ANSI Homeland Security
Standards Panel (ANSI-HSSP)

A Workshop on:

Standards for Non-Invasive Inspection Systems for Homeland Security

This workshop addressed the standards and conformity assessment needs for non-invasive explosives detection encompassing ionizing radiation, non-ionizing radiation, metal detectors, and automated target recognition for screening persons, luggage, cargo containers and vehicles.

April 29-30, 2010 Gaithersburg, MD

Final Workshop Report

Workshop Co-Chairs:
Lee Spanier, Transportation Security Laboratory (TSL),
US Department of Homeland Security (DHS)

Larry Hudson, Physics Laboratory,
National Institute of Standards and Technology (NIST)

National Institute of Standards and Technology (NIST)
Green Auditorium
100 Bureau Drive
Gaithersburg, MD 20899

Thursday – April 29, 2010

Welcome/Opening Remarks

Karen Hughes, Director, Homeland Security Standards, American National Standards Institute (ANSI), opened the meeting by welcoming and thanking the attendees for their participation. Ms. Hughes added a special thanks to the workshop co-chairs, Larry Hudson and Lee Spanier for their leadership in convening an esteemed group of individuals to address a topic receiving increasing attention worldwide. Additionally, Ms. Hughes acknowledged the National Institute of Standards and Technology (NIST) for their generous sponsorship. Ms. Hughes then introduced Larry Hudson.

Dr. Larry Hudson, Physics Laboratory, National Institute of Standards and Technology (NIST), Workshop Co-Chair, welcomed the attendees and noted that more than 160 individuals representing over 75 organizations registered for this event. A complete list of all workshop participants is appended as **Annex A**. Dr. Hudson defined the workshop objective as effectively facilitating a communication exchange between the workshop panelists and attendees with the end goal of identifying standards and tools that are currently available related to non-invasive inspection systems for homeland security, identifying gaps that may exist, and prioritizing those gaps to implement appropriate standards-based solutions. Dr. Hudson then introduced Lee Spanier.

Lee Spanier, Transportation Security Laboratory (TSL), US Department of Homeland Security (DHS), Workshop Co-Chair, thanked the attendees again for their valuable participation in this workshop. Additionally, Mr. Spanier acknowledged the hard work of the US Department of Homeland Security, specifically thanking Gary Carter and Dr. Bert Coursey for the DHS Science and Technology Directorate's continued support for the ANSI-HSSP. Mr. Spanier underscored the need for usable standards in the area of non-invasive inspection systems, and added that this workshop is intended to be a platform to exchange information and ideas about the specific standards and conformity assessment needs. Mr. Spanier then introduced Dr. George Zarur.

Keynote Address

Dr. George Zarur, Science Advisor, Transportation Security Administration (TSA), US Department of Homeland Security (DHS), began his remarks by describing his experience and involvement in establishing TSA, specifically highlighting the critical role standards play in the area of non-invasive inspection systems. Dr. Zarur added that the security field is still maturing in this area and a reasonable goal could be to strive for implementation of standards across the entire checkpoint rather than just one area, an investment for DHS in its entirety and not just TSA as single component.

In addition, Dr. Zarur discussed the benefits of having a standard that would cover multiple areas across the industry (e.g. resulting in a faster process, better results, and cheaper cost implications). Specifically, he noted that such a standard could provide the opportunity for the development of industry-wide imaging as opposed to vendor-specific imaging formats. Lastly, Dr. Zarur added that a standard in this area could help with the training and responsibilities of the operators who are viewing the images in order to lower the risk of potential human error.

Dr. Zarur concluded his remarks by noting the end result of public-private sector collaboration with the National Electrical Manufacturer's Association (NEMA) in the development of first x-ray computed tomography (CT) standard, Digital Communication in Security (DICOS), scheduled to be published by August of 2010, as a first significant measure of success from a standards perspective.

Overview of US Department of Homeland Security Explosives Standards Working Group (DHS ESWG) & Imaging Technology Standards Activities

Robert Pryor, Co-Chair, Explosives Standards Working Group, US Department of Homeland Security (DHS), delivered a presentation providing an overview of the Explosives Standards Working Group (ESWG). Mr. Pryor began his presentation by outlining the DHS

ESWG structure, relevant components involved, and standards process, noting that DHS is not a regulatory agency.

Mr. Pryor described the benefits of integrated standards development, which include greater safety for first responders and more effective technologies. Mr. Pryor added that the National Technology Transfer and Advancement Act (NTTAA) and public-private sector partnership is essential in maintaining a collaborative relationship to develop and implement necessary voluntary standards. He shared specific examples of current cooperation with organizations such as the InterNational Committee for International Technology Standards (INCITS), AOAC International, ASTM International, National Fire Protection Association (NFPA), Institute of Electrical and Electronics Engineers (IEEE), American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), National Institute for Justice (NIJ), Telecommunications Industry Association (TIA), International Organization for Standardization (ISO), and Underwriters Laboratories, Inc.(UL).

Also, he noted various standards in this area, how they are being used (e.g. procurement) and reminded participants that FEMA and TSA Grants components welcome support in developing future standards for use by grants recipients. A complete listing of all standards referenced throughout the course of the workshop is appended as **Annex B.**

Mr. Pryor noted the need for standards in this area, specifically, related to canine (e.g. reference materials) and trace explosives detection (e.g. vapor). Mr. Pryor concluded his remarks by providing the following list of proposed standards for adoption:

Through ESWG:
- NIJ 0603.01: Portable X-ray Systems for Use in Bomb Identification
- DoJ, Bomb Data Center: National Guidelines for Bomb Technicians
- National Tactical Officers Association: SWAT Standards for Law Enforcement Agencies
- IEEE N42.41: American National Standard Minimum Performance Criteria for Active Interrogation Systems Used for Homeland Security
- IEEE N42.46: American National Standard for Determination of the Imaging Performance of X-Ray and Gamma-Ray Systems for Cargo and Vehicle Security Screening

Through PPOE or ESWG:
- ASTM E2639-09: Standard Test Method for Blast Resistance of Trash Receptacles
- NIJ 0601.02: Walk-Through Metal Detectors for Use in Concealed Weapon and Contraband Detection
- NIJ 0602: Hand-Held Metal Detectors for Use in Concealed Weapon and Contraband Detection

Emerging Standards – Not yet released:
- NIJ 0117.00: Bomb Suit Standard for Public Safety

Panel 1: Ionizing Radiation Technology Standards (X-Ray & Gamma Ray Technologies)

Dr. Larry Hudson, Physics Laboratory, National Institute of Standards and Technology (NIST), served as the moderator for this panel. Dr. Hudson began his remarks by drawing attention to existing technical performance and radiation safety standards applicable to x-ray and gamma-ray security screening systems. Additionally, he outlined NIST's role in developing voluntary consensus standards and how they aid in the development of standard test methods, guidance documents, and field testing of standards and protocols. Additionally, subject matter experts surveyed the need for new or revised standards for bulk explosives detection screening of persons, luggage, cargo, and vehicles. Following panelist presentations, Dr. Hudson facilitated a discussion highlighting what standards and conformity assessment gaps need to be filled in order to anticipate evolving technologies, threats, and concept of operations (CONOPS).

Panelists for this session included:
- Daniel Kassiday, Engineer & Co-Chair HPS N43.17, Food and Drug Administration (FDA), US Department of Health and Human Services (HHS)
- Jeffrey Brasher, AIT Test Team Lead, SRA International, Inc.
- William Maguire, PhD, Engineering Research Psychologist, Transportation Security Laboratory (TSL), Science and Technology Directorate, US Department of Homeland Security (DHS)
- Thomas Cassidy, President, SCA, Inc.
- Dudley Creagh, Professor, University of Canberra

Items addressed by panelists during their remarks and in response to questions from audience members included:
- It was noted that all manufacturers of electronic products must report accidental radiation occurrence, as well as notify the Food and Drug Administration (FDA) of radiation safety defects or failure to comply with applicable mandatory performance standards.
- The use of simulants to mimic target objects was described as a vital process in developing technology.
- Information was provided on detection testing, noting that the testing uses a variety of targets and passenger profiles. In addition, testing has typically excluded persons with disabilities and special needs.
- The process for TSA to solicit vendors was discussed, and parties interested in obtaining additional information regarding the process were advised to visit www.fbo.gov.
- The need for a tool that can be a complement to OCAST in order to provide measures that relate to x-ray power/geometry to field measureable quantities was identified.
- It was noted that ANSI HPS N43.16 Radiation Safety for X and Gamma Ray Cargo and Vehicle Security Screening

Systems, Energies Up To 10 MeV, is a standard that is not currently in the public domain, and that the standard should be expanded in order to include test protocols that test across different areas.
- Training and recruitment of screeners was identified as a crucial area that requires further development.
- The need to be able to discriminate between materials was identified in order for explosives to be detected in any aspect of an X-Ray examination system.

Panel 2: Non-ionizing Technology Standards (Millimeter Wave & Passive Infrared Technologies)

Dr. Gerald Fraser, Physics Laboratory, National Institute of Standards and Technology (NIST) moderated this panel. Together with a panel of subject matter experts, he facilitated a discussion summarizing efforts to develop, commercialize, and deploy portal and standoff passive and active millimeter-wave to infrared imaging systems for the detection of explosives and other threats carried by individuals. Additionally, this panel covered the necessity for specific documentary and artifact standards to accelerate this effort and to ensure the effectiveness of the detection systems and their ability to address privacy issues. This included an examination of areas, needs, and challenges for creating technology-neutral artifact and documentary performance test standards that encompass present and future millimeter wave, terahertz, infrared, and electron back-scatter technologies. Also, this panel explained the differences in standards needs for passive versus active, and portal versus standoff technologies. Lastly, the need and ability to create a standards roadmap for these technologies was incorporated into the discussion.

Panelists for this session included:
- Erich Grossman, National Institute of Standards and Technology (NIST)
- Ted Grant, Transportation Security Laboratory (TSL), US Department of Homeland Security (DHS)
- Bob Daly, Senior Vice President, Brijot Imaging Systems, Inc.
- Douglas L. McMakin, Staff Engineer, National Security Directorate, Pacific Northwest National Laboratory (PNNL)

Items addressed by panelists during their remarks and in response to questions from audience members included:
- Physics-based standards were identified as vital for the physical quantities being imaged. It was noted that both Defense Advanced Research Projects Agency (DARPA) and NIST are currently developing physics-based standards for the components in systems.
- A need was identified for uniform safety standards, as well as simplification and standardization of testing and qualification, and standards for a variety of explosives detection scenarios.
- The benefits of standardization to industry in non-ionizing technology were noted as including design efficiency, fixed specifications, quality control baseline, interoperability, and a step toward sensor fusion.
- An international standards need in this area was identified, as there are currently no rules or standards in Europe providing guidance on how Advanced Imaging Technology (AIT) is to be used.

Panel 3: Metal Detector Standards

Nick Paulter, Program Manager, Detection, Inspection, and Enforcement Technologies, Office of Law Enforcement Standards (OLES), National Institute of Standards and Technology (NIST), moderated this panel. Panel members described their use of and contribution to the development of metal detector standards inclusive of national, international, and procurement standards. Additional discussion topics included test and evaluation of metal detectors, new ways of assessing metal detector performance, international metal detector standards, and exposure safety concerns with the use of metal detectors, and use requirements for metal detectors. Mr. Paulter concluded his introduction to the subject matter by underscoring the need for a multi-technology solution to detection standards inclusive of metal detectors.

Panelists for this session included:
- John Ely, Security Management and Program Analyst, Federal Bureau of Prisons
- Howard Bassen, Food and Drug Administration (FDA), US Department of Health and Human Services (HHS)
- Don Larson, Electronics Engineer, National Institute of Standards and Technology (NIST)
- Antonio Possolo, Chief, Statistical Engineering Division, National Institute of Standards and Technology (NIST)
- Art Mario, Chairman, ASTM F12.60, ASTM International

Items addressed by panelists during their remarks and in response to questions from audience members included:
- The Federal Bureau of Prisons identified several specific needs related to metal detectors, including high sensitivity, the ability to identify the type of metal in the field, certification for outdoor units in mass screening areas, and updates on medically implanted devices.
- A need for standards was identified in order for manufacturers to qualify their metal detector units.
- It was noted that metal detectors currently can interfere with personal medical electronic devices (PMEDS), and this is an area where further standardization would be useful.
- ASTM F1468-04a - Standard Practice for Evaluation of Metallic Weapons Detectors for Controlled Access Search and Screening, performance testing was identified as an existing standard in this area. It was noted that this standard addresses the weight of the test subject, as well as basic detection performance testing requirements.

Day 1 Wrap-Up: Summary and Expectations for Tomorrow

Dr. William Billotte, Office of Law Enforcement Standards (OLES), National Institute of Standards and Technology (NIST), provided a

high-level summary of the event's proceedings. Additionally, Dr. Billotte thanked all of the speakers, workshop co-chairs, and participants for their active participation and contributions and encouraged the audience to continue on this course to ensure identification of actionable recommendations to address standards and conformity assessment needs on day two.

Friday – April 30, 2010

Panel 4: Automated Target Recognition Software

Lee Spanier, Transportation Security Laboratory (TSL), US Department of Homeland Security (DHS), moderated this panel. Panel members described their development of automated target recognition (ATR) algorithms, use of standards, need for new standards, and new ways of assessing Automated Target Recognition (ATR) performance. Mr. Spanier noted that the list of standards cited by panel members is not all-inclusive and will serve as a useful guide in identifying relevant gaps. Furthermore, he noted that the end product will be a constellation of working groups to develop standards to support activities already underway.

Panelists for this session included:

- Hedzer Komduur, Senior Policy Officer, National Coordination for Counterterrorism Civil Aviation Security Department
- Dr. Joshua Rubinstein, Human Factors Program Lead, Transportation Security Laboratory (TSL), US Department of Homeland Security (DHS)
- Dr. Gerard Hanley, Manager of Advanced Detection, Rapiscan Systems
- Kris Roe, Director, Security and Inspection Technology, Smiths Detection
- Whitney Weller, Director of Imaging Technology, L-3 Security and Detection Systems
- Izrail Gorian, President, Iscon Video Imaging, Inc.
- Dr. Ronald Krauss, Bulk Explosives/Weapons Detection Technology Lead, US Department of Homeland Security (DHS)
- Erick Rekstad, Office of Security Technologies, Engineering Support Services, US Department of Homeland Security (DHS)
- Jeff Jortner, Sandia National Laboratories

Items addressed by panelists during their remarks and in response to questions from audience members included:

- A high false alarm rate was noted as a significant challenge in automated target recognition software. It was added that standards are needed in this area to not only reduce false alarm rates, but also to ensure that all machines are tested equally.
- A need for standards was identified in the testing of automated target recognition software, including the need for standardization of automated alarm indicators, performance measures, and test article construction.
- It was noted that standards in this area tend to be technology specific, which does not allow the standard to be applicable across different modalities. This highlights the need for both capability standards and performance standards.
- The need to have one standard that covers all current devices was discussed, including the need for a standard that develops a common platform for imaging systems.
- The need to have a standard covering simulants was identified as vital when specifying the level of accuracy required when matching the threats that are being simulated.
- A common user interface was noted as being an important component in providing a common framework for displays and other controls.
- A standards need was identified in the area of common nomenclature.

Panel Discussion: Standards Developing Organizations and Public Sector Standards Coordination

Karen Hughes, Director, Homeland Security Standards, American National Standards Institute (ANSI), moderated this panel. Panel members consisting of both public and private sector representatives, illustrated the importance of public-private sector coordination in the development of voluntary consensus standards and conformity assessment systems by sharing best practices in cross-sector collaboration. Additionally, panelists addressed topics such as security-sensitive/classified requirements versus openness in voluntary consensus building as well as linking American national standardization efforts to the international standards landscape for potential future collaboration.

Panelists for this session included:

- Dr. Bert Coursey, Standards Executive, Science & Technology Directorate (S&T) Office of Standards, U.S. Department of Homeland Security (DHS)
- Peter Chiaro, Leader, Environmental Effects Laboratory & Technical Testing and Analysis, Oak Ridge National Laboratory
- Alvin Scolnik, Vice President Technical Services, National Electrical Manufacturers Association (NEMA)
- Jaap de Ruiter, Product Manager Detection, TNO Defence, Security, and Safety

Items addressed by panelists during their remarks and in response to questions from audience members included:

- An overview of the standards that are already published in this subject area was provided, specifically noting ANSI N42.44 - Performance and Evaluation of Checkpoint Cabinet X-ray Imaging Security-screening Systems (2008), and adding that IEC 624638 - Mobile instrumentation for measurement of gamma and neutron radiation in the environment (2010), should be published by July 2010. It was noted that IEC 62438 does not define imaging requirements.
- Two standards that were highlighted when discussing cargo and vehicle imaging and interrogation systems were ANSI 42.46 - Measuring the Performance of X-ray and Gamma-ray Systems for Cargo and Vehicle Security Systems (2008), and

IEC 62523 - Radiation protection instrumentation – Cargo/vehicle radiographic inspection systems.

- A need for standardization was identified in the area of data representation. It was noted that standardizing data representation would allow for consistency when identifying a real or fake image regardless of the equipment manufacturer. This would enable equipment from a variety of manufacturers to be used by both DHS and TSA.
- The openness in the voluntary consensus standards development process was identified as a potential challenge in dealing with security sensitive and classified information matters.
- It was noted that there is an international need for performance standards in order to ensure that the various technologies used are all applied correctly.

Open Discussion: Based on what standards we know exist, can we identify the gaps that need to be filled and what are the priorities?

This forum addressed the needs of DHS, in terms of non-invasive inspection systems standards and conformity assessment systems to address current gaps looking at:

- What works?
- What doesn't work?
- What needs more research, development or refinement?
- Roles of public/private sectors.

Gordon Gillerman, Chief, Standards Services Division, National Institute of Standards and Technology (NIST), Technology Services Laboratory, led this discussion. Mr. Gillerman presented an overview of the various needs that each workshop panel had identified. He added that this workshop is a call to action for standards needs, as evidenced by the large amount of needs identified. Additionally, Mr. Gillerman noted the importance of both the public and private sector's involvement in the standards development process. A summary of the gaps identified for each panel is provided below.

Panel 1: Ionizing Radiation Technology Standards (X-Ray & Gamma Ray Technologies)

Imaging Performance

- Standard for measuring image quality of infrared AIT
- Standard for measuring image quality of mm-wave AIT
- Standard way to compare imaging performance of x-ray backscatter, mm-wave, and infrared across AIT modalities
- International standard(s) for AIT performance
- Standard training and evaluation methods for screeners
- Inclusiveness of passengers with disabilities and special needs
- Extensions of ANSI N42.46 (American National Standard for Measuring the Performance of Imaging X-ray and Gamma-ray Systems for Cargo and Vehicle Security Screening) needed, including: materials discrimination—high and low-Z tests, statistical scoring methods, downsizing of artifacts for air cargo, and safety
- Metrics that could relate x-ray power/geometry to field measureable quantities such as weight, dimensions, and composition of air cargo pieces (complement to OCAST)
- Bridging the gap between technical (e.g. image quality) performance and threat-detection performance

Radiation Safety

- Closure needed on ANSI/HPS N43.16-20XX Radiation Safety for X and Gamma Ray Cargo and Vehicle Security Screening Systems, Energies Up To 10 MeV [draft nearly complete]
- New ASTM test method needed to measure external X-ray emissions from cabinet X-ray security screening systems
- Revision needed of ASTM F 1039 Measurement of Ionizing Radiation Inside the Cabinet of X-Ray Security Screening Systems (1st draft nearly finished)

Panel 2: Non-Ionizing Radiation Technology Standards (Millimeter Wave & Passive Infrared Technologies)

- Physics-based approach vs. "protocol"-based approach to standards
- Uniform safety standards
- Simplification in and quicker time to market in standards development
- Privacy (perception)
- Sensor fusion
- Metal detector gaps (e.g. explosives, liquids, gels, powders)
- CONOPS standards (domestic & international)
- Consistency in test methods
- Stand-off (controlled portal vs. uncontrolled distance)
- Need to address a standard for packaging sensors intended for mass transit. New sensors being developed by labs are being assembled in enclosures that are nearly impossible to install in underground passenger stations. Looking inside the sensor, it appears they could be easily packaged in a transit friendly enclosure that could be installed within the existing advertising infrastructure.

Panel 3: Metal Detector Standards

- Higher sensitivity with better immunity
- Identification of type of metal in field (do no have research and development)
- Certification for outdoor units (mass screening)
- Resource for metal analysis
- Updates on medically implanted devices
- Standard for metal detector interference with PMEDS
- Standards are needed to be able to qualify manufactured units

Panel 4: Automated Target Recognition Software (ATR)

- Harmonization of standards efforts
- Standard box size should be set (box should be scaled to certain body height and allow multiple boxes)
- Consistent precision of measure
- Capability standards:
  -if you cannot see the item how can an algorithm find it?
  -people are 3D and screening systems are 2D projection surface technology
  -illumination is key but difficult to determine
  -you need to know what you do not know- cannot see
  -technology specific
- Image quality
- Data format
- ATR testing, detection and scoring Methods
- Standard format for describing body zones
- Standard test objects for daily quality assurance
- Standard poses
- Consistent divestiture
- Common nomenclature/definitions of terms
- Simulants and simulant validation

Mr. Gillerman invited the workshop participants to register for participation in further standardization projects that will be launched from this workshop. He concluded by, thanking all of the participants for their efforts and contributions over the course of this workshop.

Closing Remarks

Workshop Co-Chairs, Lee Spanier and Larry Hudson, concluded the workshop by thanking the ANSI and workshop participants for a productive meeting.

Optional Lab Tours were offered at the conclusion of the meeting and included all three stops listed below.

Optical Radiation Standards for Detection of Hidden Threats

The Optical Technology Division develops standards and calibration tools for the measurement of optical radiation from the far-infrared through the ultraviolet spectral region. Division capabilities include blackbody sources for the calibration and characterization of thermal infrared and hyperspectral imagers, hyperspectral scene projectors for the hardware-in-the-loop test and evaluation of passive standoff detection systems, and optical properties of materials measurement systems for characterizing the transmittance and reflectance of clothing, skin, and threats objects for input to hardware-in-the-loop test and evaluation systems and modeling and simulation efforts. The present laboratory tour highlighted efforts in these areas, with an emphasis on hyperspectral scene projection

Metal Detector Laboratory

Metal detectors are ubiquitous; they are at almost every controlled access point anywhere. Consequently it is important to public safety that these devices work properly. The OLES Metal Detector Lab in Gaithersburg, MD, is a facility for testing the performance of metal detectors, both hand-held and walk-through, and for evaluating the usefulness of minimum performance standards (MPS). That is, the facility is used to assess the value and utility of performance criteria given in MPS and in the applicability and accuracy of test and evaluation methods. This Lab, showed the large Cartesian robot that is used to move test objects through the portal of walk-through metal detectors (WTMDs) or past the hand-held metal detector (HHMDs). This robot is computer controlled and provides positional accuracy and reproducibility of better than 1 mm. They can also move test objects at speeds from less than 0.1 m/s (very slow walk) to greater than 3 m/s (jog). This facility also houses a phantom that emulates the electromagnetic properties of a human from about 100 Hz (lower operating frequency of some WTMDs) to 10 MHz (upper operating frequency of HHMDs). The phantom is used as a human surrogate for the 'clean tester' in the innocuous item test methods. Some of the innocuous items are placed on the phantom. The test objects, encased in plastic, are accurately machined to ensure geometric constancy of the samples. Moreover, all materials used have specified UNS designations and a given range of allowable electromagnetic properties.

National X-Ray Standards for Bulk-Explosives Detection

NIST has facilitated the development of a comprehensive suite of national x-ray performance and radiation-safety standards that cover all aviation and transportation venues where bulk explosives are screened: checkpoint, checked luggage, cargo, vehicle, and whole-body

imaging. This tour stop displayed the variety of standard test artifacts that have been produced in these recent efforts, as well as the x-ray sources and detectors used in this test facility to assess test methods and inform minimum performance requirements. In particular, testing is ongoing related to x-ray backscatter systems used for whole-body imaging as well as the portable x-ray systems used for bomb search and disarmament.

Appendix A – Attendance List

First Name	Last Name	Organization
David	Allen	National Institute of Standards and Technology (NIST)
Lori	Anderson	National Safe Skies Alliance
Howard	Bassen	U.S. Food and Drug Administration (FDA)
Fred	Bateman	National Institute of Standards and Technology (NIST)
Douglas	Bauer	U.S. Department of Homeland Security (DHS)
Simon	Bedford	Astrophysics Inc.
Tony	Berejka	Ionicorp
Lawrence	Berenson	ASIS International
Paul	Bergstrom	National Institute of Standards and Technology (NIST)
William	Billotte	National Institute of Standards and Technology (NIST)
Eugene	Bondoc	CBP-Springfield Laboratory
Douglas	Boyd	TeleSecurity Sciences
Jeffrey	Brasher	SRA International, Inc.
Lothar	Breitenback	European Commission
Brett	Cabeca	Smiths Detection
Jessica	Carl	American National Standards Institute (ANSI)
Thomas	Cassidy	SCA, Inc.
Peter	Chiaro	Oak Ridge National Laboratory
Stephen	Cockey	NAVEODTECHDIV
Tod	Companion	U.S. Department of Homeland Security (DHS)
Jerome	Conrad	U.S. Department of Homeland Security (DHS)
William	Cook	U.S. Department of Homeland Security (DHS)
Catherine	Cooksey	National Institute of Standards and Technology (NIST)
Wendy	Core	U.S. Department of Homeland Security (DHS)
Laura	Cosentino	Johns Hopkins University Applied Physics
Bert	Coursey	U.S. Department of Homeland Security (DHS)
Dudley	Creagh	University of Canberra
Bob	Daly	Brijot Imaging Systems, Inc.
Darby	Damuth	National Institute of Standards and Technology (NIST)
Jaap	de Ruiter	TNO Defence, Security, and Safety
Josue	Diaz	Booz Allen Hamilton
Lisa	Dimmick	U.S. Nuclear Regulatory Commission
Bill	Donovan	Guardian Technologies International, Inc.
Matt	Duckett	National Safe Skies Alliance
Steve	Duffy	Global Systems Technologies
John	Ely	Federal Bureau of Prisons
Dolan	Falconer	ScanTech Identification Beam Systems
Gerald	Fraser	National Institute of Standards and Technology (NIST)
Tony	Frudakis	Valley Forge Composites Technologies
Gilbert	Garcia	Battelle
Gordon	Gillerman	National Institute of Standards and Technology (NIST)
Nick	Gillett	L-3 Communications
David	Gilliam	National Institute of Standards and Technology (NIST)
Jack	Glover	National Institute of Standards and Technology (NIST)
Izrail	Gorian	Iscon Video Imaging, Inc.
Jerome	Gormley	Science Applications International Corp. (SAIC)

Ted	Grant	U.S. Department of Homeland Security (DHS)
Erich	Grossman	National Institute of Standards and Technology (NIST)
Jeff	Guerrieri	National Institute of Standards and Technology (NIST)
Gregory	Hallisey	Raytheon
Gerard	Hanley	Rapiscan Systems
Robert	Hargesheimer	U.S. Navy
John	Heavener	Parsons
Matthew	Hickman	U.S. Department of Homeland Security (DHS)
Doreen	Hill	Occupational Safety and Health Administration (OSHA), US Department of Labor (DOL)
David	Hobbs	U.S. Department of Homeland Security (DHS)
Jeffrey	Horlick	National Institute of Standards and Technology (NIST)
Joyce	Hsu	American National Standards Institute (ANSI)
Larry	Hudson	National Institute of Standards and Technology (NIST)
Karen	Hughes	American National Standards Institute (ANSI)
Martin	Hutchings	National Institute of Standards and Technology (NIST)
Kenneth	Inn	National Institute of Standards and Technology (NIST)
Jean	Johnson	National Electrical Manufacturers Association (NEMA)
Jeff	Jortner	Sandia National Laboratories
Pankaj	Karnik	JHU Applied Physics Laboratory
Daniel	Kassiday	U.S. Food and Drug Administration
Sean	Kennedy	Guardian Technologies International, Inc.
Klaus	Keus	European Commission
Sau	Kha	SRA International, Inc.
Siraj	Khan	U.S. Department of Homeland Security (DHS)
David	Knowles	U.S. Secret Service (U.S.S.S)
Hedzer	Komduur	Civil Aviation Security Department
Iztok	Koren	Brijot Imaging Systems, Inc.
Ronald	Krauss	U.S. Department of Homeland Security (DHS)
Scott	Kravis	Control Screening
John	Kulick	Siemens USA
Andy	Kung	U.S. Army
Donald	Larson	National Institute of Standards and Technology (NIST)
Brian	Le Gros	Canada Border Services Agency
Zachary	Levine	National Institute of Standards and Technology (NIST)
Thanh	Luu	ManTech International Corp
Daniel	Madson	Science Applications International Corp. (SAIC)
Bill	Maguire	U.S. Department of Homeland Security (DHS)
Art	Mario	Chairman, ASTM F12.60
Jennifer	Marshall	National Institute of Standards and Technology (NIST)
Oscar	Martin	U.S. Department of Homeland Security (DHS)
Harry	Massey	National Electrical Manufacturers Association (NEMA)
Philip	Mattson	U.S. Department of Homeland Security
Scott	McClain	U.S. Army
Jim	McGee	Senate Committee on Homeland Security and Governmental Affairs
Chris	McKay	U.S. Department of Homeland Security (DHS)
Douglas	McMakin	Pacific Northwest National Laboratory (PNNL)
Michael	Melia	U.S. Department of Homeland Security (DHS)

Matthew	Merzbacher	Morpho Detection, Inc.
Geraldine	Mijares	U.S. Department of Homeland Security (DHS)
Ronaldo	Minniti	National Institute of Standards and Technology (NIST)
Michael	Mitch	National Institute of Standards and Technology (NIST)
Manuel	Munoz	U.S. Army ARDEC
James	Ohrt	URS Corporation
Stephan	Parker	National Academies
Nick	Paulter	National Institute of Standards and Technology (NIST)
Robert	Plemons	Booz Allen Hamilton
Lauren	Porr	Booz Allen Hamilton
Antonio	Possolo	National Institute of Standards and Technology (NIST)
Robert	Pryor	U.S. Department of Homeland Security (DHS)
Shuping	Qing	Siemens Corporate Research
Thomas	Ramsay	Guardian Technologies International, Inc.
James	Reed	Federal Bureau of Prisons
Joe	Reiss	American Science & Engineering, Inc. (AS&E)
Erick	Rekstad	U.S. Department of Homeland Security (DHS)
Casandra	Robinson	Savannah River National Laboratory
Daniel	Roddy	NAVEODTECHDIV
Sonja	Rodriguez	U.S. Department of Homeland Security (DHS)
Kristofer	Roe	Smiths Detection
Daniel	Rosen	Morpho Detection, Inc.
Paul	Ross	Dynamic Security Concepts Inc.
Joshua	Rubinstein	U.S. Department of Homeland Security (DHS)
Wade	Sapp	American Science & Engineering, Inc. (AS&E)
Fran	Schrotter	American National Standards Institute (ANSI)
Alvin	Scolnik	National Electrical Manufacturers Association (NEMA)
Stephen	Seltzer	National Institute of Standards and Technology (NIST)
Peter	Shebell	U.S. Department of Homeland Security (DHS)
Fazal	Sheikh	Booz Allen Hamilton
Eric	Shirley	National Institute of Standards and Technology (NIST)
Steven	Smith	Tek84 Engineering Group
Samuel	Song	TeleSecurity Sciences
Lee	Spanier	U.S. Department of Homeland Security (DHS)
Jay	Spingarn	Sandia National Laboratories
Robert	Stenner	Pacific Northwest National Laboratory (PNNL)
Debra	Stoe	U.S. Department of Justice (DOJ)
Greg	Struba	U.S. Department of Homeland Security (DHS)
Stephen	Surko	U.S. Department of Homeland Security (DHS)
Sheldon	Takeall	Booz Allen Hamilton
William	Taylor	Washington Metropolitan Area Transit Authority (WMATA)
Govindanunny	Thekkadath	Canadian Air Transport Security Authority
Ronald	Tosh	National Institute of Standards and Technology (NIST)
Andrew	Underhill	Guardian Technologies
Michael	Watkins	Pacific Northwest National Laboratory (PNNL)
Whitney	Weller	L-3 Security and Detection Systems
Suriyun	Whitehead	U.S. Department of Homeland Security (DHS)
Don	Witters	Center for Devices and Radiological Health

Soraia	Yakubova	Marcorsyscom
Xiaoping	Yang	Project Management Institute (PMI)
Jessica	Yearry	U.S. Department of Homeland Security (DHS)
Stephen	York	U.S. Department of State Diplomatic Security
George	Zarur	U.S. Department of Homeland Security (DHS)
Robert	Zimmerman	Homeland Security Institute

Appendix B – Deliverables Referenced at the April 29-30, 2010 ANSI-HSSP Workshop on Non-Invasive Inspection Systems for Homeland Security

Developer	Document Title
ASTM	ASTM E2520-07 - Standard Practice for Verifying Minimum Acceptable Performance of Trace Explosive Detectors
ASTM	ASTM E2639-09 - Standard Test Method for Blast Resistance of Trash Receptacles
ASTM	*ASTM E30 WK23817 - Characterization of Smokeless Powder drafted. (initiated in E54, transferred to E30)
ASTM	ASTM F792-08 - Standard Practice for Evaluating the Imaging Performance of Security X-Ray Systems
ASTM	*ASTM WK 19817 - New Test Method for Determining Limits of Detection in Trace Explosive Particle Detectors
ASTM	ASTM F1468-04a - Standard Practice for Evaluation of Metallic Weapons Detectors for Controlled Access Search and Screening
Australian Customs and Border Protection Service	Factory Acceptance Testing: Pallet System (Chorley, UK) (2010)
Australian Customs and Border Protection Service	Review of the Container Examination Facilities: Port of Brisbane, Port Botany, Port Melbourne, Port Fremantle (2010)
Australian Office of Transport Security	Advanced Technology Trials in the Airline Passenger Environment (2009)
Australian Office of Transport Security	Capability Assessment of Current X-Ray Technology for the Examination of Air Cargo (2008)
HPS	*ANSI HPS N43.16 20XX - Radiation Safety for X and Gamma Ray Cargo and Vehicle Screening Systems, Energies up to 10 MeV
HPS	ANSI HPS N43.17-2009 - Radiation Safety for Personnel Security Screening Systems Using X-ray or Gamma Radiation
HPS	ANSI HPS N43.3 - General Radiation Safety Standard for Installations Using Non-Medical X-ray and Sealed Gamma Ray Sources, Energies up to 10 MeV (2008)
HPS	HPS N43.14 - Safe Operating Practices for Active Interrogation Systems for Security Screening Using Fast Neutrons
IEC	IEC 62244 - Installed Radiation Monitors for the Detection of Radioactive & Special Nuclear Materials at National Borders (2006)
IEC	IEC 62327 - Hand–held Instruments for the Detection & Identification of Radionuclides & Additionally for the Indication of Ambient Dose Equivalent Rate from Photon Radiation (2006)
IEC	IEC 62401 - Alarming Personal Radiation Devices (PRD) (2007)
IEC	IEC 62438 - Mobile instrumentation for measurement of gamma and neutron radiation in the environment (2010)
IEC	IEC 62463 - Radiation Protection Instrumentation - X-ray Systems for the Screening of Persons for Security and the Carrying of Illicit Items
IEC	*IEC 62523 - Radiation protection instrumentation – Cargo/vehicle radiographic inspection systems
IEC	*IEC XXX Environmental performance requirements for radiation instrumentation
IEC	*IEC XXX - Radiation source requirements for performance testing

IEEE	ANSI N42.32 - Performance Criteria for Alarming Personal Radiation Detectors for Homeland Security (2006)
IEEE	ANSI N42.33 - Portable Radiation Detection Instrumentation for Homeland Security (2006)
IEEE	ANSI N42.34 - Performance Criteria for Hand-held Instruments for the Detection & Identification of Radionuclides (2006)
IEEE	ANSI N42.35 - American National Standard for Evaluation & Performance of Radiation Detection Portal Monitors (2006)
IEEE	ANSI N42.37 - Training Requirements for Homeland Security Responders using Radiation Detection Instruments (2007)
IEEE	ANSI N42.38 - Performance Criteria for Spectroscopy-Based Portal Monitors Used for Homeland Security (2006)
IEEE	ANSI N42.41 - Minimum Performance Criteria for Active Interrogation Systems Used for Homeland Security (2007)
IEEE	ANSI N42.42 - Data format Standard for Radiation Detectors used for Homeland Security (2006)
IEEE	ANSI N42.43 - Performance Criteria for Mobile & Transportable Radiation Monitors used for Homeland Security (2006)
IEEE	ANSI N42.44 - Performance & Evaluation of Checkpoint Cabinet X-ray Imaging Security-screening Systems (2008)
IEEE	*ANSI N42.45 - Evaluating the Image Quality of X-ray Computed Tomography(CT) Security – Screening Systems
IEEE	ANSI N42.46 - Measuring the Performance of X-ray & Gamma-ray Systems for Cargo & Vehicle Security Systems (2008)
IEEE	*ANSI N42.47 - Measuring the Imaging Performance of X-ray & Gamma-ray Systems for Security Screening of Humans
IEEE	ANSI N42.48 - Performance Requirements for Spectroscopic Personal Radiation Detectors for Homeland Security (2008)
IEEE	*ANSI N42.49A - Performance Criteria for Alarming Electronic Personal Emergency Radiation Detectors (PERDs) for Exposure Control
ISCORS	ISCORS Technical Report (July 2008) - Guidance for Security Screening of Humans Utilizing Ionizing Radiation
NCRP	NCRP (December 2003) - Commentary no. 16 - Screening of Humans for Security Purposes Using Ionizing Radiation Scanning Systems
NEMA	*NEMA IIC-1 v0.56 - Digital Imaging Communications in Security (DICOS) Hierarchy Information Object Definition (IOD)
NIJ	NCJ 150978 - Bomb Squads: Developing Mutual Aid Agreements
NIJ	NIJ 0117.00 - Bomb Suit Standard for Public Safety
NIJ	NIJ 0601.02 - Walk-Through Metal Detectors for Use in Concealed Weapon and Contraband Detection
NIJ	NIJ 0602 - Hand-Held Metal Detectors for Use in Concealed Weapon and Contraband Detection
NIJ	NIJ 0603.01 - Portable X-ray Systems for Use in Bomb Identification
NIJ	NIJ Report 100-7
NIST	SRM 2902 Trace Explosives for Canine Detection
NIST	SRM 2905 Trace Particulate Explosives (C-4, TNT) WK23817
NIST	SRM 2906 Trace Solution Explosives (RDX, TNT, PETN) requirements
NIST	SRM 2907 Trace Terrorist Explosives (0.5% TATP, 0.01% Semtex)

NTOA	National Tactical Officers Association: SWAT Standards for Law Enforcement Agencies

*under development

Annex C – List of Interested Parties for Addressing Standards Needs Identified

First	Last	Organization	Interest
Simon	Bedford	Astrophysics Inc.	All X-ray except CT/ATR Radiation safety
Linda	Bray	Science Applications International Corp.(SAIC)	Radiation detection Radiation safety
William	Cook	U.S. Department of Homeland Security (DHS)	ATR testing & detection
Laura	Cosentino	Johns Hopkins University Applied Physics	Panels 1, 2, 3 & 4
Bob	Daly	Brijot Imaging Systems, Inc.	Panels 1 & 2 - ATR
Dolan	Falconer	ScanTech Identification Beam Systems	All areas of panel 1
Tony	Frudakis	Valley Forge Composites Technologies	X-ray 18 cargo up to 100 MEV
Gilbert	Gilbert	Battelle	AIT IQ ATR
David	Gilliam	National Institute of Standards and Technology (NIST)	Panel 1 - statistics testing
Izrail	Gorian	Iscon Video Imaging, Inc.	Image quality of infrared
Jerome	Gormley	Science Applications International Corp.(SAIC)	N43.16 N42.46 NIJ 0603.1
Erich	Grossman	National Institute of Standards and Technology (NIST)	MM wave imager ATR
Jeff	Guerrieri	National Institute of Standards and Technology (NIST) Division of Electromagnetics	MM wave PMED interference
Gerard	Hanley	Rapiscan Systems	All AIT All backscatter All ATR
John	Heavener	Parsons	Technical/U.S. operations testing
Jeff	Jortner	Sandia National Laboratories	NA
Pankaj	Karnik	JHU Applied Physics Laboratory	Panels 1, 2, 3 & 4
Ronald	Krauss	Transportation Security Laboratory (TSL), US Department of Homeland Security (DHS)	Bulk detection Simulants ATR Imaging
Scott	Kravis	Control Screening	AIT/X-ray ATR
John	Kulick	Siemens USA	Panel 2 - CONOPS
Zachary	Levine	National Institute of Standards and Technology (NIST)	Image quality - all modalities
Daniel	Madson	Science Applications International Corp.(SAIC)	Radiation detection Radiation safety Training
Scott	McClain	US Army	Screener training & testing

Douglas	McMakin	Pacific Northwest National Laboratory (PNNL)	MM wave AIT image quality AIT performance & others that deal with mm wave AIT performance
Matthew	Merzbacher	Morpho Detection, Inc.	Bridging the gap between ID & detection All ATR ATD topics
Lauren	Porr	Booz Allen Hamilton (BAH)	AIT performance & scoring ATR detection testing
Shuping	Qing	Siemens Corporate Research	ATR data format & image quality
Joe	Reiss	AS&E	AIT ATR
Erick	Rekstad	Transportation Security Agency (TSA), US Department of Homeland Security (DHS)	Standard way to compare AIT image performance ATR testing/detection Standard way to compare image performance for daily test
Joshua	Rubinstein	Transportation Security Laboratory (TSL), US Department of Homeland Security (DHS)	Panel 1 - ATR testing
Steven	Smith	Tek84 Engineering Group	AIT safety & performance ATR safety & performance
Samuel	Song	TeleSecurity Sciences	Panels 1 & 4
Govindanunny	Thekkadath	Canadian Air Transport Security Authority (CATSA)	International standardization for AIT performance CONOPS
Whitney	Weller	L-3 Security and Detection Systems	AIT image ATR quality of performance
Stephen	York	U.S. Department of State Diplomatic Security	Training Human factors
Jean	Johnson	National Electrical Manufacturers Association (NEMA)	Image quality Testing AIT ATR