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# Measurements matter in nuclear safeguards & security

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The deliverable of any laboratory is a measurement result with stated uncertainty and traceability (ISO/IEC 17025: 2005). Measurement results, particularly in safeguards, have to be accurate, comparable and traceable to a stated reference, preferably to the SI. Results provided by operator-, safeguards- or network laboratories have to be in compliance with specific quality goals for nuclear material (ITV2010) and environmental sample analysis. Metrological quality control tools are prerequisites to build up confidence in measurement results that have to be translated into meaningful safeguards conclusions or to demonstrate conformity of findings with declared processes. The European Commission - Joint Research Centre (EC-JRC) has dedicated facilities, laboratories and projects to provide certified nuclear reference materials (CRM), to develop reference methods and to organise inter-laboratory comparisons (ILC) in compliance with ISO Guide 34, ISO17025 and ISO17043, including respective training.

## Metrological quality control tools & verification/accountancy

- ▶ CRMs are used for instrument calibration, method validation, quality control, and the assessment of method performance to provide accurate measurement results
- ▶ The IRMM-1027 series are large sized dried spikes (LSD) applied for the measurement of the uranium and plutonium content of spent fuel solutions at the EURATOM safeguards on-site laboratories (OSL, LSS)
- ▶ Conformity assessment of operators and safeguards laboratories measurement systems and capabilities in line with (international) quality goals (REIMEP - Measurement Evaluation Programme)
- ▶ NUSIMEP: measurements of environmental traces characteristic for the nuclear fuel cycle; indication on the origin and processing history of nuclear material under safeguards
- ▶ NUSIMEP-7 on Uranium isotope amount ratios in uranium particles confirmed the capability of the IAEA network laboratories
- ▶ Development of uranium reference particle standards under a new EC support task to the IAEA
- ▶ Provision of reliable nuclear data and decay data

## Metrology & Training

- ▶ Safeguards inspectors verify information from operators on amounts and activities of nuclear materials
- ▶ On demand from DG ENER, a course in metrology and basic gamma-ray spectrometry for safeguards inspectors was developed by the JRC
- ▶ Skills in the nuclear field for the next generation
- ▶ JRC substantially contributes to the ESARDA COURSE on Nuclear Safeguards and Non Proliferation, the GENTLE project being a pan-European effort in the field of education and training (E&T) on Nuclear Energy and the Belgian Nuclear higher Education Network (BNEN)

## Metrology & Fukushima

- ▶ Roadmap towards decommissioning of Fukushima Daiichi Nuclear Power Plants
- ▶ Establishment of nuclear material accountancy and control measures for the fuel debris
- ▶ Use of the unique neutron resonance structure of each nuclide as a fingerprint to identify and quantify debris samples
- ▶ Production of well characterised targets for Neutron Resonance Densitometry (NRD)
- ▶ Full NRD demonstration at GELINA in 2015
- ▶ Cooperation JRC - Japan Atomic Energy Agency (JAEA)

