¹, H. Nakamura¹, H. Tomikawa¹, A. Marie Lafleur², M. C. Browne²
¹*Japan Atomic Energy Agency*, ²*Los Alamos National Laboratory*



20 Statistical Methodologies

Chair – Oscar Alique, EC Directorate Euratom Safeguards

- 14:00 32 **Attributes and metrics for safeguards-relevant information**
Nicholas Kyriakopoulos
The George Washington University
- 14:20 1 **Revisiting Currie’s Minimum Detectable Activity for Non Destructive Assay By Gamma Detection Using Frequentist Tolerance Intervals and Bayesian Prediction Intervals**
E. Agboraw¹, T. Burr¹, E. Bonner¹, S. Croft², J. Kirkpatrick³, T. Krieger⁴, C. Norman¹, P. Santi¹, S. Walsh¹
¹International Atomic Energy Agency, ²Oak Ridge National Laboratory, ³Canberra, ⁴Forschungszentrum Jülich GmbH
- 14:40 67 **Introduction to uncertainty quantification for safeguards inspectors**
E. Bonner, T. Burr, C. Norman, P. Santi
International Atomic Energy Agency
- 15:00 76 **Sensitivity study on Nash equilibrium strategies and payoffs in Jülich’s APA approach**
T. Krieger¹, M. J. Canty², J. Rutkowski¹, I. Niemeyer¹, G. Stein³, A. Rezniczek⁴
¹Forschungszentrum Jülich GmbH, ²Jülich, ³Bonn, ⁴UBA GmbH

Thursday 18 May, Afternoon

15:20-16:00

Closing Plenary

Chair – Willem Janssens, ESARDA Vice President

16:00

Coffee

