Post Doctoral position (12 months)

Study of three gamma imaging with a liquid xenon Compton telescope for medical applications.

A new functional medical imaging technique with a liquid xenon detector has been initiated at Subatech in collaboration with the CRCNA. We propose to develop a new technique for medical imaging based on radionuclides that emit quasi-simultaneously a positron and a γ-ray, such as scandium-44. A small prototype of liquid xenon detector where scintillation and ionisation signals are both measured is currently tested at Subatech and produced its first results. In a second phase, it is planned to build a bigger Compton telescope in order to show the potential of this technique for small animal imaging. This telescope will make possible the measurement of the direction of the 3rd γ-ray, emitted by the daughter nucleus of scandium-44. By adding this information to the line of response provided by the positron annihilation, it is then possible to locate in 3 dimensions each emission point.

GATE simulations have already shown the interest of this technique within the framework of small animal imaging. However, advanced studies need to be performed to assess the performances of the 3 gamma imaging technique in more realistic cases, with standard phantoms and realistic design of a cylindrical liquid xenon camera, so called XEMIS2 (XEnon Medical Imaging System).

Subatech and the CRCNA are both partner of the Excellence Laboratory IRON (Innovative Radionuclide for Oncology and Neurology) and the Équipement d'excellence program ArronaxPlus. The CRCNA team has an experience in nuclear medical imaging using PET and SPECT cameras for clinical applications but also for small animal imaging. The team has developed know-how in image analysis and quantification.

The candidate will be involved in realistic GATE simulations of XEMIS2 and in the production and analysis of images of standard phantoms. An original reconstruction algorithm using both LOR information and the 3rd incoming γ-ray will be developed for that purpose.

The candidate must hold a PhD in physics or medical imaging and will be familiar with C++ programming and Monte Carlo simulation, particularly with GEANT4. Some knowledge of GATE and nuclear medical imaging will be greatly appreciated. The position will start ideally in January 2013 and will be located at CRCNA.

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