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POST DOCTORAL POSITION

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X-ray colour imaging with flat panel sources: a new architecture for tomography

The Detector Laboratory (LDET) develops advanced spectrometric X-ray detectors for medical imaging. Compared to conventional imagers, these detectors provide quantitative information on the nature of the imaged tissues and reduce the reconstruction artefacts in tomography. However, the size necessary to cover large fields of view hinders their use for both technical and cost reasons.

The emergence of new flat panel distributed X-ray sources opens up new perspectives in the field of medical imaging. The objective of this study is to combine these two emerging technologies to propose a new multi-energy inverse geometry tomography architecture, with a large flat panel X-ray source coupled to a small advanced spectrometric detector. This geometry will benefit from the spectral information of the detector in terms of image quality, reduction of artefacts and quantification of biological tissues, while relaxing the constraint on the sensor size.

The work of the Postdoc will be to design the image acquisition chain and to develop and implement advanced reconstruction algorithms taking advantage of the spectral information provided by the detector. While algebraic methods such as SART make it possible to process ill-conditioned geometries, statistical methods are best suited to exploit the spectral information provided by the detector from parsimonious acquisition data under low dose conditions. The reconstructed volumes will be analysed in terms of image quality according to pre-defined evaluation criteria. The results will be compared with those obtained in standard tomography. Experimental validation can be carried out on a test bench with a standard movable X-ray tube that emulates of a distributed source.

The work will take place in the CEA-LETI Detector Laboratory in Grenoble, in partnership with the Institute of Theoretical Physics of CEA, Saclay. The candidate must have a strong background in signal and image processing and applied mathematics. Knowledge of inverse problems and tomographic reconstruction algorithms would be appreciated.

Key words: Medical imaging, X-ray tomography, multi-energy, distributed X-ray source, inverse problems, iterative reconstruction algorithms

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Interested candidates should send their cv and a brief letter of motivation to the contacts below by September 30, 2017

Duration : 2 years

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