



### **Highlights from TC-IR**

Ulrike Ankerhold, PTB TC-IR chair



10<sup>th</sup> General Assembly, Plenary Session Oslo, Norway, 24 to 25 May 2016

## Highlights from TC-IR – Health



### **EMRP projects** (Health Call 2011; ended by April/May 2015):

- MetroMRT Metrology for Molecular Radiotherapy, coordinator Vere Smyth NPL, UK, 14 partners
- **BioQuart** *Biologically weighted quantities in radiotherapy*, coordinator Hans Rabus, PTB, Germany, 7 partners
- MRISafety Metrology for new generation safety standards and equipment in MRI, coordinator Bernd Ittermann, PTB, Germany, 3 partners
- MetrExtRT Metrology for radiotherapy using complex radiation fields, coordinator Jean-Marc Bordy, CEA, France, 10 partners
  - => Example: from research to benefit for end-user



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WP1: Dosimetry in terms of absorbed dose to water for <u>therapy with</u> <u>medium energy x-rays</u>: traceability and standardisation



#### **Treatment:**

Therapy of benign diseases, especially inflammatory and degenerative diseases

- arthrosis of the joints
- disease of the spine
- inflammation in joints and of tendons
- muscle diseases

The success of the therapy depends on the right dose (quality assured) !



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- WP1: Dosimetry in terms of absorbed dose to water for therapy with medium energy x-rays: traceability and standardisation
- Task 1: specification of measurement conditions for  $D_w$  realisation and dissemination
- Task 2: development of primary standards for  $D_w$  for medium energy X-rays



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WP1: Dosimetry in terms of absorbed dose to water for therapy with medium energy x-rays: traceability and standardisation

Task 2: development of primary standards for  $D_w$  for medium energy X-rays

NMI	Туре	Publication	Radiation qualities
VSL B.V.	water calorimeter	Phys. Med. Biol. <b>53</b> ( <b>2008</b> ) 3531–3542	CCRI 100 -250 kV
РТВ	water calorimeter	Phys. Med. Biol. <b>57</b> ( <b>2012</b> ) 6245–6268	PTB TH 70 – TH 280 (70 – 280 kV, 8 qualities)
LNE- LNHB	water calorimeter	Phys. Med. Biol. <b>58</b> ( <b>2013</b> ) 2769–2786	CCRI 180 and 250 kV RQR 6,9,10; ISO H300
ENEA	graphite calorimeter	Phys. Med. Biol. <b>61</b> ( <b>2016</b> ) 1738–1764	CCRI 180 and 250 kV

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#### First international comparison of primary absorbed dose to water standards in the medium-energy X-ray range

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- Via Anguillarese 301, 00123 S. M. di Galeria, Italy (c) VSL B.V., Dutch Metrology Institute (VSL)
- Thijsseweg 11, 2629 JA Delft
- (d) CEA, LIST, Laboratoire National Henri Becquerel (LNE-LNHB) F-91191 Gif-sur-Yvette

#### Abstract

This report presents the results of the first international comparison of primary measurement standards of absorbed dose to water for the medium-energy X-ray range. Three of the participants (VSL, PTB, LNE-LNHB) used their existing water calorimeter based standards and one participant (ENEA) recently developed a new standard based on a water-graphite



Figure 1: Degree of equivalence  $D_i$  and the corresponding expanded uncertainty  $U_i$ 

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- Task 4: BIPM: development of primary standards for  $D_w$  and organisation of new CCRI key comparison; currently bilateral comparison PTB BIPM





WP1: Dosimetry in terms of absorbed dose to water for therapy with medium energy x-rays: traceability and standardisation

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BIPM standard, under development, shall be used for future key comparison				
BIPM	FAC & convers. $K_{air}$ to $D_{w}$	CCRI(I)/15-12	CCRI 100 -250 kV	



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- Task 5: NWIP for IEC standard, working group: IEC SC 62C, WG 3



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Task 5: NWIP for IEC standard, working group: IEC SC 62C, WG 3 (convenor: L. Büermann, PTB)

- agreed: working title: Therapy radiation qualities

– German standard DIN 6809-4: "Clinical dosimetry – part 4: X-ray therapy with X-ray tube voltages between 10 kV and 300 kV"





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### EMPIR projects (Health Call 2015; start: June/July 2016)

- **PerfusImaging** *Metrology for Multi-Modality Imaging of Impaired Tissue Perfusion*, coordinator Tobias Schäffter (PTB, Germany)
- MRTDosimetry Dosimetry for molecular radiotherapy, coordinator Vere Smyth (NPL, UK)
- MRgRT Metrology for MR guided RadioTherapy, coordinator Jacco de Pooter (VSL, The Netherlands)
- > projects with interdisciplinary consortia

### What is typical for the recent developments in medical physics ?

- => combination of different techniques
  - > example: image guided radiotherapy (diagnosis + therapy)



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**MRgRT** *Metrology for MR guided RadioTherapy*, coordinator Jacco de Pooter (VSL, The Netherlands)



Vision: 4D adaption of the irradiation (tumour (3D) and its moving)



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**MRgRT** *Metrology for MR guided RadioTherapy*, coordinator Jacco de Pooter (VSL, The Netherlands)

MRgRT: combination of different techniques / fields (MR + IR)

Goal: development of the metrological tools (traceable dosimetry, guidelines,...) for the quality assurance of these hybrid fields; needed by medical physicists for the clinical routine

precondition to answer metrological questions for recent developments in medical physics: working interdisciplinary !!





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