53rd Annual Meeting of the Institute of Nuclear Materials Management 2012

(INMM 53)

Orlando, Florida, USA
15-19 July 2012

Volume 1 of 5

TABLE OF CONTENTS

VOLUME I

OPENING SPECIAL SESSION: POST-FUKUSHIMA CHALLENGES IN SAFEGUARDS AND SECURITY
Chair: Yoshinori Meguro

OVERVIEW OF THE ACCIDENT OF FUKUSHIMA DAIICHI NUCLEAR POWER STATION AND THE PROCESS FOR ACHIEVING STABILIZATION .................................................................................................................. 1
Takeshi Ohta, Yuichiro Inoue, Masaki Kawasaki, Naoya Hirabayashi

OVERVIEW OF MID- AND LONG-TERM ROADMAP TOWARDS THE DECOMMISSIONING AND THE STATUS OF NUCLEAR MATERIAL MANAGEMENT AT FUKUSHIMA DAIICHI NUCLEAR POWER STATION .......................................................................................................................................................................................... 11
Takeshi Ohta, Yuichiro Inoue, Masaki Kawasaki, Naoya Hirabayashi

LESSONS LEARNED FROM THE ACCIDENT AT FUKUSHIMA DAIICHI NUCLEAR POWER STATION: NUCLEAR SECURITY PERSPECTIVES .......................................................................................................................... 21
Kaoru Naito

TECHNICAL SYNERGIES BETWEEN NUCLEAR SAFETY AND SECURITY .................................................. 31

SAFEGUARDS CHALLENGES AT FUKUSHIMA DAI-ICHI NUCLEAR SITE .................................................................................................................................................................................. 41
D. Parise, D. Hurt, M. Farnitano, P. Nangonya, J. Russell

SAFEGUARDS ACTIVITIES AND PLAN FOR STRENGTHENING SAFEGUARDS AND NUCLEAR SECURITY AFTER THE GREAT EAST JAPAN EARTHQUAKE .................................................................................................................................................................................. 46
Masashi Hattori, Yoshihiko Nagayama, Toshimitsu Ishii, Takafumi Ikeda, Minemasa Suehiro

U.S.-JAPAN R&D COLLABORATION ON SAFEGUARDS, NUCLEAR MATERIAL CONTROL AND ACCOUNTABILITY, AND NUCLEAR SECURITY IN RESTORATION OF FUKUSHIMA DAIICHI .................................................................................................................................................................................. 56
Matthew Van Sickle, James Conner, Michael Browne, N. Inoue, Toshiro Mochiji, Masao Senzaki, Yosuke Naoi

SESSION A FACILITY OPERATIONS — MATERIAL MANAGEMENT OPERATIONS
Co-Chairs: Shirley Cox, Rick Sprague

“A DAY IN THE LIFE” OF A MBA CUSTODIAN FOR AN INMM PAPER FROM THE Y-12 NATIONAL SECURITY COMPLEX .................................................................................................................................................................................. 61
Thomas Finch

THE ADVANTAGES AND DISADVANTAGES OF GOING PAPERLESS IN A MANUFACTURING PLANT .................................................................................................................................................................................. 65
Mickey Boatwright

USE OF STRATEGIC ROLL-UP AREAS AT CATEGORY III FACILITIES .................................................................................................................................................................................. 70
Pamela Rohde

THE ATTRACTIONNESS OF MATERIALS ASSOCIATED WITH THORIUM BASED NUCLEAR FUEL CYCLES FOR PHWRs .................................................................................................................................................................................. 75
Kendra Keady, Andrew Pritchard, Brian Collins, Mark Niehus

NUCLEAR SAFEGUARDS INFRASTRUCTURE REQUIRED FOR THE NEXT GENERATION NUCLEAR PLANT (NGNP) .................................................................................................................................................................................. 83
Philip Casey Durst, M. Schanfein

THE URANIUM BOWL: A MULTI-UNIVERSITY PHYSICAL SECURITY TABLE-TOP EXERCISE .................................................................................................................................................................................. 93
Michael Shannon, Dyrk Greenhalgh, Howard Hall

SESSION B INTERNATIONAL SAFEGUARDS — EVOLVING THE STATE-LEVEL CONCEPT
Co-Chairs: Richard Wallace, Ana Claudia Raffo-Caiado

EVOLVING THE STATE-LEVEL CONCEPT: PROJECT REVIEW & UPDATE .................................................................................................................................................................................. 102
James Casterton
LEVERAGING COMMERCIAL OFF-THE-SHELF IP SECURITY CAMERAS AND VIDEO MANAGEMENT SOFTWARE FOR INTERNATIONAL SAFEGUARDS ......................................................................................................................... 258
J. Garner, J. Younkin, N. Rowe

SAFEGUARDS ENHANCEMENTS FOR JOINT-USE APPLICATIONS OF ACCOUNTANCY SCALES .................................................................................................................................................................................. 268
R. Poland, Daniel Kremenz, Rusty Coleman, Sean Branney, Raymond Maynard

IMPLEMENTATION OF AN INTEGRATED, ROBUST AND USER-FRIENDLY ELECTRONIC DEVICE FOR UNATTENDED NEUTRON MONITORING AND LOGGING ................................................................................................................................. 274
Lee ReFalo, Gary Womack, Pete Shifflett, Steven Hamann

REAL-TIME AND INTEGRATED STREAM-ORIENTED REMOTE MONITORING (RAINSTORM) INTERFACE .................................................................................................................................................................................. 284
Keith Morgan, Christoph Brunhuber, Jim Regula, Heather Nordquist, Viorel Popescu, Stephan Rechberg, Ingo Naumann

APPLICATION OF WIRELESS LAN TECHNOLOGY TO REMOTE MONITORING FOR INSPECTION EQUIPMENT ........................................................................................................................................................................ 292
Koichi Ishiyama, Katsuhiro Yamaguchi, Toshihide Kabuki, Takashi Kimura, Tsuyoshi Hayakawa

SESSION E: MATERIALS CONTROL AND ACCOUNTABILITY — NNSA SPECIAL SESSION – COMPASS
Chair: Amy Whitworth

RISK-BASED RESIDENT FEDERAL OVERSIGHT OF SAFEGUARDS PROGRAM AT Y-12 NATIONAL SECURITY COMPLEX ........................................................................................................................................................................ 307
David Young, Richard Green

IMPROVING SENSITIVITY IN THE NNSS COMPASS MODEL .................................................................................................................................................................................. 311
John Wright

COMPASS IN ACTION - ACCOUNTING .................................................................................................................................................................................. 319
Michael Kaufman

COMPASS IN ACTION: INVENTORY ELEMENT .................................................................................................................................................................................. 325
Amy Wilson, Michael Kaufman, Michael Mitchell

COMPASS IN ACTION: PERFORMANCE EVALUATION ELEMENT ........................................................................................................................................................................ 330
Michael Mitchell, Amy Wilson, Patrick Goguen

COMPASS IN ACTION: DECLARING PROGRAM EFFECTIVENESS ........................................................................................................................................................................ 331
Amy Wilson, Michael Kaufman, Michael Mitchell

COMPASS, QUICK CARDS, AND THE MASTER ASSESSMENT SCHEDULE AT THE Y-12 NATIONAL SECURITY COMPLEX ........................................................................................................................................................................ 336
John Cuffman

SESSION F: MATERIALS CONTROL AND ACCOUNTABILITY — DESTRUCTIVE ANALYSIS/FORENSICS I
Chair: Steven Goldberg

INTERFEROMETRIC TIME-RESOLVED MEASUREMENT OF LASER-PRODUCED PLASMA FOR NUCLEAR FORENSICS APPLICATIONS ........................................................................................................................................................................ 340
J. McNutt, R. Schur, Kyle Hartig, P. Ko, I. Jovanovic

NUCLEAR FORENSICS TECHNIQUE DEVELOPMENT FOR SAMPLES OF SPENT REACTOR FUEL ........................................................................................................................................................................ 346
Matthew Sternat, William Charlton, Theodore Nichols, Donna Beals, Roger Webb

NUCLEAR AND RADIOLOGICAL DETECTION TECHNOLOGIES: PRESENT STATUS OF R&D ON NUCLEAR FORENSICS AT JAEO ........................................................................................................................................................................ 356
Satoshi Sakurai, Kaneaki Sato, Nobufumi Toda, Yoshiharu Shinoda, Masaaki Magara, Masaru Watahiki, Y. Kuno

STATUS OF THE NUCLEAR FORENSICS CAPABILITIES ESTABLISHMENT AT NECSA IN SOUTH AFRICA ........................................................................................................................................................................ 357
Aubrey Nelwamondo, Reuben Mogafe, Ian Hutcheon, Erick Ramon, Daniel Booyse, Lee Ricciuti
PREDICTIVE FALLOUT COMPOSITION MODELING: IMPROVEMENTS AND APPLICATIONS OF THE DEFENSE LAND FALLOUT INTERPRETIVE CODE ................................................ .................... 366
David Hooper, Vincent Jodoin, Ronald Lee, Mateusz Monterial

AUTOMATING THE COUPLING OF ORIGEN WITH GADRAS VIA THE FALLOUT ANALYSIS TOOL FOR NATIONAL TECHNICAL NUCLEAR FORENSICS ................................................ 376
Mateusz Monterial, Vincent Jodoin, Jordan Lefebvre, Douglas Peplow, David Hooper

POLICY VALUE OF NUCLEAR FORENSICS FOR DETERRENCE ................................................................. 386
Kate Putman, William Charlton

SESSION G: NONPROLIFERATION AND ARMS CONTROL — ATTRIBUTE MEASUREMENT SYSTEMS
Chair: Kevin Seager

REVIEW OF PRIOR U.S. ATTRIBUTE MEASUREMENT SYSTEMS ........................................................................ 396
Greg White

THIRD GENERATION ATTRIBUTE MEASUREMENT SYSTEM ........................................................................ 403
Dan Archer

CONCEPTS FOR THE MEASUREMENTS SUBSYSTEMS OF THE THIRD GENERATION ATTRIBUTES MEASUREMENT SYSTEM .................................................................................. 407
G. Warren, Dan Archer, Mark Cunningham, S. McConchie, Jonathan Thron

SIMULTANEOUS AUTHENTICATION AND CERTIFICATION OF ARMS-CONTROL MEASUREMENT SYSTEMS ................................................................................................. 414
D. MacArthur, Danielle Hauck, Jonathan Thron

ACTIVE INTERROGATION BEHIND AN INFORMATION BARRIER ........................................................................ 423
David DeSimone, Duc Vo

ATTRIBUTES FROM NMIS TIME COINCIDENCE, FAST-NEUTRON IMAGING, FISSION MAPPING, AND GAMMA-RAY SPECTROMETRY DATA ...................................................... 432
Alicia Swift, B. Grogan, James Mullens, Jason Hayward, John Mihalczo

GAMMA-RAY MEASUREMENTS OF URANIUM ITEMS INSIDE AN AWCC ..................................................... 444
Duc Vo, David DeSimone

ANALYSIS OF THE FEYNMAN VARIANCE TO MEAN RATIO USING NONLINEAR REGRESSION .................. 451
Alex Okowita, J. Mattingly

SESSION H: NONPROLIFERATION AND ARMS CONTROL — INTERNATIONAL COOPERATION FOR NUCLEAR NONPROLIFERATION AND SECURITY
Chair: Morris Hassler

NUCLEAR SECURITY SUMMIT: 2014 AND BEYOND ....................................................................................... 461
Robert Floyd, Stephan Bayer

Lars van Dassen

CHINA’S NUCLEAR WEAPONS MODERNIZATION: INTENTIONS, DRIVERS, AND TRENDS ....... 475
Hui Zhang

GLOBAL THREAT REDUCTION INITIATIVE AND THE EGYPTIAN ATOMIC ENERGY AUTHORITY AMNESTY RECOVERY PROGRAM ................................................................. 485
Robert Martinez, Michael Itamura, Yasser Mohamed, Philip Robinson

MOVING FROM CIVIL HEU MINIMIZATION TO ELIMINATION: DEFINING A NEW INTERNATIONAL AGENDA ......................................................................................... 492
Corey Hinderstein, Andrew Newman

FUTURE NEEDS FOR ADVANCED REACTOR CONCEPTS: REQUIREMENTS FOR LEU AT GREATER THAN 5% ENRICHMENT, A Y-12 PERSPECTIVE ......................................................... 499
John Creasy

HEU MINIMIZATION AFTER THE SEOUL NUCLEAR SECURITY SUMMIT ..................................................... 504
Miles Pomper
SESSION I: NUCLEAR SECURITY AND PHYSICAL PROTECTION — SECURITY SYSTEMS AND TECHNOLOGIES
Co-Chairs: Rodney Wilson, Samuel Callahan

RELIABILITY, AVAILABILITY, AND MAINTAINABILITY CONSIDERATIONS IN THE DESIGN AND EVALUATION OF PHYSICAL SECURITY SYSTEMS ................................................................. 513
David Trujillo, Carol Scharmer

DESIGN OF A RULE-BASED ACCESS CONTROL SYSTEM FOR VITAL AREA IN A NUCLEAR FACILITY .................................................................................................................. 523
Jeong-ho Lee, Hyeon-cheol Kim

COMPLEMENTARY SENSOR SELECTION FOR HIGH SECURITY APPLICATIONS ........................................ 531
J. Russell

EXTENDED PROBABILISTIC PATH ANALYSIS TO EVALUATE OPERATIONAL STRATEGIES TO MITIGATE INSIDER ADVERSARIES ................................................................. 542
Felicia Duran, Gregory Wyss

CYBER / PHYSICAL SECURITY VULNERABILITY ASSESSMENT INTEGRATION ........................................ 552
Doug MacDonald, Bret Simpkins

SESSION J: PACKAGING, TRANSPORTATION AND DISPOSITION — DISPOSITION AND DISPOSAL
Chair: Bradley Loftin

LESSONS LEARNED FROM THREE MILE ISLAND PACKAGING, TRANSPORTATION AND DISPOSITION THAT APPLY TO FUKUSHIMA DAIICHI RECOVERY .......................................................... 557
Layne Pincock, Wendell Hintze, Koji Shirai

PACKAGE AND LARGE OBJECT PROFILING WITH A GAMMA/NEUTRON SENSITIVE DETECTION SYSTEM ................................................................................................................. 567
Sean Branney, Graham Walford, L. Miller, Raymond Maynard, David Roberts

THE GLOBAL THREAT REDUCTION INITIATIVE'S ORPHAN SOURCE RECOVERY PROJECT IN THE RUSSIAN FEDERATION .................................................................................. 575
J. Russell, Anastasia Ahumada

SESSION K: EDUCATION AND TRAINING — EDUCATION AND PROFESSIONAL DEVELOPMENT
Chair: Steven Ward

THE UNIVERSITY OF TENNESSEE INSTITUTE FOR NUCLEAR SECURITY ................................................ 584
Howard Hall, James Sumner, Alan Icenhour, Joseph Stainback, Chris Clark, Chris Robinson, Eric Abelquist,
Arlene Garrison

NUCLEAR FORENSICS EDUCATIONAL NEEDS ......................................................................................... 591
Lily Crabtree, Matthew Baruzzini, Howard Hall

NRC DEVELOPMENTAL PROGRAMS: NUCLEAR SAFETY PROFESSIONAL DEVELOPMENT PROGRAM .................................................................................................................... 596
Eric Freeman, Steven Ward

FORMAL QUALIFICATION PROGRAMS FOR MC&A INSPECTORS AND LICENSE REVIEWERS AT THE NRC .............................................................................................................. 601
Suzanne Ani, David Ditto, Glenn Tuttle

SESSION A: FACILITY OPERATIONS — NUCLEAR MATERIAL MANAGEMENT OPERATIONS I
Co-Chairs: Dale Dunsworth, Ron Milligan

PROCESSING OF MARK-42 TARGET MATERIALS FOR RECOVERY OF AMERICIUM AND CURIUM .............................................................................................................................. 607
Brad Patton, Dennis Benker, Emory Collins, Sharon Robinson, Robert Wham

PROGRESS DOWN-BLENDING SURPLUS HIGHLY ENRICHED URANIUM .................................................. 617
Gary Person, Dale Davis, Russ Schmidt
SAVANNAH RIVER SITE’S H-CANYON FACILITY: A NATIONAL ASSET WITH NEW MISSION
Virginia Magoulas ............................................................................................................................... 625

POTENTIOMETRIC SENSOR FOR REAL-TIME REMOTE SURVEILLANCE OF ACTINIDES IN MOLTEN SALTS
Natalie Gese, Jun-Fong Jue, Brenda Serrano, Guy Fredrickson ............................................................................................................................... 632

DISMANTLEMENT PLANNING AT Y-12 NATIONAL SECURITY COMPLEX
Brian Gullett ........................................................................................................................................... 641

THE U.S. PLUTONIUM BALANCE, 1944-2009
Peter DeSausles, Leigh B. Gunn ........................................................................................................... 646

EVOLVING EXPANSION OF SRS CATEGORY I STORAGE CAPABILITY
Richard Koenig, E. Hackney .................................................................................................................. 654

CONVERSION AND REUSE OF HIGHLY ENRICHED URANIUM HEXAFLUORIDE
Becky Eddy ............................................................................................................................................ 659

SESSION B: INTERNATIONAL SAFEGUARDS — PROCESS MONITORING
Co-Chairs: Barbara Hoffheins, Tom Burr

EVALUATING SAFEGUARDS BENEFITS OF PROCESS MONITORING AS COMPARED WITH NUCLEAR MATERIAL ACCOUNTANCY
Humberto Garcia, Wen-Chiao Lin, Scott DeMuth, Reed Carlson, T. Burr, Allen Bakel ........................................................................................................................................ 666

APPLYING PROCESS MONITORING AT GAS CENTRIFUGE ENRICHMENT PLANTS USING COMMERCIAL OFF-THE-SHELF INDUSTRIAL CONTROL PRODUCTS
R. Snow, J. Garner, M. Whitaker, J. Younkin, D. Lockwood, N. Rowe ........................................................................................................................................ 676

TRANSUDER SIGNAL NOISE ANALYSIS FOR SENSOR AUTHENTICATION
John Svoboda, M. Schanfein .................................................................................................................. 685

LEVERAGING THE INTRINSIC FEATURES OF COMMERCIAL OFF-THE-SHELF WEIGHING INDICATORS TO BUILD CONFIDENCE IN INTERNATIONAL SAFEGUARDS MEASURES
J. Garner, J. Whitaker, J. Younkin, N. Rowe ................................................................................................. 695

DATA-DRIVEN VERSUS PERIOD-DRIVEN CHANGE DETECTION FOR PROCESS MONITORING
T. Burr, Michael Hamada, Chris Orton ....................................................................................................... 705

SESSION C: INTERNATIONAL SAFEGUARDS — GAS CENTRIFUGE ENRICHMENT PLANT SAFEGUARDS
Co-Chairs: Orpet Peixoto, Richard Poland

FIXED PLANT PROLIFERATION ANALYSIS OF IRAN’S NATANZ PLANT
Houston Wood, Patrick Migliorini ........................................................................................................... 715

A ROBUST INFRASTRUCTURE DESIGN FOR GAS CENTRIFUGE ENRICHMENT PLANT UNATTENDED ONLINE ENRICHMENT MONITORING
J. Younkin, J. Garner, N. Rowe .................................................................................................................. 724

THERMAL CAMERA IMAGING FOR SECURITY MONITORING OF GCEP SYSTEMS
Charles Morrow II, Belle Upadhyaya, Jose March-Leuba, Taner Uckan ........................................................................................................................................ 734

GENERALIZED MODELING OF ENRICHMENT CASCADES THAT INCLUDE MINOR ISOTOPES
Charles Weber ........................................................................................................................................... 744

TRANSIENT ISOTOPE SEPARATION MODELING OF GAS CENTRIFUGE ENRICHMENT PLANTS
Patrick Migliorini, Houston Wood ........................................................................................................... 754

ONSITE GASEOUS CENTRIFUGE ENRICHMENT PLANT UF₆ CYLINDER DESTRUCTIVE ASSAY
Norm Antheier, Bret Cannon, Amy Qiao, Jennifer Carter, Bruce McNamara, Matthew O’Hara, Jon Phillips, Michael Curtis ........................................................................................................................................ 764
VOLUME 2

FIELD TRIAL OF LANL ON-LINE ADVANCED ENRICHMENT MONITOR FOR UF₆ GCEP ...................... 773
ANALYSIS OF PROBABILITY OF DETECTION OF PLAUSIBLE DIVERSION SCENARIOS AT
GAS CENTRIFUGE ENRICHMENT PLANTS USING ADVANCED SAFEGUARDS ........................................... 783
  Kevin Hase, Heather Erpenbeck, B. Boyer

SESSION D: INTERNATIONAL SAFEGUARDS — THE ROLE OF SSACs/RSACs UNDER THE
STATE LEVEL CONCEPT
Co-Chairs: James Casterton, Mosatiwa Rasweswe
ENHANCED COOPERATION WITH SSACs/RSACs UNDER THE SLC .......................................................... 793
  David Hatt, Therese Renis, Norbert Peter, Igor Tsvetkov, Sigitaus Kurselis, Paul Meylemans, Wolfgang Kahnmeier,
  Johan Dackner, Herbert Dratschmidt
THE ROLE OF THE SSAC IN CANADA UNDER THE STATE-LEVEL CONCEPT .................................................. 800
  Tom Ellacott, Karen Owen-Whitred
THE ROLE OF THE STATE SYSTEM OF ACCOUNTING FOR AND CONTROL OF NUCLEAR
MATERIALS (SSAC) UNDER THE STATE-LEVEL CONCEPT: THE SOUTH AFRICAN
PERSPECTIVE .................................................................................................................................................... 805
  M. Rasweswe, B. Nangu, D. Tillwick, L. Shayi
FUNDAMENTALS AND GOOD PRACTICES FOR SAFEGUARDS REGULATORY
AUTHORITIES – AN ASIA-PACIFIC SAFEGUARDS NETWORK (APSN) PROJECT ............................................. 814
  Craig Everton, Robert Floyd
COOPERATION BETWEEN SSACs/RSACs AND THE IAEA UNDER THE STATE-LEVEL
CONCEPT: AN EVOLVING PROCESS ................................................................................................................ 823
  A. Raffo-Caiado, J. Johnson

SESSION E: INTERNATIONAL SAFEGUARDS — SCIENCE FOR VERIFICATION II
Co-Chairs: Sergey Zykov, Mark Schanfein
A REVIEW OF CURRENT SAFEGUARDS TECHNOLOGY DEVELOPMENTS AT LOS
ALAMOS NATIONAL LABORATORY .................................................................................................................... 829
  Stephen Croft, Karen Miller
STRENGTHENED NUCLEAR SAFEGUARDS: A STATISTICAL VIEW IN THE CONTEXT OF
COMBINING PROCESS MONITORING AND NUCLEAR MATERIAL ACCOUNTING DATA ........................................ 839
  T. Burr, Kory Budlong Sylvester, Michael Hamada, John Howell, Claire Longo, Mitsuo Suzuki, Brian Weaver
THE IMPORTANCE OF ESTABLISHING AND MAINTAINING CONTINUITY OF
KNOWLEDGE DURING 21ST CENTURY NUCLEAR FUEL CYCLE ACTIVITIES ............................................. 849
  Chris Pickett, N. Rowe, J. Younkin, Bernard Wishard, Robert Bean, Dianna Blair, Ray Lawson, George Weeks,
  Keith Tolk
SAFEGUARDS VERIFICATION MEASUREMENTS USING LASER ABLATION, ABSORBANCE
RATIO SPECTROMETRY IN GASEOUS CENTRIFUGE ENRICHMENT PLANTS .................................................. 860
  Norm Anheier, Bret Cannon, Gourihar Kulkarni, John Munley, Dan Nelson, Amy Qiao, Jon Phillips
APPLICATION OF SAFEGUARDS-BY-DESIGN FOR THE PYROPROCESSING FACILITIES IN
ROK ....................................................................................................................................................................... 870
  H. Kim, H. Shin, D. Song, T. Lee, B. Han, S. Ahn, S. Park
GAME THEORETICAL PERSPECTIVES FOR DIVERSION PATH ANALYSIS ................................................... 876
  R. Avenhaus, M. Canty, T. Krieger

SESSION F: MATERIALS CONTROL AND ACCOUNTABILITY — NDA NEUTRON
MEASUREMENTS AND TECHNIQUES I
Chair: Robert McElroy
MCNPX SIMULATIONS OF UF₆ NEUTRON SPECTROSCOPY MEASUREMENTS USING
LIQUID SCINTILLATOR DETECTORS FOR ²³⁵U ENRICHMENT DETERMINATION ........................................... 886
  M. Paff, S. Clarke, E. Miller, S. Pozzi, S. Kiff, E. Padovani
IMPLEMENTATION OF DYNAMIC CROSS-TALK CORRECTION (DCTC) FOR MOX HOLDUP ASSAY MEASUREMENTS AMONG MULTIPLE GLOVEBOXES (896)
Hironobu Nakamura, David Beddingfield, Jeff Montoya, Hideo Nakamichi, Yasunobu Mukai, Tsutomu Kurita

IDENTIFICATION OF LITHIUM ISOTOPES USING TIME-TAGGED NEUTRON SCATTERING (905)
B. Grogan, John Mikhailzo

CHARACTERIZATION OF SPECIAL NUCLEAR MATERIAL USING A TIME-CORRELATED PULSE-HEIGHT ANALYSIS (915)
E. Miller, S. Clarke, A. Enqvist, S. Pozzi, P. Marleau, J. Mattingly

FAST NEUTRON IMAGING FOR MATERIALS ACCOUNTANCY OF URANIUM HEXAFLUORIDE (925)
S. Kiff, E. Bruhaker, M. Gerling, P. Marleau, Wondwosen Mengesha, Michael Streicher

DEVELOPMENT PLAN OF Pu NDA SYSTEM USING ZnS CERAMIC SCINTILLATOR (931)
Masatoshi Kureta, Kazuhiko Soyama, Michio Seya, Akira Ohzu, Mitsuo Haruyama, Misao Takase, Kaoru Sakasai, Tatsuya Nakamura, Kentaro Toh

NEUTRON LIGHT OUTPUT FUNCTIONS MEASURED FOR EJ309 LIQUID SCINTILLATION DETECTORS (939)
A. Enqvist, C. Lawrence, S. Pozzi, T. Massey

MULTIPLICITY DISTRIBUTIONS AND ENERGY-ANGLE CORRELATIONS IN SPONTANEOUS FISSION NEUTRON EMISSIONS (949)
B. Wieger, A. Enqvist, M. Flaska, S. Pozzi

DEMONSTRATION PLAN OF Pu NDA SYSTEM USING ZnS CERAMIC SCINTILLATOR (959)
Hironobu Nakamura, Masatoshi Kureta, Akira Ohzu, Kazuhiko Soyama, Tatsuya Nakamura, Yasunobu Mukai, Michio Seya

SESSION G: MATERIALS CONTROL AND ACCOUNTABILITY — ACCOUNTING SYSTEMS
Chair: Michelle Romano

RELIABLE SAFEGUARDS VERIFICATION MEASUREMENTS RESULTS AND THE INTERNATIONAL TARGET VALUES 2010 (965)
Fabio Dias, Silvio de Almeida, Geraldo Renha Jr.

MANUFACTURING OPERATIONS MANAGEMENT MODERNIZATION AT THE Y-12 NATIONAL SECURITY COMPLEX (972)
Andrew Jackson, James Plemmons

NUCLEAR MATERIAL ACCOUNTING AND CONTROL SOFTWARE (978)
Valeriy Chernyadyev

APPLICABILITY OF THE CURIUM RATIO TECHNIQUE FOR SAFEGUARDING AT ELECTROCHEMICAL RECYCLING PROCESS (985)
Seong-Kyu Ahn, Hee-Sang Shin, Tae-Hoon Lee, Bo-Young Han, Se-Hwan Park, Ho-Dong Kim

ENHANCING THE MATERIAL CONTROL & ACCOUNTING MEASUREMENT SYSTEM AT THE STATE SCIENTIFIC CENTER OF THE RUSSIAN FEDERATION – INSTITUTE FOR PHYSICS AND POWER ENGINEERING NAMED AFTER A.I. LEYPUNSKY (994)
Gennady Bezhunov, Sergey Bogdanov, Vyacheslav Gorbachev, Boris Ryazanov, Vladimir Talanov, Carolyn Scherer

IMPLEMENTING STATE-LEVEL TRACKING OF NUCLEAR MATERIAL (1002)
Steven Ward

SOURCE TERM CHARACTERIZATION FOR SNM PIT STORAGE FACILITIES (1010)
Jessica Paul, Michael Chin, Glenn Sjoden

SESSION H: NONPROLIFERATION AND ARMS CONTROL — MIDDLE EAST AND NORTH AFRICA PERSPECTIVES ON NUCLEAR INFRASTRUCTURE
Chair: Jadallah Hammal

JORDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY’S EFFORTS TO ENSURE SAFE AND SECURE NUCLEAR INFRASTRUCTURE IN JORDAN (1021)
Salaheddin Maktawi

NUCLEAR ENERGY, NUCLEAR SECURITY AND ARAB SPRING, DYNAMICS AND WHO IS WHO? (1025)
Mustafa Bahran, Rian Bahran
JORDAN ATOMIC ENERGY COMMISSION: MOVING SAFELY AND SECURELY TOWARDS NUCLEAR POWER .......................................................... Kamal Araj

JORDAN'S HUMAN RESOURCES DEVELOPMENT NUCLEAR EDUCATION & TRAINING PROGRAMS .............................................. Dala’ Amawi

MOROCCO'S CNESSEN AS A REGIONAL CENTER OF EXCELLENCE FOR SAFETY AND SECURITY .......................................................... Ahmed Boufraqech

IMPLEMENTATION AND EXPANSION OF THE GULF NUCLEAR ENERGY INFRASTRUCTURE INSTITUTE (GNEII) ............................ Adam Williams, Abdelaziz Al-Madhloum, Philip Beeley, Byung Koo Kim, David Boyle, Michael Schuller, Faraj Ghanbari, Amir Mohagheghi

SESSION I: NONPROLIFERATION AND ARMS CONTROL — IMAGING DETECTORS
Chair: Arden Dougan


FAST-NEUTRON CODED-APERTURE IMAGING OF SPECIAL NUCLEAR MATERIAL CONFIGURATIONS ............................................ P. Hausladen, M. Blackston, E. Brubaker, D. Chichester, P. Marleau, R. Newby

RESPONSE CHARACTERIZATION FOR THE HYDROGEN-BASED LIQUID SCINTILLATION DETECTOR EJ309 ........................................... C. Lawrence, A. Enqvist, T. Massey, M. Flaska, S. Clarke, S. Pozzi, F. Becchetti

COMPARISON OF NEUTRON PULSE HEIGHT DISTRIBUTIONS FROM ORGANIC SCINTILLATORS CALCULATED BY Geant4 AND MCNPX-PoliMi .......................................................... S. Naeem, S. Clarke, J. Dolan, S. Pozzi

EDGE DETECTION AND SHAPE RECOGNITION IN NEUTRON TRANSMISSION IMAGES ................................................................. E. Sword, S. McConchie

DEVELOPMENT OF A REMOTE GAMMA RAY AND NEUTRON DETECTION ELEMENT SUITABLE FOR “SINGLE PIXEL” OR COMpressive IMAGING .......................................................... Graham Walford, Sean Branney, David Roberts, Raymond Maynard, L. Miller, Christoph Borel, David Bunker, John Dewes

TERRESTRIAL AND COSMIC BACKGROUND RADIATION EFFECT ON A DUAL-PARTICLE IMAGING SYSTEM ................................................ Michael Hamel, Marc Becchetti, Alexis Poirtrasson-Riviere, John Polack, Kiyotaka Ide, S. Clarke, M. Flaska, S. Pozzi

IMAGE-BASED MATERIAL DISCRIMINATION ALGORITHMS FOR ARMS CONTROL ................................................................. Sean Robinson, Andrew Gilbert, Ben McDonald, Tim White, Ken Jarman, Alex Misner

IMAGE HASHES AS TEMPLATES FOR VERIFICATION ................................................................. Tad Janik, Ken Jarman, Sean Robinson, Allen Seifert, Ben McDonald, Tim White

SESSION J: PACKAGING, TRANSPORTATION AND DISPOSITION — SHIPPING, TRACKING AND DESIGN I
Co-Chairs: Holger Vöelzke, Kerry Dunn

ENGINEERING REQUIREMENTS FOR FLOW-FORMED CONTAINMENT VESSELS FOR TYPE B RADIOACTIVE MATERIALS .................................................. M. DeMicco, L. Fischer, R. Haafner, L. Hugler, E. Russell Jr., C. Syn

MANUFACTURING PROCESS CAPABILITY ANALYSIS FOR SAVY-4000 NUCLEAR MATERIAL STORAGE CONTAINER QUALITY ASSURANCE .......................................................... Paul Smith, Elizabeth Kelly, Luke Anderson, Timothy Stone

LOS ALAMOS NATIONAL LABORATORY OVERVIEW OF THE SAVY-4000 DESIGN: MEETING THE CHALLENGE FOR WORKER SAFETY .......................................................... Timothy Stone, Paul Smith, Kirk Veirs, Jonathan Teague, Michael Blair

METHODS FOR ESTIMATING ENCAPSULATED LEAD SHIELD BODY DEFORMATION IN DYNAMIC IMPACTS .......................................................... Chartes McKeel, Daniel Leduc
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPLICATION OF FLOW FORMING FOR USE IN RADIOACTIVE MATERIAL PACKAGING DESIGNS</td>
<td>1178</td>
</tr>
<tr>
<td>Paul Blanton, Kurt Eberl, G. Abramczyk</td>
<td></td>
</tr>
<tr>
<td>SESSION K: POSTER SESSION</td>
<td></td>
</tr>
<tr>
<td>Chair: Taner Uckan</td>
<td></td>
</tr>
<tr>
<td>TIME MEASUREMENT REDUCTION ON LARGE VOLUME AND SENSITIVE CALORIMETER FOR NUCLEAR APPLICATIONS</td>
<td>1186</td>
</tr>
<tr>
<td>G. Jossens, C. Mathonat, G. Etherington</td>
<td></td>
</tr>
<tr>
<td>EVALUATION OF THE UNITED STATES SUPPORT PROGRAM’S INTERNSHIP AND JUNIOR PROFESSIONAL OFFICER PROGRAMS</td>
<td>1195</td>
</tr>
<tr>
<td>Jessica Cruz, Jade Patterson, Susan Pepper</td>
<td></td>
</tr>
<tr>
<td>IMPLEMENTATION EXPERIENCE OF THE ADDITIONAL PROTOCOL AT KOREA ATOMIC ENERGY RESEARCH INSTITUTE(KAERI)</td>
<td>1204</td>
</tr>
<tr>
<td>Hyun Sook Kim, Byung Doo Lee, Han Suk Ko, Sung Ho Lee, Ho Jun Park</td>
<td></td>
</tr>
<tr>
<td>ASSESSMENT OF LASER-INDUCED BREAKDOWN SPECTROSCOPY AS A METHOD TO PRE-SCREEN ENVIRONMENTAL SWIPE SAMPLES</td>
<td>1209</td>
</tr>
<tr>
<td>C. Fricke-Begemann, R. Noll, A. Monteth, A. Maddison, M. Durr</td>
<td></td>
</tr>
<tr>
<td>HIGH SPATIAL AND TEMPORAL RESOLUTION PARTICLE DETECTORS</td>
<td>1216</td>
</tr>
<tr>
<td>John Neal, Lynn Bootner, John Mihalczko</td>
<td></td>
</tr>
<tr>
<td>OPEN-SOURCE/GEOSPATIAL INFORMATION WORKING GROUP</td>
<td>1222</td>
</tr>
<tr>
<td>Karl Horak, Denise Bleakly, Michael McDaniell</td>
<td></td>
</tr>
<tr>
<td>THE USE OF MODAL TESTING WITHIN NUCLEAR WEAPON DISMANTLEMENT VERIFICATION</td>
<td>1227</td>
</tr>
<tr>
<td>Phil Duborn, Paula Hayden, Helen White, Philip Ind</td>
<td></td>
</tr>
<tr>
<td>PRELIMINARY PERFORMANCE RESULTS FOR A HYBRID K-EDGE DENSITOMETER (HKED) INSTALLED AT THE RADIOCHEMICAL ENGINEERING DEVELOPMENT CENTER (REDC)</td>
<td>1237</td>
</tr>
<tr>
<td>R. McElroy, J. Chapman, C. Romano, R. Venkataraman</td>
<td></td>
</tr>
<tr>
<td>USING SPECTRAL SUMMING TO DETERMINE RADIONUCLIDE ACTIVITY FOR LANL WASTE DRUMS PREVIOUSLY CONTAINING TRANSURANIC WASTE</td>
<td>1247</td>
</tr>
<tr>
<td>Kathleen Gruetzmacher, Roland Buitos, Lucas Gallegos, Scott Ferran, Charlie Lucero III</td>
<td></td>
</tr>
<tr>
<td>URANIUM CHARACTERIZATION BY SHAPED FEMTOSECOND LASER-INDUCED BREAKDOWN SPECTROSCOPY</td>
<td>1254</td>
</tr>
<tr>
<td>P. Ko, Kyle Hartig, J. McNatt, I. Jovanovic</td>
<td></td>
</tr>
<tr>
<td>FUTURE ROLES OF SSAC INSPECTIONS IN THE ROK</td>
<td>1261</td>
</tr>
<tr>
<td>Seong Youn Jo, Seung Ho Ahn</td>
<td></td>
</tr>
<tr>
<td>HIGH-RESOLUTION FAST-NEUTRON SPECTROMETRY FOR ARMS CONTROL AND TREATY VERIFICATION</td>
<td>1268</td>
</tr>
<tr>
<td>D. Chichester, J. Johnson, Edward Seabury</td>
<td></td>
</tr>
<tr>
<td>DEVELOPING A METHODOLOGY FOR CHARACTERIZATION OF BUILDING MATERIALS’ NATURAL RADIATION BACKGROUND AND INTEGRATION INTO AN MCNP MODEL FOR RADIATION PORTAL MONITORING SYSTEMS</td>
<td>1276</td>
</tr>
<tr>
<td>Matthew Fitzmaurice, Alexander Solodov, Craig Marianno, William Charlton, Jake Livesay, Tyler Guzzardo</td>
<td></td>
</tr>
<tr>
<td>U.S. CITIZENS WORKING IN INTERNATIONAL ORGANIZATIONS IN VIENNA, AUSTRIA</td>
<td>1286</td>
</tr>
<tr>
<td>Donna Occhiogrosso, Susan Pepper, Laura MacArthur, Tanya Collins</td>
<td></td>
</tr>
<tr>
<td>CONDROP – DEVELOPMENT OF NUMERICAL SIMULATION APPROACHES FOR DROP TEST ANALYSES OF STEEL SHEET CONTAINERS</td>
<td>1294</td>
</tr>
<tr>
<td>Christian Protz, Holger Volzke, Manel Ellouz, Eva-Maria Kasparek, Uwe Zenczer, Heike Grunewald, Klaus-Peter Grander</td>
<td></td>
</tr>
<tr>
<td>A TEST STAND FOR URANIUM CONCENTRATION MEASUREMENTS</td>
<td>1301</td>
</tr>
<tr>
<td>J. Cochran, J. Cantrell</td>
<td></td>
</tr>
<tr>
<td>MASS CHANGE AND EVOLVED GAS ANALYSIS OF ACTINIDE CERAMICS</td>
<td>1306</td>
</tr>
<tr>
<td>David Wayne</td>
<td></td>
</tr>
<tr>
<td>HIGH ACCURACY U-235 ENRICHMENT VERIFICATION STATION FOR LOW ENRICHED URANIUM ALLOYS</td>
<td>1316</td>
</tr>
<tr>
<td>Cole Lillard, Jason Hayward, Martin Williamson</td>
<td></td>
</tr>
</tbody>
</table>
THE SAFEGUARDS-BY-DESIGN APPROACH: A HISTORICAL PERSPECTIVE ............................................. 1323
Jacqueline L. Shipwash, K. Durbin

ASSESSMENT OF USING NON-DESTRUCTIVE ASSAY TO QUANTIFY THE SPENT FUEL DECAY HEAT OF SPENT FUEL ASSEMBLIES .......................................................................................................................... 1329
J. Gerhart, Stephen Tobin, Peter Jansson, A. Bellan, Henrik Liljenfeldt

DEVELOPMENT OF METHODOLOGY AND FIELD DEPLOYABLE SAMPLING TOOLS FOR SPENT NUCLEAR FUEL INTERROGATION IN LIQUID STORAGE .......................................................................................................................... 1339
C. Berry, C. Milliken, M. Martinez-Rodriguez, D. Hathcock, M. Heitkamp

ASSESSMENT OF ACTIVE INTERROGATION WITH BREMSSTRAHLUNG TO DETECT SPECIAL NUCLEAR MATERIAL IN A LITTORAL ENVIRONMENT .......................................................................................................................... 1349
Michael Martin, Martin Nelson, Mark Murray

MODELING AND SIMULATION OF INSIDER ADVERSARY SCENARIOS ................................................................. 1359
Felicia Duran, Dean Dominguez, Jordan Parks, Rebecca Ward

APPLICATIONS OF LIBS TO SAFEGUARDS FOR ELECTROCHEMICAL-PROCESSING FACILITY .......................................................................................................................... 1369
Bo-Young Han, Youn-Shil Kim, Hee-Sung Shin, Ho-Dong Kim

THE TRANSPARENCY EFFORTS OF KAERI ON THE DEVELOPMENT OF THE WEB-BASED ACCOUNTING SYSTEM UNDER THE INTEGRATED SAFEGUARDS .................................................................................................................. 1379
Hansuk Ko, Byung Doo Lee, Sing Ho Lee, Ho Jun Park, Hyeon-Sook Kim

URANIUM ENRICHMENT STANDARDS OF THE Y-12 NUCLEAR DETECTION AND SENSOR TESTING CENTER .......................................................................................................................... 1387
J. Cantrell

RECENT INVESTIGATIONS USING THE NEUTRON SCATTER CAMERA .......................................................................................................................... 1394
J. Brennan, E. Brubaker, M. Gerling, P. Marleau, S. Mrowka, J. Steele

LABORATORY-SCALE UF6 TEST BED SUPPORTING NONPROLIFERATION RESEARCH AND DEVELOPMENT .......................................................................................................................... 1399
Lee Trowbridge, Darrell Simmons, D. Lee

REFLECTIVE PARTICLE TAG SYSTEM PERFORMANCE EVALUATION .......................................................................................................................... 1408
Grace Thompson, Christopher Wilson, Charles Little, David Novick, Peter Merkle

ELECTRONIC TRACKING FOR THE TRANSPORT OF NUCLEAR AND OTHER RADIOACTIVE MATERIALS .......................................................................................................................... 1418
Yang Liu, Ronald Pope, Hanchung Tsai, James Shuler

CONCRETE CHARACTERIZATION USING GAMMA-RAY INTERACTION METHODS .......................................................................................................................... 1428
Jeremy Osborn, Craig Marianno, Alexander Solodov, William Charlton

SPECTROSCOPIC ON-LINE MONITORING FOR CONTROL AND SAFEGUARDING OF RADIOCHEMICAL STREAMS AT SPENT FUEL REPROCESSING PLANT .......................................................................................................................... 1435
Samuel Bryan, Tatiana Levitskaya, Emily Valerio, A. Lines, A. Casella, James Peterson

TRANSFORMING THE URANYL NITRATE CALIBRATION LOOP EQUIPMENT (UNCLE) AT ORNL INTO A USER FACILITY .......................................................................................................................... 1443
D. Lee, S. Dewji, Megan Ketron

INTERFACE MEASURES BETWEEN SAFEGUARDS AND PHYSICAL PROTECTION FOR A NUCLEAR POWER PLANT .......................................................................................................................... 1452
Jae Kwang Kim

ECONOMICS OF MODELING AND SIMULATION FOR NUCLEAR SECURITY .......................................................................................................................... 1456
Jeffrey Hawley

10B LINED TUBELET PROPORTIONAL COUNTERS: CHARACTERISTICS OF GEOMETRY AND SIGNALS FOR WASTE ASSAY .......................................................................................................................... 1462
Robert McKeag, Kyriakos Tsrbatzoglou

PASSIVE NEUTRON ASSAY FOR URANIUM MASS MEASUREMENT IN SCRAP AND WASTES .......................................................................................................................... 1469
V. Nizhnik, M. Pickrell, S. Zykov

APPLICATION OF LANTHANUM BROMIDE DETECTORS FOR IAEA SAFEGUARDS VERIFICATION .......................................................................................................................... 1478
M. Koestlbauer, V. Nizhnik, G. Sheppard, S. Zykov

SAMPLING AND ANALYSIS OF THE HEADSPACE GAS IN 3013 TYPE PLUTONIUM STORAGE CONTAINERS AT LOS ALAMOS NATIONAL LABORATORY (LA-UR 12-01724) .......................................................................................................................... 1487
Matt Jackson, John Berg, Kirk Veirs, Laura Worl
GRADUATE RESEARCH ASSISTANT PROGRAM FOR PROFESSIONAL DEVELOPMENT AT OAK RIDGE NATIONAL LABORATORY GLOBAL NUCLEAR SECURITY TECHNOLOGY DIVISION ................................................................. 1493
D. Eipeldauer, Bruce Shelander

NOVEL REMOTE HANDLING CELLS TO SUPPORT NUCLEAR R&D ................................................................. 1500
Robert Williamson

THE DEVELOPMENT OF A VERSATILE PIEZORESISTIVE MICROCANTILEVER SENSOR PLATFORM ................................................................. 1510
T. Porter, R. Venedam

CENTRALIZED RADIATION DETECTOR NETWORK FOR LOCATING AND IDENTIFYING CLANDESTINE NUCLEAR MATERIALS ................................................................. 1514
Mark Delgado, Jay Haksar

SESSION A: FACILITY OPERATIONS — SCHEDULING, STORAGE, INVENTORY MANAGEMENT
Chair: Rosemarie Martyn

TECHNOLOGY DEPLOYMENT COOKBOOK ................................................................. 1519
P. Predhomme

VOLUME 3

PRACTICE OF TECHNOLOGICAL PROCESS MONITORING IN PRODUCTION MBA ................................................................. 1526
V. Chukov, G. Lavrentevska, S. Shmelev, L. Zharkova

STATE AND FACILITY NUCLEAR MATERIAL ACCOUNTING SYSTEM FOR EMERGING NUCLEAR POWER COUNTRIES ................................................................. 1532
Samuel Lee Brown Jr.

SESSION B: INTERNATIONAL SAFEGUARDS — OPEN SOURCE AND GEOSPATIAL INFORMATION DISCOVERY BALLROOM
Co-Chairs: Jacques Baute, Karl Horak

DEVELOPMENT OF ANALYTICAL INSTRUMENTS FOR PREDICTION OF NUCLEAR TERRORIST ACTIVITIES: SOME FEATURES OF THE APPROACH ................................................................. 1537
Ivan Andryushin, Eugeny Varseev, Gennady Pshakin

OPEN-SOURCE GEOSPATIAL INFORMATION AND SOFTWARE TOOLS FOR SAFEGUARDs ANALYSTS ................................................................. 1547
Karl Horak, Michael McDaniel, Denise Bleakly

GEOGRAPHIC INFORMATION SYSTEMS (GIS) — FROM VISUALIZATION TO ANALYSIS ................................................................. 1555
Sven Nussbaum, Irmgard Niemeyer

GEOSPATIAL IMAGING TOOLBOX FOR INTERNATIONAL SAFEGUARDS APPLICATIONS ................................................................. 1564
Vincent Paquit, Regina Ferrell, Anil Cheriyadat, Ranga Raju Vatsavai, Philip Bingham, Shaun Gleason, Ana Claudia R. Caiado

VISUALIZATION OF ENVIRONMENTAL SAMPLING RESULTS AT INSPECTED FACILITIES ................................................................. 1572
K. Vilece, C. Norman, J. Baute, G. Giurveri, M. Kiryu, M. Pellechi

SESSION C: INTERNATIONAL SAFEGUARDS — ADVANCES IN NDA TECHNOLOGY AND SOFTWARE I
Chair: Marc Humphrey

NEW GENERATION NEUTRON COINCIDENCE COUNTING SOFTWARE ................................................................. 1583
Joseph Francis Longo, Jonathan Dowell, Caroline Boyle

THE FEYNMAN-Y STATISTIC IN RELATION TO SHIFT-REGISTER NEUTRON COINCIDENCE COUNTING: PRECISION AND DEAD TIME ................................................................. 1589
Stephen Croft, Daniela Henslova, Danielle Hauck, A. Favalli, Peter Santi
SESSION D: INTERNATIONAL SAFEGUARDS/MATERIALS CONTROL AND ACCOUNTABILITY — DEVELOPMENT OF BASIC MEASUREMENT TECHNOLOGIES IN JAPAN FOR DEBRIS OF MELTED FUEL FORMED IN SEVERE ACCIDENTS
Co-Chairs: Russell Johns, Hironobu Nakamura

FEASIBILITY STUDIES AND DEVELOPMENT OF NDA TECHNOLOGIES FOR NM IN THE MELTED FUELS OF FUKUSHIMA-DAIICHI NPP
Michio Seya, Hideo Harada, Fumito Kitatani, Mitsuo Koizumi, Ryoichi Hajima, Takehito Hayakawa, Christopher Angell, Alan Michael Bolind

PROPOSAL OF NEUTRON RESONANCE DENSIOTOMETRY FOR PARTICLE LIKE DEBRIS OF MELTED FUEL USING NRTA AND NRCA
Mitsuo Koizumi, Fumito Kitatani, Hideo Harada, Jun Takamine, Masatoshi Kureta, Michio Seya, Harufumi Tsuchiya, Hideki Iimura

MEASUREMENT TECHNIQUE OF PLUTONIUM AND MINOR ACTINIDES USING NUCLEAR RESONANCE FLUORESCENCE WITH LASER COMPTON SCATTERING GAMMA-RAYS
Takehito Hayakawa, Christopher Angell, Toshiyuki Shizuma, Ryoichi Hajima, Nobuhiro Kikazawa, Michio Seya, Mamoru Fujiwara

SIGNIFICANT IMPROVEMENT OF NUCLEAR RESONANCE FLUORESCENCE NON-DESTRUCTIVE ASSAY BY USING THE AVERAGE RESONANCE TECHNIQUE AND PHOTOFISSION
Christopher Angell, Takehito Hayakawa, Toshiyuki Shizuma, Ryoichi Hajima

SESSION E: MATERIALS CONTROL AND ACCOUNTABILITY — NONDESTRUCTIVE ANALYSIS — GAMMA MEASUREMENTS I
Chair: Jason Shegur

IDENTIFICATION MEASUREMENTS OF NUCLEAR MATERIAL – DETECTIVE EX VERSUS FALCON 5000

A NEW ALGORITHM FOR RADIOISOTOPE IDENTIFICATION OF SHIELDED AND MASKED SNM/RDD MATERIALS
Ron Jeffcoat, Lane Owsley, James Pitton, Greg Okopal

COMPARISON OF HOLDUP DETECTION SYSTEMS
Angela Lousteau, John Smookbury

MCNPX-POLIMI FOR THE SIMULATION OF THE NEUTRON AND GAMMA RAY EMISSIONS FROM NUCLEAR FISSION

DEVELOPMENT OF THE NEUTRON-GAMMA-NEUTRON (NGN) APPROACH FOR THE FRESH AND SPENT FUEL ASSAY
Dina Chernikova, Vadim Romodanov, Valeriy Sukharov

SESSION F: MATERIALS CONTROL AND ACCOUNTABILITY — POLICY AND BEST PRACTICES
Chair: Thomas Pham

CHANGES TO NRC REGULATIONS AND GUIDANCE FOR MATERIAL CONTROL AND ACCOUNTING
Steven Ward, Thomas Pham

PROPOSAL OF HEALTHINESS CONFIRMATION PROCEDURE IN ELECTRO MANOMETER SYSTEM IN TERMS OF NUCLEAR MATERIAL ACCOUNTANCY
Yasunobu Mukai, Kaoru Shoji, Hiroki Hayashi, Hironobu Nakamura, Tsutomu Kurita
A COMPARATIVE ANALYSIS BETWEEN A CUMULATIVE INVENTORY DIFFERENCE APPROACH AND A DISCRETE INVENTORY DIFFERENCE APPROACH ................................................................. 1717
Amy Johnson, David Tomar

AN INTEGRATED RFID AND BARCODE TAGGED ITEM INVENTORY SYSTEM FOR
DEPLOYMENT AT NEW BRUNSWICK LABORATORY ................................................................. 1724
J. Younkin, M. Kuhn, Colleen Gradle, Lynne Preston, Brigham Thomas, Leesa Laymance, Ron Kuziel

MC&A ISSUES AT THE MOX FUEL FABRICATION FACILITY ....................................................... 1734
Edwin Lyman

SESSION G: NONPROLIFERATION AND ARMS CONTROL — PROLIFERATION RESISTANCE
Chair: Jason Roback

INPRO COLLABORATIVE PROJECT ON PROLIFERATION RESISTANCE AND
SAFEGUARDABILITY ASSESSMENT TOOLS (PROSA) ....................................................... 1740
Hong-Lae Chang, Eckhard Haas, James Kent Sprinkle, Michael Zentner, Jeremy Whitlock, Won-Il Ko

PROPOSED BENCHMARK CASES FOR PROLIFERATION RISK ASSESSMENT MODELING ............... 1748
Royal Elmore, William Charlton, Sunil Chirayath

MATERIAL TYPE AND SAFEGUARDABILITY CONSIDERATIONS FOR INNOVATIVE
SODIUM FAST REACTORS FUEL INCLUDING DIFFERENT MINOR ACTINIDES
COMPOSITIONS ...................................................................................................................... 1758
G. Renda, F. Alim, G. Cojazzi, F. Peerani

PROLIFERATION RESISTANCE ASSESSMENT OF VARIOUS METHODS OF SPENT
NUCLEAR FUEL STORAGE AND DISPOSAL ........................................................................... 1769
Lenka Kollar

NEW TECHNOLOGY, OLD CHALLENGES: PROJECTING LASER ENRICHMENT’S IMPACT
ON NONPROLIFERATION ........................................................................................................... 1779
Timothy Westmyer

SESSION H: NONPROLIFERATION AND ARMS CONTROL — ACTIVE INTERROGATION
Co-Chairs: James Lemley, William Brosey

ACCELERATOR TECHNOLOGY FOR LONG RANGE DETECTION OF NUCLEAR
MATERIAL ..................................................................................................................................... 1789
James Lemley, Krishnaswamy Gounder, Peter Zielinski

SIMULATION OF A NOVEL ACTIVE INTERROGATION SYSTEM USING MCNPX ...................... 1793
Steven Brown, A. Kaplan, Joseph Karbowski, Mark Norsworthy, S. Clarke, S. Pozzi

MONTE CARLO MODELING OF CORRELATIONS IN PULSED NEUTRON DATA ...................... 1800
Scott Stewart, M. Swinhoe, Jonathan Thron, William Geis, William Charlton

ACTIVE GAMMA SPECTROSCOPY WITH NMIS ........................................................................... 1809
Mark Walker, John Mihalczo

IDENTIFICATION OF NON-RADIOLOGICAL MATERIALS WITH NMIS ........................................ 1819
Mark Walker, John Mihalczo

SESSION I: NUCLEAR SECURITY AND PHYSICAL PROTECTION — NUCLEAR SECURITY
POLICY
Co-Chairs: Melissa Krupa, Joseph Rivers

TOWARD A NEW VISION OF PROTECTION SYSTEM DESIGN .................................................... 1829
Richard Donovan

MECHANISMS TO STRENGTHEN THE DEPARTMENT OF ENERGY’S HUMAN
RELIABILITY PROGRAM BY ADOPTING A CONTINUOUS ASSESSMENT PROGRAM (CAP) ........... 1835
Joseph Stainback, Russ Reynolds, A. Pederson

SUMMARY OF CHANGES IN INFIRC/225/REVISION 5 AND IMPACTS TO NUCLEAR
SECURITY REGIMES .................................................................................................................. 1842
Ruth Duggan

NEW APPROACH FOR ANALYZING THE INSIDER THREAT ....................................................... 1850
Ruth Duggan, Carol Scharmer
SESSION J: PACKAGING, TRANSPORTATION AND DISPOSITION — SHIPPING, TRACKING AND DESIGN II
Chair: Stephen O’connor

ONSITE TRANSPORTATION AUTHORIZATION CHALLENGES AT THE SAVANNAH RIVER SITE ............................................................................................................................... ................................................... 1856
Robert Watkins, B. Loftin, Don Hoang

ADAPTING A CERTIFIED SHIPPING PACKAGE FOR STORAGE APPLICATIONS .......................................................... 1861
B. Loftin, G. Abramczyk

TAGGING, TRACKING AND LOCATING WITHOUT GPS ............................................................................................................................... ................................................... 1866
Joseph Cordaro, Todd Coleman, Davis Shull, James Shuler

DEVELOPMENT OF THE HS99 AIR TRANSPORT TYPE A FISSION PACKAGE ............................................................................................... ................................................... 1876
Paul Blanton, Kurt Eberl, Linda Paschal

LEVERAGING AVAILABLE DATA TO SUPPORT EXTENSION OF TRANSPORTATION SHIPPING PACKAGES SERVICE LIFE ............................................................................................... ................................................... 1884

SESSION K: EDUCATION AND TRAINING — INTERNATIONAL EDUCATION DEVELOPMENT
Chair: Cathy Key

INTERNATIONAL NUCLEAR SECURITY EDUCATION NETWORK (INSEN): STIMULATING THE DEVELOPMENT OF ACADEMIC COURSES IN NUCLEAR SECURITY ............................................................................................... ................................................... 1892
A. Braunegger-Guelich, C. Hobbs, A. Heyes

NUCLEAR SECURITY EDUCATION AT THE UNIVERSITY OF TENNESSEE ............................................................................................... ................................................... 1898
Howard Hall

ARMS CONTROL AND NON-PROLIFERATION COURSE AT UTK ............................................................................................... ................................................... 1907
A. Pederson

INNOVATIONS IN UNIVERSITY NONPROLIFERATION EDUCATION THROUGH A JOINT ORNL-NCU PARTNERSHIP ............................................................................................... ................................................... 1913
S. Skutnik, D. Eipeldauer, T. Margrave

NEXT GENERATION SAFEGUARDS INITIATIVE UNIVERSITY OUTREACH: LOS ALAMOS NATIONAL LABORATORY TEACHING A POLITICAL SCIENCE COURSE ON NUCLEAR SAFEGUARDS & SECURITY POLICY AT NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY ............................................................................................... ................................................... 1920
Sara Kutchesfahani, Carolyn Scherer, B. Boyer, Elise Elfman

SESSION A: FACILITY OPERATIONS — NUCLEAR MATERIALS MANAGEMENT II
Co-Chairs: Teresa Knight, Virginia Magoulas

SELECTION OF SURPLUS PLUTONIUM MATERIALS FOR DISPOSITION TO WIPP ............................................................................................... ................................................... 1930
Jeffrey Allender, James McClard, John Christopher

STORAGE MODELING OF PRIMARY STORAGE FACILITIES AT Y-12 ............................................................................................... ................................................... 1936
Brennan Thompson

PLUTONIUM-238 SUPPLY PROJECT ............................................................................................... ................................................... 1942
Robert Wham

URANIUM SAMPLING & CHARACTERIZATION AT THE Y-12 NATIONAL SECURITY COMPLEX ............................................................................................... ................................................... 1950
Jeniece May, Russ Schmidt, Jennifer Vanover

NUCLEAR MATERIALS MANAGEMENT PROGRAM AT THE NNSS ............................................................................................... ................................................... 1958
Mary Price, Benjamin Garcia

LIFE-CYCLE MANAGEMENT OF NUCLEAR MATERIAL AT SANDIA NATIONAL LABORATORIES ............................................................................................... ................................................... 1962
Stanley Haynes, Todd Erenstein, Warren Strong

NON-MAA STORAGE CONSOLIDATION AT Y-12 ............................................................................................... ................................................... 1967
Lynn Bland

PHASE II VAULT TESTING OF THE ARGONNE RFID SYSTEM ............................................................................................... ................................................... 1973
Richard Koenig, Terence Willoner, Richard Turlington, Brian Craig, Hanchung Tsai, Yang Liu

NUCLEAR MATERIALS WITHIN THE UNITED STATES ............................................................................................... ................................................... 1982
Brian Horn, Peter Dessauels, Angela Randall
SESSION B: INTERNATIONAL SAFEGUARDS — POLICIES, CHALLENGES AND COUNTRY ISSUES
Co-Chairs: Antonio Oliveira, J. Stephen Adams

SAFEGUARDS CULTURE: WHAT IS IT AND DOES IT MATTER? ................................................................. 1987
Stephen Mladineo, S. Frazar

OVERVIEW OF SAFEGUARDS AND NUCLEAR MATERIAL MANAGEMENT IN PAKISTAN ............. 1997
Tariq Mahmud

U.S. ADDITIONAL PROTOCOL SPECIFIC ISSUES AND STATUS ........................................................... 2007
Stephen Adams

ENHANCING THE EFFECTIVENESS OF THE INTERNATIONAL ATOMIC ENERGY AGENCY’S SAFEGUARDS SYSTEM ...................................................... 2015
Adam Scheinman, D. Lockwood, Mark Goodman, Stephen Adams

STOCKS AND FLOWS OF U AND Pu IN A WORLD WITH 3.6 TWE OF NUCLEAR POWER ............ 2022
Robert Goldston

PHASED IMPLEMENTATION OF IAEA VERIFICATION IN NUCLEAR WEAPON STATES TO PROMOTE NONPROLIFERATION, ARMS CONTROL AND DISARMAMENT OBJECTIVES ........................................... 2032
Jon Phillips, S. Frazar, C. Toomey

SESSION C: INTERNATIONAL SAFEGUARDS — INTERNATIONAL AND REGIONAL COOPERATION
Co-Chairs: Silvio De Almeida, Susan Pepper

POSSIBLE TRENDS FOR FURTHER DEVELOPMENT OF THE INTERNATIONAL URANIUM ENRICHMENT CENTER (IUEC) IN POST-FUKUSHIMA ERA ............................................. 2113
Gleb Efremov

PROSPECTIVE OF REGIONAL SAFEGUARDS COOPERATION IN CONNECTION WITH THE ASIA/PACIFIC SAFEGUARDS NETWORK(APSN) ............................................................... 2050
Dr. Kwan-Kyoo

THE UNITED STATES SUPPORT PROGRAM: 35 YEARS OF SAFEGUARDS ENHANCEMENTS .......... 2060
Jay Disser, Joseph Indusi, Tyler Devries-Wallace, Andrew Gross, Jessica Cruz, Jade Patterson, Susan Pepper

SPIRAL DEVELOPMENT FOR SAFEGUARDS INSTRUMENTATION ....................................................... 2069
M. Koskelo, H.Undem, M. Good, S. Frazar, M. Schanfein, S. Kadner

STATUS OF ROK SUPPORT PROGRAM ......................................................................................... 2077
Na Young Lee, Byung Marn Koh

ASSESSMENT OF ALTERNATIVE FUNDING MECHANISMS FOR THE IAEA .................................... 2081
C. Toomey, Evan Wyse, Andrew Kurzrok, Ben Ford

IAEA ANALYTICAL CAPABILITIES FOR THE FUTURE ..................................................................... 2088
David Donohue, Christian Schmitzer, Steven Balsley, Gabriele Voigt

IMPLEMENTATION OF THE IAEA ADDITIONAL PROTOCOL IN MOROCCO: USDOE/CNESTEN COOPERATION .......................................................................................... 2097
Linda Hansen, Abdeljalil Jraut, Mark Killinger, Mo Bissani, Matthew Van Sickle

IMPLEMENTATION OF COMPLEMENTARY ACCESSES AT NRC AND NRC AGREEMENT STATE LICENSEES ........................................................................................................ 2103
Eric Freeman, Thomas Grce, David Hanks, Brian Horn

SESSION D: INTERNATIONAL SAFEGUARDS — NDA – SPENT FUEL #1 (NDA OF SPENT FUEL ASSEMBLIES — DEPLOYED SYSTEMS AND AN UPDATE ON THE NEXT GENERATION SAFEGUARDS INITIATIVE)
Co-Chairs: Stephen Tobin, Said Abousahl

UPDATE ON THE NEXT GENERATION SAFEGUARD INITIATIVE PROJECT TO DETERMINE PU MASS IN SPENT FUEL ASSEMBLIES ................................................................. 2113

THE JAEA PART OF THE JOINT JAEA-U.S. DOE PROJECT FOR PU MEASUREMENT OF FUGEN SPENT FUEL ASSEMBLIES BY INTEGRATED PNAR AND SINRD .............................................. 2123
Noriyasu Ebara, Yoshiaki Katano, Takahisa Nakamura, Hisatsugu Takagi, Alan Michael Bolind, Michio Seya
VOLUME 4

HMS-4 HARDWARE AND SOFTWARE TODAY AND WHERE IT IS HEADING TOMORROW .......................... 2264
Alex Okowita, Steve Cleveland

FEASIBILITY STUDY OF GAMMA SPECTROSCOPY OF LOW-VOLATILE FPs FOR SPECIAL NUCLEAR MATERIAL ACCOUNTANCY IN MOLTEN CORE MATERIAL .......................................................... 2272
Hiroshi Sagara, Hirofumi Tomikawa, Masaru Watahiki, Y. Kuno

SESSION F: MATERIALS CONTROL AND ACCOUNTABILITY — NEW MEASUREMENT METHODS AND TECHNIQUES
Chair: Amy Wilson

EFFICIENT COUNTING OF STORAGE DRUMS USING 3-D LASER SCANNING TECHNOLOGY ................................................................. 2282
Gunnar Bostrom, V. Sequeira, Paul Meylemans, Valentí Canadell Bofarull

CHARACTERIZATION OF THE CLYC DETECTOR FOR NEUTRON AND PHOTON DETECTION ............................................................. 2291
M. Bourne, C. Musi, E. Miller, S. Clarke, S. Pozzi, A. Gueorguiev

DEVELOPMENT AND TESTING OF A NOVEL GAMMA RAY CAMERA FOR RADIATION SURVEYING, CONTAMINATION MEASUREMENT AND RADIATION DETECTION ........................................... 2298
John Mason, Marc Looman, Adam Poundall, Daniel Pancake, Richard Creed

THE NEED AND OPPORTUNITY FOR IMPROVED UNCERTAINTY QUANTIFICATION AND REPORTING FOR NONDESTRUCTIVE ASSAY ......................................................... 2308
R. Venkataraman, Stephen Croft, T. Burr, R. McElroy, D. Nakazawa, J. Kirkpatrick

SHORT-TERM CHANGES IN VALUES REPORTED BY AN ENRICHMENT MONITOR ........................................................... 2318

INTRODUCING IMPROVED DETECTION SYSTEMS AND TECHNIQUES INTO NONDESTRUCTIVE ASSAY (NDA) PROGRAMS ............................................................... 2327
Graham Walford, Richard Mayer, David Rakel, L. Miller, John Gunning, Sean Branney, David Roberts, Raymond Maynard, John Dewes

CALORIMETER-BASED ADJUSTMENT OF MULTIPLICITY DETERMINED 240Pu EFF KNOWN-α ANALYSIS FOR THE ASSAY OF PLUTONIUM .................................................. 2329
Franklin DuBose

APPLICATIONS OF COMPUTERIZED SIMULATIONS IN NONDESTRUCTIVE WASTE ASSAYS .......................................................... 2339
Bob Ceo, Joseph Wachtler

SESSION G: NONPROLIFERATION AND ARMS CONTROL — FUTURE ARMS CONTROL AND TREATY VERIFICATION APPROACHES
Chair: Gerald Devault

SOCIETAL VERIFICATION: LEVERAGING THE INFORMATION REVOLUTION FOR ARMS CONTROL VERIFICATION ................................. 2344
Kelsey Hartigan, Corey Hinderstein

VERIFYING NONPROLIFERATION, ARMS CONTROL AND DISARMAMENT: WHAT ROLE FOR SOCIAL MEDIA? .......................................................... 2352
Joseph Pilat, Kory Budlong Sylvester

USE OF SOCIAL MEDIA TO TARGET INFORMATION-DRIVEN ARMS CONTROL AND NONPROLIFERATION VERIFICATION .......................................................... 2361
Sean Kreiling, Laura Schmidt Williams, Zoe Giestelum, Kevin Whatam, Court Corley, Nick Cramer, Stuart Rose, Eric Bell, Michelle Gregory

THE UNITED KINGDOM - NORWAY INITIATIVE: FURTHER RESEARCH INTO MANAGED ACCESS OF INSpectORS DURING WARHEAD DISMANTLEMENT VERIFICATION .............................. 2371
Steinar Backe, Elin Enger, Strykaar Hustviste, Steinar Holbraten, Halvor Kippe, Svein Mykkelkvit, Ole Reistad, Tonje Sekse, Rajdeep Singh Sidhu, Colin Waters, David Chambers

TOWARDS A TACTICAL NUCLEAR WEAPONS TREATY? IS THERE A ROLE OF IAEA TOOLS OF SAFEGUARDS? .......................................................... 2381
Emily Cura Saunders, Ariana Rowberry, Bryan Fearney
IAEA SAFEGUARDS, ARMS CONTROL AND DISARMAMENT ................................................................. 2389
Joseph Pilat, Kory Budlong Sylvester

A NEW APPROACH TO NUCLEAR WARHEAD VERIFICATION USING A ZERO-KNOWLEDGE PROTOCOL .................................................................................................................. 2395
Alexander Glaser, Boaz Barak, Robert Goldston

ELECTROMAGNETIC SIGNATURE TECHNIQUE AS A PROMISING TOOL TO VERIFY NUCLEAR WEAPONS STORAGE AND DISMANTLEMENT UNDER A NUCLEAR ARMS CONTROL REGIME ........................................................................ 2405
Kyle Bunch, Laura Schmidt Williams, Mark Jones, Pradeep Ramuhalli

SESSION H: NONPROLIFERATION AND ARMS CONTROL — CHAIN OF CUSTODY TECHNOLOGIES
Co-Chairs: Halvor Undem, George Weeks

CHAIN OF CUSTODY FIELD EVALUATIONS .................................................................................. 2412
Sharon DeLand, Regina Griego, Lloyd Montoya, Gerald Schotik, Jennifer Tanner, Faranak Nekoogar

TINY GAMMA SPECTROMETER FOR MATERIAL MONITORING APPLICATIONS ...................... 2422
Ross Hymel, Barry Schoeneman, Troy Ross

PHYSICAL AUTHENTICATION FOR NUCLEAR SAFEGUARDS AND OTHER INSPECTION APPLICATIONS USING FLASH THERMOGRAPHY ................................................................. 2433
Grace Thompson, Alvaro Cruz-Cabrera, Mark Nissen, Manuel Trujillo

A PASSIVE TAMPER INDICATING ENCLOSURE FOR USE WITHIN A NUCLEAR WEAPONS MONITORING REGIME .................................................................................................. 2442
Helen White, Jennifer Tanner, Keir Allen, Jake Benz, Sarah McOmish, Kevin Simmons

FIRST PROTOTYPE OF INTRINSICALLY TAMPER INDICATING CERAMIC SEAL (ITICS) ............ 2452
Heidi Smartt, Juan Romero, Maikael Thomas, David Zamora, Charles Walker, Kenneth Peterson

3-D IMAGING WITH GROUND PENETRATING RADAR (GPR) FOR ON-SITE INSPECTION ........ 2460
Farid Dowla, Faranak Nekoogar

THE ROLE OF PORTAL MONITORS IN ARMS CONTROL AND DEVELOPMENT NEEDS ............ 2467
Danielle Hauck, D. MacArthur, Michael Browne, R. Parker

WIRED SEAL AND INTELLIGENT HASP ARRAY ........................................................................ 2477
M. Koskelo, Michael Ondrik, David Johnson, Blane Beckes, Shameel Talcott, Micha Auerbach

ADDRESSING THE CHALLENGES OF RFID FOR SAFEGUARDS .............................................. 2483
Aharon Deland

SESSION I: NUCLEAR SECURITY AND PHYSICAL PROTECTION — PHYSICAL PROTECTION PRACTICES
Chair: Dave Corbett

INTEGRATION OF THE PHYSICAL PROTECTION SYSTEM AT THE CONSOLIDATED PRODUCTION BUILDING AT OAO ........................................................................................................ 2492
V. Bozin, V. Mosolov

INCREASE THE LEVEL OF INTERACTION BETWEEN MC&A AND PP SYSTEMS FOR ENHANCEMENT OF NUCLEAR MATERIAL SECURITY AT THE JOINT INSTITUTE FOR NUCLEAR RESEARCH (JINR) IN DUBNA, RUSSIA ................................................................. 2496
V. Kartavtsov, V. Samoilov, B. Shestakov, I. Zuev, Constance McAninch, Geneva Johnson

USING THE CENTRALIZED MANAGEMENT SYSTEM IN PHYSICAL PROTECTION SUSTAINMENT ............................................................................................................................. 2508
Larry Ross, Richard Rock, Andrey Rozhnov, Roman Gromyshev, Karen Kaldenbach, Christopher Hayes, Asya Minulina, Yuri Evstigneev, Andrei Muravyov, Vassily Zavgorodni

TESTING AND COMMISSIONING THE INTEGRATION OF THE NUCLEAR MATERIAL PROTECTION SYSTEM AT JOINT INSTITUTE FOR POWER AND NUCLEAR RESEARCH – SOSNY, BELARUS ......................................................................................................................... 2514
Vassily Zenevich, Heather Kauffman, Kevin Hogan

CHALLENGES TO ENSURING OPERABILITY OF PROTECTION SYSTEMS WHILE MAINTAINING RISK REDUCTION AT THE JOINT INSTITUTE FOR POWER AND NUCLEAR RESEARCH - SOSNY, BELARUS ......................................................................................................................... 2519
Gennady Zenevich, Heather Kauffman, Kevin Hogan
OUTLOOKS OF FURTHER DEVELOPMENT AND UPGRADES TRENDS OF PHYSICAL PROTECTION SYSTEMS AT LUCH
V. Chukov, G. Lavrentyeva, S. Leonov

PRACTICAL IMPLEMENTATION OF NUCLEAR SECURITY CULTURE PRINCIPLES WHEN DECOMMISSIONING NUCLEAR REACTORS AT FSUE RISI
A. Chlenov, T. Piskureva

SESSION J: PACKAGING, TRANSPORTATION AND DISPOSITION — CONTENT CHARACTERIZATION
Chair: Yung Liu

PRECEDENTS FOR AUTHORIZATION OF CONTENTS USING DOSE RATE MEASUREMENTS
G. Abramczyk, B. Loftin, J. Bellamy, S. Nathan

FUNCTIONAL BOUNDING CONTENT ENVIRONMENT FOR TYPE B RADIOACTIVE MATERIAL TRANSPORTATION PACKAGES
S. Sitaraman, Soon Kim, B. Anderson

EXPANDING OSRP’S MISSION IN RECOVERING NEW ISOTOPES FOR WIPP DISPOSAL
Ioana Witkowski, Julia Whitworth, Alex Feldman, Mike Pearson

PACKAGING CERTIFICATION PROGRAM METHODOLOGY FOR DETERMINING DOSE RATES FOR SMALL GRAM QUANTITIES IN SHIPPING PACKAGINGS
S. Nathan, G. Abramczyk, B. Loftin, J. Bellamy

SESSION K: EDUCATION AND TRAINING — INTERNATIONAL EDUCATION AND TRAINING PERSPECTIVE AND PARTNERSHIPS
Chair: Jaime Vidaurre-Henry

THE WINS ACADEMY: A NEW APPROACH TO INTERNATIONAL PROFESSIONAL DEVELOPMENT FOR THOSE WITH ACCOUNTABILITIES FOR NUCLEAR SECURITY MANAGEMENT
Roger Howsley

NUCLEAR NONPROLIFERATION CAPACITY BUILDING SUPPORT BY INTEGRATED SUPPORT CENTER FOR NUCLEAR NONPROLIFERATION AND NUCLEAR SECURITY: MODELING THE SUPPORT PROGRAM FOR VIETNAM AND BEYOND
Kazuko Hamada, Masao Senzaki, Michiaki Ohkubo, Youske Naoi, Naoki Kobayashi, Nguyen Nu Hoai

ONE PATH TO INTEGRATING NUCLEAR SAFETY, SECURITY AND SAFEGUARDS SYSTEMS: PERSPECTIVES OF GNEII ALUMNI
Wael Al Hashmi, Rashed Al Remethi, Maryam Qasem, Sultan Al Darmaki, Noora AlKatheeri, Abdelaziz Al-Madhloum, Michael Schuller, Adam Williams

THE METHODOLOGY OF THE TRAINING DEMAND ASSESSMENT WHEN IMPLEMENTING A SYSTEM APPROACH TO THE TRAINING AT NUCLEAR ENTERPRISES
V. Kornelyuk, Y. Seleznev, M. Kandalova, T. Piskureva

DESIGN INFORMATION VERIFICATION AT RESEARCH REACTORS TRAINING COURSE
Josh Tackentien, Robert McNair, Klaas van der Meer, Dieter Zahradnik

DEMAND FOR NUCLEAR NONPROLIFERATION WORKFORCE AND TRAINING COURSES IN SOUTH KOREA
J. Kim, S. Ryu, Y. Suh, H. Choi

Viktor Gavryliuk, Volodymyr Kirischuk, Olena Romanova, Olena Levina, Oleksii Diakov, Sergey Drapey, Dmitry Proskurin, Anna Gavryliuk-Barakova, Alona Samsonenko

STUDY ON SUSTAINABLE REGIONAL NUCLEAR FUEL CYCLE FRAMEWORK FROM NUCLEAR NON-PROLIFERATION VIEWPOINT (I) HISTORICAL REVIEW AND BASIC CONCEPT TO PROPOSE NEW FRAMEWORK
SESSION A: FACILITY OPERATIONS/NONPROLIFERATION AND ARMS CONTROL —
FACILITY DESIGN AND FUEL SUPPLY
Co-Chairs: Michelle Romano, Ben Watts

STUDY ON SUSTAINABLE REGIONAL NUCLEAR FUEL CYCLE FRAMEWORK FROM
NUCLEAR NON-PROLIFERATION VIEWPOINT: (II) PREREQUISITES FOR FORMULATION
OF THE FRAMEWORK

FACILITY SAFEGUARDABILITY ASSESSMENT: A TOOLKIT FOR SAFEGUARDS BY
DESIGN

SESSION B: INTERNATIONAL SAFEGUARDS — ADVANCES IN NDA TECHNOLOGY AND
SOFTWARE II
Co-Chairs: James Disser, Peter Santi

THE ROLE OF ACTIVE NEUTRON INTERROGATION TO SAFEGUARDS NON-
DESTRUCTIVE ASSAY (NDA) IN THE POST 3HE WORLD
R. McElroy, Stephen Croft

DESIGN AND DEVELOPMENT OF A 3HE REPLACEMENT SAFEGUARDS NEUTRON
COUNTER BASED ON BORON-LINED PROPORTIONAL DETECTOR TECHNOLOGY

AN INVESTIGATION OF 10B LINED PROPORTIONAL COUNTERS FOR USE IN
SAFEGUARDS APPLICATIONS
Kevin McKinny, Thomas Anderson, Nathan Johnson, Sasha Philips, Eric Weissman, Brian Young

DESIGN OF THE IMPROVED PLUTONIUM CANISTER ASSAY SYSTEM 2 (IPCA 2)
Karen Miller, M. Swinhoe, J. Marlow, I. Martinez, Taketeru Nagatani, H. Menlove, Shoko Iso, Koki Tomine,
Masanori Kawasue

DETECTOR VALIDATION AND SOURCE TERM ANALYSIS OF URANYL NITRATE TO
DETECT DIVERSION AT NATURAL URANIUM CONVERSION FACILITIES
S. Desvji, R. McElroy, D. Lee, J. Chapman, N. Hertel

SESSION C: INTERNATIONAL SAFEGUARDS — REPROCESSING: MODELING AND
MEASUREMENTS
Co-Chairs: Shirley Johnson, Yusuke Kuno

ELECTROCHEMICAL REPROCESSING SAFEGUARDS MODELING
Benjamin Cipiti
SAFEGUARDING THE NEXT GENERATION REPROSSING PLANT - SOLUTION MONITORING IN SOLVENT EXTRACTION ................................................................. 2793

INTEGRATED SAFEGUARD AND SECURITY FOR REPROCESSING PLANT MONITORING ................................................................. 2801
Rebecca Ward, Felicia Duran, Benjamin Cipiti

AUTOMATIC CALIBRATION FOR K-EDGE DENSITOMETRY: APPLICATION TO SAMPLES THAT EXHIBIT PROMINENT ABSORPTION EDGES FROM TWO ACTINIDES ................................................................. 2810
Michael Collins

A PROPOSED ANALYTICAL MODE THAT PERMITS A K-EDGE DENSITOMETER TO CONTINUOUSLY MONITOR CONCENTRATION CHANGES OF ACTINIDES IN A FLUID ................................................................................................................................. 2818
Michael Collins

OPTIMIZATION OF A QUARTZ-CRYSTAL SPECTROMETER DESIGN FOR ANALYZING K X-RAYS FROM PU AND U ........................................................................................................................................................................... 2827
Alison Goodsell, William Charlton

hiRX DETECTION OF PLUTONIUM IN SURROGATE SPENT FUEL MATRIX ................................................................................................................................. 2836
George Havrilla, Michael Collins, Velma Montoya, Hakim Boakhalfa, Benjamin Cipiti

ULTRA HIGH ENERGY X-RAY FLUORESCENCE APPLICATION TO CHARACTERIZATION OF NUCLEAR FUEL ................................................................................................................................. 2844
George Havrilla, Michael Collins, Velma Montoya, Timothy Elam, Sarvjit Shastri, Ali Maksehi

SESSION D: INTERNATIONAL SAFEGUARDS — NDA – SPENT FUEL #2 (NDA OF SPENT FUEL ASSEMBLIES – (1) REPOSITORY SAFEGUARDS AND (2) SPENT FUEL SIMULATIONS
Chair: Mark Schanfein

IMPROVEMENTS FOR SPENT FUEL VERIFICATIONS BY SAFEGUARDS INSPECTORS ................................................................................................................................. 2851
Andreas Smejkal, Maurizio Boella, P. Schwabach, Konrad Schoop, Darius Ancius, Stefano Vaccaro, I. Gauld, Doro Wiarda

INVESTIGATION OF POSSIBLE NON-DESTRUCTIVE ASSAY (NDA) TECHNIQUES FOR THE FUTURE SWEDISH ENCAPSULATION FACILITY ................................................................................................................................. 2861
Niklas Lundkvist, S. Grape, Peter Jansson, Stephen Tobin

MEASURING BORON CONCENTRATION IN A SPENT FUEL POOL USING BARE AND CADMIUM COVERED NEUTRON DETECTORS ................................................................................................................................. 2871
J. Gerhart, C. Freeman, Stephen Tobin, A. Belian, Adrienne Lafleur, H. Menlove

CREATING NDA “WORKING STANDARDS” THROUGH HIGH-FIDELITY SPENT FUEL MODELING ................................................................................................................................. 2881
S. Skutnik, I. Gauld, C. Romano, H. Trellue

UTILIZING NGSI SPENT FUEL SENSITIVITY LIBRARIES TO ESTIMATE MODEL UNCERTAINTIES ................................................................................................................................. 2891
B. Broadhead, I. Gauld, H. Trellue, J. Galloway, T. Burr

DETERMINATION OF INITIAL ENRICHMENT, BURNUP, COOLING TIME OF PWR SPENT FUEL ASSEMBLIES BY ANALYSIS OF PASSIVE GAMMA SPECTRA AND NEUTRON COUNT RATE ................................................................................................................................. 2901

PROSPECTS FOR SPENT FUEL MEASUREMENTS USING HIGH-RATE GERMANIUM DETECTORS ................................................................................................................................. 2911
Douglas Rodriguez, L. Campbell, James Fast, Robert Runkle

CONCEPTUAL DESIGN FOR THE DEVELOPMENT OF UNIFIED SPENT FUEL ATTRIBUTE TESTER BY MCNP ANALYSIS ................................................................................................................................. 2918
Ki Hyun Kim, Jae Bum Park, Seung Ho Ahn, Byung Marn Koh

GRAPHICAL USER INTERFACE SOFTWARE FOR GROSS DEFECT DETECTION AT THE ATUCHA-I PLANT ................................................................................................................................. 2926
A. Wong, S. Sitaraman, Y. Ham, Orpet Peixoto
### Session E: Materials Control and Accountability — Nondestructive Analysis — Neutron Measurements and Techniques II

**Chair:** Jeffrey Chapman

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutron Assay System for Confinement Vessel Disposition</td>
<td>2935</td>
</tr>
<tr>
<td>Katherine Frame, M. Bourne, William Crooks, L. Evans, Douglas Mayo,</td>
<td></td>
</tr>
<tr>
<td>David Miklo, William Salazar, Sy Stange, Jose Valdez, Georgiana</td>
<td></td>
</tr>
<tr>
<td>Vigil</td>
<td></td>
</tr>
<tr>
<td>Clyc Scintillators for Neutron Handheld Instruments</td>
<td>2943</td>
</tr>
<tr>
<td>A. Gueorguiev, J. Glodo, J. Tower, U. Shirwadkar, P. O'Dougherty,</td>
<td></td>
</tr>
<tr>
<td>K. Shah</td>
<td></td>
</tr>
<tr>
<td>Demonstration of Emitted-Neutron Computed Tomography to Count Fuel</td>
<td>2952</td>
</tr>
<tr>
<td>P. Hausladen, M. Blackston, E. Brubaker, D. Chichester, P. Marleau,</td>
<td></td>
</tr>
<tr>
<td>R. Newby</td>
<td></td>
</tr>
<tr>
<td>Theory of Particle Detection and Multiplicity Counting with Dead Time</td>
<td>2962</td>
</tr>
<tr>
<td>Effects</td>
<td></td>
</tr>
<tr>
<td>Lenard Pazsit, Imre Pazsit</td>
<td></td>
</tr>
<tr>
<td>Design and Performance of High-Efficiency Counters Based on Boron-</td>
<td>2971</td>
</tr>
<tr>
<td>Lined Straw Detectors</td>
<td></td>
</tr>
<tr>
<td>Jeffrey Lacy, Athanasios Athanasiaides, Christopher Martin, Liang</td>
<td></td>
</tr>
<tr>
<td>Sun, Gerson Vazquez-Flores</td>
<td></td>
</tr>
<tr>
<td>Validation of the MCNPX-POLIMI Code to Design a Fast-Neutron</td>
<td>2984</td>
</tr>
<tr>
<td>Multiplicity Counter</td>
<td></td>
</tr>
<tr>
<td>A. Kaplan, J. Dolan, M. Flaska, S. Pozzi, D. Chichester</td>
<td></td>
</tr>
<tr>
<td>Active-Interrogation Measurements of Induced-Fission Neutrons from</td>
<td>2989</td>
</tr>
<tr>
<td>Low-Enriched Uranium</td>
<td></td>
</tr>
<tr>
<td>J. Dolan, M. Marcath, M. Flaska, S. Pozzi, D. Chichester, A. Tomanin,</td>
<td></td>
</tr>
<tr>
<td>P. Peerani, D. Cester, G. Nebbia</td>
<td></td>
</tr>
</tbody>
</table>

### Volume 5

**Session F: Materials Control and Accountability — Destructive Analysis/Forensics II

**Chair:** Steven Wyrick

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irmm Quality Control Tools – A Contribution to the Standardisation</td>
<td>3017</td>
</tr>
<tr>
<td>Process in Nuclear Safeguards, Nuclear Forensics and Nuclear Security</td>
<td></td>
</tr>
<tr>
<td>R. Jakopic, Y. Aregbe, J. Truyens, S. Richter</td>
<td></td>
</tr>
<tr>
<td>A Progress in Development of Environmental Sample Analysis in Kaeri</td>
<td>3025</td>
</tr>
<tr>
<td>Kyuseok Song, Jong-Ho Park, Seong Yong Oh, Myunghee Lee</td>
<td></td>
</tr>
<tr>
<td>Iso/IEC 17025 Accreditation for Accountancy Analysis at PfDC</td>
<td>3030</td>
</tr>
<tr>
<td>Hiro Okazaki, Mika Sumi, Katsuo Abe, Tomio Kageyama, Hiroaki Nakazawa</td>
<td></td>
</tr>
<tr>
<td>Quality Control and Uncertainty Evaluation for Accountancy Analysis</td>
<td>3039</td>
</tr>
<tr>
<td>At PfDC-Jaea</td>
<td></td>
</tr>
<tr>
<td>G. Gardienier, R. Essex</td>
<td></td>
</tr>
<tr>
<td>The Next Generation Safeguards Initiative’s Ultra-High-Purity Uranium-</td>
<td>3048</td>
</tr>
<tr>
<td>233 Preservation Effort</td>
<td></td>
</tr>
<tr>
<td>Alan Krichinsky, Debra Bostick, Joe Giaquinto, Charles Bayne, Steve</td>
<td></td>
</tr>
<tr>
<td>Goldberg, M. Humphrey, Ian Hutchoon, T. Sobolev</td>
<td></td>
</tr>
<tr>
<td>Thorium Reference Materials for Isotopic Studies</td>
<td></td>
</tr>
<tr>
<td>G. Gardienier, R. Essex</td>
<td></td>
</tr>
<tr>
<td>Characterization of the Uranium Isotopic Abundances in Nbl Certified</td>
<td>3058</td>
</tr>
<tr>
<td>Reference Material 125-A</td>
<td></td>
</tr>
<tr>
<td>K. Mathew, M. Kraiem, R. Essex, M. Soriano</td>
<td></td>
</tr>
</tbody>
</table>
SESSION G: NONPROLIFERATION AND ARMS CONTROL — EXPORT CONTROL
Chair: Todd Perry

VOLUNTARY PRINCIPLES AND NUCLEAR PROLIFERATION: DEVELOPING AN INDUSTRY BASED APPROACH TO STRENGTHENING THE NONPROLIFERATION REGIME .......... 3082

Ed Nagle

SESSION H: NONPROLIFERATION AND ARMS CONTROL/NUCLEAR SECURITY AND PHYSICAL PROTECTION/MATERIALS CONTROL AND ACCOUNTABILITY — MATERIAL PROTECTION, CONTROL, AND ACCOUNTING
Co-Chairs: Lorilee Brownell

RESULTS OF THE FIRST INTER-LABORATORY COMPARATIVE TEST OF URANIUM CONTROL SAMPLES ............................................................... 3092
Leonid Karpiuk, Andrey Stepanshko, Veronica Sviridova, Charles Roche, Colleen Gradle, Parker O'Shell, Bruce Jensen, Jeff Sanders, Lev Neymotin

EVALUATING THE STATE OF THE PHYSICAL PROTECTION SYSTEM AT A NUCLEAR FACILITY ............................................................................................................................... 3096
Iurii Soltys

DEVELOPMENT OF PHYSICAL PROTECTION REGULATIONS FOR ROSATOM STATE CORPORATION SITES UNDER THE U.S.-RUSSIAN MPC&A PROGRAM ................................................................ 3101
Alexander Izmaylov, Vladimir Bathin, Nikolay Shemigon, Patricia O'Brien, Troy Wright, Michael Hazel, John Tuttle, Mitchel Cunningham, Mellinda Lane, Dmitry Kovchegin

EFFECTIVENESS ASSESSMENT OF NUCLEAR AND RADIOACTIVE MATERIAL PHYSICAL PROTECTION IN TRANSPORTATION THEORY, PRACTICE, REGULATIONS ............................................................... 3107
Alexander Izmaylov, Yuri Davydov, Dmitri Skvortsov, Sergey Timoshenko, Yuri Ablov, Gerald Thomas, William Brusidion

APPROACHES TO STRENGTHEN CHINA’S NUCLEAR SECURITY ................................................................. 3115
Hui Zhang

MANAGEMENT SYSTEM FOR NUCLEAR SECURITY CULTURE IN THE JOINT INSTITUTE FOR POWER&NUCLEAR RESEARCH INSTITUTE – SOSNY, NATIONAL ACADEMY OF SCIENCES, BELARUS ............................................................................................................................... 3125
H. Kiyavitskaya, L. Domaschenko

SESSION I: PACKAGING, TRANSPORTATION AND DISPOSITION — TESTING
Chair: Glenn Abramczyk

FRESH FUEL TRANSPORTATION PACKAGE IN A HYPOTHETICAL ACCIDENT CONDITION OF FIRE: THERMAL ANALYSIS AND EVALUATION OF THE POTENTIAL FOR CRITICALITY ................................. 3130
Jimmy Chang, Andrew Barto, Judith M. Cuta

DESTRUCTIVE TESTING OF A LARGE, TYPE B, DRUM-TYPE RADIOACTIVE MATERIAL SHIPPING CONTAINER ................................................................................................. 3140
Jeffrey Arbital, Drew Winder, Monty Guini

CONTAINER SAFETY ASSESSMENT FOR THE DISPOSAL OF NON-HEAT GENERATING RADIOACTIVE WASTE IN THE KONRAD REPOSITORY ................................................................... 3150
Manel Ellouz, Holger Voltske, Christian Protz

BALLISTICS TESTING OF THE 9977 SHIPPING PACKAGE FOR STORAGE APPLICATIONS ..................... 3159
B. Loftin, G. Abramczyk, Richard Koenig
## Session J: Education and Training — Applications of Technology to Education and Training

**Chair:** Dawn Eipeldauer

**National Criticality Experiments Research Center: Capabilities and Status**  
David Hayes, William Myers  
3165

**Training Capabilities at the ORNL Safeguards Technology Integration Center**  
Angela Lousteau, Chris Pickett, R. McElroy  
3170

---

## Session A: Facility Operations — Facility Safeguards and Material Management Best Practices

**Co-Chairs:** Jeffrey Allender, Steven Ward

**Statistical Assessment of Bias Significance in SNM Measurement Systems**  
Michael Shipman  
3177

**Pressurization of Sealed Pu-238 Bearing Containers in Design Basis Accidents: Analysis and Risk Reduction**  
Jonathan Teague  
3186

**Safety, Security, Safeguards and Physical Protection Experience in the Operation and Maintenance of a Miniature Neutron Source Reactor, NIRR-1 at Ahmadu Bello University, Zaria, Nigeria**  
3196

**Nuclear Material Accounting and Control System Based on RFID Technology**  
Sergey Shilkin, Vladimir Agamalyan  
3203

**Unconventional U-233 Staging Package Selection Leads to Cost Savings**  
Robert Kanning Jr., Rustin Long, Benjamin Garcia  
3209

---

## Session B: International Safeguards — UF6 Cylinder Tracking

**Co-Chairs:** Karyn Durbin, David Hatt

**Next Generation Safeguards Initiative: The Life of a Cylinder**  
J. Morgan, J. White-Horton  
3216

**NGSI: Function Requirements for a Cylinder Tracking System**  
Sean Branney, R. Poland, Raymond Maynard, Braden Brown  
3226

**NGSI: IAEA Verification of UF6 Cylinders**  
Michael Curtis  
3232

**A Comparison of International and Domestic Standards Identifying Uranium Hexafluoride (UF6) Cylinders**  
Carolynn Scherer, B. Boyer  
3239

**Next Generation Safeguards Initiative: Overview and Policy Context of UF6 Cylinder Tracking Program**  
B. Boyer, J. Whitaker, J. White-Horton, K. Durbin  
3250

---

## Session C: International Safeguards — Antineutrino Detection

**Co-Chairs:** Therese Renis, Craig Everton

**Antineutrino-Based Reactor Monitoring for Future IAEA Safeguards Applications**  
3260

**Use of Antineutrino Detection for Assessment of Fuel Burnup**  
N. Bowden, A. Bernstein, B. Cabrera-Palmer, T. Classen, S. Dazeley, A. Erickson, G. Keefer, S. Kiff, L. Kogler, D. Reyna  
3273

**Analysis of the Antineutrino Signature of Leu/Mox Fueled LWRS and SFRS**  
Thomas Saltor, Douglas Fynan, Andrew Ward, Tom Downar, John Lee  
3283
ONLINE MONITORING OF A CANDU6 ON-LOAD REFUELED REACTOR VIA DEPLOYMENT OF AN ANTI-NEUTRINO DETECTOR
N. Bowden, A. Bernstein, T. Classen, B. Cabrera-Palmer, L. Kogler, D. Reyna, G. Jonkmans, B. Sur

A COMPACT AND PORTABLE ANTI-NEUTRINO DETECTOR FOR REACTOR MONITORING
D. Reyna, B. Cabrera-Palmer, S. Kiff, L. Kogler, A. Bernstein, N. Bowden, T. Classen, S. Dazeley, A. Erickson, G. Keefer

ESTIMATED SENSITIVITY OF THE ANTI-NEUTRINO PROBE FOR FUTURE REACTOR MONITORING
M. Fallot

SPECTRAL ANTI-NEUTRINO SIGNATURES AND PLUTONIUM CONTENT OF REACTORS
Patrick Huber

SESSION D: INTERNATIONAL SAFEGUARDS — NDA – SPENT FUEL #3 (NDA OF SPENT FUEL ASSEMBLIES WITH ACTIVE INTERROGATION)
Chair: Michio Seya

DIRECT MEASUREMENT OF INITIAL ENRICHMENT AND BURN-UP OF SPENT FUEL ASSEMBLY WITH A DIFFERENTIAL DIE-AWAY TECHNIQUE BASED INSTRUMENT
Vladimir Henzl, M. Swinhoe, Stephen Tobin

SENSITIVITY OF THE DELAYED NEUTRON TECHNIQUE TO VARIATIONS IN THE SPENT FUEL LIBRARIES AND NEUTRON ABSORBERS
H. Trellue, Alex McKinney, A. Favalli, Stephen Tobin, T. Burr

ASSESSMENT OF DELAYED GAMMA-RAY TECHNIQUE PARAMETERS FOR SPENT NUCLEAR FUEL ASSAY
V. Mozin, A. Hunt, E. Reedy, B. Ludewigt

PRELIMINARY SIMULATIONS FOR GEOMETRIC OPTIMIZATION OF A HIGH-ENERGY DELAYED GAMMA SPECTROMETER FOR DIRECT ASSAY OF PU IN SPENT NUCLEAR FUEL
J. Kalisek, L. Campbell, Douglas Rodriguez

DETERMINATION OF TOTAL PLUTONIUM CONTENT IN A SPENT FUEL ASSEMBLY BY MEASURING PASSIVE NEUTRON COUNT RATE AND MULTIPLICATION WITH THE DIFFERENTIAL DIE-AWAY INSTRUMENT
Vladimir Henzl, Stephen Croft, M. Swinhoe, Stephen Tobin

EXAMINING 239PU AND 240PU NUCLEAR RESONANCE FLUORESCENCE MEASUREMENTS ON SPENT FUEL FOR NUCLEAR SAFEGUARDS
Brian Quiter, Thibault Laplace, Bernhard Ludewigt

LSDS SYSTEM DEVELOPMENT FOR ISOTOPIC FISSION DETECTOR
Yong Deok Lee, Chang-Je Park, Geun-il Park, Kee Chan Song

STATUS ON ESTABLISHING THE FEASIBILITY OF LEAD SLOWING DOWN SPECTROSCOPY FOR DIRECT MEASUREMENT OF PLUTONIUM IN USED FUEL

TESTING OF SMALL DETECTORS WITH GLASS ROD LIGHT GUIDES FOR MULTIPLICITY MEASUREMENT PURPOSES
Dina Chernikova, Imre Pazsít, Anders Nordlund, Berit Dahl, Gudmar Grosshoeg, Jan Paltin, Mikael Elfman

SESSION E: MATERIALS CONTROL AND ACCOUNTABILITY — NDA NEUTRON MEASUREMENTS AND TECHNIQUES III
Chair: Karen Miller

HELIUM-3 ALTERNATIVE NEUTRON DETECTORS FOR MULTIPLICITY COUNTERS
Azaree Lintereur, James Ely, Edward Siciliano, M. Swinhoe

AN ANALYSIS TECHNIQUE FOR ACTIVE NEUTRON MULTIPLICITY MEASUREMENTS BASED ON FIRST PRINCIPLES
Braden Goddard, William Charlton, L. Evans, P. Peerani

A NEW METHOD FOR THE ANALYSIS OF THE DETECTION SIGNAL ARRIVING FROM A PULSED NEUTRON ACTIVE INTERROGATION FACILITY
C. Dubi, T. Rubnik, I. Israelashvili
TIME-DEPENDENT MCNPX-PoliMi WITH VARIANCE REDUCTION ................................................................. 3428
S. Prasad, S. Clarke, S. Pozzi, E. Larsen
MEASUREMENTS AT LOS ALAMOS NATIONAL LABORATORY PLUTONIUM FACILITY IN SUPPORT OF GLOBAL SECURITY MISSION SPACE ................................................................. 3438
Sy Stange, Douglas Mayo, Gary Herrera, Anastasia McLaughlin, Charles Montoya, Becky Quihuis, Julio Trujillo, Craig Van Pelt, Tracy Wenz
DETERMINATION OF PU CONTENT OF U/TRU INGOT OF PYROPROCESSING USING THE PASSIVE NEUTRON ALBEDO REACTIVITY TECHNIQUE ........................................... 3444
Tae-Hoon Lee, Spencer Menlove, H. Menlove, Hee-Sung Shin, Ho-Dong Kim
A MULTI-ENERGY MODEL FOR FISSILE MASS ESTIMATION ................................................................. 3455
T. Ridnik, C. Duhi, I. Israelashvili, J. Bagi, J. Huzitti
JAEA DEVELOPMENT PROGRAMS OF ADVANCED TECHNOLOGIES FOR SAFEGUARDS AND SECURITY ............................................................................................................................... 3465
Alan Michael Bolind, Masatoshi Kureta, Kazuhiko Soyama, Ryoichi Hajima, Hideo Harada, Takahisa Nakamura, Michio Seya
A COLLECTION AND DISTILLATION OF THE IMPORTANT PHYSICS FOR UNDERSTANDING, INTERPRETING, AND EVALUATING NEUTRON-BASED NON-DESTRUCTIVE ASSAY TECHNIQUES FOR NUCLEAR FUEL ................................................................. 3475
Alan Michael Bolind, Michio Seya

SESSION F: NONPROLIFERATION AND ARMS CONTROL — THREAT REDUCTION, ASSESSMENT AND RESPONSE
Chair: James Placke
NONPROLIFERATION, NUCLEAR SECURITY, AND THE INSIDER THREAT ................................................................. 3485
Galya Balatsky, Ruth Doggan
COMPUTER BASED ILLICIT TRAFFICKING INCIDENT PROCESSING SYSTEM FOR IAEA’S ITDB ............................................................................................................................................... 3494
Ickhyun Shin, Wan Ki Yoon, Hosik Yoo, Jungsoo Kim, Sungsoun Jang, Hyeon-Chul Kim, Jeong-ho Lee, Hyungmin Seo, Kook Heui Kwon
NONPROLIFERATION PROBLEMS IN CENTRAL ASIA: PREVENTING TRAFFICKING OF NUCLEAR MATERIALS AND RADIATION SOURCES ................................................................................................................................. 3501
Bekhzod Yuldashev, Jeffery Richardson, Siegfried Hecker
NUCLEAR MATERIAL ANALYSIS FOR FORENSIC AND OTHER SECURITY PURPOSES - BOOK BY THE STOCKHOLM INTERNATIONAL PEACE RESEARCH INSTITUTE ............................................................................................................................... 3511
Vitaly Fedchenko
RAPID ANALYSIS OF THE SNM SMUGGLING THREAT SPACE FOR ACTIVE INTERROGATION USING A GREEN’S FUNCTION APPROACH ................................................................................................................................. 3518
Hiroatatsu Armstrong, Erich Schneider
A NEW STANDARD FOR PREEMPTIVE MILITARY ACTION AGAINST WMD THREATS ................................................................. 3527
Fred Wehling

SESSION G: NONPROLIFERATION AND ARMS CONTROL — TRANSPARENCY AND EVALUATION
Chair: Teri Leffer
STRUCTURING THE NUCLEAR NONPROLIFERATION TRANSPARENCY PROBLEM ................................................................. 3537
G. Baldwin, R. Mongiello
DEVELOPMENT OF AN INFORMATION SHARING FRAMEWORK: COMMUNICATION STRATEGIES ............................................................................................................................................... 3543
Y. Kawakubo, B. Hoffheins, N. Inoue, R. Mongiello, G. Baldwin
DEVELOPMENT OF AN INFORMATION SHARING FRAMEWORK: EFFORTS AT REGIONAL TRANSPARENCY IN THE ASIA PACIFIC ................................................................................................................................. 3553
R. Mongiello, G. Baldwin
OVERVIEW OF JAPAN ATOMIC ENERGY AGENCY’S REGIONAL TRANSPARENCY EFFORTS ............................................................................................................................................... 3563
B. Hoffheins, Y. Kawakubo, N. Inoue, R. Mongiello, G. Baldwin
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUCLEAR WEAPONS PROLIFERATION PATHWAY UTILITY ATTRIBUTE WEIGHTING</td>
<td>3573</td>
</tr>
<tr>
<td>Survey</td>
<td></td>
</tr>
<tr>
<td>David Sweeney, William Charlton</td>
<td></td>
</tr>
<tr>
<td>A QUANTITATIVE EVALUATION OF STATES’ NUCLEAR NONPROLIFERATION</td>
<td>3582</td>
</tr>
<tr>
<td>CREDIBILITY</td>
<td></td>
</tr>
<tr>
<td>Eun-Ha Kwon, Won-II Ko, Ho-Dong Kim, Kwang-Seok Lee</td>
<td></td>
</tr>
<tr>
<td>SESSION H: NUCLEAR SECURITY AND PHYSICAL PROTECTION — RADIATION PORTAL</td>
<td></td>
</tr>
<tr>
<td>MONITORING</td>
<td></td>
</tr>
<tr>
<td>Chair: Rob York</td>
<td></td>
</tr>
<tr>
<td>FAST NEUTRON TIME ENCODED IMAGING FOR SPECIAL NUCLEAR MATERIAL</td>
<td>3591</td>
</tr>
<tr>
<td>DETECTION</td>
<td></td>
</tr>
<tr>
<td>Aaron Nowack, J. Brennan, E. Brubaker, M. Gerling, P. Marleau, K.</td>
<td></td>
</tr>
<tr>
<td>McMillan, Patricia Schuster, J. Steele</td>
<td></td>
</tr>
<tr>
<td>PROBABILISTIC EFFECTIVENESS METHODOLOGY USE IN PREVENTIVE</td>
<td>3600</td>
</tr>
<tr>
<td>RADIOLOGICAL/NUCLEAR DETECTION</td>
<td></td>
</tr>
<tr>
<td>Ross Snare III</td>
<td></td>
</tr>
<tr>
<td>TESTING OF VEHICLE RADIATION PORTAL MONITORS FOR THE FALSE ALARM RATE</td>
<td>3608</td>
</tr>
<tr>
<td>Leonid Kagan, Andrei Stavrov</td>
<td></td>
</tr>
<tr>
<td>FIELD OF VIEW MEASUREMENTS ON A COLLIMATED TRANSPORTABLE HPGE SYSTEM</td>
<td>3615</td>
</tr>
<tr>
<td>USED IN SEARCH SYSTEM</td>
<td></td>
</tr>
<tr>
<td>Timothy Twomey, Ronald Keyser</td>
<td></td>
</tr>
<tr>
<td>DESIGN OF A NEW COLLIMATION SYSTEM TO PREVENT INTERFERENCE BETWEEN X</td>
<td>3621</td>
</tr>
<tr>
<td>RAY MACHINES AND RADIATION PORTAL MONITORS</td>
<td></td>
</tr>
<tr>
<td>Tyler Guzzardo, R. Livesay</td>
<td></td>
</tr>
<tr>
<td>PASS/FAIL CRITERION FOR A SIMPLE RADIATION PORTAL MONITOR TEST</td>
<td>3627</td>
</tr>
<tr>
<td>T. Burr, A. Gavron</td>
<td></td>
</tr>
<tr>
<td>NEW URANIUM STANDARDS AND TESTING CAPABILITIES AT THE Y-12 NUCLEAR</td>
<td>3635</td>
</tr>
<tr>
<td>DETECTION AND SENSOR TESTING CENTER</td>
<td></td>
</tr>
<tr>
<td>Carter Hull, J. Cantrell, Martin Williamson, Justin Holland, Steven Russell</td>
<td></td>
</tr>
<tr>
<td>LAB-BASED MEASUREMENT OF REMEDIATION TECHNIQUES FOR RADIATION PORTAL</td>
<td>3645</td>
</tr>
<tr>
<td>MONITORS (INITIAL REPORT)</td>
<td></td>
</tr>
<tr>
<td>Jake Livesay, Angela Lousteau, Tyler Guzzardo</td>
<td></td>
</tr>
<tr>
<td>EMERGENCY ANDROID-BASED APPLICATION FOR RADIATION EVASION IN NUCLEAR</td>
<td>3655</td>
</tr>
<tr>
<td>FACILITIES</td>
<td></td>
</tr>
<tr>
<td>Bassam Khuwalleh, Mohammad Khasawneh, Mostafa Ali</td>
<td></td>
</tr>
</tbody>
</table>

Author Index