

Call for applications
Research Engineer position (full time, fixed term: 1 year)
in advanced radiotherapy programs

Scientific background

In the field of groundbreaking radiotherapy modalities, the local forces in Grenoble are federating the research in using advanced radiation delivery for the management of two severe neurological pathologies: malignant brain tumors and drug-resistant epilepsy. Indeed, these cerebral pathologies represent a major societal challenge due to the absence of curative therapeutic approaches, to complex and very expensive care, as well as the significant impact on the patient's families. Advanced radiotherapy techniques such as synchrotron radiotherapy, boron neutron capture therapy, as well as theragnostic approaches such as internal radiotherapy or radiotherapy enhanced by nanoparticles (1,2), are very promising and have the potential to effectively treat these incurable diseases.

The advent of synchrotron radiation (SR) has added a new dimension to the use of x-rays in imaging and therapy. Several beamlines currently have active research programs in medicine using high-flux coherent x-ray beams produced by a synchrotron source. Regarding the complexity of these techniques, clinicians, medical researchers, medical and nuclear physicists are collaborating closely with synchrotron scientists to spearhead this development towards clinical trials. In particular, synchrotron microbeam radiotherapy has reached translational research phase with veterinary trials on glioma bearing dogs (3). This is realized in the frame of a long-term proposal at the ESRF. The transfer of the technique on patients is at the core of ambitious clinical research projects for which funding has been requested and that should start in 2024.

In parallel, a small-animal irradiator will be installed on the IRMaGe platform in Grenoble and should be commissioned starting in Spring 2023. This device will allow to perform stereotactic radiotherapy on small animals in a clinical workflow including treatment planning and dosimetry. The abovementioned therapeutic innovations will directly benefit from the synergistic effect provided by the inter-comparison of such disruptive radiotherapy techniques with the gold-standard external beam irradiations using the x-rays provided by the small-animal irradiator. This device could also be modified to be able to perform combined radiotherapy research and also provide microbeams. These projects are a joint effort between several actors, with a strong support from LabEx PRIMES, France Life Imaging, and UGA.

Description of the position

The recruited research engineer will actively participate to the experiments performed at the ESRF in the context of the veterinary trial (50%). This includes treatment planning, dosimetry and dose verifications. The research engineer will participate to the development and benchmarking of medical physics methods related to the project : treatment planning system including dose calculation algorithms; experimental dosimetry; patient specific QA; online monitoring of treatments.

The research engineer will commission and benchmark the preclinical research platform (Xstrahl SARRP) (50%) in order to enable image-guided preclinical radiotherapy on the

IRMaGe platform. This includes setting up the various experiments, image guidance, treatment planning; experimental dosimetry. The engineer will also develop treatment planning for combined therapies using high-Z nanoparticles.

Contract term and localization:

The primary contract duration is 12 months, with possibility to be extended through UGA fundings. The salary is based on experience – according to the grid of research engineers at the university.

The contract should start between 1st of February and 1st of March 2023.

The research engineer will be based in Grenoble on the IRMaGe platform and will perform frequent experiments at the ESRF.

Required skills:

- Master and/or PhD in medical physics or equivalent. Experience in experimental radiotherapy – mandatory. Experience in synchrotron radiation is a must.
- Python for data analysis, Monte Carlo modeling. Radiotherapy Treatment Planning. Instrumentation and experimental dosimetry (ion chambers, films etc).
- Proficient in English.

Contacts and applications:

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Applications containing motivation letter, CV, possibly support letters, should be sent to the three contact persons.

Deadline for applications: January 8, 2023.

References :

1. Verry, C., Dufort, S., Lemasson, B., Grand, S., Pietras, J., Troprès, I., ... & Tillement, O. (2020). Targeting brain metastases with ultras-small theranostic nanoparticles, a first-in-human trial from an MRI perspective. *Science advances*, 6(29), eaay5279.
2. Bulin, A. L., Broekgaarden, M., Chaput, F., Baisamy, V., Garrevoet, J., Busser, B., ... & Elleaume, H. (2020). Radiation Dose-Enhancement Is a Potent Radiotherapeutic Effect of Rare-Earth Composite Nanoscintillators in Preclinical Models of Glioblastoma. *Advanced Science*, 7(20), 2001675.
3. Adam JF, Balosso J, ... Verry C, Serduc R, Towards neuro-oncologic clinical trials of high dose rate synchrotron Microbeam Radiation Therapy: first treatment of a spontaneous canine brain tumor. 2022. *Int J Radiat Oncol Biol Phys*. 2022. 113(5), 967-973.