

Report to the EURAMET GA on TC-IR activities

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TC-IR Chair

1. General Aspects

This report summarizes the activities of the EURAMET Technical Committee for Ionizing Radiation for the period May 2017 to May 2018. The TC-IR currently has contact persons from 28 EURAMET member countries. IAEA and BIPM as liaison organization are observers. The TC-IR annual contact person meeting was organized by BEV in Vienna in the first week of February 2018 and was held over 2.5 days. It started with an one-day joint meeting with TC-MC to foster knowledge exchange between the TCs and to identify ideas for cooperation. The focus laid on topics which concern both TCs: the revised MRA and its consequences, EURAMET news and capacity building as well as the presentation of scientific topics on which members of both TCs work already together. On the other days the TC-IR annual meeting was held. Topics were the presentations of different activities and institute highlight reports, two scientific talks and the elections of new working group leaders and the re-election of the TC-Chair. MIRS/IJS in Ljubljana, Slovenia, will be the host of the next TC-IR CP annual meeting end of January 2019. A separate meeting for the preparation of project proposals for the EMPIR calls 2018 was organized and held mid of December 2018 in Berlin, directly after the EMPIR Health workshop of the TG Health.

2. Projects – comparisons

There are 11 ongoing EURAMET-TC-IR projects. Two projects were completed May 2017 through May 2018.

ID	Starting Date	Title	Coordinating institute	Collaboration type
1132	2013-01-17	Comparison of the ambient dose equivalent rate for photon radiation	PTB	Comparison
1285	2013-03-01	EURAMET RI(I)-K1.1 and K4.1 Comparison of air kerma and dose to water standards for Co-60 radiation beams for radiotherapy	METAS	Comparison
1383	2015-09-01	EURAMET.RI(II)-K2.I-131 Bilateral Comparison on I-131 standardisation	POLATOM	Comparison
1326	2014-09-01	Bilateral comparison of the air kerma standards for Cs-137 and Co-60 gamma-ray beams for radiation protection measurements	IST/ITN	Comparison
1362	2015-05-18	Comparison of air kerma measurements for Tungsten anode based mammographic X-ray beam qualities	IAEA	Comparison

1387	2016-02-01	EURAMET RI(I)-S14 Supplementary comparisons of the calibration of low energy x-ray air kerma standards	NRPA	Comparison
1388	2016-02-01	EURAMET.RI(I)-S.3.2 Supplementary comparisons of the calibration of protection level x-ray air kerma standards	NRPA	Comparison
1386	2016-02-01	EURAMET RI(I)-S15 Supplementary comparison of the calibration of medium energy x-ray air kerma standards	NRPA	Comparison
1398	2017-01-01	Comparison of personal dose equivalent at 0.07 mm and 3 mm depth, Hp(0.07) and Hp(3), for beta radiation	PTB	Comparison
1435	2017-11-27	Measurement of Ho-166 specific activity under nuclear decay data (status "proposed")	CMI	Comparison
1437	2018-04-10	The follow-up interlaboratory comparison of the radionuclide calibrators (status "proposed")	FTMC	Traceability

Projects completed May 2017 through May 2018

ID	Date	Title	Coordinating institute	Collaboration type
608	2001-10-01	EUROMET.RI(III)-S1 International Inter-comparison Test Program of instrument calibrations for neutron dosimetry	LNE-IRSN	Comparison
1389	2016-02-01	Bilateral comparison of air kerma and absorbed dose to water measurements for Co-60 and Cs-137	BEV	Comparison

3. CMCs of TC-IR

TC-IR has a working group for CMCs and comparisons that was led by Dirk Arnold, PTB, Germany, who stepped down from this position in early February. At the annual meeting this year Carole Fréchou, LNHb, France was elected as new group leader. The working group is split in the three teams *Radioactivity*, *Dosimetry* and *Neutrons* for the CMC reviews and for monitoring of comparisons. The membership of the review teams was updated at the last annual meeting. Detailed information is given in the annex.

One topic at the joint workshop of TC-MC and TC-IR was the revision of the CIPM-MRA. An overview of the document *Recommendations from the Working Group on the Implementation and Operation of the CIPM MRA (08/2016)* (available on the BIPM website) was given as introduction, following the TC-MC and TC-IR approaches were presented and discussed.

TC-IR has prepared the document *TC-IR Proposal for a revised scheme for the CMCs for the IR fields Radioactivity, Dosimetry and Neutrons* that was presented at the CCRI meetings at BIPM end of June. There, the proposal was discussed intensively and TC-IR was asked for developing it

further, especially regarding the question how this new approach can be implemented in the MRA system. Hence, TC-IR has prepared a proposal as redevelopment of the document *International Rules for completing the CMC Tables for Ionizing Radiation*. As consequence of the discussions CCRI(III), the international neutron metrology community, has converted all neutron CMCs according the proposed TC-IR approach and have therefore shown the benefit of this new approach. EURAMET TC-IR and CCRI are in closed contact, the approach shall be implemented in the CCRI strategy.

CMC review completed and published in the reporting period (2017-2018)

Subfield	JCRB file name	NMI/country	Claims/date
Radioactivity	—	—	—
Dosimetry	EURAMET.RI.30.2018 EURAMET.RI.29.2017	IAEA, Int. Org. MI/IRB/Croatia	1, (08/01/2018) 2, (14/09/2017)
Neutron	—	—	—

Overview of the ionizing radiation CMCs

	Country/lab	Dosimetry	date of publ.	review pending IRTC	review pending RMOs	Activity	date of publ.	review pending IRTC	review pending RMOs	Neutron	date of publ.	review pending IRTC	review pending RMOs	published total
1	Austria/BEV	50	31/01/2012			100	15/09/2003							150
2	Bulgaria/BIM NCM	7	14/02/2007		3	16	04/06/2013		8					23
3	Czech Republic/CM	7	11/03/2005	7		104	15/09/2003	104		12	19/05/2005	22		123
4	Finland/STUK	30	31/01/2012											30
5	France/LNE-LNHB	82	10-04-2013			205	16/09/2016			15	19/05/2005			302
6	Germany/PTB	90	07/10/2014			158	20/01/2010			20	19/05/2005	26		268
7	Greece/GAEC	35	12/10/2009											35
8	Hungary/MKEH	26	31/01/2012			74	04/06/2013							100
9	IAEA	27	09.01.2018											27
10	Italy/ENEA	76	11/03/2005	76		13	15/09/2003			9	19/05/2005			98
11	JRC					110	15/09/2003							110
12	Netherlands/VSL	21	31/01/2012			57	15/09/2003							78
13	Norway/NRPA	22	31/01/2012											22
14	Poland/GUM	4	31/01/2012			58	15/09/2003							62
15	Portugal/ITN	43	11/03/2005		38									43
16	Romania/IFIN					36	10/05/2013							36
17	Slovakia/SMU	30	15/05/2008			37	15/05/2008			9	15/05/2008			76
18	Spain/CIEMAT	52	15/05/2008		17	97	15/05/2008		109					149
19	Sweden/SSM	26	31/01/2012											26
20	Switzerland/METAS	3	31/01/2012			21	15/09/2003							24
21	United Kingdom/NPL	27	20/07/2015			116	15/09/2003	115		42	19/05/2005			185
22	Slovenia/MIRS-IJF-F2	9	30/11/2015			5	13.11.2015							14
23	Turkey/TAEK					3	26/08/2014							3
24	Denmark/Riso	9	20/04/2015											9
25	Croatia/IRB	2	16.09.2017											2
Total EURAMET		678		83		1210		219		107		22		1995
All IR CMCs		1023				2882				207				4112

The yellow colored claims are older than 5 years and have to be revised.

5. Activities of the TC-IR Working Groups

Working group *CMCs and Comparisons* (new leader: Carole Fréchou, LNHb, France)

This working group has CMC reviewing as its main task. The work is under the supervision of the CIPM MRA. The technical procedures, set up by the documents CIPM MRA D-04 and EURAMET Guide No. 3 *EURAMET Procedures and Review Criteria for CMCs*, should be followed. The group leader organizes the CMC reviewing, follows the results of comparison projects and coordinated the TC-IR activities in all aspects concerning CIPM MRA revision. For review of CMC claims three review teams for the fields Radioactivity, Dosimetry and Neutron were established. The review process is organized and/or done by the respective team leader.

Members of this working group are strongly involved in TC-IR activities and many discussions at different meetings regarding the proposed TC-IR approach as answer to the revised MRA. This approach is described in the document *TC-IR Proposal for a revised scheme for the CMCs for the IR fields Radioactivity, Dosimetry and Neutrons*, and to demonstrate the feasibility of its implementation in the MRA system the document *International Rules for completing the CMC Tables for Ionizing Radiation* was revised, see also section 3.

Working group *Ionizing Radiation and Radionuclides in Health* (new leader: Jacco de Pooter, VSL, The Netherlands)

This working group focuses on important topics concerning the application and use of ionizing radiation in the field of Health. At the last annual TC-IR meeting new activities and progress of research projects were presented and demonstrated the importance of the interdisciplinary work for this field.

The working group establishes connections with stakeholders, standardization bodies and research organizations and institutes to enhance the interdisciplinary work in metrology for Health as well as to be able to realize important topics in project proposals for EMPIR and other funding bodies. Members of the group were involved in the organization of the TC-IR brainstorming meeting for the preparation of the EMPIR calls 2018 (amongst others the Health Call) held mid of December 2018 at PTB Berlin.

Working group *Ionizing Radiation and Radionuclides in Environment, Energy and Industry* (new leader: Stefan Neumaier, PTB, Germany)

This working group has the focus on important topics concerning the application and use of ionizing radiation in the field Environment, Energy and Industry. An important task is to observe the developments in ionizing radiation to identify new metrological challenges for developing the TC-IR strategy and to initiate project proposals for EMPIR and other funding bodies. At the last annual TC-IR meeting an overview was given about new interesting topics and the progress of research projects in the fields Environment, Energy and Industry. Several members of this group are also very active in EURADOS to facilitate the connections with stakeholders and research organizations to enhance the interdisciplinary work in metrology for Environment. The group was involved in the discussion of the preparation of the scope of EMPIR Call Environment 2019.

Contact persons *Capacity Building* (contact person: Denis Glavič-Cindro, MIRS/IJS, Slovenia)

TC-IR currently has 28 registered contact persons, 16 from NMIs and 11 from DIs. 10 contact persons come from EU member states with an emerging metrological infrastructure in IR, 3 institutes do not have any CMC claims. To coordinate the TC-IR activities for capacity building and to stay in touch with the EURAMET officer for capacity building the position of a TC-IR contact person *Capacity Building* was established. Denis Glavič-Cindro has attended the 2nd Annual Meeting of the EURAMET BoD Working Group for Capacity Building which took place October 25-26, 2017 in Vilnius, Lithuania. She presented the needs identified in the discussions at TC-IR meetings which are:

- practical training courses:
 - needs for training visits or training courses on calibration of dosimeters or standard instruments
 - training how to prepare successful project proposal with good impact
 - training in organization and coordination of comparisons on the EURAMET and BIPM level
 - practical training in preparing documentation for submitting CMCs in KCDB

and

- training visits with, for example, researcher mobility grants on the TC-IR related projects.

6. Participation in EMRP/ EMPIR

I. New EMPIR JRPs with start in 2018:

MetroMMC,	17FUN02, Measurement of fundamental nuclear decay data using metallic magnetic calorimeters, Dirk Arnold (PTB, Germany), start June 2018
DOSEtrace,	17RPT01, Support for claiming CMCs in calibration of radiation protection dosimeters, Amra Šabeta (IMBiH, Bosnia and Herzegovina) start June 2018

II. EMPIR JRPs with start in 2017:

MetroRadon	16ENV10, Metrology for radon monitoring, Hannah Wiedner (BEV, Austria), start June 2017
MetroDecom II	16ENV09, In-situ Metrology for decommissioning nuclear facilities, Simon Jerome (NPL, UK), start June 2017
Preparedness	16ENV04, Metrology for mobile detection of ionising radiation following a nuclear or radiological incident, Stefan Neumaier (PTB, Germany), start August 2017
RTNORM	16NRM03, <i>kQ</i> factors in modern external beam radiotherapy applications to update IAEA TRS-398, Massimo Pinto (ENEA-INMRI), duration 2017-2019

III. Current EMPIR projects:

Digital Standard	14SIP07, Standard for digital data format for nuclear instrumentation, John Keightley (NPL, UK)
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PerfusImaging	15HLT05, Metrology for Multi-Modality Imaging of Impaired Tissue Perfusion, Tobias Schäffter (PTB, Germany)
MRTDosimetry	15HLT06, Dosimetry for molecular radiotherapy, Andrew Robinson (NPL, UK)
MRgRT	15HLT08, Metrology for MR guided RadioTherapy, Jacco de Pooter (VSL, The Netherlands)
MetroBeta	15SIB10, Radionuclide beta spectra metrology, Mark Kellett (LNE-LNHB, France)

IV. EMRP projects completed in 2017:

Absorb	14RPT04, Absorbed dose in water and air, Jean Marc Bordy (LNE-LNHB, France)
MetroDECOM	ENV54, Metrology for Decommissioning of Nuclear Plants, Jiri Šurán (CMI, Czech Republic)
MetroERM	ENV57, Metrology for Early Warning Networks, Stefan Neumaier, (PTB, Germany)

8. Meetings

TC-IR Brainstorming meeting for EMPIR Calls 2018:

A separate meeting with the focus on presentations and discussions of project proposals for the EMPIR calls 2018 (Health, SI Broader Scope, Support for Networks, Normative, Research Potential, Support for Impact) was organized and held mid of December 2018 in Berlin, directly after the Stakeholder Workshop of the TG Health for the EMPIR Call Health.

TC-IR Contact Person meeting in 2018 and joint workshop TC-MC and TC-IR:

The TC-IR Contact Person annual meeting was organized by BEV in Vienna in early February 2018. The meeting was held over 2.5 days and was split in two parts. At the first day a joint meeting with TC-MC was held to foster knowledge exchange between the TCs and to identify ideas for cooperation. The focus laid on topics which concern both TCs. The four sessions dealt with the revised MRA and its consequences, EURAMET news, capacity building and scientific topics on which members of both TCs work already together. On the other days the annual meeting with TC-IR topics was held. A couple of project activities, institute highlight reports and activities of the working groups were presented. Two scientific talks were given, one about the radionuclide data base DDEP and one about the new IAEA TRS 483 (Code of Practice on small field dosimetry for radiotherapy). Furthermore, elections of new working group leaders and the re-election of the TC-Chair were conducted.

MIRS/IJS in Ljubljana, Slovenia, will be the host of the next TC-IR CP annual meeting end of January 2019.

9. Issues

At the last TC-IR contact person meeting all pending TC-IR comparisons (see EURAMET-TC-IR website) were discussed. Two comparisons are older than 5 years (both started in 2013). But they are almost completed, the comparison reports are under review. All other running comparisons are on schedule.

10. Strategic Planning

Work will continue to strengthen cooperation with stakeholders, standard bodies and international organizations. Efforts will be focused on interdisciplinary work, to find and initiate interdisciplinary projects within the Grand Challenges. Especially the recent developments in the field Health require interdisciplinary metrological research what is also reflected in the proposed projects initiated by TC-IR members for the current EMPIR Health Call 2018.

Furthermore, comparisons shall be planned more strategic and in such a way that they cover a broad field to underpin a couple of CMCs. A mid- and long-term time table for comparisons and a list of volunteers acting as pilot lab will be developed.

11. Outlook for 2018/2019

1. Next TC-IR CP meeting:
 - January 29-31, 2019
 - hosted by MIRS/IJS in Ljubljana, Slovenia
 - 2.5 days meeting combined with a brainstorming meeting to discuss project proposals for the EMPIR calls 2019 Environmental, Energy, Normative and SIP.
2. CMC review is ongoing.
3. Comparisons: strategic planning shall be done, the scopes of the comparisons to be able to underpin with one comparison a couple of CMCs shall be identified and a time table for comparisons shall be prepared.
4. Capacity Building: supporting the requests of the contact persons by e.g. training visits in other institutes or training courses in organizing and performing comparisons. One possibility could be RPot - EMPIR projects dedicated for training in metrological IR-topics.
5. Possible collaborations with other European projects / programs in the field of ionizing radiation shall be identified and intensified.



ANNEX

Internal organization of TC-IR: chair, group leaders, group members (status: May 2018)

1. **TC-Chair:** Ulrike Ankerhold (PTB, Germany), re-elected: 2018 (2nd term)
2. **Management Board:**
Member: Ulrike Ankerhold (PTB, Germany), Carole Fréchou (LNHB, France), Jacco de Pooter (VSL, The Netherlands), Stefan Neumaier (PTB, Germany), Denis Glavič-Cindro (MIRS/IJS, Slovenia)
3. **Working group *CMCs and Comparisons***
Group leader: Carole Fréchou (LNHB, France), elected: 2018
Review team *Radioactivity*:
Team leader: Carole Fréchou (LNHB, France), nominated: 2018
Member: Franz Josef Maringer (BEV, Austria), László Szücs (BKMH, Hungary), Marco Capogni (ENEA, Italy), John Keightley (NPL, UK)
Review team *Dosimetry*:
Team leader: Linda Persson (SSM, Sweden), nominated: 2017
Member: Jean-Marc Bordy (LNE-LNHB, France), Jacco de Pooter (VSL, The Netherlands), Maja Vojnić Kortmiš (IRB, Croatia), João Cardoso (IST/ITN, Portugal), Argiro Boziari (EXHM/GSCL-EIM, Greece), Massimo Pinto (ENEA, Italy), Simon Duane (NPL, UK)
Review team *Neutrons*:
Team leader: Andreas Zimbal (PTB, Germany), nominated: 2017
Member: Neil Roberts (NPL, UK), Zdenek Vykydal (CMI, Czech Republic), Vincent Gressier (IRSN, France)
4. **Working group *Ionizing Radiation and Radionuclides in Health***
Group leader: Jacco de Pooter (VSL, The Netherlands), elected: 2018
Member: Jean-Marc Bordy (LNE-LNHB, France), Andrew Robinson (NPL, UK), Linda Persson (SSM, Sweden), Teemu Siiskonen (STUK, Finland), João Henrique Garcia Alves (IST/ITN, Portugal), Ulrike Ankerhold (PTB, Germany)
5. **Working group *Ionizing Radiation and Radionuclides in Environment, Energy and Industry***
Group leader: Stefan Neumaier (PTB, Germany), elected: 2018
Member: Franz Josef Maringer (BEV, Austria), Carole Fréchou (LNE-LNHB, France), Monika Mazanova (CMI, Czech Republic)
6. **Contact person *Capacity Building***
Contact person: Denis Glavič-Cindro (MIRS/IJS, Slovenia), elected: 2017