



COST Action CA20129

MultiChem

Multiscale Irradiation and Chemistry Driven
Processes and Related Technologies



Workshop

“Multiscale modeling of radiation-induced biodamage for radiotherapy applications”

**Particle Therapy Research Center (PARTREC), University Medical Center Groningen
Groningen, the Netherlands
September 21-22, 2023**

The MultiChem Workshop “Multiscale modeling of radiation-induced biodamage for radiotherapy applications” will discuss the recent achievements, current challenges and future developments in multiscale modeling of biodamage phenomena and corresponding new radiobiological experiments and how they can be translated into clinical settings.

The workshop will bring together expert theoreticians and leaders in computational multiscale modeling, experimentalists and radiotherapy practitioners studying irradiation-driven damage of biomolecular systems and exploiting this knowledge to develop novel radiotherapy techniques.

The presentations will cover experiments with biomolecular targets, radiobiological experiments on healthy and tumor tissues, various multiscale modeling tools for calculating the impact of cell irradiation, as well as tools for treatment planning and clinical dosimetry.

Scientific program

Thursday, September 21

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| 10 ⁰⁰ – 10 ²⁰ | Workshop opening (Alexander Gerbershagen, Alexey Verkhovtsev, Andrey Solov'yov) Stefan Both , PARTREC, UMCG, Groningen, the Netherlands <i>Welcome speech</i> |
| 10 ²⁰ – 12 ⁰⁰ | Chair: Alexey Verkhovtsev Andrey Solov'yov , MBN Research Center, Frankfurt am Main, Germany <i>Multiscale approach for the physics behind ion-beam cancer therapy: new possibilities for treatment planning optimization</i> Alexander Gerbershagen , PARTREC, UMCG, Groningen, the Netherlands <i>Presentation of PARTREC</i> Rob Coppes , PARTREC, UMCG, Groningen, the Netherlands <i>Use of salivary gland organoids to study the differential effects of proton versus photon irradiation on regenerative response</i> |
| 12 ⁰⁰ – 13 ⁰⁰ | Lunch |
| 13 ⁰⁰ – 14 ³⁰ | Chair: Alexander Gerbershagen Thomas Schlathölder , Zernike Institute for Advanced Materials, University of Groningen, the Netherlands <i>What gas-phase experiments can teach us about biological radiation damage</i> Jaroslav Kočíšek , J. Heyrovský Institute of Physical Chemistry CAS, Prague, Czech Rep. <i>Electron and ion impact on surface deposited DNA nanostructures</i> |

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| | Ilya Solov'yov , Carl von Ossietzky University Oldenburg, Oldenburg, Germany <i>Multiscale modeling of biomolecular systems and irradiation-induced processes therein</i> |
| 14 ³⁰ – 15 ⁰⁰ | Coffee break |
| 15 ⁰⁰ – 16 ³⁰ | Chair: Nigel Mason Alexey Verkhovtsev , MBN Research Center, Frankfurt am Main, Germany <i>Atomistic approach for structural characterization and modeling irradiation-driven processes involving radiosensitizing nanoparticles</i> Cecile Sicard-Roselli , Institut de Chimie Physique, CNRS, Université Paris-Saclay, Orsay, France <i>Impact of small coatings on hydroxyl radical production by irradiated gold nanoparticles</i> Julien Audouin , Université Paris-Saclay, CNRS, Gif-sur-Yvette, France <i>Radiation chemistry in the Bragg peak of proton tracks: Experimental results and comparison with Geant4-DNA simulations</i> |
| 16 ³⁰ – 17 ³⁰ | Discussion |
| 18 ³⁰ – 21 ⁰⁰ | Social dinner |

Friday, September 22

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| 09 ⁰⁰ – 11 ⁰⁰ | Chair: Gérard Baldacchino Francesco Romano , INFN Catania, Italy & PARTREC, UMCG, Groningen, the Netherlands <i>Geant4 and microdosimetry</i> Pietro Pisciotta , UMCG, Groningen, the Netherlands <i>Microdosimetric quantities for treatment planning in proton therapy</i> Martin Falk , Institute of Biophysics CAS, Brno, Czech Republic <i>DNA repair in the context of chromatin – an opportunity and challenge for modelling</i> Michael Hausmann , Kirchhoff-Institute for Physics, Heidelberg University, Heidelberg, Germany <i>Topological changes of the whole chromatin of cell nuclei during DNA repair as a collective response to radiation induced damages</i> |
| 11 ⁰⁰ – 11 ³⁰ | Coffee break |
| 11 ³⁰ – 12 ³⁰ | Chair: Richard Amos Revaz Shanidze , Kutaisi International University, Kutaisi, Georgia <i>Open source software tools for proton therapy</i> Peter van Luijk , PARTREC, UMCG, Groningen, the Netherlands <i>Impact of tissue and organ interactions on the tolerance of normal tissues to radiation</i> |
| 12 ³⁰ – 13 ³⁰ | Lunch |
| 13 ³⁰ – 14 ³⁰ | Chair: Michael Hausmann Arjen van der Schaaf , UMCG, Groningen, the Netherlands <i>Treatment planning in radiotherapy using outcome prediction models</i> Richard Amos , Translational Proton Therapy Physics, University College London, UK <i>Advancing personalized ion beam cancer therapy with multiscale modelling</i> |
| 14 ³⁰ – 14 ⁴⁰ | Workshop closing |
| 14 ⁴⁰ – 16 ⁰⁰ | Guided tour across PARTREC |