Postdoctoral Position in medical physics (M/F)
“Models and experimental methods for proton minibeams radiation therapy (pMBRT)”

The hosting structure

Institut Curie Research Center
Institut Curie is a major player in the research and fight against cancer. It consists of a Hospital group and a Research Center of more than 1000 employees with a strong international representativeness. The objective of the Research Center is to develop basic research and to use the knowledge produced to improve the diagnosis, prognosis, and therapeutics of cancers as part of the continuum between basic research and innovation serving the patient.

Context

Laboratory
The Orsay Proton therapy Center (CPO) founded in 1991 is part of the radiation oncology department at Institut Curie hospital group, which is one of the European-wide recognition as a Comprehensive Cancer Center of excellence. This position will be associated with a research project at Institut Curie whose goal is to evaluate the spatial fractionation of the dose in proton therapy, and is an exciting opportunity to join the radiation therapy research activities in Orsay, within the hospital and the research center.

The Laboratory of Translational Imaging in Oncology (LITO) is a research unit (U1288) supported by Inserm (= French NIH) and Institut Curie, the first cancer center in France (https://www.lito-web.fr/). LITO has approximately 30 researchers, including physicists, engineers, physicians, pharmacists, and technologists.

Position
Proton minibeam radiotherapy (pMBRT) is an innovative therapeutic approach which uses a strong spatial modulation of the dose to create alternating regions of high and low dose. pMBRT combines the advantages of proton therapy and the spatial fractionation of the dose for normal tissue sparing. Institut Curie has already demonstrated that this distinct dose delivery method increases the tolerance of normal (brain, skin, lung) tissue while providing equivalent or superior tumour control in preclinical models, resulting in an outstanding increase of the therapeutic index. Thus, pMBRT may benefit the treatment of large or resistant tumours, for which the requested dose is compromised by the surrounding normal tissue toxicities.

This project aims at developing the medical physics tools needed to bring pMBRT to patients as well as to unravelling the distinct radiobiological mechanisms in pMBRT. To this end, a series of radiobiological (in vivo experiments), simulations and dosimetric studies will be performed during the project.

Within the radiation oncology department based at the Institut Curie- Hospital Orsay (91), the medical physics’ team is therefore recruiting a postdoctoral fellow, with a strong interest in translational research on cancer treatment. As part of the activities of this project, the applicant would be expected to work in the following areas:

- Developments of computational methods for pMBRT-PT: strategies to obtain the best spatial resolution in healthy tissues and coverage of large volumes need to be evaluated for the current machine settings and new algorithms, in particular for hypofractionated realistic treatment plans. With that aim, the applicant will parameterise a MC based (eg TOPAS+ clinical or research TPS) dose-calculating engine to be tested for the simulation of realistic clinical treatments, with conformal multi-fields and/or transmission/shoot through plans.
- Optimisation of dosimetric methods for pMBRT-PT: accurate dose determination is paramount for the treatment success as well as for the interpretation of radiobiological experiments. Our group is working on addressing the challenges of small beams dosimetry for radiobiology/clinical investigations. Radiation therapy dosimetry (protons), robustness and uncertainties, inter-comparisons and high spatial resolution detectors (scintillators, films, chambers,
diamonds, alanine etc) will be made as several experimental characterisation campaigns are underway with minibeams, and the researcher will participate in these measurements.

References

- Proton minibeam radiation therapy for treating metastases: a treatment plan study, R Ortiz, R Belshi, L De Marzi, and Y Prezado, Medical Physics, 10.1002/mp.16203 (2022)
- Preclinical dosimetry in proton minibeam radiation therapy: robustness analysis and guidelines, R Ortiz, L De Marzi, and Y Prezado, Medical Physics, 49(8), 5551–5561 (2022)
- Proton Minibeam Radiation Therapy and Arc Therapy: proof of concept of a winning alliance, R Ortiz, L de Marzi, Y Prezado, Cancers. (2022); 14(1):116

Candidate Profile

The candidate must hold a PhD in radiation physics, medical physics or detection physics • Radiation matter interactions / radiation therapy / dosimetry • Preferred expertise and experience in one or more of the following areas: programming skills (MATLAB, Python, C++) – Monte Carlo simulations (ex: Geant4/TOPAS) – Measurements – Treatment planning. You will also be expected to have experience in working as part of a multidisciplinary team.

All our opportunities are open to people with disabilities

Contract information

Type of contract: Fixed-term contract.
Starting date: As soon as possible
Duration: 18 months
Working time: full time- number of days
Remuneration: according to the current grids
Benefits: Collective catering, reimbursement of transportation fees up to 70%, supplementary health insurance
Location of the position: Orsay
Reference: 2023-10-U1288-POSTDOC01

Contact

Please apply by e-mail (CV + application letter + references/support letter) to ludovic.demarzi@curie.fr.

Publication date: October 5th, 2023
Deadline for application: December 31st, 2023

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