

Nonproliferation and National Security at Brookhaven National Laboratory

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70 YEARS OF
DISCOVERY

A CENTURY OF SERVICE



My Background

- Grew up in Huntington (Elwood)
- Studied Civil Engineering at MIT
- Began at BNL in the Department of Nuclear Engineering's Structural Analysis Division
- Moved to the International Safeguards Project Office (ISPO)
- Served as ISPO's Liaison Officer in Vienna, Austria from 1994 to 1998
- Served as Head of ISPO from 1999 to 2010
- Became Department Chair in 2015

Definitions

- Safeguards – the activities undertaken to account for and control nuclear material
- Nonproliferation – preventing the increase of weapons
 - Horizontal
 - Vertical
- Arms Control
- Disarmament - reducing weapons
 - Global Zero

Setting the Stage

- International Atomic Energy Agency
 - Established in 1957 following President Eisenhower's Atoms for Peace speech
 - Promotes the peaceful uses of nuclear power and prevents the spread of nuclear weapons
 - ~180 member states provide financial support
 - United Nations' "Nuclear Watchdog" – safeguards inspectors
 - Monitoring agency
 - Reports to the United Nations Security Council

Setting the Stage

- Treaty on the Nonproliferation of Nuclear Weapons (NPT)
 - IAEA originally inspected facilities offered for safeguards in agreements with each member state
 - NPT opened for signature in 1968, entered into force in 1970
 - Enabled IAEA to perform Comprehensive Safeguards Inspections
 - Established nuclear weapons states and non-nuclear weapons states
 - Nuclear Weapons States: US, UK, China, Russia, and France
 - Non-signers: India, Pakistan, and Israel (threshold states)

Setting the Stage

- September 11, 2001
 - Increased attention on U.S. borders and domestic security
 - Inspired a generation of U.S. citizens to dedicate their lives to make the world a safer place
 - U.S. created the Department of Homeland Security to centralize domestic security efforts

Setting the Stage

- Iraq
 - Signatory of NPT that was found to be noncompliant after first Gulf War
 - IAEA was verifying states' declarations
 - Led to an international effort to strengthen the IAEA's safeguards program
 - Additional Protocol – strengthened safeguards and focus on undeclared activities

Setting the Stage

- North Korea
 - Signed and then resigned from the NPT in the 1990s
 - Agreed Framework – agreement to provide power reactors in exchange for shutting down their research reactor
 - Second agreement to shutdown its research reactor and reprocessing program in 2000s
 - Recently:
 - US and DPRK leaders trading insults
 - 2018 Winter Olympics
 - Invitation from DPRK to meet with President Trump
 - Kim Jung Un crossed the DMZ to meet with Moon Jae-in
 - Planned Summit

Setting the Stage

- Iran
 - Ongoing questions about Iran's pursuit of enrichment technology
 - 2015: Joint Comprehensive Plan of Action
 - The Iran Deal
 - Limited enrichment capability in exchange for the removal of sanctions
 - 2018: US is withdrawing – other parties vow to continue



Nonproliferation and National Security Department

Susan E. Pepper, Chair
Donna Muscarella, Administrative Assistant

Nonproliferation
and Radiation
Detector R&D
Peter Vanier

International
Safeguards
Project Office
Ray Diaz

Nonproliferation
Policy and
Implementation
Katherine Bachner

Nonproliferation
and Homeland
Security Field
Support
Biays Bowerman

International Safeguards Project Office

- Management of the U.S. Support Program to IAEA Safeguards
 - Transfers technology and services available in the U.S. to increase the effectiveness and efficiency of IAEA Safeguards
- Staff at BNL and in Vienna, Austria
- Network of national laboratory and private sector technology and technical service providers
- Provides instruments and integrated systems, training, software and data systems, statistical analysis, and technical services



International Safeguards Project Office



* National Labs [⊖] Analytic Laboratories - IAEA NWAL

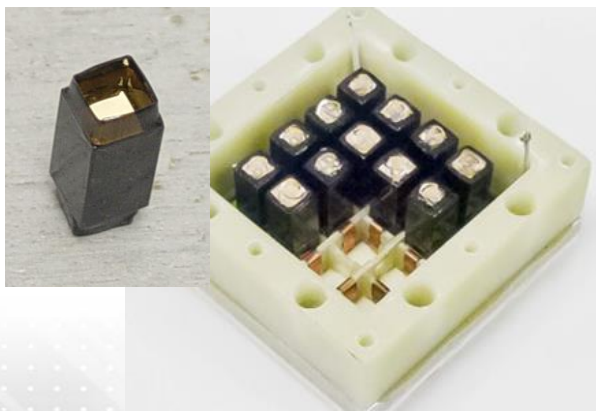
International Safeguards Project Office

- Recruitment of US citizens for positions with the IAEA Department of Safeguards
 - Regular staff positions
 - Cost Free Experts
 - Junior Professional Officers

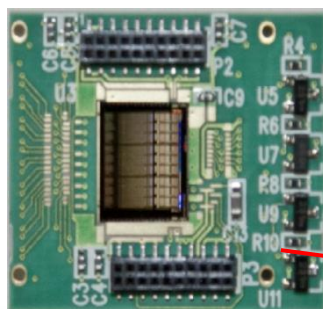


Radiation Detector R&D

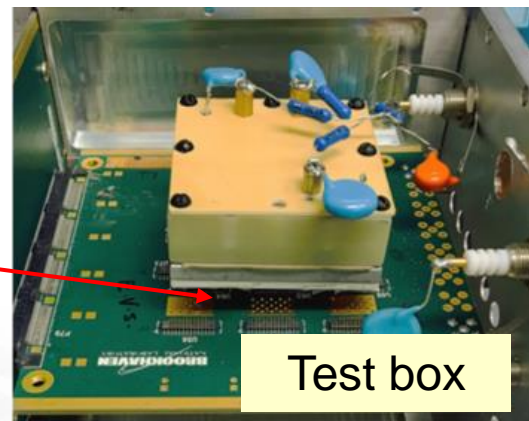
- Capability to integrate across the development path from material synthesis, crystal growth and characterization, prototyping and testing
- Long-standing track record in development and optimization of CZT
- Synergy between Rad Detector Research Group and Instrumentation Division
- Emphasis on maturation of Frish-grid CZT detectors, which eliminate the use of large expensive crystals



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ASIC and
ASIC board



Test box

Radiation Detector R&D

- Detector Commercialization
- Crossover to the medical field
- Instrumentation Testing



Training

- For IAEA inspectors
- For representatives of other member states
- U.S. government agencies
- Students/early career professionals



Radiological Assistance Program

- Region 1 Northeast covers the Northeast United States
- 3 full time members and 21 part time members
- Work with local and regional law enforcement agencies
- On call to respond to radiological incidents within 6 hours
- Planned assistance to cultural, sporting and political events
 - Pope Francis' visit in 2016
 - Presidential Inauguration and Political Conventions
 - Boston Marathon
 - New Years Eve at Times Square
 - Super Bowl
 - U.S. Open Tennis Championship
 - United Nations General Assembly



Region 1 RAP Deployment at the Super Bowl

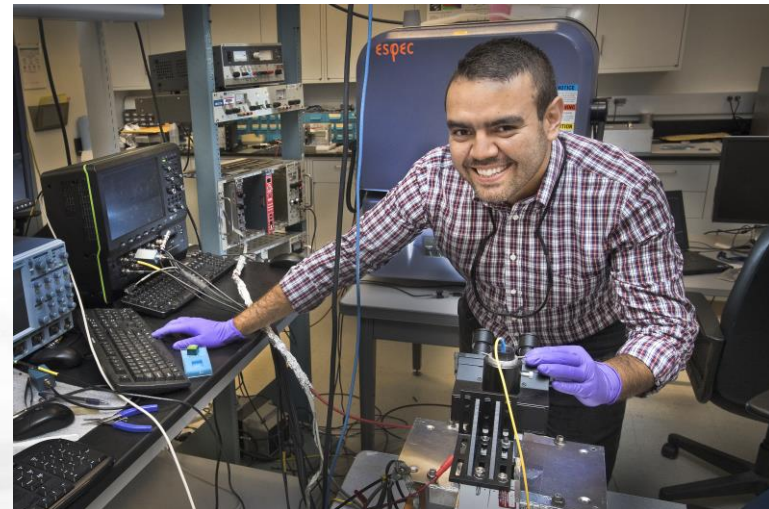


Region 1 RAP Team



Students

- Internships
- Nuclear Nonproliferation, Safeguards and Security in the 21st Century
 - Two-week short course held each June (cost free to participants)
 - For graduate students and professionals
- University courses – lectures and lab exercises
- Tour and lecture programs at BNL
- Opportunities to work with the IAEA
 - Established an internship program for U.S. students and recent graduates



Off-site Assignments

- National Nuclear Security Administration
 - Barbara Hoffheins, Office of International Nuclear Safeguards as a Safeguards Technology Expert
- State Department
 - Stephen LaMontagne, Bureau of Multilateral Nuclear Affairs
 - Josh Tackentien, US Mission Vienna as the ISPO Liaison Officer

Use of BNL User Facilities

- Nuclear Forensics
 - National Synchrotron Light Source II
- Equipment Testing
 - NASA Space Radiation Laboratory
 - Accelerator Test Facility



Sponsors

- US Department of State
- US Department of Energy
 - National Nuclear Security Administration
- US Department of Defense
- US Department of Homeland Security
- National Institutes of Health

Thank you!

