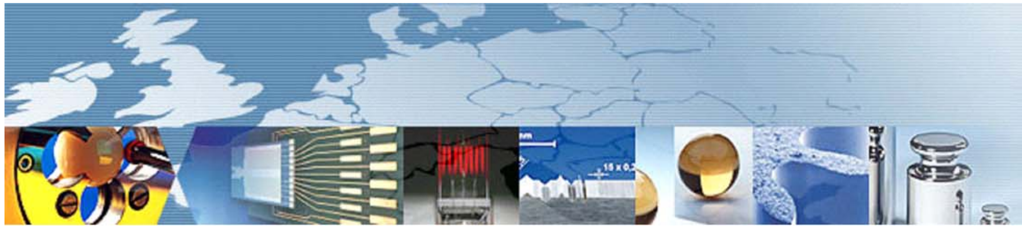


TC for Ionising Radiation:

Highlights and Challenges

István Csete, TC-IR Chair

MKEH ,Hungary

2nd EURAMET General Assembly

Marseille, France, 2 to 4 June 2008

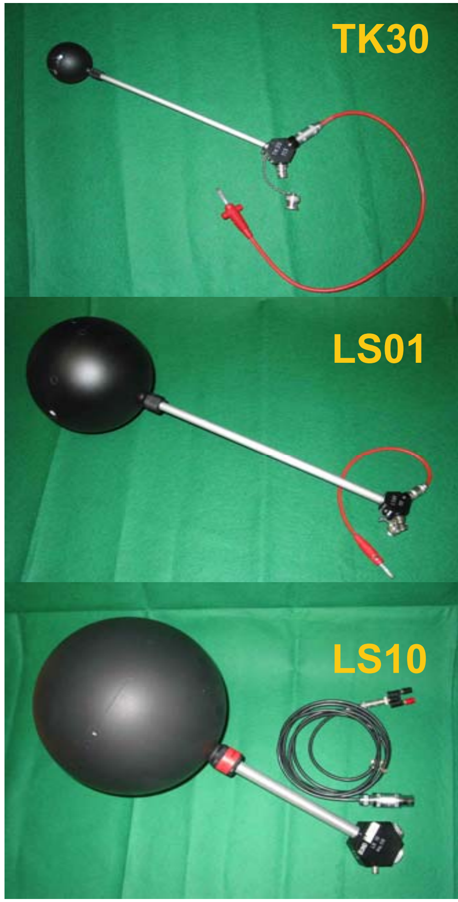
EURAMET
European Association of National Metrology Institutes

OUTLINE

- **Conclusions of the EUROMET RI(I)-S3 Supplementary Comparison** ***(EUROMET project No. 545, 2004-2008)***
- **Scientific challenges of JRP T2.J06 and T2.J07** ***(EMRP ERANET plus, funded by EC)***
- **Challenges in radionuclide metrology**
- **Organisational challenges of IR TC (2008-2011)**

Intercomparison of NMI's air kerma standards for ISO 4037 narrow spectrum series X-ray radiation (30 kV-300 kV)

EUROMET RI(I)-S3 Suplementary Comparison



First intercomparison to support the CMCs related to the rad. prot. dosemeter calibration in X-ray beams !

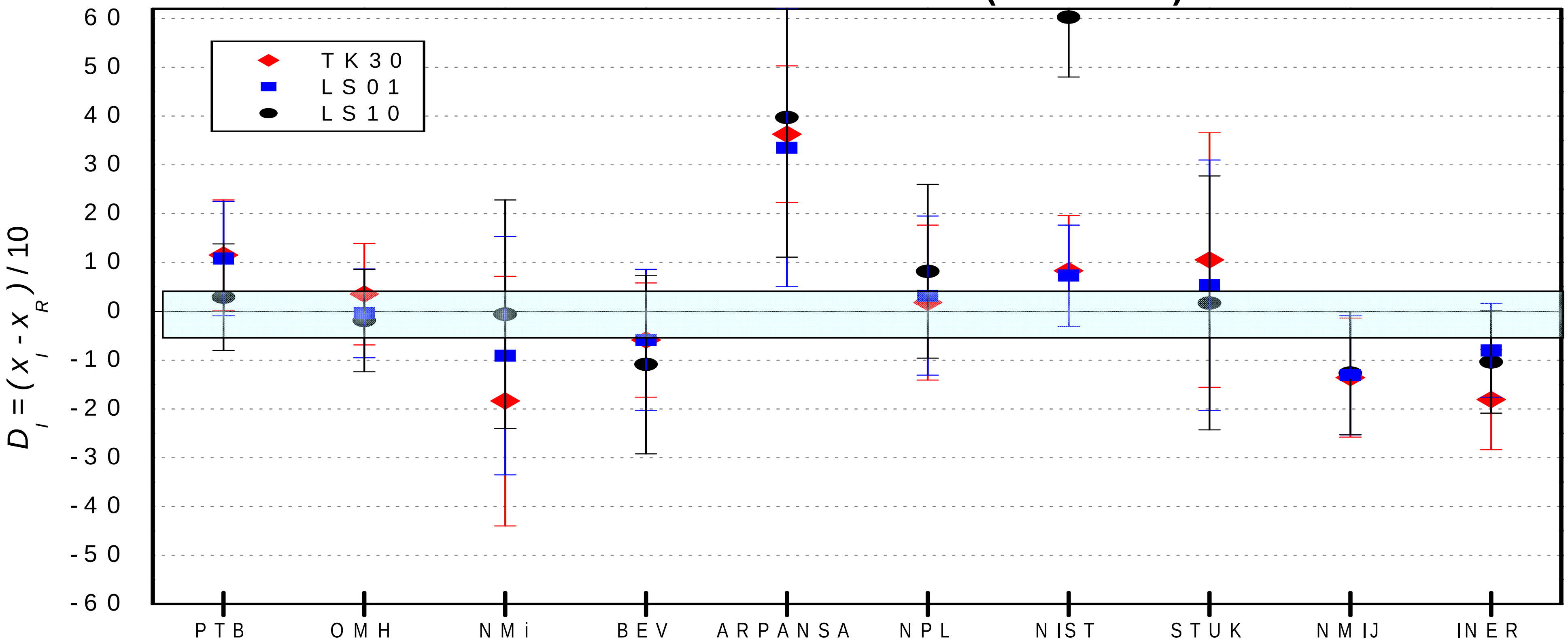
Tasks: 1. Establising the air kerma (K_{air}) SCRV and DoE for the rad. prot. applications ($H^{*} = K_{air} \times h^{*}_{K}(10;E)$)

2. Influence of beam size used for calibrations

Participants: PTB; OMH (MKEH); NMi; BEV; NPL; *STUK*; ARPANSA; NIST; NMIJ; INER

Conclusions of the EUROMET RI(I)-S3 Supplementary Comparison

DoE for 300 kV and influence of the beam (chamber) size on the results

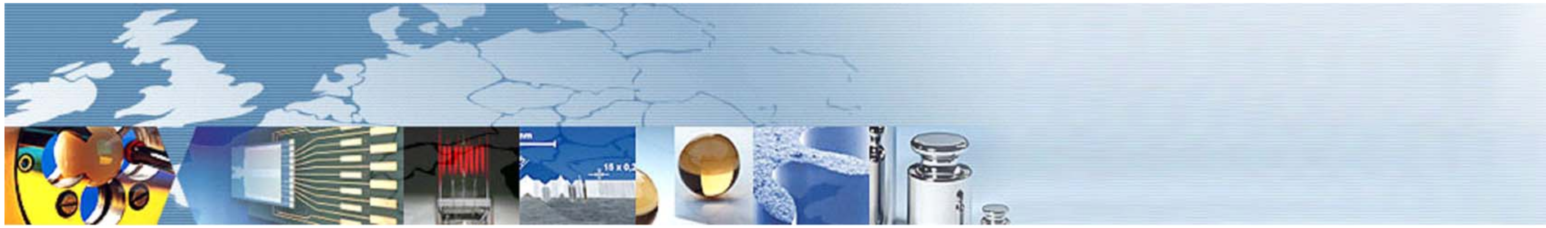


Inconsistent ($DoE_i/U_i > 1$) results for all qualities were 9%,10.5% and 16% for TK30;LS01;LS10 chambers respectively

Conclusions of the EUROMET RI(I)-S3 Supplementary Comparison

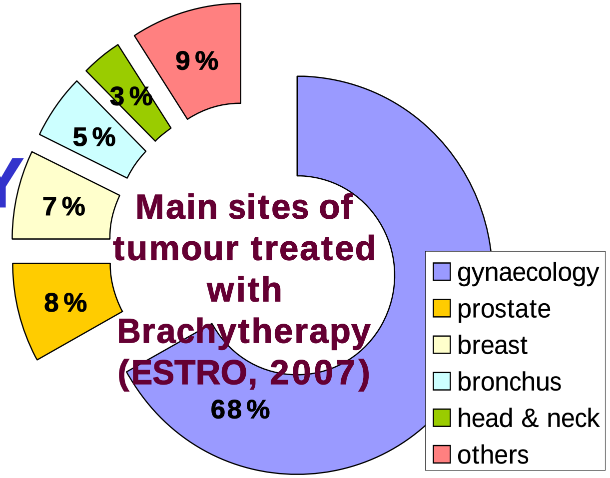
1. Review of calibration procedures using broad beam for low dose rate
2. Investigation of X-ray beam profiles
3. Re-evaluation of published CMCs uncertainties of participants
4. Encourage the missing 5 NMIs having primary standard to link this supplementary comparison to use singe SCRV and DoE matrix.

ISO 4037 Narrow beam quality CMC claims 10 beam qualities						
	NMI	Country	CMC U % published	Traceable to	U(DoE) %	incon. results (small beam)
1	ARPANSA	Australia	1,5		1.0-3.6	1
2	BEV	Austria	0,8		0.7-1.1	0
3	NMi	Netherland	1,5		1.3-2.6	2
4	NPL	UK	1,6		1.6-2.0	0
5	NIST	USA	1		0.7-1.1	1
6	MKEH	Hungary	1		0.7-1.0	0
7	PTB	Germany	0,77		0.7-1.1	0
8	INER	Taiwan	1		0.6-1.1	2
9	NMIJ	Japan	1,2		0.7-1.2	2
10	STUK	Finland	?	PTB	2.5-3.0	1
11	NIM	China	3,3		?	
12	LNE-LNHB	France	1,8		?	
13	ENEA	Italy	2,8		?	
14	GUM	Poland	1		?	
15	VNIIM	Russia	1,5		?	
16	Belgim	Belarus	5	VNIIM		
17	CMI	Czech Rep.	4	IAEA		
18	IAEA	Int. Org.	1,2	PTB		
19	RMTC	Latvia	3	PTB		
20	ITN	Portugal	1,8	PTB		



Scientific challenges of iMERA+ JRP T2.J06

INCREASING CANCER TREATMENT EFFICACY USING 3D BRACHYTHERAPY

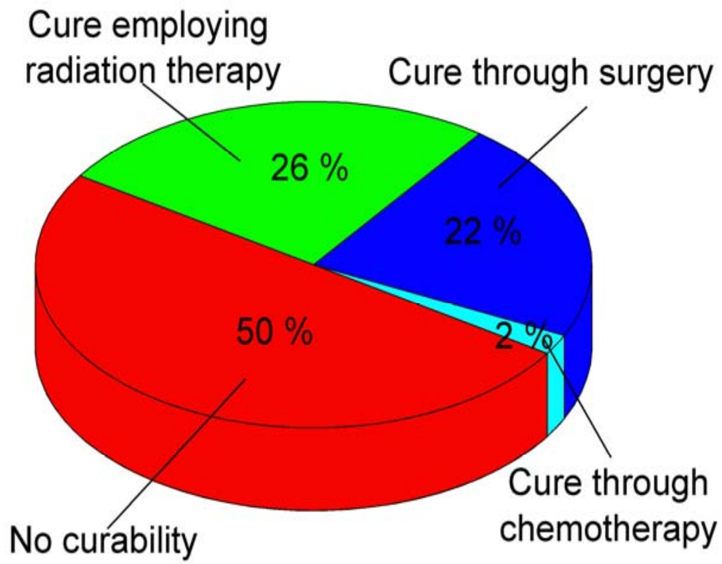


1. **Development of two different wide-angle water-equivalent extrapolation chambers, waterproof X-ray spectrometer for LDR I-125, water and graphite calorimeter for HDR Ir-192 to determine the absorbed dose to water $u(D_w)<2\%$ at 1cm from the sources. *(183 work months)***

2. **Accurate determination of 3D dose distributions *(MC calc.,gel, 1mm³ scintillation probe, TLD, alanine, semiconductor, liquid ionization chambers, 2D multidetector systems, radiochromic films tech. Collaborators: PTW, Wellhöfer, Linköping Univ.)***

Scientific challenges of iMERA+ JRP T2.J07

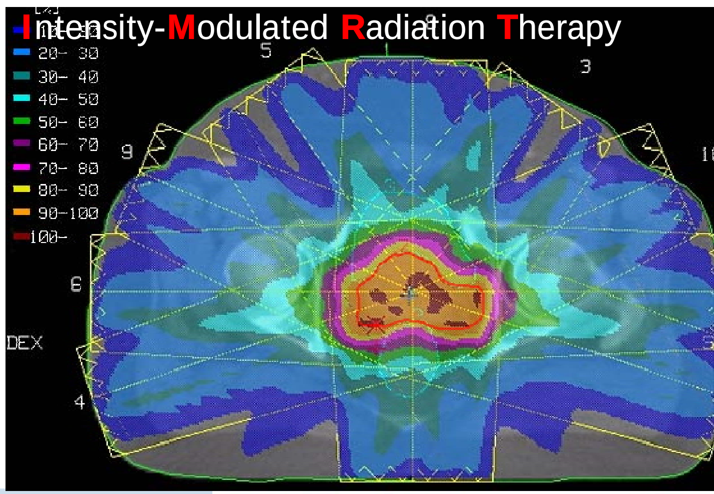
2.3 Mio cancer/ year in the EU
3 %/year increase



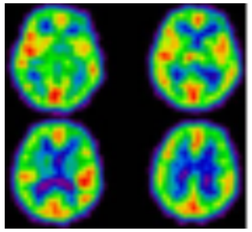
External Beam Cancer Therapy

High conformity between the tumor volume and dose distribution is required, (u(D)<2.5% ICRU)

1. **Development of water (PTB) and graphite calorimeters (NPL, LNHB) to determine the absorbed dose to water u(Dw)<0.5% in 3 cm diameter, 6-25 MeV energy photon beams**
2. **Determine the 3D dose distribution by Alanine/ESR dosimeters, (~ 1Gy?) diamond and MOSFET detectors, and radiochromic film**



Challenges in radionuclide metrology



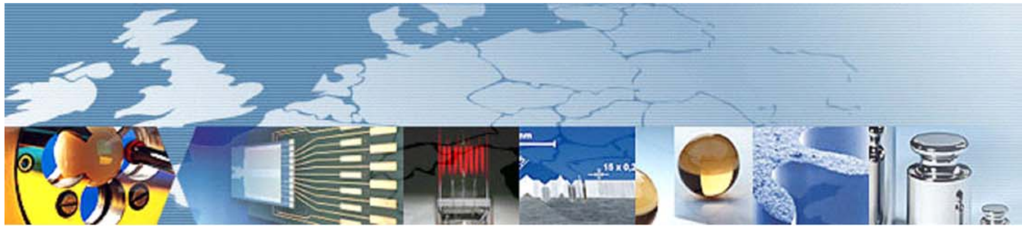


Standardisation, decay data evaluation and international traceability of radionuclides emerging in medical applications

- **for radio immunotherapy**
  (At-211; Cu-67; Lu-177 ; Sc-47; Sn-117m; Y-86;Sc-44m; Sr-82; Ac-225; Bi-213; Bi-212; Re-186; Re-188; Th-226…)
- **for PET imaging (Cu-64; Sc-44; Fe-52; Zr-89; Co-55; I-124…)**

Develop primary standardisation techniques ($4\pi\beta$-γ ; TDCR-LSC) for short–lived radionuclides (F-18; C-11; N-13; O-15) for PET

Apply the possibilities offered by digital signal processing techniques

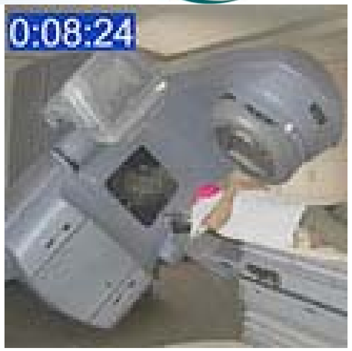


Organisational challenges of IR TC

1. **Nomination of the most competent persons for TC chair and convenors at the next CP meeting in this October**

2. **Maintain the integrity of the IR TC *(16 DIs, 15 NMIs)*, more efforts to involve the emerging laboratories into the EMRP and supporting comparisons of CMCs *(11 ERANET+ partners, 21 labs have CMCs)***

3. **Maintaining common absorbed dose to water primary standards for high energy photon and electron beams, and fluence determination of reference neutron beams ?**



Thank you for your attention!