

Final report
INanoTherad International Conference
Advanced Strategy for Radiotherapy

**ADVANCED STRATEGIES FOR
RADIOTHERAPY**

From lab bench to medical application
iNanoTheRad Meeting



2021 Nov. 15-17
Auditorium Pierre-Lehmann
IJCLAB
Orsay, FRANCE

SPEAKERS

- Dr R. Berbeco**, Boston, USA
- Dr. K. Butterworth**, Belfast, UK
- Dr. S. Debosz Dufrenoy**, Orsay, FR
- Prof. D. Jaroszynski**, Glasgow, UK
- Prof. G. Landry**, Munich, GER
- Dr. A. Lévy**, Villejuif, FR
- Prof. V. Miller**, Philadelphia, USA
- Prof. P. Poortmans**, Antwerp, BEL
- Dr E. Porcel**, Orsay, FR
- Dr Y. Prezado**, Orsay, FR
- Dr Ch. Robert**, Orsay, FR
- Prof. U. Schramm**, Dresden, GER
- Prof. E. Troost**, Dresden, GER
- Prof. N. van den Berg**, Utrecht, NL
- Dr C. Verry**, Grenoble, FR
- Dr MC. Vozenin**, Lausanne, CH

Rationals

This conference will bring together international experts, researchers and students in medical physics, radiation chemistry and physics, development of radiation sources, radiobiology, nanoscience and nanomedicine, and radiotherapy and oncology, to share ideas and formulate secure and personalized treatments of the future.

This is at the heart of the ambitious iNanoTheRad project of Université Paris-Saclay, which promotes innovative strategies based on irradiation by new sources (high-dose rate, high LET, spatially structured, plasma) and the addition of tumor targeted nano-agents and drugs to improve the effects of radiation.

This event will be hybrid, articulating a face-to-face conference of up to 125 participants at the Université Paris-Saclay, one of the eight World Innovative Clusters (2013 MIT technology review) and a virtual conference (total number of participants 200 max.).

On the agenda: a series of conferences, competitive poster and talk sessions. Please note that students of two Paris Saclay masters will be attending (SERP and Medical Radiophysics)

SESSIONS

- 1. External radiotherapy in clinic**
- 2. AI & imaging for radiation therapies**
- 3. New sources & associated dosimetry for radiotherapy**
- 4. New radiation therapies modalities**
- 5. Nanoparticles enhanced radiotherapies in diagnosis and treatment**

Short talks and poster contribution will be selected from abstracts

SCIENTIFIC COMMITTEE

- Dr G. Baldacchino**, FR
- Dr E. Bourneuf**, FR
- Dr F. Confalonieri**, FR
- Pr G. Créhanche**, FR
- Dr S. Debosz Dufrenoy**, FR
- Dr M. Dutreix**, FR
- Pr S. Lacombe**, FR
- Dr E. Porcel**, FR
- Dr Ch. Robert**, FR
- Dr J. Santos Sousa**, FR
- Dr O. Seksek**, FR
- Dr C. Truillet**, FR

ORGANISATION COMMITTEE

- N. Baudry**, FR
- Dr E. Hamonou**, FR
- Dr E. Porcel**, FR
- Dr J. Santos Sousa**, FR
- Dr O. Seksek**, FR

Context and topic

With 9.6 million deaths in 2018, cancer remains the second leading cause of death worldwide. Radiotherapy is an effective and irreplaceable treatment technique used in more than 50% of oncology treatments. However, the health benefits of radiotherapy remain limited by the side effects it induces and the radioresistance of certain tumours. All over the world, research organisations and their industrial partners are mobilizing to develop innovations that will overcome these negative impacts and invent the new generation of radiotherapy. This conference was organised to bring together international experts, researchers and students in medical physics, radiation chemistry and physics, development of radiation sources, radiobiology, nanoscience and nanomedicine, and radiotherapy and oncology, to share ideas and formulate secure and personalized treatments of the future.

The future of radiotherapy is at the heart of the newly formed Interdisciplinary Centre for nanotechnology and radiation-based cancer therapies, iNanoTheRad, of Université Paris-Saclay (UPSaclay). The objective of the interdisciplinary iNanoTheRad center is to propose new clinical solutions based on the use of innovative irradiation sources (high-dose rate, high LET, spatially structured, plasma), and innovative drugs and nanoparticles aiming at increasing the sterilizing effect of radiations on the tumour, combating radio-resistance and personalizing treatments. This paradigm shift requires a parallel adaptation of training, as the new professions in this field require increasingly interdisciplinary skills. To this end, the Centre brings together a large network of researchers, teachers, and physicians from UPSaclay who pool their expertise to collectively advance treatments and the training of new generations of professionals.

Agenda and Speakers

The agenda was prepared by a scientific committee of 12 researchers from the iNanoTheRad coordination all highly qualified in their own fields. It covered 5 interdisciplinary topics over 2,5 days that, altogether will bring the breakthroughs in radiation based therapies for cancer. All 5 sessions were introduced and explored by 5 to 10 internationally renowned speakers.

The first session was dedicated to External Radiotherapy in Clinic and was chaired by Eric DEUTSCH, Head of the Radiotherapy department at the Institute Gustave Roussy, and Charles TRUILLET, researcher at Biomaps. Five high-level presentations were made on ongoing or recent clinical trials performed at the European level and involving new radiation sources in combination or not with nanoparticles. Very

The second session, AI and imaging for radiation therapies, chaired by Maria VAKALOPOULOU, Assistant Professor at Centrale-Supelec and Erika PORCEL, Associate professor at Paris-Saclay, took us through the new promising possibilities that AI offers to improve radiotherapy through imaging and guidance.

The third session untitled New sources and associated dosimetry for radiotherapy, chaired by Gérard BALDACCHINO and Sandrine DOBOSZ DUFRENOY, research-engineers at CEA. The session explored the opportunities offered by new radiation sources for radiotherapy.

The fourth session was dedicated to new radiation therapies modalities and was chaired by Marie DUTREIX, researcher at Institut Curie. And João SANTOS SOUSA, researcher at CNRS/LPGP. Five presentations reported on recent progress in the research into the effect of specific changes in the way radiations are applied and their promising interest for radiation therapy.

The last session looked at the added value of the utilisation of radio sensitizing nanoparticles for diagnosing or treating cancer. It was chaired by Sandrine LACOMBE, Professor at Paris-Saclay and Erika PORCEL, Associate professor at Paris-Saclay.

Student session and prize

One of the conference objectives was to foster the participation of students by way of proposing talks rather posters and 2 prizes consisting in 500 euros vouchers for the best student presentations. The prizes were won by Aashini Rasjpal, PhD student at Paris-Saclay, for her presentation on “Detecting superoxide radical anions resulting from core-shell ionization upon exposure to soft X-rays”, and by Lukas Gerken, Phd student at ETH Zurich, for his presentation on the “Design and development of industrially scalable inorganic nanoparticles for X-ray therapy: physical, chemical and in-vitro radio-enhancement in comparison to gold nanoparticles”.

In addition, the conference organisation worked together with the coordinators of the Master SERP (www.master-serp.eu) and Master on Medical Radiophysics ([M2 Radiophysique Médicale | Université Paris-Saclay \(universite-paris-saclay.fr\)](http://M2 Radiophysique Médicale | Université Paris-Saclay (universite-paris-saclay.fr))) at Université Paris-Saclay in order to insert the conference program in their agenda so that the students could attend the conference and benefit from high-level international research and networking. Altogether, around 40 students have participated the conference.



Budget and sponsors

The conference was made possible thanks to the support of INanoTheRad, the labex PALM and NanoSaclay, the Soci t  Fran aise du Cancer, the Canc rop le, the D partement de Chime d’Orsay and the Master SERP. We would like to thank them here once again for their support.



The support from the Société Française du Cancer (SFC) was an important contribution to the success of the conference. The SFC was presented during the conference by the former president of the SFC, Dr. Marie Dutreix. The coordination of INanoTheRad wants to thank the SFC for its support.

Conclusion

This hybrid conference hosted 110 participants in the IJCLAB auditorium at Université Paris-Saclay, and 30 participants online. Participants mostly came from Europe while we also had the pleasure to welcome representatives from South-Korea and the US. The audience praised the highly quality of the presentations and was happy with the interdisciplinarity of the conference. It was decided that the international conference would be organised every 2 years in the frame of INanoTheRad. The next edition will be in November 2023.

Invited Speakers



Dr Ross I. BERBECO is the Director of Medical Physics Research at the Brigham and Women's Hospital (BWH) and Dana-Farber Cancer Institute (DFCI) and an Associate Professor at Harvard Medical School (HMS). Originally trained in High-Energy Physics, Dr. Berbeco received postdoctoral training in Medical Physics at the Massachusetts General Hospital and Harvard Medical School. Since 2005, Dr. Berbeco has been a faculty member at the BWH/DFCI/HMS, receiving ABR certification in 2010. His research interests include real-time motion management, novel imaging devices, 4DPET/CT, nanoparticles as radiation amplifiers, and pre-clinical radiation therapy. To perform this work, Dr. Berbeco has been a primary mentor for over 20 postdoctoral fellows, graduate and undergraduate students with funding provided by Industrial and Federal sources.



Prof. Marco BORGHESI teaches Plasma Physics at the Queen's University of Belfast, where he is employed as an academic since 1999, and he is the Head of the Centre for Plasma Physics since 2017. His research interests lay in the area of intense laser-plasma interactions, with particular expertise in laser-driven acceleration of ion beams. He has led as PI large UK-wide EPSRC projects such as LIBRA (2007-12) and more recently A-SAIL (2013-20), aimed to the advancement of laser-ion acceleration towards future medical applications. Within these projects, he has provided key contributions to the development of innovative ion acceleration schemes, and of ultra-high dose-rate radiobiology applications employing laser-driven ions. He is a frequent user of the PW-class lasers of the Central Laser Facility, Rutherford Appleton Laboratory (UK). Prof. Borghesi received in 2017 the APS John Dawson Award for Excellence in Plasma Physics Research for pioneering applications of proton radiography in high-energy density plasma.



Dr Karl BUTTERWORTH is a senior lecturer at the School of Medicine, Dentistry and Biomedical Sciences of the Patrick G Johnston Centre for Cancer Research at the Queen's University of Belfast. His fields of interest include radiation biology, radiation oncology and cancer imaging, nanomedicine, preclinical models, and small animal radiotherapy.



Dr Sandrine DOBOSZ DUFRENOY is a researcher in the group « Physics at High Intensity », LIDYL, CEA Paris Saclay, France and expert in plasma physics and in the study of relativistic electron source generated by ultra-intense laser-plasma coupling. Her research is mainly conducted on UHI100 laser facility, hosted in CEA-Saclay. She had the opportunity to work on 100TW-class laser chain in Europe (France, Sweden) and on large scale facility in UK (RAL). She collaborates with European laboratories through European Laserlab Joint Research Activities (laser-plasma source for dosimetry developments), ARIES (access on the electron source at UHI100). She is involved in the preparation of laser-plasma acceleration experiments on the future multi-PW laser APOLLON (CEA-Orme des Merisiers).



Prof. Dino JAROSZYNSKI FRSE, FInstP, leads a group studying collective radiation-matter interactions and its applications at the University of Strathclyde. He was recently Scottish Universities Physics Alliance (SUPA) Theme Leader in Nuclear & Plasma Physics and is Chair of International Committee on Ultrahigh Intensity Lasers (ICUIL). He has contributed to setting up two free-electron laser (FEL) facilities (CLIO in France and FELIX in the Netherlands) and made pioneering advances in FELs. In 1999, he established research at Strathclyde to investigate laser-plasma interactions and the application of radiation & particle beams. He led the RCUK funded ALPHA-X project, which made several significant advances: e.g. 1st demonstration of a laser wakefield accelerator (LWFA), published as one of the acclaimed “Dream Beam” papers in Nature in 2004, developed LWFA diagnostics, first full characterisation of LWFAs, and demonstrated undulator & betatron based gamma-ray sources, as well as the use of very high energy electron (VHEE) beams for radiotherapy, concentrating dose using focussed VHEE and gamma-ray beams, and LWFA applications in nuclear physics. He founded, and is the Director of, the Scottish Center for the Application of Plasma-based Accelerators (SCAPA) to develop laser-plasma particle and radiation sources and apply them in cross-disciplinary projects.



Prof. Guillaume LANDRY obtained his M.Sc. in Medical Radiation Physics from McGill University in Canada in 2009 and his PhD from Maastricht University in the Netherlands in 2014. Since 2019 he is W2 Professor for Image Guided Radiation Therapy at the Department of Radiation Oncology of the University Hospital of the LMU Munich. He is PI in two Deutsche Forschungsgemeinschaft funded projects, and in 2018 he was recipient of the Research Prize of the Deutschen Gesellschaft für Medizinische Physik. His research group is active at the intersection of imaging and radiation therapy and aims at exploiting the latest development in computer science and image processing, such as deep learning, to improve the use of images in radiation therapy, with specific aim at rendering images suitable for radiation dose calculation, organ identification and outcome prediction.



Prof. Vandana MILLER MD is an Associate Professor in the department of Microbiology and Immunology at Drexel University College of Medicine. Her research is focused on harnessing the immunomodulatory capability of non-thermal plasma for applications in cancer treatment, wound healing, skin diseases, viral diseases and vaccine delivery. She has initiated a major shift in the philosophy of using plasmas for treatment of cancer whereby plasma may be used to trigger immune responses against cancer cells. She works closely with tumor immunologists, surgeons, dermatologists, virologists and immunologists, and collaborates with plasma scientists all across the world. Two successful clinical trials were conducted based on her work for Actinic Keratosis and viral warts.



Prof. Philip POORTMANS former President of the European Cancer Organisation. After a short stay in Turnhout, Belgium, Prof Poortmans started working as a radiation oncologist in Tilburg in 1991, where he would stay for 23 years. From August 2014 to February 2017, he was head of the radiation oncology department of the Radboud university medical centre in Nijmegen, The Netherlands. Between March 1, 2017 and end of November 2019, he was Head of the Radiation Oncology Department of Institut Curie, Paris - St. Cloud - Orsay, France. Since November 7, 2017 Prof Poortmans is Marie Curie Professor of the Paris Science & Lettres University & Institut Curie. In April 2020 he started a part-time medical advisory function for Sordina IORT Technologies spa. In July 2020, he started as Radiation Oncologist at Iridium Kankernetwerk, with an affiliation with the University of Antwerp, Belgium.



Dr Erika PORCEL is an Associate Professor at Institute of Molecular Sciences, at University Paris Saclay, France. She received her Ph.D. in Sciences in 2011 at University Paris Sud, France. During 2011-2012 she was teacher assistant at University Paris Sud. In 2012 she started to study medical physics at Institut Curie, France, and she obtained the certification to be a medical physicist in 2013. She is an expert in the study of the combination of nanoparticles with hadrontherapy for cancer treatment, in which she has been interested since 2008. She recently patented platinum nanoparticles for this purpose. She was awarded in 2010 with a grant from the Japan Society for the

promotion of Sciences to stay 3 months in Japan to conduct research at the HIMAC (heavy Ion Medical Accelerator of Chiba) and at the KEK Synchrotron. She is strongly involved in medical physics education at bachelor and master level as a teacher and as co-coordinator of the master.



Dr Yolanda PREZADO is the founder and leader of the interdisciplinary team “New Approaches in Radiotherapy (NARA)” based at Institut Curie, Orsay, France. The main research avenue of the team NARA is the conception and development of innovative methods based on the use of the spatial fractionation of the dose. In particular, NARA has pioneered a novel technique called Proton Minibeam radiation therapy. Yolanda Prezado obtained her PhD in Physics in 2003. She is a board certified medical physicist (Spain). She has been developing her research in radiotherapy, first at Hospital Universitario de Salamanca (Spain), then at the Biomedical Beamline of the European Synchrotron Radiation facility (Grenoble, France) and at CNRS since 2011. Her research interests include charged particle therapy, dose calculations (Monte Carlo simulations), small field dosimetry and radiobiology. She is the Chair of the European Federation of Medical Physics and deputy spokesperson of the International Biophysics collaboration.



Dr. Charlotte ROBERT, PhD, is an assistant professor at the University Paris-Saclay, where she coordinates a master's degree dedicated to medical physics. After a PhD focused on the optimization of solid-state SPECT systems, she completed her training with a three-year post-doctoral fellowship at the IMNC (Imaging and Modeling for Neurology and Oncology) laboratory in Orsay, France, on Monte-Carlo simulation applied to proton therapy. In 2013, she joined the INSERM U1030 research unit dedicated to molecular radiotherapy to set up a new team dedicated to AI and multimodal imaging for the personalization of radiotherapy treatments (improvement and acceleration of patient management, determination of prognostic models of treatment response, new drug-radiotherapy combinations). Since 2019, she coordinates the research and teaching activities of the Gustave Roussy medical physics department.



Prof. Ulrich SCHRAMM joined the Helmholtz-Center Dresden-Rossendorf in 2006 and was appointed Director of the Institute of Radiation Physics in 2011. His interest lies in the development and application of laser plasma proton accelerators, high peak current laser wakefield electron accelerators,

high power laser systems, and dedicated metrology with a history in heavy ion storage ring based atomic physics, beam cooling and ultra-cold crystalline beams. With a growing team he established the center of high-power radiation sources, today operating a dual beam Petawatt ultra-short pulse laser in two independent target areas and commissioning a fully diode laser pumped high energy Petawatt system. His team also developed world-leading simulation capabilities, expressed in the open-source simulation code PIconGPU. He is a member of Oncoray in Dresden, bundling expertise in clinical radiation oncology, radiobiology, medical physics, and accelerator physics. With Oncoray he has pioneered dose controlled in-vitro experiments with laser accelerated protons and compact pulsed magnet beam delivery technology.



Prof. Dr. med. Esther TROOST, Division Head of 'Image-guided Radiooncology' of Helmholtz-Zentrum Dresden-Rossendorf, Co-Chair of Department of Radiotherapy and Radiation Oncology of University Hospital and Faculty of Medicine Carl Gustav Carus of the Technische Universität Dresden (UKD). Esther

Troost is an expert in image-guided high-precision therapy and contributes to the advancing field of individualized medicine in photon- and proton-based radiotherapy. To further promote and improve the impact of radiotherapy, it is essence of her work to foster interdisciplinary collaborations as well as bring new research findings into clinical application. Networking and outreach have been crucial for her success and numerous publications in international high-ranking journals as well as a couple of renowned prizes, such as the ESTRO Varian Award, reflect her clinically relevant and patient-oriented research.



Prof. Nico van den BERG is the head of the Computational Imaging group for MRI diagnostics and therapy of the Centre of Image Sciences at the UMC Utrecht. The Computational Imaging group covers all aspects of the MRI workflow for

diagnostics and therapy, from first principles modelling and hardware engineering to translating new MRI methods into clinic. His research combines expertise from the fields of (MR) physics, mathematics, computing and artificial intelligence to explore the next generation techniques to make MRI exams much shorter, reduce patient discomfort and therefore also increase robustness and diagnostic quality. His research also focuses on the use of MRI for radiation

therapy. This includes 3D motion tracking of moving targets in MR guided radiation delivery, MRI-only radiation planning and deep learning image processing.



Dr Camille VERRY (M), 39 years old: Dr Verry is senior Radiation Oncologist (MD, PhD) at the University Hospital in Grenoble (France) since 2013, member of STROBE Inserm UA7 team, and associate researcher at Dana Farber Cancer Institute (Harvard Medical School) since August 2021 (Fulbright award). Dr Verry is national coordinator of 2 clinical trials involving nanoparticles and principal investigator of 7 clinical trials concerning radiation therapy. His research is focused on improving the efficacy of radiation therapy for incurable tumors using synchrotron radiation or nanoparticles. His PhD results has led to a first-in-man clinical trial with the injection of a gadolinium nanoparticle (AGuIX) as a radiosensitizing agent. The first encouraging results concerning patients with multiple brain metastases have been published and pave the way for NanoRad2 multicenter randomized trial currently recruiting (NCT03818386). He is presently at Dana Farber for the beginning of 2 clinical trials with nanoparticles for pancreatic and lung cancer treated by MRI-Linac.



Dr Marie-Catherine VOZENIN, the research projects that I develop with my team have focused on deciphering the biological response to radiotherapy. Our collective goals are to find innovative tools, pharmacological or technological, able to protect normal tissue and enhance tumor control. In this context, we have developed a novel modality of radiation therapy called FLASH-Radiotherapy that minimizes normal tissue toxicity and eradicates tumors in various organs including the brain, lung, and skin and in various species including mice, zebrafish, pigs and cats. The protection of normal tissue by FLASH-RT was termed the FLASH effect, resulting in a series of investigations to characterize the mechanisms involved. Our work has been involved in many aspects of the FLASH effect. Monte Carlo simulations along with innovative and traceable dosimetric approaches have been undertaken to investigate the physico-chemical parameters involved in the interaction of FLASH-RT with biological matter. Further, our work has been the first to demonstrate that the protective effects of FLASH-RT are the result of an immediate consumption of local oxygen and production of less deleterious spectrum of ROS species. Much of our recent work has focused on investigating the entirely different biological response induced after FLASH exposure. Our work has also focused on the neuro-inflammatory response and immune infiltration activated at different time points after FLASH irradiation.

Importantly, we have worked to secure the translation of FLASH-RT into clinical trials for human patients with cancer.

Conference Program

Monday 15 November 21	
08:30-09:00	Registration and welcome coffee
09:00-09:25	Opening introduction by Sandrine Lacombe
09:25-09:45	Keynote presentation by Prof. Philip Poortmans
09:45-12:35	Session 1 External radiotherapy in clinic - Where do we stand?, chairman Eric DEUTSCH, co-chair Charles TRUILLET
09:45-10:15	<i>Drug-radiotherapy combinations - A review of clinical trials, Antonin LEVY (FR, Villejuif)</i>
10:15-10:45	<i>Advanced imaging for precision ion beam therapy in clinical and pre-clinical research, Katia PARODI (DE, Munich)</i>
10:45-11:15	<i>Coffee break</i>
11:15-11:45	<i>Proton-carbon ion therapy: what is the clinical evidence?, Esther TROOST (DE, Dresden)</i>
11:45-12:10	<i>Theranostic gadolinium-based nanoparticles: an exciting collaborative and multidisciplinary road from the concept to First in Man, Olivier TILLEMENT/François LUX (FR, Lyon)</i>
12:10-12:35	<i>Results of Nano-Rad first in man study: AGuIX® nanoparticles as radiosensitizers for radiotherapy, Camille VERRY (FR, Grenoble)</i>
12:35-14:00	Lunch break and virtual visit of the campus
14:00-16:40	Session 2 AI and imaging for radiation therapies, chairman Maria VAKALOPOULOU, co-chair Erika PORCEL
14:00-14:30	<i>Introduction to AI and its role in the radiotherapy workflow, Guillaume LANDRY (DE, Munich)</i>
14:30-14:55	<i>Role of AI in real-time MRI guided Radiotherapy, Nico VAN DEN BERG (NL, Utrecht)</i>
14:55-15:10	<i>Radiomics predicts the location of second local recurrence after re-irradiation in head and neck carcinom, Arnaud BEDDOCK (FR, Orsay)</i>
15:10-15:25	<i>Sponsorpresentation: SFC, Canceropole, Labex Palm & Nanosaclay, Orsay Chemical s departement, Master SERP, Marie DUTREIX (FR, Orsay)</i>
15:25-15:55	<i>Coffee break</i>
15:55-16:25	<i>AI for precision radiotherapy, Charlotte ROBERT (FR, Villejuif)</i>
16:25-16:40	<i>[18F]-FDG PET radiomics features to predict survival in patients with locally advanced cervical and anal carcinomas, Stéphane NIYOTEKA (FR, Villejuif)</i>
16:40-18:00	Selected short presentations, chairman Sandrine LACOMBE
16:40-16:55	<i>A portable gamma camera for the optimization of the patient dosimetry in radioiodine therapy of thyroid diseases, Théo BOSSIS (FR, Orsay)</i>
16:55-17:10	<i>Challenges and Contradictions in Metal Nanoparticle-Mediated Radiosensitization, Martin FALK (CZ, Brno)</i>
12' each	<i>Radiolytic Yields of •OH and e-aq along a 30 MeV-Proton Track in Water using in-line Fluorescence Detection, Julien AUDOUIN (FR, Gif-sur-Yvette)</i>
	<i>Nanometric micellar vectors for imaging and radiotherapy, Sophia GODEL (FR, Saclay)</i>
	<i>Prediction of therapeutic effects generated by the combination of metallic nanoparticles and radiotherapy, Charles BOSSON (FR, Orsay)</i>

Tuesday 16 November 21**08:30-09:00 Welcome coffee**

- 09:00-12:35 Session 3** **New sources and associated dosimetry for radiotherapy, chairman Gérard BALDACCHINO, co-chair Sandrine DOBOSZ DUFRENOY**
- 09:00-09:30 VHEE beams from laser-plasma accelerators for radiotherapy, Dino JAROSZYNSKI (UK, Glasgow)*
- 09:30-10:00 Laser proton accelerators: status and perspectives for high dose rate applications, Ulrich SCHRAMM (DE, Dresden)*
- 10:00-10:15 ELYSE electron accelerator as a tool for FLASH-radiotherapy studies in Kilo to Giga Gy per second, Serguey DENISOV (FR, Orsay)*
- 10:15-10:40 Laser-accelerated ion sources for ultra-high dose rate radiobiology, Marco BORGHESI (UK, Belfast)*
- 10:40-11:10 Coffee break*
- 11:10-11:35 Dosimetry of laser-plasma ultra-shortelectron beams for radiobiological investigation of extreme high dose rate effects, Sandrine DOBOSZ DUFRENOY (FR, Orsay)*
- 11:35-11:50 Intense lab-size Compton sources - The ThomX project, Marie JACQUET (FR, Orsay)*
- 11:50-12:05 Laser-driven nanosecond-FLASH: a proton source to investigate high dose, ultra-high dose-rate radiobiology, Alessandro FLACCO (FR, Palaiseau)*
- 12:05-12:20 Geant4 Monte Carlo simulation of early DNA damage by Auger-electron-emitting radionuclides, Daniel ADJEI (FR, Orsay)*
- 12:20-12:35 Photo-injector at IJCLab : a tool to produce ultrashort electrons bunch for radiobiological applications, Guillaume MARTINET (FR, Orsay)*

12:35-14:00 Lunch break

- 14:00-16:40 Session 4** **New radiation therapies modalities, chairman Marie DUTREIX, co-chair João SANTOS SOUSA**
- 14:00-14:30 Flash radiation therapy: sometimes quicker is better, the emerging story for ultrafast beam delivery for ultrafast cancer treatment, Marie-Catherine VOZENIN (CH, Lausanne)*
- 14:30-15:00 Non-thermal plasma - an emerging player in cancer therapy, Vandana MILLER (US, Philadelphia)*
- 15:00-15:30 Spatial fractionation of the dose in radiation therapy, Yolanda PREZADO (FR, Orsay)*
- 15:30-16:00 Coffee break*
- 16:00-16:20 Spatial-temporal dependency of radiation-induced cardiac toxicity, Karl BUTTERWORTH (UK, Belfast)*
- 16:20-16:40 Dosimetry and radioprotection evaluations of very high energy electron beams, Thongchai MASILELA (FR, Orsay)*
- 16:40-18:00** **Selected short presentations, chairman Olivier SEKSEK**
- 16:40-17:55 A scoping review of analytical out-of-field dose calculation methods for external photon beam radiotherapy, Nathan BENAZON (FR, Villejuif)*
- Central Role of spatial ROS distribution at the nanometric scale in the molecular response to carbon ion irradiation, Gersende ALPHONSE (FR, Lyon)*
- Detecting superoxide radical anions, resulting from core-shell ionization upon exposure to soft X-rays, Aashini RAJPAL (FR, Gif-sur-Yvette)*
- 12' each A review of recent studies involving dosimetry and focussing on VHEE from linear accelerators and laser-plasma Wakefield accelerators, Jason MILL (UK, Glasgow)*
- Enhanced proton treatment with a LDLR-ligand peptide-conjugated gold nanoparticles targeting the tumor microenvironment in an infiltrative brain tumor model, Eunho KIM (KR, Daegu)*

Wednesday 17 November 21

08:30-09:00 Welcome coffee

09:00-12:15 Session 5 **NPs enhanced therapies in diagnosis and treatment, chairman Sandrine LACOMBE, co-chair Erika PORCEL**

- 09:00-09:30 *Radio-enhancing nano-agents, inspiring tools for better cancer treatments, Erika PORCEL (FR, Orsay)*
- 09:30-09:45 *The role of gold nanoparticles catalytic effect in the detection of reactive oxygen species and radiosensitization, Viacheslav SHCHERBAKOV (FR, Orsay)*
- 09:45-10:05 *Bimetallic gold-decorated platinum and palladium nanoparticles as potential radiosensitizers in proton radiotherapy, Bartosz KLEBOWSKI (PL, Krakow)*
- 10:05-10:25 *Pharmacokinetics properties derived from PET imaging of innovative radio-enhancer platinum nanoparticles in preclinical model, Charles TRUILLET (FR, Orsay)*
- 10:25-10:55 *Coffee break*
- 10:55-11:10 *Gold based nanomaterials for dual application in radiation therapy: radio-enhancement and dosimetry in situ, Marie HULLO (FR, Fontenay-aux-Roses)*
- 11:10-11:30 *Proton Stimulation Targeting Plaque Magnetite Reduces Amyloid- Plaque and Iron Redox Toxicity and Improves Memory in an Alzheimer's Disease Mouse Model, Jong-Ki KIM (KR, Daegu)*
- 11:30-11:45 *Design and Development of Industrially Scalable Inorganic Nanoparticles for X-ray Therapy: Physical, Chemical and In-Vitro Radio-Enhancement in comparison to Gold Nanoparticles, Lukas GERKEN (CH, Zurich)*
- 11:45-12:15 *Nanoparticle-mediated tumor vascular modulation improves cancer therapy, Ross BERBECCO (US, Boston)*

12:15-13:00 Prizes and general conclusion