



Public Health
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EURADOS Working Group 6: *Computational Dosimetry*

Chair: Rick Tanner, PHE

Secretary: Carmen Villagrasa, IRSN

EURADOS AM2016, Milan, February 2016



Working Group 6: tasks

- Task 6.1: Neutron energy distribution unfolding
- Task 6.2: Micro and nano dosimetry
 - Collaboration with WG7, Internal Dosimetry
- Task 6.3: Individual monitoring
 - Collaboration with WG10, Retrospective Dosimetry
- Task 6.4: In-vivo monitoring
 - Collaboration with WG7, Internal Dosimetry
- Task 6.5: Linac modelling
- Task 6.6: Voxel phantoms
- Task 6.7: High-energies
 - Collaboration with WGs 9 & 11, benchmarking for high energy



Work Plan 2015-16

1. Plenary Meeting at AM2015, Dubrovnik, February – 22 people
2. Paper on WG7 collaboration by Vrba et al presented at IM2015
3. WG10/6 EURADOS travel award: Michael Discher (Helmholtz to PHE & Durham U)
4. EURADOS Report: Co-sponsored Mind-IBCT (Micro- and Nano-Dosimetry for Ion Beam Cancer Therapy) Workshop – ready for publication
5. Formulate benchmarking for high energies with WG9 and WG11
6. Plenary meeting – IRSN, November ~ 15 people (+ WGs 7, 9, 10, 11)
7. Neutron spectrum unfolding: intercomparison
8. Develop intercomparison on the implementation of the ICRP reference phantoms
9. PMB paper: “Intercomparison exercise of Monte Carlo codes for the modelling of a medical linac”: M. LeRoy & Caccia – draft circulated
10. Plenary Meeting at AM2016, Milano, February – 33 people in WG6 meeting, up to 54 in joint meetings



6.1 Neutron spectrum unfolding

- Task Leader J.-M. Gomez Ros (CIEMAT); Deputy C. Domingo (UAB)
- Intercomparison on unfolding methods
- Ideal Bonner sphere set modelled to generate response functions
- Four realistic “workplace” fields – Monte Carlo models
- **Intercomparison launched at AM2016**
- Will distribute via:
 - EURADOS newsletter and website
 - Independent targetted mailing list (~ 60 people)
 - RSIIC, NEA
- Deadline for results: September 2016
- Analysis by February 2017



6.1 Neutron spectrum unfolding



European Radiation Dosimetry Group

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Exercise on neutron spectrum unfolding in Bonner sphere spectrometry

J-M. Gomez-Ros, R. Bedogni, C. Domingo, J.S. Eakins, N. Roberts and R.J. Tanner

EURADOS Working Group 6, Computational Dosimetry, is running an exercise to compare the practice of unfolding in laboratories that devolve neutron spectra from Bonner sphere spectrometers. This comparison is open to participants from any country or institute, and to those who practice unfolding for other applications. The exercises have been designed to avoid problems of correlated errors associated with the use of unfolded Bonner sphere data as the basis for the intercomparison. Instead, the counts in the Bonner spheres have been calculated using Monte Carlo methods to ensure that the sphere counts are truly representative of the workplace described in the Monte Carlo model. The motivation is to assess the practice of unfolding in terms of its reliability and accuracy.

Four files need to be downloaded by participants:

[The Exercise specification](#)

[The response data for the Bonner sphere set](#)

[The Counts in each detector for each problem](#)

[The template for reporting the results](#): **THIS MUST BE USED BY PARTICIPANTS**

Deadline for submission of results: 9th September 2016

Created on Monday, February 08, 2016 Updated on Monday, February 08, 2016 By anonymous

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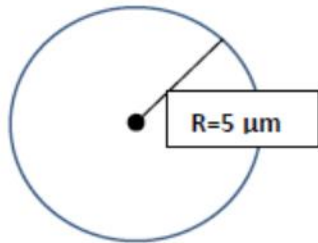


6.2 Micro & nano dosimetry

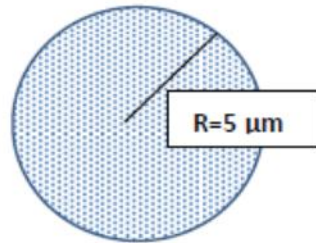
- Task leader Hans Rabus (PTB) seconded for a year. Will replace with Carmen Villagrasa (IRSN). Deputy E. Gargioni (Hamburg)
- EURADOS exercise on uncertainty assessment in micro- and nanodosimetry using Monte Carlo calculations – **launched – see EURADOS website**
- Fundamental issues in track structure simulations
 - Monte Carlo means classical treatment of quantum objects
- **EURADOS Report on Workshop “Challenges in micro- and nanodosimetry for ion beam cancer therapy”**
- Collaboration with WG 7 TG 7 on Monte Carlo modelling of radiation effects of nanoparticles



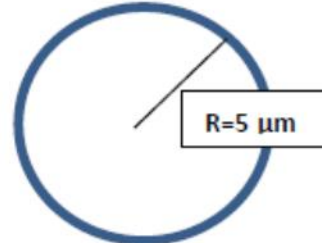
6.2 Micro & nano dosimetry



1. Point Source

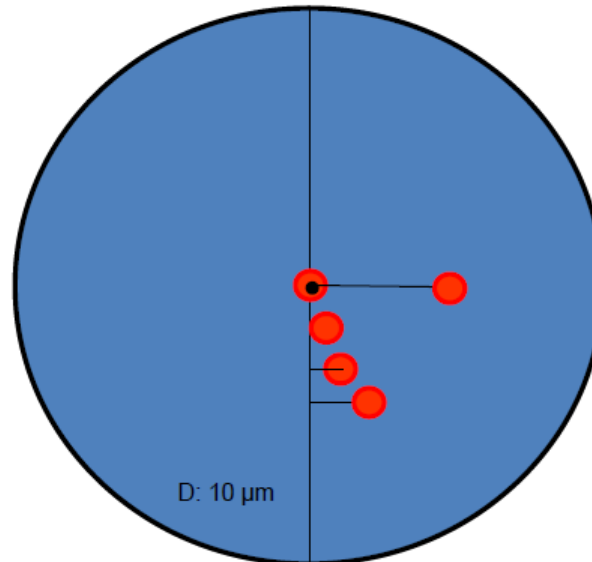


2. Volume source



3. Surface source

Radioactive ^{125}I source is placed within a liquid water sphere with $10\ \mu\text{m}$ diameter



- ^{125}I Source
- Target 1 diameter: 3 nm (liquid water)
- Target 2 diameter: 8 nm (liquid water)

Distances from the source: 0, 1, 2, 4 and 8 times the target radius



6.3 Individual Monitoring

Task Leaders: Wilson (AWE) and Struelens (SCK)

- Training school on computational methods applied to individual monitoring
 - Programme under revision to account for ICRU and eye lens changes
 - Considering running in Autumn 2016, perhaps with WG7 course
- Restructuring this task. Brainstorming sessions at AM2015 yielded potential tasks
 - Criticality dosimetry – Monte Carlo modelling and unfolding
 - Skin dosimetry – development of microscopic model to better simulate tissue reactions in skin
 - Modelling in collaboration with WG 10, Retrospective Dosimetry



6.4 In vivo monitoring

- Task Leader: Vrba (CTU)
- Collaboration with Working Group 7, Internal Dosimetry
- Paper presented at IM2015 and prepared for the proceedings
- Work programme on hold whilst CATHyMARA project in progress
- Possible development of a reference skull phantom/model



6.5 Linac modelling

- Task leaders Blideanu (CEA) and Caccia (ISS)
- Paper on the intercomparison of linac modelling almost ready for submission to Physics in Medicine and Biology – draft paper circulated for comment
- Possible preparation as a EURADOS report
- Use results as input to develop a training module



6.6 Voxel Phantom Development

- Task Leader M. Zankl (Helmholtz); Deputy C. Huet (IRSN)
- Two successful schools on voxel phantoms run at IRSN and Helmholtz
 - Hold a further school, possibly in 2017 or 2018
- Test of the IMPLEMENTATION of ICRP reference phantoms
 - Use non-ICRP 116 geometries to test whether users have
 - Correctly set up the phantom from raw data
 - Know how to implement it in a Monte Carlo code
 - Know how to calculate effective dose, SAF ...
 - External and internal problems, medical imaging
 - Environmental/emergency



6.7 High energies

- Task Leader S. Rollet (AIT); Deputy S. Agosteo (POLIMI)
- Specific issues connected to Monte Carlo for high energies owing to the lack of high energy cross-section data
- Strong model dependence of results
- Planned benchmarking with WG9 and WG11:
 - Lively joint meeting this morning – 54 participants
 - Discussions about models and codes, and availability of evaluated cross sections
 - Rollet, Agosteo and Wilson (AWE) will represent WG6



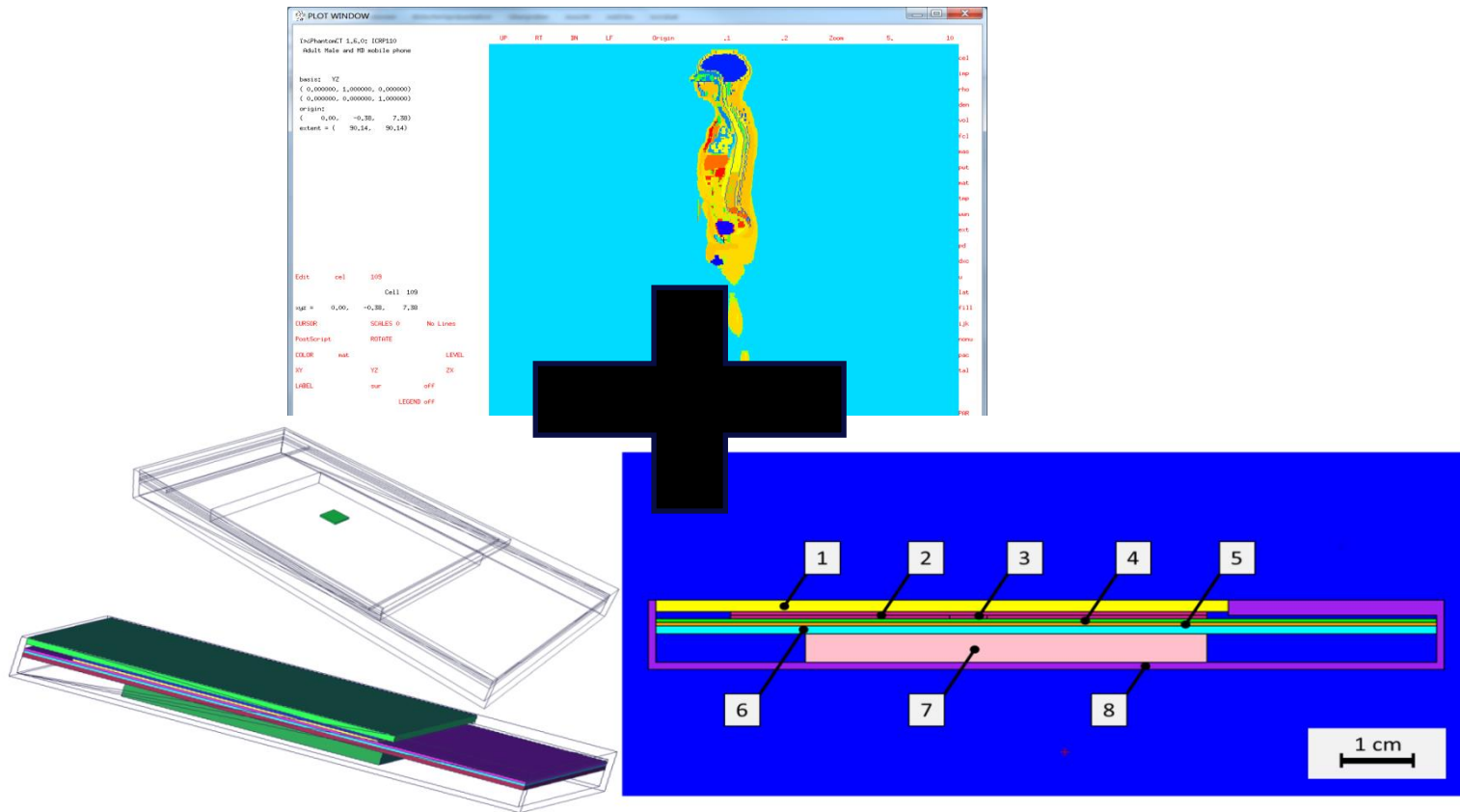
Collaboration with WG10 (6.3)

- Working on modelling for retrospective dosimetry
- Formulating a work plan.
- Initial results on variation in mobile phone dose with position on body.
- Work in its initial stages.
- EURADOS Young Scientist award to help get this initiative underway – should yield material for 1 or 2 papers
- Proposed to invite WG10 members to autumn WG6 meeting to progress this task. Discussed:
 - Mobile phone dose modelling
 - Quantities for accident/emergency dosimetry



Michael Discher – EURADOS travel grant

**Goal: translation of the absorbed dose in the mobile phone
to appropriate dose quantities**





Work Plan 2015-16

1. Plenary Meeting at AM2016, Milan, February – 56 people registered
2. Plenary meeting at RPW2016, Oxford in September (10-15 people)
3. EURADOS Report: Co-sponsored Mind-IBCT (Micro- and Nano-Dosimetry for Ion Beam Cancer Therapy) Workshop – publish
4. Deadline for intercomparison on uncertainties on track structure modelling 30th June 2016
5. Neutron spectrum unfolding intercomparison: disseminate widely. Deadline for submissions 5th September 2016
6. Work plan for benchmarking for high energies with WG9 and WG11
7. Develop intercomparison on the implementation of the ICRP reference phantoms: finalize proposals for Autumn 2016
8. PMB paper: “Intercomparison exercise of Monte Carlo codes for the modelling of a medical linac”: M. LeRoy & Caccia