

Development of a PET Insert for Human Brain Imaging: Detection System

In recent years, the combination of techniques such as PET and MRI has shown a great potential to study the processes and progression of diseases (cancer, Alzheimer's) as well as to control and observe novel treatments response. A brain-size PET detector ring insert for an MRI system is being developed that, if successful, can be inserted into any existing MRI system to enable simultaneous PET and MRI images of the brain to be acquired without mutual interference.

The PET insert consists of detector modules arranged in a ring of 30 cm diameter. Each detector block is composed of a scintillator crystal array coupled to the Philips Digital Photon Counting. We divided the study of the detection system in three stages. First, we characterized the coupling of the scintillator crystal with the SiPM. Next, we simulated the behaviour of the ring insert using Monte Carlo methods. Finally, we verified the simulation results with the collected data. Several crystals, including LYSO, BGO and GaGG were tested.

As a result of this methodology, we obtained the I-V curves and the energy and time resolution of our system. Results show that the coupling is appropriate and that the sensibility of our system is adequate to move to the next study phase: MRI compatibility.

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