



EURAMET GA

Hans Bjerke
TC-Chair IR


Sarajevo, June 2011

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TC IR Report 2011
Sarajevo June

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Ionising Radiation
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IONISING RADIATION, WHAT CAN WE?

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- Hope for cancer patients
- Diagnostic imaging (medical and industrial)
- Energy
- Understanding of nano cosmos and macro cosmos
- New industrial products at nano level
- Environmental information
- Society safety and security

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Hope for cancer patients



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iMERA projects




- Brachytherapy, piloted by M.P. Toni (INMRI-ENEA) has 10 participants, three collaborators and one observer. The total cost is 3600 000 € and the EC support with 1200 000 €. The project is ending in July 2011.
- External Beam Cancer Therapy, piloted by Ulrike Ankerhold (PTB), has 9 participants.
 - JRP Management and Coordination (PTB)
 - Hadron Therapy (NPL)
 - Primary Standards for IMRT (LNE-LNHB)
 - Secondary Standards for IMRT (ENEA)
 - IMRT Beam Specifier and Reference condition (NPL)
 - Verification of treatment planning systems for IMRT (STUK)
 - Impact: Exploitation, Dissemination and Knowledge Transfer activities (all)

November 29th to December 1st
2011
Braunschweig
Germany

Topics

- ✓ High-Intensity Therapeutic Ultrasound
- ✓ Hadron Therapy (protons and carbon ions)
- ✓ primary and secondary standards of absorbed dose to water for IMRT and brachytherapy
- ✓ 3D dose distributions and treatment planning for IMRT and brachytherapy
- ✓ international comparisons

Venue:
Physikalisch-Technische Bundesanstalt (PTB)
Braunschweig, Germany
further informations: <http://www.ptb.de/CAMCT>

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Organized by the EURAMET joint research project funded from European Community's Seventh Framework Programme (FP7) under the project "External Beam Cancer Therapy (EBCT) and Improving cancer treatment efficacy using 3D brachytherapy (Brachytherapy)".

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Conference on Advanced Metrology for Cancer Therapy

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BRACHYTHERAPY STANDARDS FOR LOW DOSE RATE BRACHYTHERAPY SOURCES

(prescription dose rate from 5 to 20 mGy/min)



LNE-LNHB standard based on a free-in-air ring-shaped ionisation chamber and a water equivalent spherical source phantom assembly.



PTB standard based on a large extrapolation ionisation chamber with water equivalent walls.



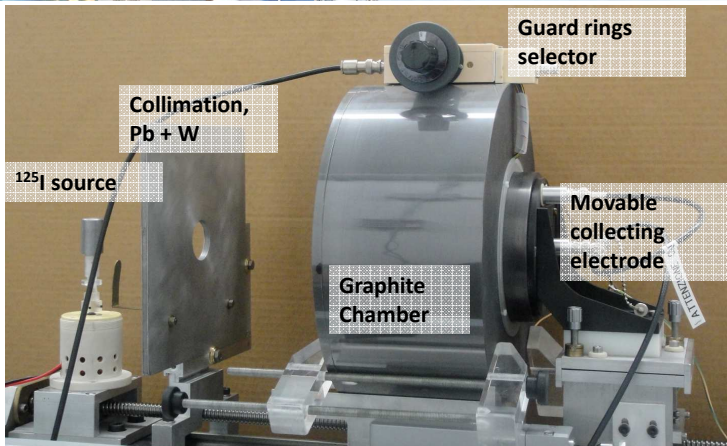
ENEA standard based on a large angle and variable volume ionisation chamber that allows measurements in graphite phantom.

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Guard rings selector

Collimation, Pb + W

^{125}I source

Graphite Chamber

Movable collecting electrode

The ENEA-INMRI D_w standard for LDR ^{125}I BT seeds

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BRACHYTHERAPY STANDARDS FOR HIGH DOSE RATE BRACHYTHERAPY SOURCES
(prescription dose rate of 200 mGy/min or higher)

ENEA-INMRI standard based on a ring-shaped graphite calorimeter

NPL standard based on a ring-shaped graphite calorimeter

PTB standard based on a water calorimeter

VSL standard based on water calorimeter

Thermistor (4x)
Heat sink (Al)
Glass cell wall

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EBCT **EURAMET**
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STUK / WP7 / EBT2 film scanner

Film scanner for the novel type of yellow GafChromic film EBT2 has been constructed and tested. A poster has been presented in the ESTRO meeting in September 2010.

USB stepper motor controller

stepper motor X

stepper motor Y

Keithley 6517

Detector

LED

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Planning a medical-type linear accelerator at the BIPM for 2013-2016

- The BIPM needs access to its own dedicated accelerator in order to achieve the necessary uncertainty for national standards.
 - The comparison BIPM.RI(I)-K6
 - BIPM primary calorimeter standard taken to NMIs
 - SSDs need calibration at the BIPM

The main beam for cancer treatment in the world are the high energy photon beams

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Energy

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Metrology for New Generation Nuclear Power Plants



**Metro Fission Kick-off Meeting
NPL 14-15th September 2010**

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Industry and environment

**MetroMetal,
J.M. Los Arcos**

14 partners (13 countries + JRC)
21 stakeholders (9 countries + ICRM + ICRP)

PARTNER	Short name	Country
1	CIEMAT	Spain
2	BEV/PTP	Austria
3	CEA	France
4	CMI	Czech Republic
5	ENEA	Italy
6	IFIN-HH	Romania
7	IJS	Slovenia
8	ITN	Portugal
9	JRC	EC
10	MKEH	Hungary
11	POLATOM	Poland
12	PTB	Germany
13	SMU	Slovakia
14	STUK	Finland

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Industry and environment

MetroMetal

MELTING

SCRAP PORTALS →

MELTING SAMPLES →


←BLACK & GREY SLAGS

+ FUMES DUST !!


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Industry and environment



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Metrology for Radioactive Waste Management.


MetroRWM (Petr Kovar, CMI)


- **WP1: Development of standardised traceable measurement methods for solid radioactive waste clearance (free release) and disposal (CMI, BEV/PTP, CEA, CIEMAT, ENEA, IJS, MKEH, NPL, POLATOM, PTB, SMU, ENVINET-REG1)**
- **WP2: Development of novel instruments and methods for in-situ measurements (NPL, ENEA, PTB, SMU, ENVINET-REG1).**
- **WP3: Development of a gaseous effluent monitor/sampler for stored wastes (NPL, BEV/PTP, CMI, ENEA, MIKES, PTB).**
- **WP4: Development of standards and 'spiked' or characterized 'real' reference materials (PTB, CEA, CMI, ENEA, JRC, MKEH, NPL, POLATOM).**
- **WP5: Improvements to decay data for radionuclides present in nuclear wastes (CEA, CIEMAT, CMI, JRC-IRMM, POLATOM, PTB).**
- **WP6: Creating Impact (BEV/PTP, All)**
- **WP7: JRP Management and Coordination (CMI, All).**

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EURAMET projects




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Project No.	Type	Subfield	No. of part.	Pilot lab.	Status	Duration
1085	Co-operation in research	radio-nuclides	6	LNH-LNHB	Measurements in progress	2009-2011
?	Comparison	radio-nuclides	?	PTB	proposed	2011-2012
1104	research	neutron	4	NPL	proposed	2009-
936	comparison	neutron	3	NPL	Measurements in progress	2008-2009
822	RI(III) S2 comparison	neutron	3	PTB	Measurements completed Draft A report in progress	2004-2009
1177	Comparison	dosimetry	20	IRCL/ GAEC-EIM	Agreed and started	2011-2012
1175	Bilateral comparison	dosimetry	2	IRCL/ GAEC-EIM	proposed	2011
?	Comparison of alanine dosimeters	dosimetry	3	LNE-LNHB	proposed	2009-
1132	Comparison	dosimetry	15	PTB	proposed	2011-
738	RI(I) S5 comparison	dosimetry	17	PTB	Measurements completed Draft A in progress	2005-2008
628	Comparison	dosimetry	4	NPL	No progress	2005-

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Institute	Country	Dosimetry (Section I)	Radionuclides (Section II)	Neutron measurements (Section III)
BEV	Austria	50	100	
SCK-CEN	Belgium			
BIM	Bulgaria	7		
CMI	Czech Republic	7	104	12
RISOE	Denmark			
IRMM	European Commission		110	
STUK	Finland	31		
LNE-LNHB	France	63	166	15
PTB	Germany	88	158	20
EEAE	Greece	35		
MKEH	Hungary	20	84	
DMRP	IAEA	13		
GR	Iceland			
RPII	Ireland			
ENEA-INMRI	Italy	76	13	9
VMT/FTMC	Lithuania			
NRPA	Norway	22		
GUM	Poland	5	68	
ITN-LMRI	Portugal	43		
IFIN-HH	Romania		34	
DMDM	Serbia			
SMU	Slovakia	30	37	9
IJS	Slovenia			
CIEMAT	Spain	52	97	
SSM	Sweden	29		
METAS	Switzerland	8	21	
VSL	The Netherlands	28	57	
TAEK	Turkey			
NPL	United Kingdom	36	116 (13)	42 (5)
Total		643 (19)	1165	107
15			1915	
Member state	Associate of CGPM	International organization		



IR contact persons

CMCs:
 Dosimetry:
 643 (19)
 Radionuclide:
 1165 (13)
 Neutron m. 42 (5)

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Organisation and work

■ Sub-committees

Dosimetry: Convenor: István Csete, MKEH

Radionuclides: Convenor: Bruno Chauvenet, LNE-LNHB

Neutron measurements: Convenor: Not appointed


■ Belgium and Lithuania are coming up.

■ Latvian IR lab divided in two and not linked to metrology

Remember many DIs!

**If you are about to take decision regarding IR,
 please ask us before acting**






CMCs – solid work

CMC file	Laboratory	Country	Dosimetry	Radionuclides	Neutrons	Status
EURAMET.RI.11.2010	PTB	Germany	88			Approved
EURAMET.RI.9.2009	PTB	Germany		158		Approved
EURAMET.RI.6.2006	RMTC	Latvia	12	57		Greyed out
COOMET.RI.8.2010	NSC IM	Ukraine		1		Reviewing
APMP.RI.5.2010	KRISS	Korea	14	163	11	Reviewing
APMP.RI.5.2010	NMIJ	Japan	18	195	13	Reviewing


Interregional reviewing EURAMET


Laboratory	Country	Dosimetry	Radionuclides
MKEH	Hungary	23	77
BIM	Bulgaria	7	11
METAS	Switzerland	8	
VSL	Holland	28	
STUK	Finland	31	
SMU	Slovakia	58	
NRPA	Norway	22	
BEV ¹⁷	Austria	54	

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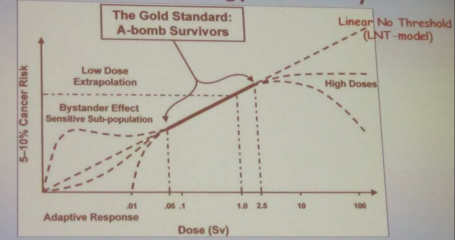
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Safety and security

- The Tsunami at Fukushima called for new attention on risk assessment of IR
- Different operational radiation quantities, with unit sievert (Sv)
- Effect on biology as function of
 - Type of radiation and energy
 - Dose rate, fractionation
 - Irradiating part of organ
- Hans Rabus, PTB:



dose-response relationship for radiation induced carcinogenesis (Hall 2004)

A novel dosimetry concept based on nanodosimetry

