Joint Research Centre (JRC)

Serving society, stimulating innovation, supporting legislation

Introduction to IRMM and JRC Enlargement & Integration action

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Joint Research Centre

The Joint Research Centre

7 institutes in 5 Member States - ≅ 2700 staff

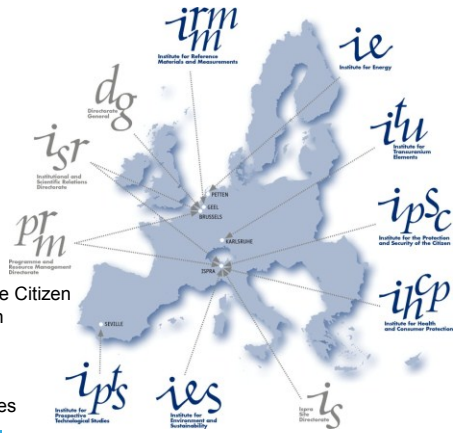
IRMM - *Geel Belgium*
- Institute for Reference Materials and Measurements

IET - *Petten The Netherlands*
- Institute for Energy and Transport

ITU - *Karlsruhe Germany*
- Institute for Transuranium Elements

IPSC - IHCP - IES - *Ispra Italy*
- Institute for the Protection and Security of the Citizen
- Institute for Health and Consumer Protection
- Institute for Environment and Sustainability

IPTS - *Sevilla Spain*
- Institute for Prospective Technological Studies



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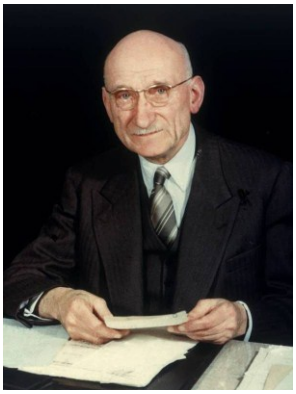
The JRC's roots



Rebuilding Europe after the second world war

9 May 1950: Schuman declaration

Proposed that the joint output of coal and steel in France and Germany be placed within the framework of a strong, supranational structure, the High Authority.

The Treaty establishing the European Coal and Steel Community (ECSC) was signed in Paris on 18 April 1951 and entered into force on 24 July 1952.

The JRC's roots

The Treaty of Rome (25 March 1957)

Founding the European Economic Community **and** the European Atomic Energy Community **(Euratom)**

→ Creation of the JRC
(legal basis in Treaty Article 8):

1) *…. the Commission shall establish a **Joint Nuclear Research Centre**. This Centre shall ensure that the **research programmes** and other tasks assigned to it by the Commission **are carried out**.*
2) *It shall also ensure that a uniform nuclear terminology and a standard system of measurements are established.*
3) *It shall set up a central bureau for nuclear measurements.*

The IRMM's roots

"The Joint Centre shall include:

… a bureau of standards specialising in nuclear measurements for isotope analysis and absolute measurements of radiation and neutron absorption, equipped with its own experimental reactor."

Euratom Treaty, Annex V, 1957

- Interaction of neutrons with matter and accurate measurement of radiation and nuclide decay properties are of great importance:
  - evaluating safety and risks of nuclear power plants
  - nuclear waste management
  - new concepts of nuclear power production.
  - nuclear medicine

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JRC-IRMM in figures:

- **300 staff**
- **4 scientific units**
- **200 peer-reviewed publications (2010)**

JRC-IRMM topics:

- **nuclear safety and security**
- **food safety**
- **environment**
- **health**
- **aviation security**

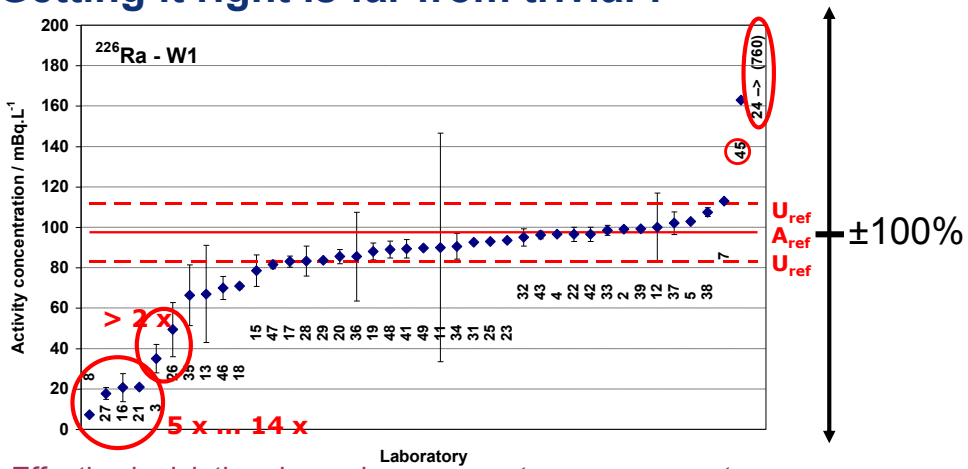
JRC-IRMM mission

"To promote a common and reliable European measurement system in support of EU policies."

Estimated that 40% of EU Directives (i.e.legislation) involve measurements.

Motto: Confidence in measurements

Getting it right is far from trivial !



- Effective legislation depends on accurate measurements
- IRMM provides the tools to measure properly and in a harmonised way

Broad impact of measurements

- Better measuring techniques
  → better labelling and monitoring by national authorities
  → improved **safety of food**
- More accurate and globally comparable medical measurements
  → improved quality of life and cost effectiveness of **healthcare**
- Better environmental measurements and monitoring
  → better quality of **air, water and soil**
- Comparable testing results → less barriers to **cross-border trade**
- Appropriate measurement standards at an early stage of emerging technologies and services → **enhanced innovation**
- Comparable nuclear measurements → improved safety of new and existing **nuclear power plants** and management of **nuclear waste**

Broad impact of measurements

- Better measuring techniques
  → better labelling and monitoring by national authorities
  → improved **safety of food** **radioactivity in food, CRM, reference centre**
- More accurate and globally comparable medical measurements
  → improved quality of life and cost effectiveness of **healthcare** **decay data for RNs in medicine**
- Better environmental measurements and monitoring
  → better quality of **air, water and soil** **ILCs for DG ENER**
- Comparable testing results → less barriers to **cross-border trade** **IPA Turkey**
- Appropriate measurement standards at an early stage of emerging technologies and services → **enhanced innovation** **decommissioning, security**
- Comparable nuclear measurements → improved safety of new and existing **nuclear power plants** and management of **nuclear waste** **decay data, CRM**
- Improved **nuclear security** **Irradiators for ITRAP+10 (AA DG HOME, US DHS)**

RADMET work

The kind of things we do …

… to build confidence in measurements and to ensure their comparability:

- Method development and validation
- Validated data
- Reference measurements
- Production of reference materials
- Inter-laboratory comparisons
- Training, knowledge transfer
- Scientific advice to policy makers

- *'Once measured, accepted everywhere.'*

Radionuclide metrology laboratory of IRMM

Primary standardisation laboratory of radioactivity

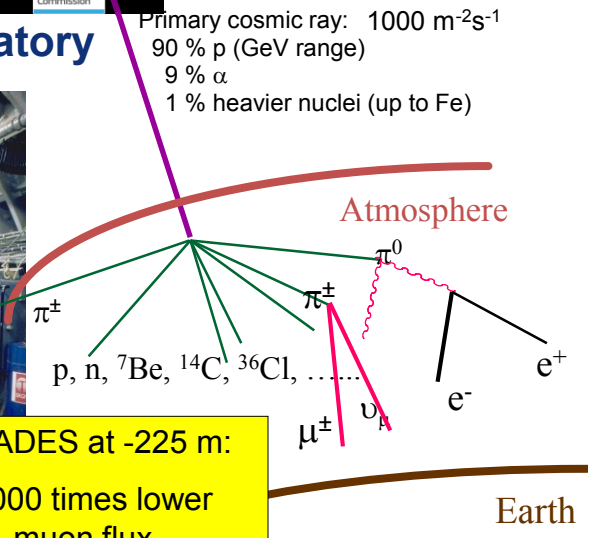
- $4\pi\ \beta$–γ coincidence counting systems
- $4\pi\gamma$ counting
- $4\pi\ \beta$–γ sum counting
- 4π e^-, β, γ, X-ray counting (unique CsI sandwich detector)
- defined solid angle alpha-particle counting
- liquid scintillation counting:
  - CIEMAT/NIST method
  - TDCR method

Radionuclide metrology laboratory of IRMM

Secondary standardisation laboratory

- ionisation chambers
- gamma-ray spectrometry
- radiochemistry laboratory
- in the underground low-level radioactivity laboratory HADES:
  gamma-ray spectrometry with detection limits of the order of mBq/kg

Underground laboratory



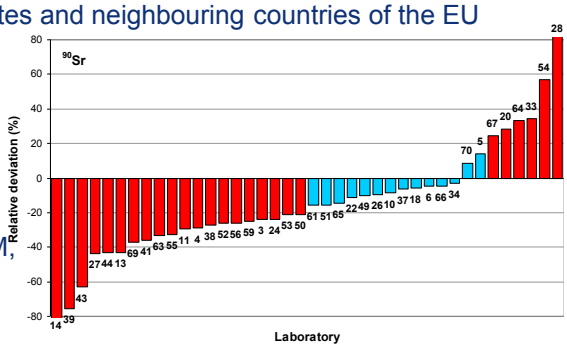
In HADES at -225 m:

10000 times lower muon flux

International comparisons for field laboratories

- Organizing comparisons for laboratories monitoring environmental radioactivity in the member states and neighbouring countries of the EU
- Completed so far:
  - ^{137}Cs in air filters (2007);
  - ^{137}Cs,^{40}K,^{90}Sr in milk powder (2008);
  - ^{226}Ra,^{228}Ra,^{234}U,^{238}U in mineral waters (2010);
  - radionuclides in soil,i.a.NORM, with 73 labs (2011)

  → see example of results:



- Evaluated at present: ^{137}Cs,^{40}K,^{90}Sr in bilberry powder; 88 labs, comparison report drafted
- Comparison being done at present: gross alpha/beta activity in water

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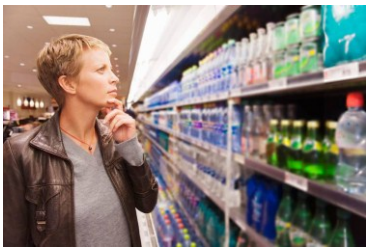
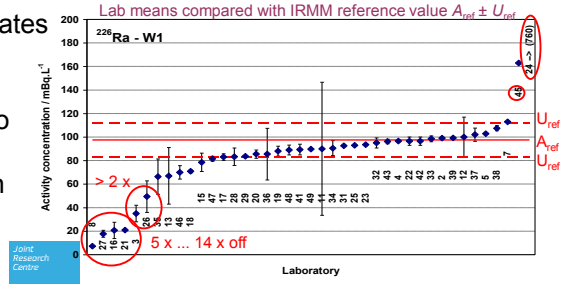
From recent ILC: radioactivity in mineral water



- In anticipation of new European requirements for monitoring radioactivity in drinking water, IRMM benchmarked labs determining low concentrations of natural radioactivity in mineral waters
- 14 % of all radium results are off by a factor of two or more
- The comparison clearly demonstrates that a number of monitoring labs need to **improve their analysis procedures** for radium in order to correctly identify drinking water sources for which remedial action is necessary



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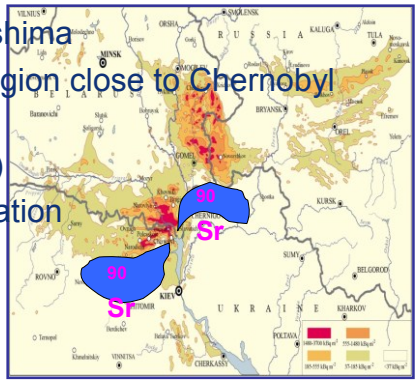
Reference material for radionuclides in dried bilberries

- Need for CRMs underlined by Fukushima
- Material provision: from Ukrainian region close to Chernobyl (contract with CMSET Kiev)
- Material processing (IRMM RM Unit)
- Characterisation of activity concentration (^{40}K,^{137}Cs, ^{90}Sr) via CCRI(II) supplementary comparison
- Nine laboratories (NMIs, Dis), large variety in efficiency calibration and determination methods → **robust property values of CRM**
- 2013: certification report accepted, CRM available, publication



Vinča Institute of Nuclear Sciences, Belgrade, 13-15 November 2012

Reference data in policy-relevant domains

- **Participation in EMRP (Art. 169) projects:**
  - **JRP MetroFission** (Metrology for new generation nuclear power plants): IRMM tasks: neutron metrology and decay data (^{238}U)
  - **JRP MetroRWM** (Metrology for radioactive waste management): IRMM tasks: development of reference materials for free release systems, improved half-lives of waste-relevant radionuclides
  - **JRP MetroMetal** (Ionizing radiation metrology for the metallurgical industry): IRMM tasks: characterisation of reference materials, MC simulations, comparisons
  - Member of consortium for proposed **JRP MetroNORM**

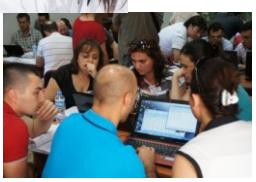
EU nuclear safety standards (BSS) require actions on NORM

Knowledge transfer & training

- Established training programmes via fellowships at IRMM (PhD and post-doc)
- IPA Turkey project “improving chemical and ionizing radiation metrology In Turkey”
  - 8 long-term trainees (½ to 1 year) in RADMET during past 3 years
  - many short-term training courses (1 day to 2 weeks)

Knowledge transfer & training

- Specific training courses and workshops for researchers from new member states and enlargement countries, e.g.
  - VERMI training courses in radionuclide metrology
  - Training in radiochemistry measurements for practitioners, organised at Jožef Stefan Institute since 2010
  - Workshop on gamma-ray spectrometry and applications (Nov. 2012)



JRC Enlargement & Integration action

- Activities (workshops, training courses and conferences)
- Eligible countries: Albania, Bosnia and Herzegovina, Croatia, Macedonia, Moldova, Montenegro, Serbia, Turkey, and some others
- Activities organised by RADMET:

Laboratory course on radiochemical separations for practitioners	**W/IRMM/2011/02**	**April, June and October 2012**	**Ljubljana, Slovenia**
Applications of gamma-ray spectrometry to environmental samples	(*) 2012-IRMM-A-06	13-15 November 2012	Belgrade, Serbia
GAMMA-2 Prompt Fission Gamma-Ray Emission in Fission and Related Topics	2013-IRMM-A-03	September 2013, 4 days	Novi Sad, Serbia
19th International Conference on Radionuclide Metrology and its Applications (ICRM 2013)	2013-IRMM-A-04	17-20 June 2013, 4 days	Antwerp, Belgium