Development of a Compton telescope for hadron therapy treatment monitoring

Research Project / Research Group Description:
The IRIS group (Image Reconstruction, Instrumentation and Simulations for medical applications) of IFIC has a wide experience in the development of medical imaging systems in the fields of PET, Compton Imaging and Hadron Therapy. The main research lines combine both detector development and image reconstruction, and are currently focused on the development of a Compton telescope for hadron therapy treatment monitoring and of a PET system with monolithic crystals coupled to silicon photomultipliers. The group benefits from the interaction with other groups at IFIC working on high energy physics, and also with several hospitals. It counts with a fully equipped laboratory and a microPET/CT for research purposes. The group has participated in several European and international projects and collaborations.

The Compton telescope is made of three detector layers of LaBr3 crystals coupled to SiPMs. The group activities include the full range of detector development: system simulations, detector and electronics assembly and testing, characterization and data analysis, development of image reconstruction algorithms and tests in beam. The current version of the telescope prototype has been successfully developed and tested in the laboratory and in beam campaigns. The system is capable of operating two or three detector planes, and of imaging radioactive sources of different energies.
The system limitations for the application have been identified, and an improved version is under development. The new version will feature last generation silicon photomultipliers and will be capable of using the information conveyed by two and tree-interaction events for the energy spectrum found on clinical environments.

Job position description:
The successful candidate is expected to participate in all aspects of the development and testing of the new version of the telescope, with a further specialization of her/his main field of interest. The candidate will receive advanced training on detectors and electronics, MonteCarlo simulations of the system and the physics of signal building, and also on iterative image reconstruction methods. She/he will also participate in the daily tasks of the group, such as supervising Master students, attending seminars and courses, conferences, etc. Optionally, the candidate will have the possibility of teaching at the University of Valencia.

Requirements:
- University degree in physics, informatics, mathematics or a related field with a good final grade.
- Strong motivation and interest in the field and the project.
- Good English writing and communication skills.

The following skills will also be valued:
- Programming skills (preferably C++), knowledge of data analysis codes (preferably ROOT), knowledge of simulation codes GEANT4, GATE, FLUKA.
- Fellowships, training courses, etc. related to medical imaging.
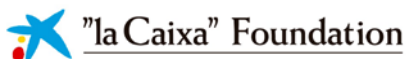
- Experience in image reconstruction and/or instrumentation.
- Experience in hadron therapy or Compton imaging.

A basic knowledge of Spanish can be helpful, but is not required for the position. Female candidates are encouraged to apply.

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Research project/Research Group website
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