

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, mainly for 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 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 group is currently working on the development of a Compton telescope for treatment assessment in hadron therapy. The system is made of three detector layers of LaBr3 crystals coupled to SiPMs. The group activities include the full range of system development: system simulations, detector and electronics assembly and testing, characterization and data analysis, development of image reconstruction algorithms and tests in beam.

Job position description:

The first 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 a new version is under development with improved energy and timing resolution. The new device will feature last generation silicon photomultipliers and will be capable of using the information conveyed by two and three-interaction events for the energy spectrum found on clinical environments.

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.

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Research project/Research Group website

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