

# The European Commission's science and knowledge service

Joint Research Centre

## JRC Nuclear Security Safeguards and non- proliferation Activities

Tokyo, 5 June 2017

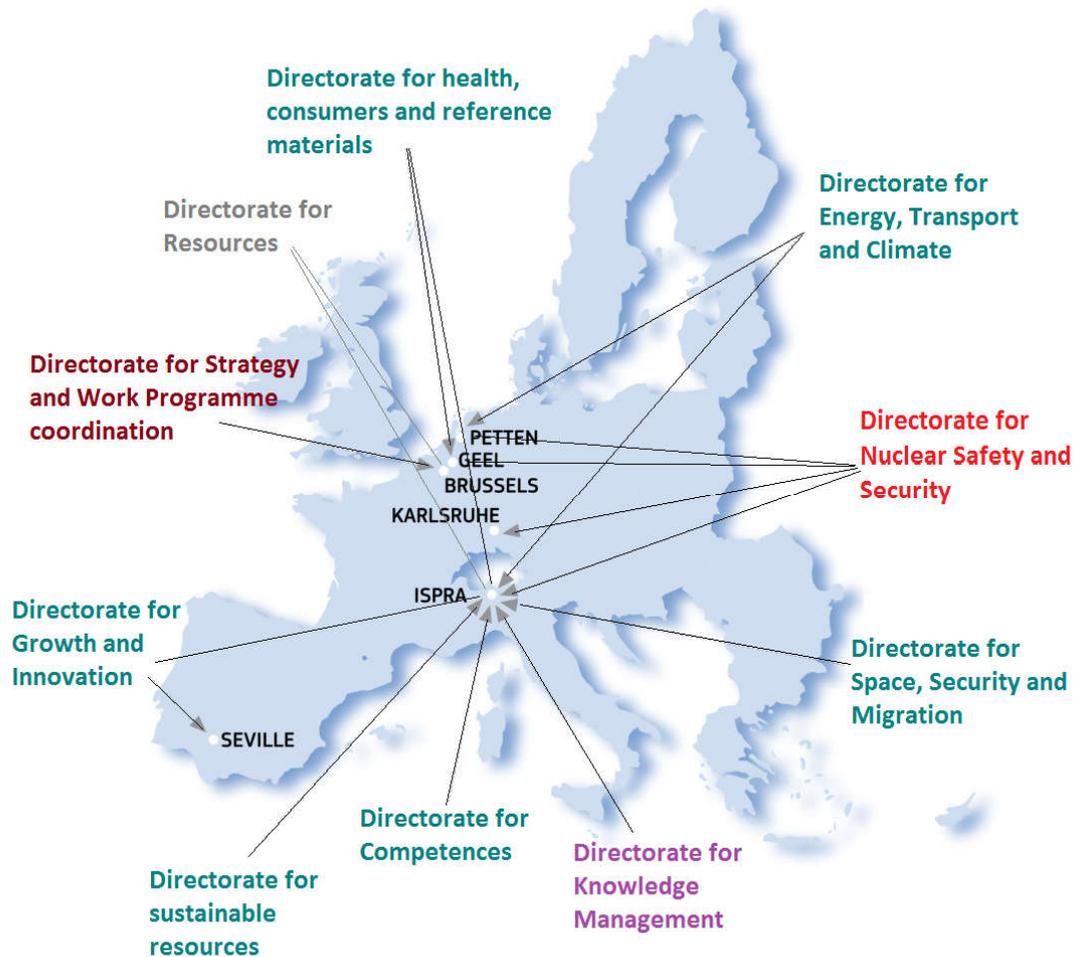
Said Abousahl

Head of Euratom Coordination Unit

EC/JRC-HQ



# JRC at a glance



Established 1957  
5 locations  
around 3000 staff

## ***The Vision:***

To play a central role in creating, managing and making sense of collective scientific knowledge for better EU policies.

## ***The Mission:***

As the scientific and knowledge service of the Commission our mission is to support EU policies with independent evidence throughout the whole policy cycle.

## **High-level objectives for JRC EURATOM Research and Training Programme (2014-2018)**

- 1.– Improve nuclear safety including, fuel and reactor safety, waste management and decommissioning, and emergency preparedness.**
- 2.– Improve nuclear security including: nuclear safeguards, non-proliferation, combating illicit trafficking and nuclear forensics.**
- 3.– Raising excellence in the science base for standardisation.**
- 4.– Foster knowledge management, education and training.**
- 5.– Support the policy of the Union on nuclear safety and security and the related evolving Union legislation.**

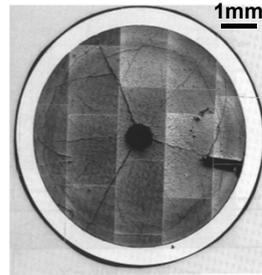


# JRC's Euratom Activities

Safety of Generation II and III nuclear reactors



Safety of Generation IV nuclear reactors



Nuclear Emergency Preparedness and Response



Partnership and support to Member States, Stakeholders; international cooperation



Radioactive waste management

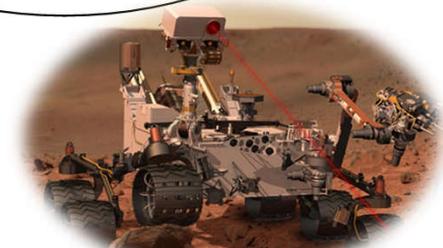
Nuclear safeguards and non-proliferation



Nuclear Security CBRNE



Nuclear decommissioning



Nuclear Science Application



Knowledge management, education & training, R&D infrastructure



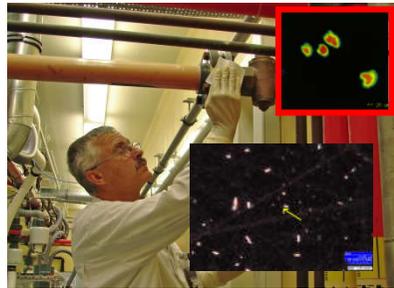
# Nuclear Security and Safeguards at JRC

## Effective and Efficient Safeguards



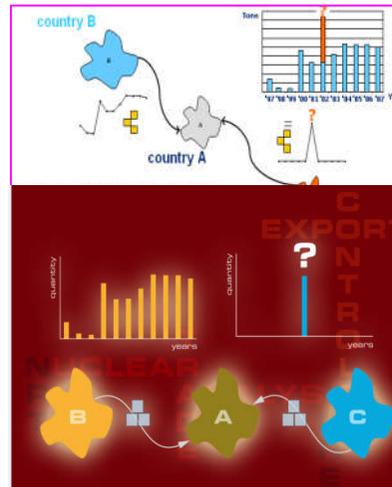
- Nuclear material measurements
- Reference materials
- Containment & Surveillance
- Process monitoring
- On-site laboratories

## Verification Absence of Undeclared Activities



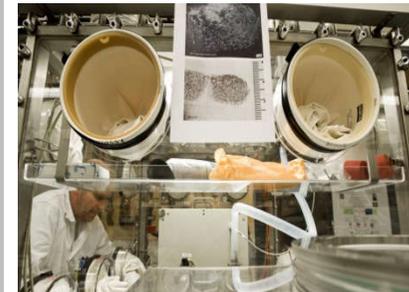
- Trace & particle analysis
- In-field tools for investigative inspector
- Reference materials

## Nuclear Non Proliferation



- Export control
- Trade analysis
- Non-proliferation studies

## Combating Illicit Trafficking

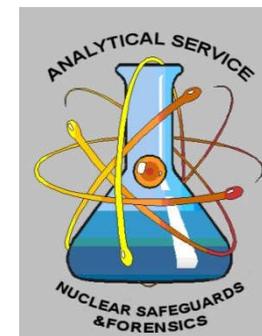


- Equipment development
- Testing & validation
- Nuclear forensics
- Nuclear preparedness
- National response plan
- CBRN, IfS, ...

**TRAINING & EDUCATION** European Nuclear Security Training Centre Promotion  
/Dissemination of EU's highest Safety/Security standards

# Nuclear Security and Safeguards at JRC

## Destructive and Non-Destructive Analysis for Safeguards



(10 years under ISO 17025)

- High precision U and Pu isotopic composition (TIMS)
- High precision U and Pu concentration (IDMS, Titration, Hybrid K-edge/XRF-densitometry)
- Impurity measurements (ICP-MS, C, N)
- Particle analysis using Large Geometry SIMS
- Pu and Am mass by Calorimetry
- Neutron Measurements
- Gamma measurements



COMPUCEA

Certified nuclear reference materials

Development and provision of uranium and plutonium reference materials for method validation, calibration and quality control in the analysis of nuclear material and environmental samples.



# Nuclear Security and Safeguards at JRC

## 3D Laser Verification System (3DLVS)

Design Information Verification (DIV) and change monitoring

Used by IAEA

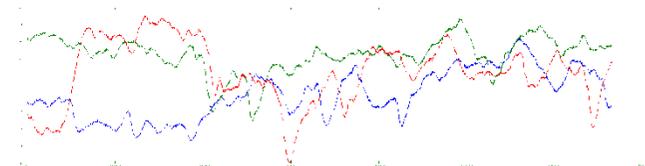


## Laser Surface Mapping for Containment Verification (LMCV)

Identification/integrity verification of dry storage casks (DSC)

Used by IAEA

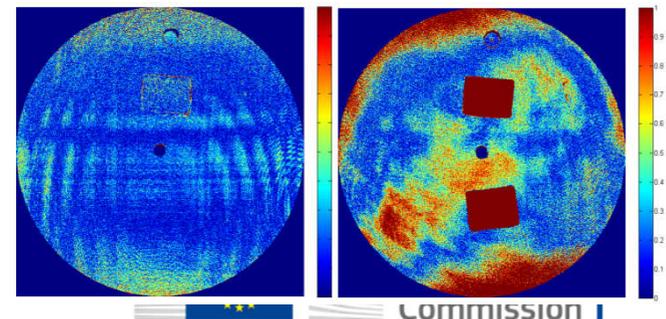
Signatures of three different welds



## Laser Item Identification System (L2IS)

Identification/authentication of UF<sub>6</sub> cylinders for enrichment

Used by IAEA



# Nuclear Security and Safeguards at JRC

Used by IAEA

Ultrasonic bolt seals for underwater storage (JRC Candu Sealing System)

Pakistan, Canada, France, Romania



Used by IAEA

Ultrasonic Optical Sealing Bolts (UOSB) for dry storage

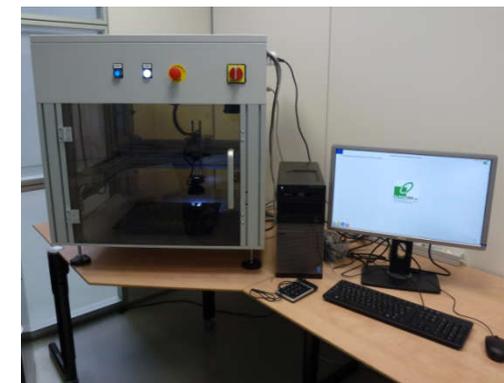
Lithuania, others (brand new)



Low cost electronic seal



Automated image acquisition system for the verifying copper brass seal images



# Nuclear safeguards and non-proliferation

## On-site Labs at reprocessing plants

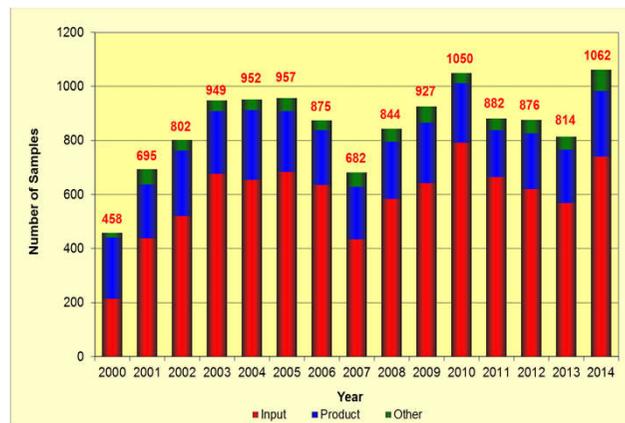
- Scientific support to Euratom safeguards implementation
- Equipment developments
- Sample analysis



OSL Sellafield (UK)



OSL La Hague (F)



## Undeclared Nuclear Activities

Analysis of small aerosol particles in dust from environmental/swipe samples can provide information on the nuclear materials handled in the facility

- LG-SIMS lab under ISO17025
- Continuous R&D effort to improve analytical capabilities

Large Geometry SIMS



# Training for Nuclear Safeguards Inspectors

<b>Active neutron interrogation (JRC)</b>	<b>course</b>	<a href="#">Link</a>
<b>Nucleonica - Nuclear data training (JRC)</b>	<b>course</b>	<a href="#">Link</a>
<b>Uranium Enrichment Determination by gamma-ray spectrometry (JRC)</b>	<b>course</b>	<a href="#">Link</a>
<b>Advanced hands-on RADAR/CRISP/XSEAT (JRC)</b>	<b>course</b>	<a href="#">Link</a>
<b>Mass/Volume Methodology and Tank calibration course (JRC)</b>	<b>course</b>	<a href="#">Link</a>
<b>Data Analysis and Interpretation (JRC)</b>	<b>course</b>	
<b>3D Laser-based Design Information Verification (JRC)</b>	<b>course</b>	<a href="#">Link</a>
<b>Training course on JRC CANDU Sealing System (JCSS) (JRC)</b>	<b>course</b>	<a href="#">Link</a>
<b>Training on the JRC ultrasonic optical sealing bolt (UOSB) system (JRC)</b>	<b>course</b>	<a href="#">Link</a>
<b>New Tools for image reviews (Luxembourg/Vienna) (JRC)</b>	<b>course</b>	<a href="#">Link</a>
<b>IRTC SSAC Follow-up Course on Non-Destructive Analysis (NDA) of Nuclear Materials (JRC)</b>	<b>course</b>	
<b>Passive neutron assay (JRC)</b>	<b>course</b>	<a href="#">Link</a>
<b>Plutonium isotopic composition by gamma spectrometry (JRC)</b>	<b>course</b>	<a href="#">Link</a>

# Training for Nuclear Safeguards Inspectors

## U Enrichment Determination by Gamma-ray Spectrometry

### Prerequisites

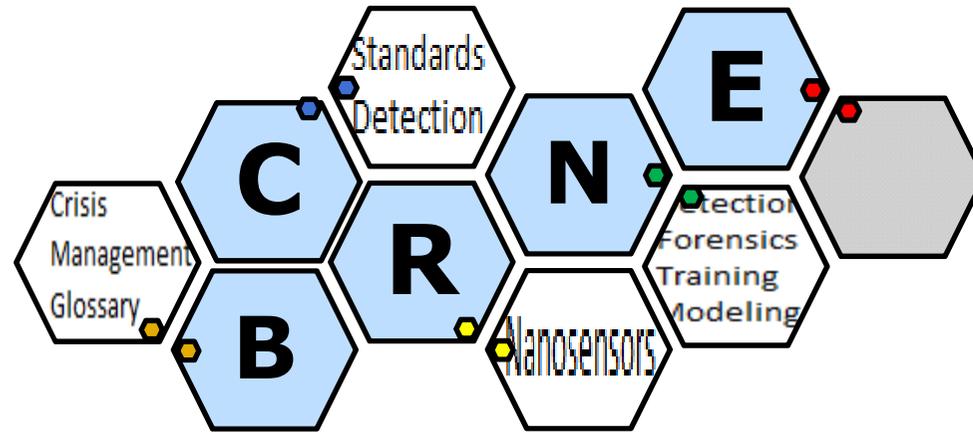
- Non Destructive Analysis Physics basic course

### Scope

- The course is focused on non-destructive gamma spectrometric techniques for the measurement of the U235 enrichment.
- The physics and the measurement are outlined and oriented towards the operational requirements.
- The complete enrichment measurement procedure including spectrum evaluation and error estimation is discussed.
- An in-depth review of the algorithms routinely used including conceptual explanations is introduced. Insights into the behaviour and capabilities of these algorithms are developed.
- Two thirds of the time is foreseen for practical exercises to make the course participant familiar with the electronic chain, enrichment measurement technique and troubleshooting.

# CBRN security Activities

**CBRN** - Chemical,  
Biological, Radiological,  
Nuclear



- Performance assessment of RN detection equipment. Commercial equipment testing
- Development of methods for detection of Special Nuclear Materials with a high potential for practical applications
- Identification of high confidence nuclear forensics signatures
- Urban Dispersion International Evaluation Exercise
- RN support to the EU CBRN Centres of Excellence Initiative

# ITRAP+10

## Illicit Trafficking Radiation Detection Assessment Programme

Performance tests of equipment used against illicit trafficking of nuclear material and radioactive sources



# ITRAP+10 – Phase I

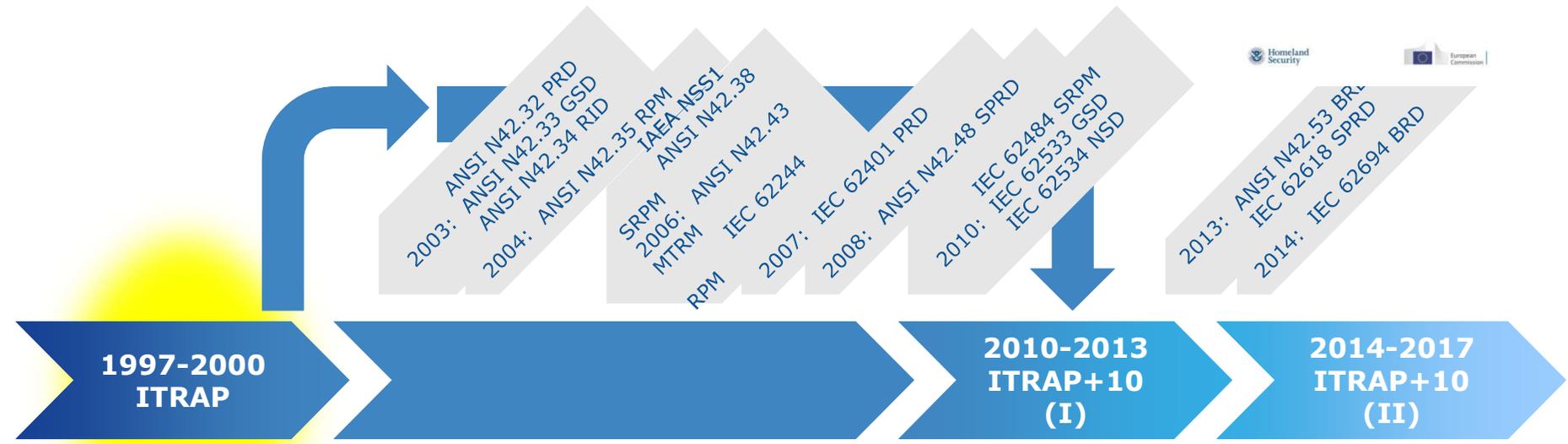


- Large-scale test of ±170 instruments
- Initiated by EU DG HOME (EU CBRN Action Plan 2009)
- Parallel programme by US DHS-DNDO & DOE
- Test against IEC & ANSI standards
- Vast amount of data: manufacturers; standards; policy makers/implementers



Illicit Trafficking Radiation Assessment Program (ITRAP+10)  
Test campaign summary report

January 25, 2016



<https://ec.europa.eu/jrc/en/publication/illicit-trafficking-radiation-assessment-program-itrap10-test-campaign-summary-report>



# ITRAP+10 – Phase II

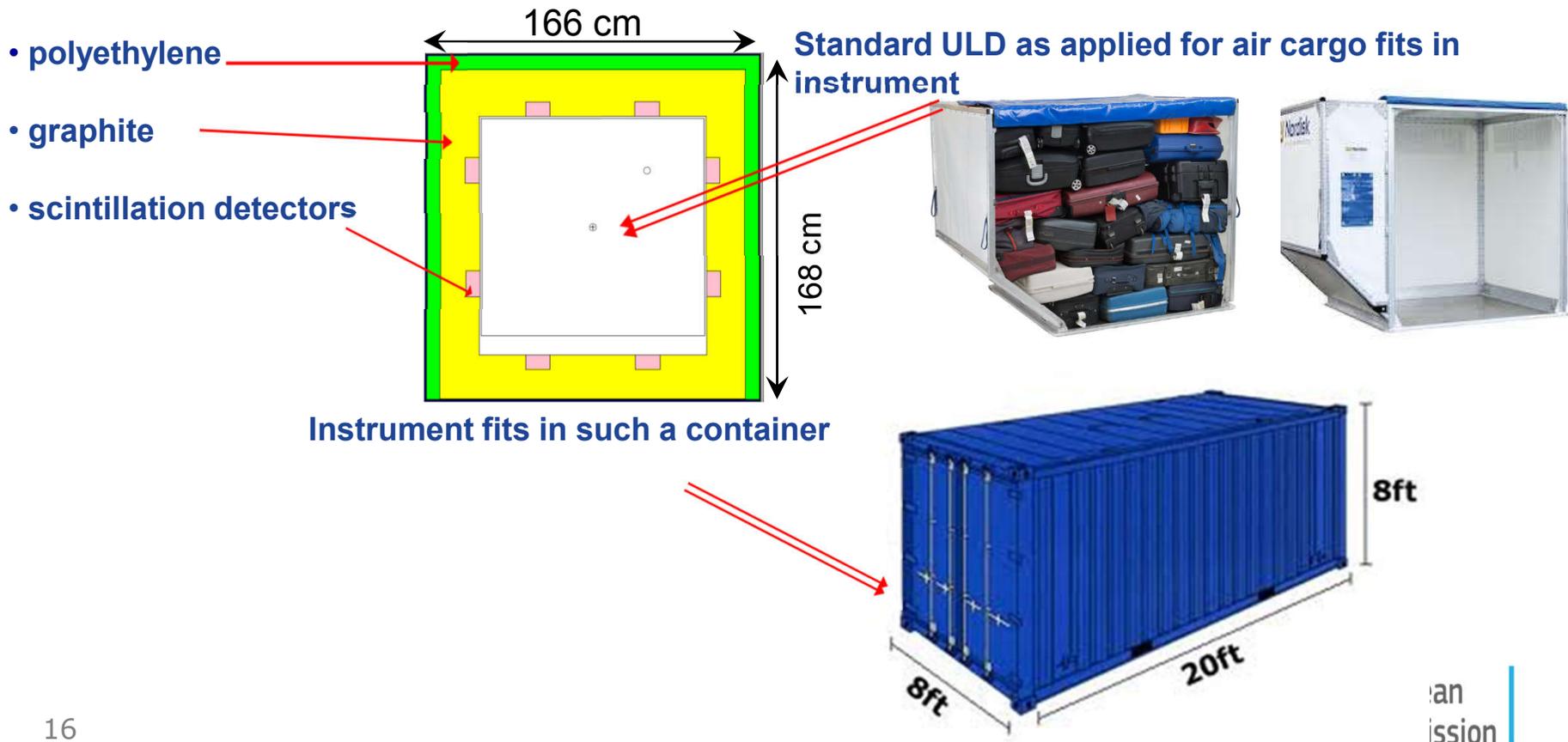
- Test vehicle mounted mobile detectors
- Prepare MS labs for EU certification: round robin (PRD, RID, SRPM)
- ITRAP+10 impartial test data used to **revise and develop** standards:
  - 11/2016-03/2020 IEC 62327 Ed.2 (RID) and IEC 62401 Ed.2 (PRD)
  - 06/2014-09/2017 IEC 62244 Ed.2 (RPM)
  - 03/2017-08/2020 IEC 63121 Ed.1 (vehicle-mounted mobile detectors)



# Detection of SNM in Shielded Containers by Pulsed Neutron Interrogation

## Scale-up of experimental results to industrial size (preliminary results)

- Assay of Unit Load Devices (ULDs) for air cargo
- Accommodate largest standard ULD: LD1 for Boeing 747-400: 234 x 153 x 163 cm, 4.90 m<sup>3</sup>



# Nuclear Forensics

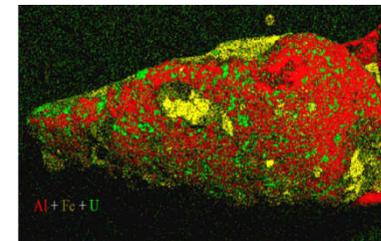
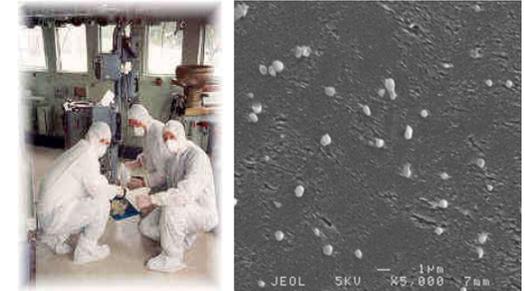
## Background:

JRC expertise in Safeguards (EURATOM Treaty) → Nuclear Forensics

- Origin of the nuclear material that has been diverted, stolen or lost

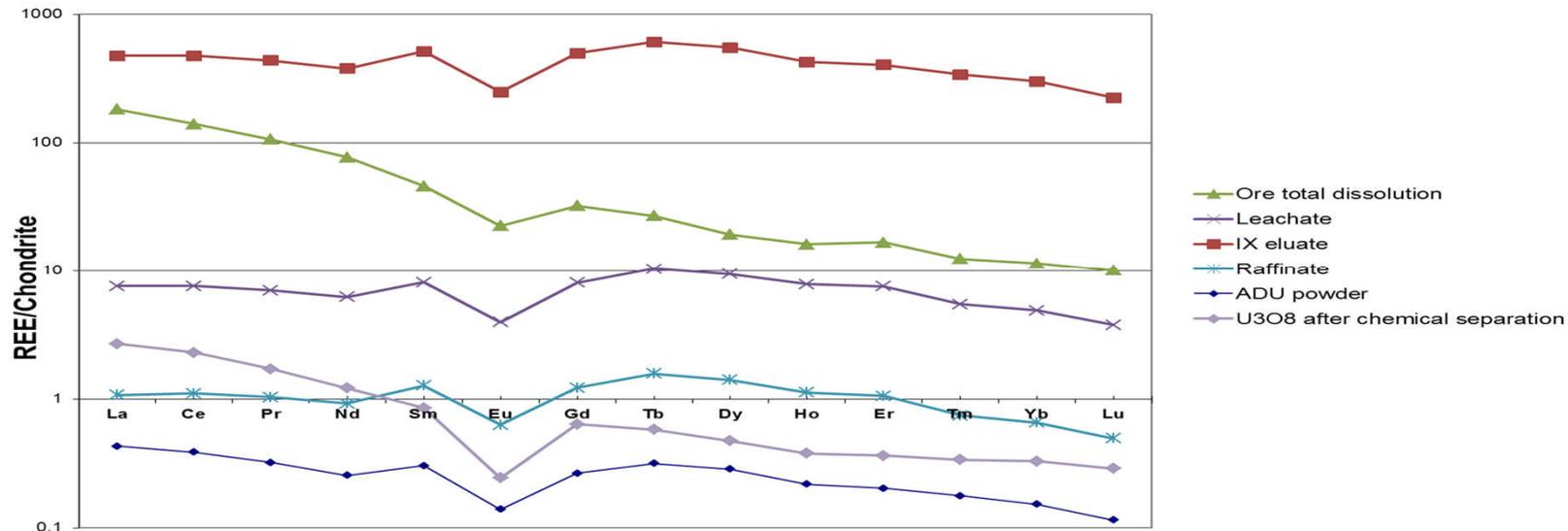
## Areas of Application

- **Illicit Trafficking of Nuclear Materials** (e.g. Uranium in scrap metal)
- **Non-Proliferation** (e.g. HEU particles)
- **Nuclear Safeguards** (e.g. consistency of chemical impurities with declared processes)
- Environmental Issues (e.g. analysis of radioactive particles found on the beaches near Doureay)



## Example: IAEA Coordinated Research Project: Propagation of Nuclear Forensics Signatures at the Front-End Fuel Cycle:

1. Investigation of earlier identified signatures propagation throughout various stages of uranium processing (e.g. UOC,  $UO_3$ ,  $UO_2$ ,  $UF_4$ )
2. Identification of new signatures in those materials

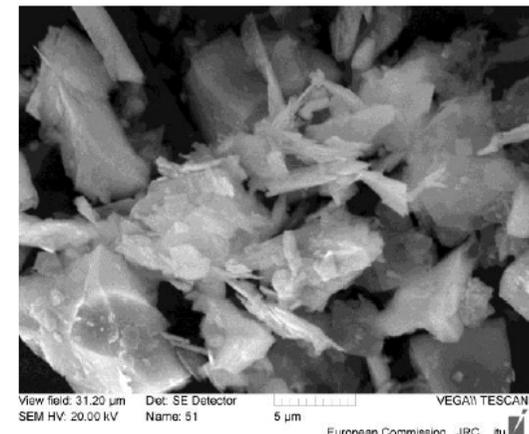


### 1. Stable isotope ratios:

- $^{204}, ^{206}, ^{207}, ^{208}Pb$
- $^{87}Sr/^{86}Sr$
- $^{143}Nd/^{144}Nd$
- $^{34}S/^{32}S$

### 2. Morphology

18



# Urban Dispersion International Evaluation Exercise (UDINEE)

**Project included in the EU CBRN Action Plan  
2013-2017**

- verify and evaluate the capacities of dispersion models to simulate realistic RDD in urban environments;
- assess the real capacity of these systems to respond to emergency
- under many aspects such as: timeliness of the prediction, accuracy of the prediction, limitations;
- support the use of local models for decision making and policy development;

## Activities 2014-2017



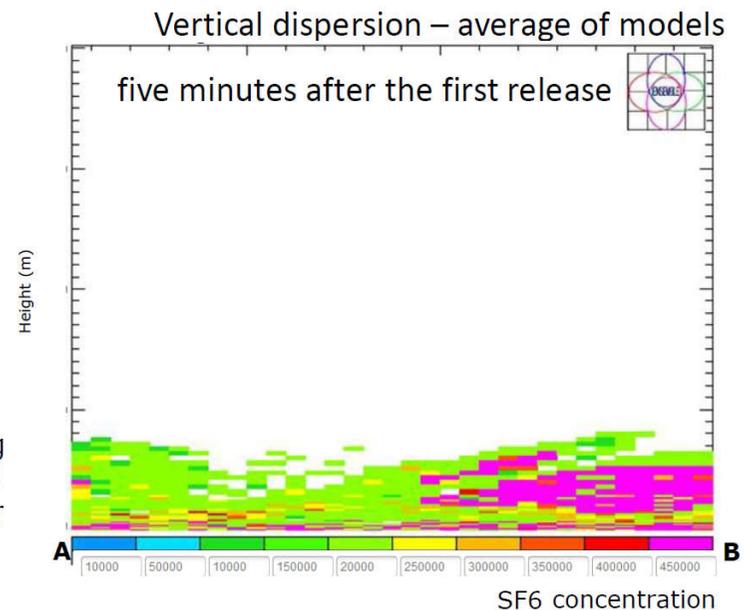
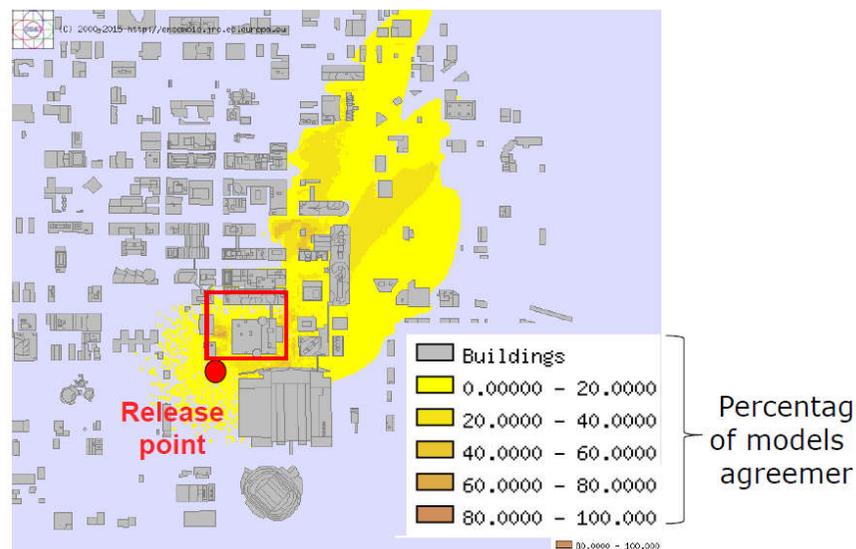
## 2<sup>nd</sup> Workshop 27-28 March 2017 @ the JRC, Ispra, Italy

**Participants:**  
Italy, Belgium, UK, Greece,  
Slovakia, Poland, USA

**Follow up actions of the workshop:**

- **Source term reconstruction**
- **Model uncertainties**
- **Explosion simulation capabilities**

Horizontal dispersion – Horizontal agreement between models;  
five minutes after the first release – 2m



# Strengthening Nuclear Security through continuous professional development and training



# European nuclear security training centre (EUSECTRA)

**Audience** - front line officers, their management, trainers and other experts in the field of illicit trafficking

## Scope

- To improve EU MS and partner countries capabilities to address the threats associated with illicit incidents involving nuclear or other radioactive materials by providing hands-on training using real nuclear material
- Training areas include: border detection, mobile detection, covert search, train-the-trainers, mobile response (i.e., MEST), reach-back, creation of national response plans, nuclear forensics, radiological crime scene management, nuclear security awareness and sustainability of a national nuclear security posture

More than **200 participants** in 2016

Hosted high level and specific events including NF methodology course, CNS, APEX, and recently NUFORSE





## The NUClear FORensics Simulation Exercise (NUFORSE) 2-5 May 2017, JRC Karlsruhe



- **Table top exercise**, intended to provide an opportunity for those responding to material found outside of regulatory control to test their ability to respond to simulated incidents, to identify the response and coordination issues that could arise during a variety of scenarios and to make decisions in response to those issues
- The exercise focuses on nuclear security and forensics in the **GUAM region**
- Sponsored by the Nuclear Smuggling Detection and Deterrence (NSDD) program of the United States and the European Commission Joint Research Centre (JRC)

### Some statistics:

- 2.5 days active simulation
- 300+ emails sent by the 4 teams (About 80% substantial)
- 160+ fictional documents created
- About 50% of the 4 prepared cases played
- 15 Participants



# Apex Europa High level scenario-based radiological and nuclear security exercise

The important issue of security of radioactive sources was very recently addressed by the EU:

The **APEX-Europa High Level EU Scenario-Based Exercise on Nuclear Security**, 23/11/2016, JRC Karlsruhe

The first exercise of this nature involving almost all EU member states (all MS responded positively, 26 MS present due to last minute constraints)



# Apex Europa High level scenario-based radiological and nuclear security exercise

Involving fictional states but in the context of the EU specific characteristics

Scenario included elements of radioactive source security:

- Physical protection
- Transport
- Detection
- Emergency preparedness
- Forensics



Scenario consists of two moments:

- radioactive source is stolen in one MS and taken to a second MS
- small quantity of nuclear materials originating from outside the EU is seized at Schengen border after being detected at the airport in a passenger's carry-on luggage.

# Apex Europa High level scenario-based radiological and nuclear security exercise

- 26 out of 28 EU MS took part to the exercise
- MS delegations included policy and technical level, dealing with various aspects of nuclear security (prevention, detection, response)

The exercise allowed identification of some **priority areas** for enhanced cooperation:

- training and exercises
- border technologies and reachback capabilities
- different levels of capabilities among EU MS, the existing and emerging challenges, and the possible added value of the EC in liaising between interested MS, can be further explored
- the network for sharing nuclear forensic competences
- analysis and benchmarking of environmental dispersion models
- further discussion on security of radioactive sources at EU and global level would be welcomed



The DG of the JRC, Vladimir Sucha, during the opening



Vice-President of the EC, Maroš Šefčovič, during the official dinner

# EU "External" Security Strategy

**Instrument contributing to Stability and Peace (IcSP): € 2.3 billion**

**IcSP - art. 5 (€ 478 million)**

**Global and trans-regional and emerging threats**

- Fighting Organised Crime (Human Beings, SALW, Drugs, Money Laundering, Cyber crime);
- Protecting Critical Infrastructures (Maritime, Aviation, Cyber Security);
- Countering Terrorism (Horn of Africa, Pakistan, Sahel...);
- Security threats emanating from Climate Change;
- **CBRN Risk Mitigation (regional Centres of Excellence, Export Control, Bio safety, Dual Use containment...)**



Funded by the European Union



CBRN  
**Centres  
of Excellence**  
An initiative of the European Union



# EU CBRN Centres of Excellence Initiative





Funded by the European Union

# Partner Countries



CBRN  
Centres  
of Excellence  
An Initiative of the European Union

**56 Partner Countries in 8 regions,**  
from African Atlantic Facade to South  
East Asia

**28 of the GICNT nations are  
Partner Countries in the CoE  
Network**



- |                            |                           |
|----------------------------|---------------------------|
| 1.  Afghanistan            | 15.  Montenegro           |
| 2.  Bosnia                 | 16.  Morocco              |
| 3.  Cambodia               | 17.  Philippines          |
| 4.  Cote d'Ivoire          | 18.  Saudi Arabia         |
| 5.  Albania                | 19.  Serbia               |
| 6.  Georgia                | 20.  Seychelles           |
| 7.  Algeria                | 21.  Singapore            |
| 8.  Iraq                   | 22.  Tajikistan           |
| 9.  Jordan                 | 23.  Thailand             |
| 10.  Kyrgyz Republic       | 24.  Ukraine              |
| 11.  Libya                 | 25.  United Arab Emirates |
| 12.  Republic of Macedonia | 26.  Uzbekistan           |
| 13.  Malaysia              | 27.  Vietnam              |
| 14.  Armenia               | 28.  Zambia               |





Funded by the European Union

# Needs Assessment (NAQ)



CBRN  
Centres  
of Excellence  
An initiative of the European Union

- 8 sections in the scope of CBRN risk mitigation
- Approx. 300 closed questions with possibility to include additional information
- Available in English, French, Arabic, Russian



## NEEDS ASSESSMENT Questionnaire

### Section 1. Legislation and Regulations

List of identified institutions:  
This list is non-exhaustive and will depend on the government of each country

- › Ministry of Foreign Affairs
- › Ministry of Defence
- › Ministry of Interior
- › Ministry of Justice
- › Ministry of Health
- › Ministry of Agriculture or Animal Care
- › Ministry of Industry
- › Ministry of Energy
- › Ministry of Economy
- › First Responders
- › Emergency Medical Services
- › Fire Brigade Services
- › Crisis Center
- › Police/Gendarmerie
- › Custom/Border Officers

Specific and more developed guidelines are available in an attached document.

PLEASE PROVIDE YOUR DATA:

Institution(s):

Name(s):

Job Function/Role:

E-mail:

Country:

Date:



### Section 1. Legislation and Regulations

Q1.1: Does your country have national legislation in place for Chemical substances with respect to:

	Yes	No	Don't know	Additional info/evidence
1.1.1) Licensing/national register of users?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
1.1.2) Transport of dangerous goods?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
1.1.3) Acquisition/sales of dangerous goods?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
1.1.4) Import/export control?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
1.1.5) Border control?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
1.1.6) Customs control?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
1.1.7) Material control?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
1.1.8) Facility protection?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
1.1.9) Crisis management?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
1.1.10) Civil protection/civil defence?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>

If yes, please provide the names/references of the laws/regulations related to Chemical substances



Q1.6: Do you have sufficient means to enforce compliance with national laws and regulations?

Yes	No	Don't know	Additional info/evidence
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>

Q1.7: Do you employ non-binding international guidelines/recommendations or other codes of good conduct?

Yes	No	Don't know	Additional info/evidence
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>





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# National Action Plans (NAPs)



CBRN Centres of Excellence  
An initiative of the European Union

1. Assessment of CBRN threats and risks in the PC
2. Current capacities to mitigate risks
3. List of obligations linked to international instruments
4. Current national institutional structure
5. Proposed steps to reinforce national CBRN capacity
6. Elaboration of concrete actions to fill in gaps

Table of practical information on proposed actions

Strategic objective (e.g., reduce chem accidents, enhance bio preparedness)	Existing resources/capabilities (e.g., experts, guidelines, equipment, etc.)	Needed resources/capabilities (e.g., experts, guidelines, equipment, etc.)	Proposed actions/activities to fulfill objectives (e.g., workshops, training courses, technical support, etc.)	Lead agency and other stakeholders involved (e.g., national agencies, other countries, etc.)	Budget estimate	Time frame (expected duration, start/end date)	Priority level (High, Medium, Low)	Notes (e.g., relevant CBRN scenario)
<b>Prevention</b>								
Objective 1			1. 2. ...					
Objective 2			1. 2. ...					
<b>Detection</b>								
Objective 1			1. 2. ...					
Objective 2			1. 2. ...					
<b>Preparedness and response</b>								
Objective 1			1. 2. ...					
Objective 2			1. 2. ...					
<b>General actions, including CBRN governance</b>								
Objective 1			1. 2. ...					
Objective 2			1. 2. ...					





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## Status of NAQs

- In 2016- 5 NAQ Workshops
- In total 25 PC completed
- In 2017- Plans for NAQs in 4 partner countries



NAQ with Afghanistan CBRN National Team  
Tashkent, Uzbekistan 28-29 April 2016 - 05 May 2016

## Status of NAPs

- In 2016- 13 NAP Workshops
- In 15 PC NAP completed
- In 13 PC NAP under development



NAQ with Kingdom of Saudi Arabia  
Brussels, Belgium - 8-9 August 2016 - 09 August 2016





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# CoE Projects



➤ **35 completed projects; 60 total**

➤ **Recent RN Projects**

<b>PROJECT 060</b>	Support to the Centre of Excellence of Eastern and Central Africa in Nuclear Security	Eastern and Central Africa
<b>PROJECT 058</b>	CBRN SEEE Equipment for forensics	South East and Eastern Europe
<b>PROJECT 057</b>	Strengthening crime scene forensics capabilities in investigating CBRN incidents in the South East and Eastern Europe region	South East and Eastern Europe
<b>PROJECT 055</b>	Strengthening cross-border capacity for control and detection of CBRN substances	African Atlantic Façade, North Africa and Sahel
<b>PROJECT 052</b>	Provision of specialised CBRN equipment for the training of first responders	South East and Eastern Europe
<b>PROJECT 050</b>	Provision of specialised equipment to enhance CBRN preparedness and response capabilities	African Atlantic Façade, Eastern and Central Africa





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# New activities

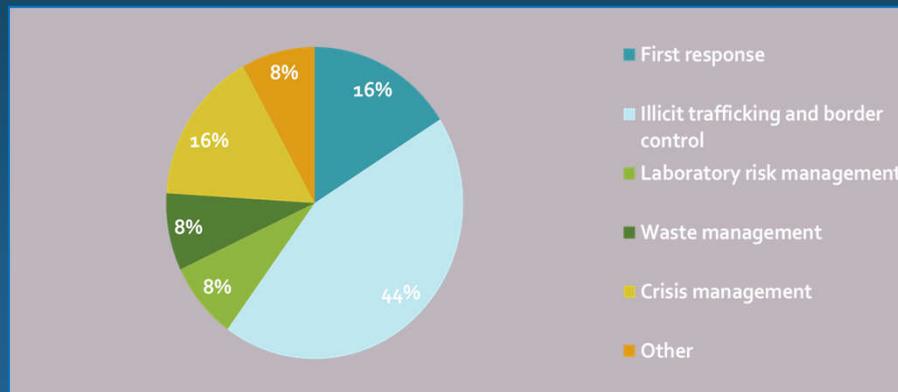


## ➤ Regional training centres

- SEEE, SEA: identification of existing training infrastructure – to create regional network of training institutions and centres
- AAF: under discussion – creation of physical regional training centre

## ➤ Development of **CoE CBRN training programme**

- Objective: to develop a shareware and harmonised CoE training programme



**Technical Areas of the CoE training programmes**



# **International Cooperation and Coordination**

- **IAEA, NEA/OECD**
- **GICNT, UNSC 1540 Committee, GP**
- **Border Monitoring Working Group, Nuclear Smuggling International Technical WG**
- **US-DoE, US-DoS, US-DNDO**
- **Japan JAEA, China, Canada, India (ongoing)...**
- **CBRN CoE partners**

## EU supports IAEA in the field of nuclear security and Technical cooperation

Sources of Funds	Budget (Euro)	Beneficiary Regions	Implementation period
EU - JA I	3,329,000	South-Eastern Europe, Central Asia, Caucasus	12/2005-04/2007
EU - JA II	3,914,000	South-Eastern Europe, Central Asia, Caucasus, North Africa, Middle East	02/2006-09/2008
EU - JA III	6,995,000	South-Eastern Europe, Central Asia, Caucasus, Middle East, Africa	02/2007-12/2008
EU - JA IV	7,703,000	South-Eastern Europe, Central Asia, Caucasus, Middle East, Africa, South-East Asia	10/2009-06/2012
EU- CD V	9,966,000	South-Eastern Europe, Central Asia, Caucasus, Middle East, Africa, South-East Asia, Gulf, South America, Caribbean & Central America	01/2011-12/2014
EU -CD VI	8,050,000	all IAEA Member States	01/2014-12/2016
EU - CD VII	8,645,374	all IAEA Member States	12/2016-12/2019
<b>Total</b>	<b>48,602,374</b>		

# **Improving reporting culture to the IAEA's Incident and Trafficking (ITDB)**

## through training and capacity building of the Point-of-Contacts in the European Union

- New project
- Duration 18 months (start was in Dec 2016)

Kick-off meeting at the IAEA in January 2017. Decided activities:

- JRC participation in the POC training in July 2017 at the IAEA (invited talk on the best practice document on reporting).
- Organising two workshops/trainings for the EU POCs in Karlsruhe (tentatively in Feb and Mar 2018) with the IAEA participation. Curriculum to be drafted.
- Sub-contract for the development/improvement of the ITDB web-based tools and data security (start in second half of 2017)

## **GICNT – Magic Maggiore Ispra, 28-30 March 2017**

- 75 participants
- 40+ countries
- 5 continents

Europe, Russia, USA, Canada, Africa, Latino America and Asia (India, Pakistan, Thailand, Tajikistan, Cambodia, Japan ... ) and the IAEA



### **Focus:**

- Role of Scientific and Technical Expert Support
- Opportunities and Challenges of Technical Reachback
- Building on Core Components of Technical Reachback
- Advanced Technologies

## **GICNT –Magic Maggiore Ispra, 28-30 March 2017**

- 75 participants
- 40+countries
- 5 continents



## **GICNT/Future joint activities**

**FALCON 2 exercise** (scheduled for spring 2019 in UAE):

- Capacity building  
(lead by JRC in framework of COE)
- Exercise preparation  
(lead by GICNT)



Nuclear Forensics Working Group

# EXPERT WITNESS TESTIMONY WORKSHOP

Karlsruhe, Germany | 26 June 2017



**to be hosted at JRC  
Karlsruhe (26 June 2017)**



# Cooperation with JAEA

**LEGAL BASIS:** Agreement between Japan Atomic Energy Agency and the European Atomic Energy Community represented by the European Commission in the field of **Nuclear Material Safeguards Research and Development.**

- ▶ JAERI, former JAEA, and EC/JRC signed original agreement in 1990
- ▶ Cooperation, information exchange, researcher exchange
- ▶ Agreement extended 4 times in 1996, 2000, 2005, 2011 and 2016

## COOPERATION ON:

- AS-1 Neutron Resonance Densitometry Method
- AS-2 Information Exchange on Nuclear Forensics
- AS-3 Nuclear Forensics Uranium Age determination
- AS-4 Information Exchange on work relevant for CLEAR lab
- AS-5 Nuclear Safeguards Training
- AS-6 Nuclear Security Training
- AS-7 Active neutron NDA



Uranium age dating samples

# Cooperation with JAEA

AS – 1 Feasibility study and development of Neutron Resonance Densitometry (NRD) for characterization of particle-like debris of melted fuel (2012 – 2015)

## AS– 7 Development of active neutron NDA techniques for Nuclear Nonproliferation, Security and Safety (2015 – 2018)

### Combine complementary active techniques

- Neutron Resonance Transmission Analysis (NRTA)
- Neutron Resonance Capture & Prompt Gamma Ray Analysis (NRCA &PGA)
- Delayed Gamma Spectroscopy (DGS)
- Differential Die Away (DDA)

### Objectives

- Study and improve **methodologies**
- **Application studies**
- Production of calibration and transfer **standards**
- Experimental **validation** at existing facilities
- Design parameters of a **compact facility**

#### Use of nuclear facilities at JRC & JAEA

- JRC Geel : GELINA, MONNET & TARGET
- JRC Ispra : PUNITA
- JAEA Tokai : TRP – PCDF
- JAEA Tokai : NUCEF