

# METROLOGY IN CHEMISTRY AT DI MIRS/IJS/O-2

**Milena Horvat**

**Department of Environmental Sciences, IJS/O-2  
Jožef Stefan Institute, Ljubljana, Slovenia**

EURAMET DI workshop, Kongens  
Lyngby, 18.-19. February, 2016



## **Jožef Stefan Institute - JSI**

1949 – Institute of Physics  
1959 – Jožef Stefan Nuclear Institute  
1969 – Jožef Stefan Institute

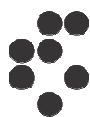


**Jožef Stefan 1835 – 1893**

The Jožef Stefan Institute is named after the distinguished 19th century physicist Jožef Stefan, most famous for his work on the Stefan-Boltzmann law of black-body radiation

The Mission of the Jožef Stefan Institute:

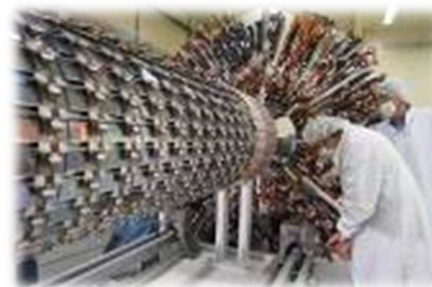
**Creation, spread and transfer of knowledge in the fields of natural, life and engineering sciences to the benefit of the society**



Jožef Stefan Institute, Ljubljana, Slovenia  
[www.ijs.si](http://www.ijs.si)

**Human resources:**

- 500 researchers
- 250 support staff and administration
- 150 PhD students



**CHEMISTRY, BIOCHEMISTRY,  
NEW MATERIALS**

K1 Inorganic Chemistry and Technology  
K3 Physical and Organic Chemistry  
K5 Electronic Ceramics  
K6 Engineering Ceramics  
K7 Nanostructured Materials  
K8 Synthesis of Materials  
K9 Advanced Materials  
B1 –B3 Biochemistry

**PHYSICS AND NUCLEAR  
TECHNOLOGY**

F1 Theoretical Physics  
F2 Low and Medium Energy Physics  
F3 Thin Films and Surfaces  
F4 Surface Engineering and Optoelectronics  
F5 Solid State Physics  
F7 Complex Matter  
F8 Reactor Physics  
F9 Experimental Particle Physics  
R4 Nuclear Engineering

**ENVIRONMENTAL SCIENCE**

O2 Environmental Sciences

**ELECTRONICS AND  
INFORMATION TECHNOLOGIES**

E1 Automation, Biocybernetics and Robotics  
E2 Systems and Control  
E3 Artificial Intelligence  
E5 Open Computer Systems and Networks  
E6 Communication Systems  
E7 Computer Systems  
E8 Knowledge Technologies  
E9 Intelligent Systems



Jožef Stefan Institute, Ljubljana, Slovenia

**Department of Environmental Sciences**

[www.environment.si](http://www.environment.si)

**25 researcher; 6 technical and administrative staff, 18 PhD students**

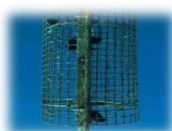
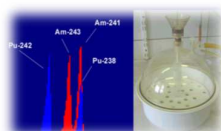
- Environmental analytical chemistry
- Biogeochemical cycling (*including isotope geochemistry*)
- Radiochemistry/radioecology
- Environment and health (*chemicals, food quality, human biomonitoring*)
- Waste treatment, clean technologies
- Modelling, risk assessments & analysis

**Funding:**

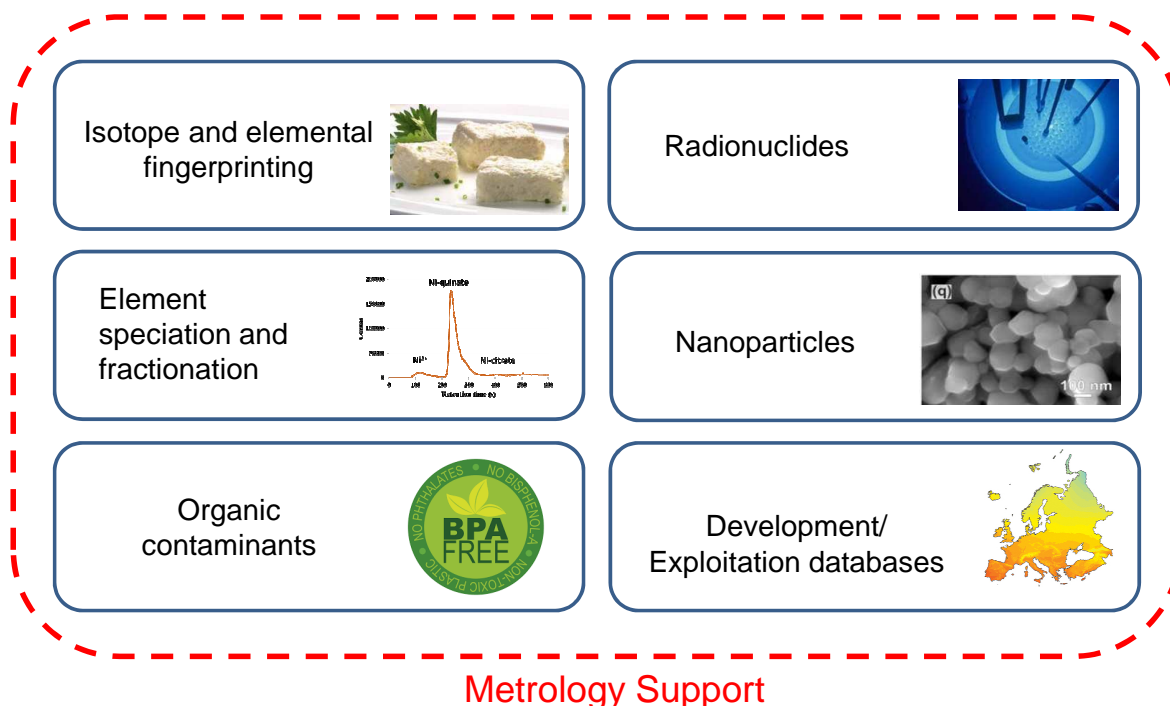
**50 % - national research funds**

**25% - EU funding**

**25 % - industrial projects**



## Our research focus...



**75 – 85 SCI articles/year; on average 35 citation/article**



## O2 - Infrastructure and equipment

- **Clean laboratories and laboratories for radiochemistry (3000m<sup>2</sup> laboratory space, 800 m<sup>2</sup> office space)**
- **Isotope ratio mass spectrometry**  
EA-IRMS, GC-C-IRMS, DI-IRMS, Py-IRMS, MC-ICP-MS
- **Mass spectrometry**  
UPLC-qTOF-MS/MS, ICP-MS, ICP-MS QQQ, LA-ICP-MS, LC-ICP-MS, GC-ICP-MS, SP-ICP-MS, GC(IT)MS, GC-MSD, LC-MS/MS, GC-MS/MS
- **Spectrophotometry**  
HG-AFS, CV-AFS
- **Nuclear methods**  
TRIGA MARK II nuclear reactor, alpha, beta and gamma counting, NAA
- **Access to equipment: JSI departments & infrastructure (microscopy, NMR center)**





In 2015 opening of the 1100 m<sup>2</sup> of new and 800 m<sup>2</sup> of renewed laboratory space with new equipment (6.7 mioEUR)



**ISO Fd Food**  
ERA Chair

**ERA Chair ISO-FOOD**  
for isotope techniques in  
food quality, safety and traceability

[www.isofood.eu](http://www.isofood.eu)



Institut  
"Jožef Stefan"  
Ljubljana, Slovenija

**Isofood Hg Training**



**ISO Fd Food**  
ERA Chair

**Quality assurance for Hg measurements in food and environmental samples**

**25<sup>th</sup>-27<sup>th</sup> November 2015**  
Jožef Stefan Institute  
Ljubljana, Slovenia

[www.isofood.eu](http://www.isofood.eu)

**ISO Fd Food**  
ERA Chair

**ISO-FOOD Summer School  
Radionuclides in food**

**June 6-10, 2016**  
Jožef Stefan Institute, Department of Environmental  
Sciences, Ljubljana, Slovenia

[www.isofood.eu](http://www.isofood.eu)

**Objectives**  
Determining the activity concentration of particular radionuclides in food and water is important to be able to study the cumulative radiation effects on human health, since the dose coefficients are always related to specific radionuclides. European legislation requires that member states obtain information about activity concentrations of radionuclides in food, feed and water. This summer school aims to provide participants with the knowledge and skills necessary to carry out these tasks.



**Topics**

1. Legislation
2. Analytical techniques for determination of natural and man-made radionuclides
3. Separation procedures
4. Interpretation of results
5. Statistics
6. Uncertainty estimation
7. Traceability and use of reference materials
8. Interlaboratory comparison



**Participant's profile**  
The summer school is designed for researchers (doctoral and postdoctoral level) and application scientist i.e. from the National Reference Laboratories and the Control Laboratories. A working knowledge of English is essential. Participants are requested to familiarise themselves with the ISO/IEC 17025 Standard.



**Experience based learning**  
Both theory and practice will be combined throughout the course to give participants the opportunity to put the concepts learned into practice. Participants are encouraged to bring their

**Deadline for application**  
Registration opens 22 February 2016  
Registration closes 6 May 2016

**Candidate selection**  
13 May 2016



# IJS/O-2 – organization of ILCs

- IJS PT-SL1 – Sewage sludge (major and trace elements)
- SOIL-1 – Preparation and characterization of soil reference material from mercury contaminated site for comparability studies
- PT-WB1, PT-WB2, PT-WB3 – Trace elements (Cd, Pb, Hg, As, Se, Cu, Zn) in lyophilized blood
- FF-3613, FF-3614, GG-0461 – Trace elements (Cd, Pb, Hg, As, Se, Cu, Zn) in fresh blood
- PT-SED2 – Determination of Trace Elements (As, Cd, Co, Cr, Cu, Mo, Ni, Hg, Pb, Zn) in Sediment



9

## Accreditation Certificate LP-090

2009-06-01



Reg. št. / Ref. No.: 811-44/06-50

Datum izdaje / Issued on: 1. junij 2009

Zamenjuje izdajo z dne / Replaces Annex dated: -

Vojavnost akreditacije je mogoče preveriti na spletni strani SA, [www.sa.gov.si](http://www.sa.gov.si).  
Information on current accreditation status is available at the SA website, [www.sa.gov.si](http://www.sa.gov.si).

PRILOGA K AKREDITACIJSKI LISTINI  
Annex to the accreditation certificate

LP-090

### 1 AKREDITIRANI ORGAN / Accredited body

Institut Jožef Stefan  
Jamova cesta 39, 1000 Ljubljana  
Odsek za znanosti o okolju: Skupina za radiokemijo, Skupina za biogeokemijo, Laboratorij za analizo kemijo okolja

### 2 STANDARD

SIST EN ISO/IEC 17025:2006

### 3 OBSEG AKREDITACIJE / Scope of accreditation

V okviru te akreditacijske listine Slovenska akreditacija priznava akreditiranemu organu usposobljenost za opravljanje naslednjih dejavnosti: / SA hereby acknowledges the accredited body as being competent for performing the following activities:

#### 3.1 Skrajšan opis obsega akreditacije / A short description of the scope

Področja preskušanja glede na vrsto preskušanja / Testing fields with reference to the type of test:

- kemija / chemistry
- radiokemija, sevanje / radiochemistry, radiation

## Methods:

1. Determination of **strontium** by beta counting
2. Determination of **tritium activity** by liquid scintillation counting
3. Determination of **<sup>14</sup>C** in alkaline solution
4. Determining of **elemental composition** of environmental samples using  $k_0$ -INAA
5. Determination of **total mercury** in water samples
6. Water quality – Application of inductivity coupled plasma mass spectrometry (ICP-MS) Part 2: Determination of **62 elements**
7. Water quality – Determination of **organotin compounds** – Gas chromatographic method ICP-MS detection

# Accreditation Certificate LP-090

Since 2012



Reg. št. / Ref. No.: 811-44/06-50  
Datum izdaje / Issued on: 1. junij 2009  
Zamenjuje izdajo z dne / Replaces Annex dated: -  
Veljavnost akreditacije je mogoče preveriti na spletni strani SA, www.sa.gov.si.  
Information on current accreditation status is available at the SA website, www.sa.gov.si.

PRILOGA K AKREDITACIJSKI LISTINI  
Annex to the accreditation certificate

LP-090

## 1 AKREDITIRANI ORGAN / Accredited body

Institut Jožef Stefan  
Jamova cesta 39, 1000 Ljubljana  
Odsek za znanosti o okolju: Skupina za biogeokemijo, Laboratorij za  
analizno kemijo okolja

## 2 STANDARD

SIST EN ISO/IEC 17025:2005

## 3 OBSEG AKREDITACIJE / Scope of accreditation

V okviru te akreditacijske listine Slovenska akreditacija priznava akreditiranemu organu  
usposobljenost za opravljanje naslednjih dejavnosti: / SA hereby acknowledges the accredited body  
as being competent for performing the following activities:

### 3.1 Skrajšan opis obsega akreditacije / A short description of the scope

Področja preskušanja glede na vrsto preskušanja / Testing fields with reference to the type of test:

- kemija / chemistry
- radiokemija, sevanje / radiochemistry, radiation

0605-23 • Izdaja 5

Stran 1 od 6

## Methods:

1. Determination of **strontium** by beta counting
2. Determination of **tritium activity** by liquid scintillation counting
3. Determination of **<sup>14</sup>C** in alkaline solution
4. Determining of **elemental composition** of environmental samples using  $k_0$ -INAA

11



# Accreditation Certificate LP-090

Scope of the LP-090 dated 2014-06-18:

## • Chemistry

- Determination of 31 elements (Ag, As, Au, Br, Ca, Ce, Co, Cr, Cs, Eu, Fe, Hf, Hg, K, La, Mo, Na, Nd, Rb, Sb, Sc, Se, Sm, Sr, Ta, Tb, Th, U, Yb, Zn and Zr) in soil, sediments, ores, sewage sludge, **biological samples, foodstuffs and fuels** by  $k_0$ -INAA

## • Radiochemistry

- Determination of **strontium** in samples from the environment (soil, sediment, water, aerosol filter), foodstuffs, milk, feedstuffs and residue by beta counting
- Determination of **tritium** activity by liquid scintillation counting (water, urine)
- Determination of **<sup>14</sup>C** in alkaline solution (water, urine)

12




# Accreditation Certificate LP-090



## 2014-06-18 for $k_0$ -INAA

Tabela / Table 2



**SLOVENSKA  
AKREDITACIJA**

Priloga k akreditacijski listini  
Annex to the Accreditation Certificate  
LP-090  
Datum izdaje / Issued on: 18. junij 2014  
Zamenjava izdaja z dne / Replaces Annex dated: 21. februar 2013  
Veljavnost akreditacije je mogoče preveriti na  
Informations on current accreditation status is available at:  
www.slo-akreditacija.si

3.2.2 Odslek za oznako o skupini, Skupina za radiokemijo, Birinje 40, 1231 Podgorica

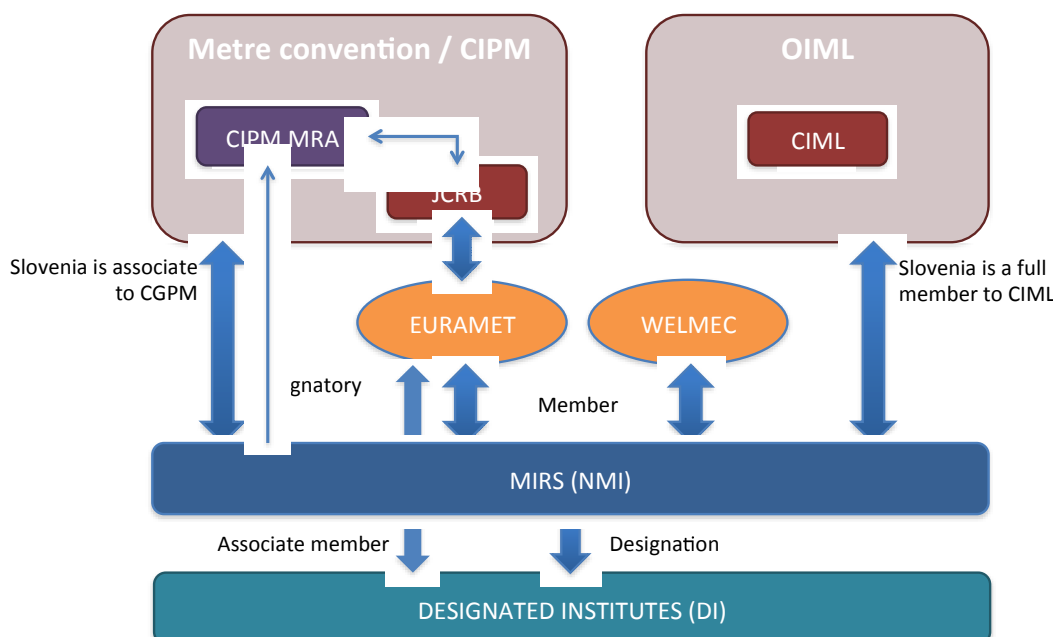
Tabela / Table 2

Tip obsega: fiksni / Type of scope: fixed	
Metla preskušanja v laboratoriju / Site: in the laboratory	
Področja preskušanja glede na vrsto preskušanja: kemija / Testing fields with reference to the type of test: chemistry	
Področja preskušanja glede na vrsto preskušanja: okolje in vzorci iz okolja; živila; kmetijski proizvodi (krmna); biološki vzorci /	
th reference to the type of test item: environment and samples from the environment; foodstuffs; agricultural	
ers); biological samples	
Področja (Products), Biological samples	
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products
Območje preskušanja ali nestrandardne preskusne metode in morebitne navezave na druge standarde ali metode	Materiali; proizvodi Materials; products

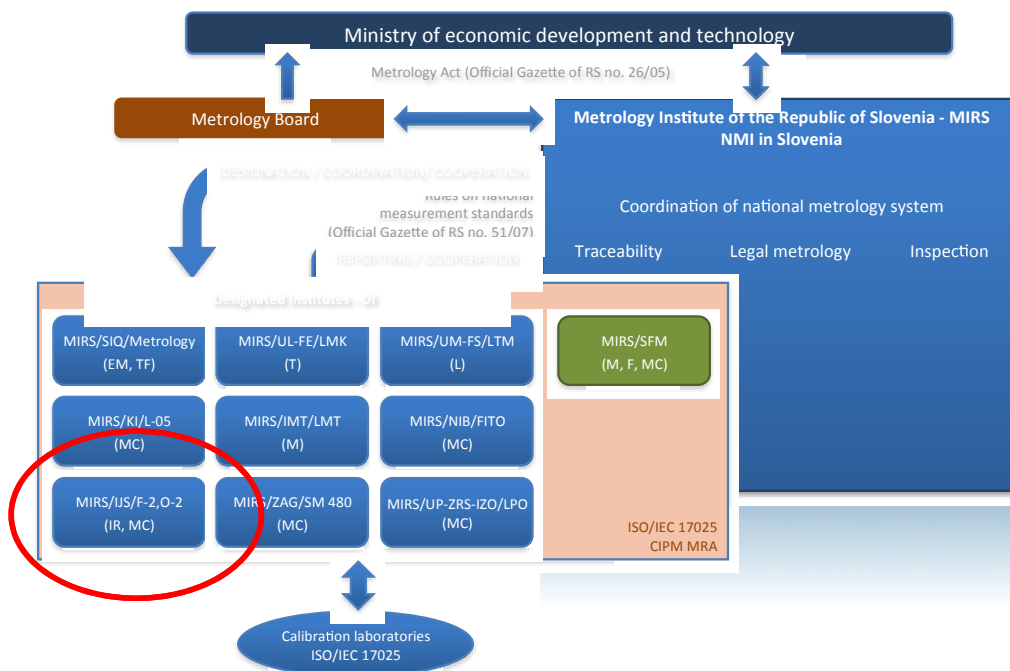
13

## NMS – Traceability International cooperation

REPUBLIC OF SLOVENIA  
MINISTRY OF ECONOMIC DEVELOPMENT AND TECHNOLOGY  
METROLOGY INSTITUTE OF THE REPUBLIC OF SLOVENIA



## NMS – Traceability National hierarchy



## MIRS/IJS/O-2

- **Designated as DI in 2010**, amount of substance (mass fraction of elements): sediments, soils, ores, and particulates !!

**No CMCs in KCDB until 2015!!**

**Why?**

### LIST OF AMOUNT OF SUBSTANCE CATEGORIES

April 2009

<b>1. High purity chemicals</b> 1.1 Inorganic compounds 1.2 Organic compounds 1.3 Metals 1.4 Isotopics 1.5 Other	<b>10. Biological fluids and materials</b> 10.1 Blood serum 10.2 Renal fluids 10.3 Hair 10.4 Tissues 10.5 Bone 10.6 Botanical materials 10.7 Other
<b>2. Inorganic solutions</b> 2.1 Elemental 2.2 Anionic 2.3 Other	<b>11. Food</b> 11.1 Nutritional constituents 11.2 Contaminants 11.3 GMOs 11.4 Other
<b>3. Organic solutions</b> 3.1 PAHs 3.2 PCBs 3.3 Pesticides 3.4 Other	<b>12. Fuels</b> 12.1 Coal and coke 12.2 Petroleum products 12.3 Bio-mass 12.4 Other
<b>4. Gases</b> 4.1 High purity 4.2 Environmental 4.3 Fuel 4.4 Forensic 4.5 Medical 4.6 Other	<b>13. Sediments, soils, ores, and particulates</b> 13.1 Sediments 13.2 Soils 13.3 Ores 13.4 Particulates 13.5 Other
<b>5. Water</b> 5.1 Fresh water 5.2 Contaminated water 5.3 Sea water 5.4 Other	<b>14. Other materials</b> 14.1 Cements 14.2 Paints 14.3 Textiles 14.4 Glasses 14.5 Thin films 14.6 Coatings 14.7 Insulating materials 14.8 Rubber 14.9 Adhesives 14.10 Other
<b>6. pH</b>	<b>15. Surfaces, films, and engineered nanomaterials</b> 15.1 Inorganic 15.2 Organic 15.3 Biomaterials 15.4 Other
<b>7. Electrolytic conductivity</b>	
<b>8. Metal and metal alloys</b> 8.1 Ferrous metals 8.2 Non-ferrous metals 8.3 Precious metals 8.4 Other	
<b>9. Advanced materials</b> 9.1 Semiconductors 9.2 Superconductors 9.3 Polymers and plastics 9.4 Ceramics 9.5 Other	



## Participation in Inter-comparison studies at the highest level (until 2013/14)



Organizer	Material	Year	Analytes
IRMM	IMEP-14 Sediment	2000	Major and trace elements
	CCQM-K44 Sewage Sludge	2006	Major and trace elements
	IMEP-29 Feed of plant origin	2009	Total As, Cd, Pb, Hg and Sn; Extractable Cd and Pb
	IMEP-112	2011	Total and inorganic arsenic in wheat, vegetable food and algae
	IMEP-38	2013	Determination of total As, Cd, Pb and Hg in compound feed
BAM	CCQM-P34 Aluminum	2002	Fe, Cu, Mn, Cr and Zn
	CCQM-P 34.1 Aluminum	2003	Fe, Cu, Mn, Cr and Zn
	Yttrium Stabilized Zirconium Oxide	2013	Th, U and Hf
IAEA	CCQM-P104 Phosphogypsum	2008	As, Cd, Cr and Cu
	Determination of Trace Elements in IAEA-452 Biota Sample	2008	Trace elements and methylmercury
INCT	INCT-OBT-5 Oriental Basma Tobacco Leaves	2008	Inorganic trace elements
	INCT-PVTL-6 Polish Virginia Tobacco Leaves	2008	Inorganic trace elements
ISPRA	ISPRA RM021 Lagon Sediment	2010	As, Cd, Ni, Pb, Cu, Co and Mn
	ISPRA RM039 Lake Sediment	2013	As, Cd, Ni, Pb, Cu, and Co
NIM, China	CCQM-P128 & APMP.QM-P17	2011	Pb, As measurements in cosmetic (cream)
	CCQM-K106 & P128.1	2013	Pb, As and Hg measurements in cosmetic (cream)
GLHK	CCQM-K89 & P126	2011	Trace and essential elements in <i>Herba Ecliptae</i>
	APMP.QM-S5	2011	Essential and toxic elements in Seafood
CMQ, Chile	CCQM-K30.1 & CCQM-P12.2	2012	Pb in Wine & Pb, Fe, Cu and Cd in Wine
NMIJ	CCQM-K08 & CCQM-P147	2013	Determination of arsenic species, total As and Cd in brown rice flour

17

## MIRS/IJS/O-2

- Since 1968 involved on over 40 certification of matrix reference materials (NIST, IRMM; NIES, IAEA,...)
- Involved in homogeneity testing, characterization and feasibility studies for production of IRMM, IAEA, ISPRA, BAM and INCT reference materials for mass fractions of elements (31 elements) of various origins:
  - Characterization of **18 different RMs during last 4 years** – e. g. ERM®-EF411 (hard coal), ERM®-EF412 (brown coal) and ERM®-EF413 (furnace coke), ISPRA RM021 (Lagoon Sediment)), etc...
- Participation in national and international projects (also in EMRP ENV02 and EMRP ENV08, ENV052 MeTra)

# Co-organization of the CCQM KC



**Key Comparison CCQM-K127  
and Pilot Study CCQM-P162**  
(Toxic and trace elements in soil)  
**Contaminant and other elements in soil**

Coordinated: Centro Nacional de Metrología - Mexico  
and Jožef Stefan Institute, Ljubljana (IJS) - Slovenia

Milena Horvat	M. Rocio Arvizu Torres
Radojko Jačimović	J. Velina Lara Manzano
Tea Zuliani, Polona Vreča	

Jožef Stefan Institute (JSI)      Centro Nacional de Metrología (CENAM)

Tsukuba, Japan  
October 14<sup>th</sup>, 2014

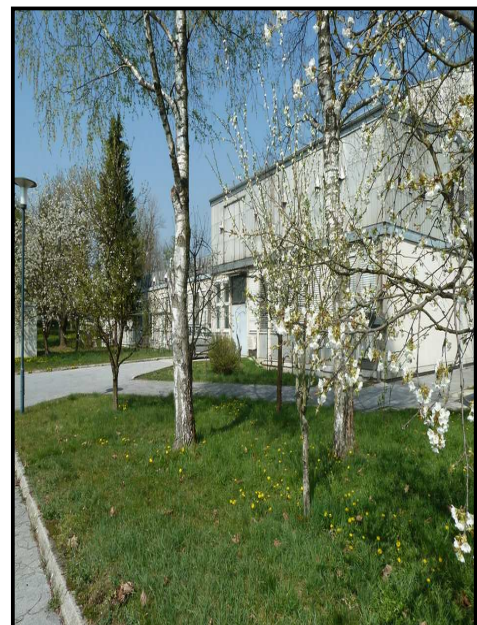
## MIRS/IJS/O-2

### **Problem** until September 2014:

- Limited scope of designation in the BIPM database (**only amount of substance in sediments, soils, ores, and particulates**)

### **Solution** after September 2014:

- Enlarge the scope of designation in the BIPM database to allow the expertise in metrology in chemistry (amount of substance), **mass fraction of chemical elements and their species in inorganic and organic matrices**





## CMC claims in 2014/15 supported by:

- *Herba ecliptae* - CCQM-K89: **As, Co, Zn, Cd, Pb**
- Seafood - APMP.QM-S5: **As, Zn, Fe**
- Cosmetic cream – CCQM-K106: **As, Hg**
- Brown rice flour: CCQM-K108: **As**

## Conclusions (1/2)

- **National metrology system and strategy & goals**
  - *the role of DIs should be clearly defined (national standards & traceability)*
  - *prerequisite for sustainable operation of DI and the national metrology systems*
  - *equality of NMIs and DIs in metrology strategic planning and its implementation*
- **The area of designation (metrology area)**
  - *MC – should be related to the amount of substance rather than matrix*

## Conclusions (2/2)

- **DI carry important knowledge and expertise and infrastructure**
  - cost-effective use of resources&expertise
- **Effective cooperation/dialog between NMI and DIs and among DIs is needed at the national level**
  - *Allowing for coordinated activities in EURAMET TC's and effective integration of DIs to the activities of EURAMET*