

## EURADOS Working Group 6

### Computational Dosimetry

#### Motivation

The scope of the action is to promote scientific research and development activities in the field of Monte Carlo Modelling for Radiation Dosimetry and Protection.

The core of the WG expertise is radiation transport Monte Carlo modelling which has an high relevance and impact on all dosimetric applications of ionizing radiation fields. This motivation implies a transversal role among the other Eurados WGs, covering a large number of up-to-date topics in radiation dosimetry.

Special attention is also devoted to training and tutorial actions on the competent use of Monte Carlo codes. Exercises are proposed and made available on EURADOS website for MC codes users and the analysis of the results and of the codes performances are discussed in dedicated workshops or at conferences.

The strongly improved computer capabilities allow to treat the very heavy geometries of antropomorphic VOXEL Human Phantoms. However, the series of rather complex techniques needed for such a development are in the domain of a few Laboratories worldwide. The WG assists in the dissemination of such knowledge to a larger number of MC users.

Some of the WG6 members are already full or corresponding members of DOCAL (DOSimetry CALculation) Task Group of the ICRP Committee 2, ICRU RC 26 (ICRU Report Committee 26: "Operational Radiation Protection Quantities for External Radiation") and ISO. With different Task Groups the WG covers various modelling aspects from micro and nano scale (domain in which the standard MC models fail) to macrodosimetry related to both external and internal exposures. This implies advanced modelling of the human body through voxelized geometries, application of such models to in-vivo measurements of incorporated radionuclides, neutron monitoring and spectrometry with related unfolding procedures, instrument response function simulations, irradiation facilities design and their dosimetric assessment and Monte Carlo assisted design and type test procedures for individual dosimeters for a given Operational Quantity.

#### Aims

- Lung in vivo measurements complemented with MC simulations (in collaboration with WG7-Internal Dosimetry)
- Comparison on neutron spectrometry unfolding techniques usage
- Design and dosimetry assessment of a LINAC facility
- Individual monitoring: from theoretical basis to practical implementation (in collaboration with WG2: Individual Monitoring)
- Micro and nano dosimetry issues
- High energy fields (part of the activity in collaboration with WG11 on High Energy Fields)

- VOXEL Phantoms development, following the need to disseminate among the stakeholders all the criteria and techniques to obtain a human Voxel model from raw data

## Actions

### Completed

- Lung in vivo measurements complemented with MC simulations. A thorso phantom with contaminated lung was used for activity measurements and Monte Carlo simulations.

### Planned

- A Training School on the development of voxel human geometries for MC codes. The School will be held at IRSN Fontenay aux Roses from 11<sup>th</sup> to 13<sup>th</sup> October 2011.
- Micro-dosimetry measurements and MC simulations to characterize hadrontherapy beams (e.g. at CATANA facility) and instrumentation. The action is a coordination among some laboratories in Europe involved in the field and is an open framework to collaborate in this specialized area. A final training event is foreseen in 2012.
- Comparison exercise on the design and dosimetry assessment of a LINAC facility where the participants will be invited to determine the beam characteristics exiting the machine and to calculate the dose profiles in a water standard tank used for calibrations. Problem specifications are already available on EURADOS website.
- Training course on "*Individual monitoring: from theoretical basis to practical implementation*". The role of Monte Carlo simulation in the design and type test procedures for individual will be described: from the evaluation of operation quantities, their energy and angle dependence, the mutual perturbation of dosimeters during simultaneous calibrations, the importance of protective equipments on the way to wear the dosimeter etc.
- Comparison exercise on reconstructing a neutron spectrum from the knowledge of the system response function and the values of the counts obtained with a set of BSS (Bonner Sphere System). Various degrees of pre-information will be given to the users about three selected scenarios (i.e. LINAC, outside a spent fuels transport flask, neutron calibration facility). Different unfolding techniques will be applied by the participants.
- Design of detectors (ionization equipment, scintillators, REM counters, BSS, passive etc.) for high energy fields accompanied by a "cook-book" for practical solutions
- In collaboration with WG11, a study is to analyze the sources of discrepancies due to the different models employed in the various high energy codes to generate X-section data for the whole energy MeV-GeV investigated domain. A final Wrkshop or Winter School is foreseen.

## Members

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## Additional information

[WG06\\_AM2011\\_web](#)