Abstract

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The data analysis project I present in this abstract is about the analysis of raw data taken from acquisitions with a PET-detector in the INFN sez. Pisa laboratory. Positron emission tomography (PET) is a functional imaging technique that uses radioactive substances known as radiotracers to visualize and measure changes in metabolic processes. PET measures the two annihilation photons that are produced back-to-back after positron emission by the radiotracer. Scintillation pixelated detectors are used as detection elements. Due to the positron annihilation we expect to observe two photons at roughly the same time (in coincidence) in the detector. The annihilation event will then be located somewhere on the line connecting the two photon-detection points. Knowing the position of all the annihilation events it's possible to reconstruct the activity map of the radiotracer obtaining the PET image.
The final aim of the project is to obtain a file containing all the coincidence events that were detected during the acquisition. To be able to do this the following steps are required:

- calculate pedestals of the detector;
- compute the calibration of the tdc (time to digital converter);
- identification of the position of the hits on the detector obtaining a flood map;
- identification of the pixel id for every event;
- energy calibration of the detector pixel by pixel and then energy resolution of the detector;
- calculation of the timestamp for every event;
- identification of the coincidence events introducing a coincidence window of 10 ns.

Moreover the user has the possibility to choose by terminal if he wants to compute the CTR (coincidence time resolution) and to plot the energy spectrum of every pixel.

The computational time should be optimized by using parallel computing.