



Contribution ID: 231

Type: **Poster**

Fast Timing MPGD for ToF-PET

Tuesday, 24 May 2022 15:38 (1 minute)

The positron emission tomography (PET) is an effective functional imaging technique especially for cancer diagnosis. Its performance is strictly connected to the ability to detect and reconstruct photons emitted by the positron - electron annihilation. Its sensitivity is enhanced when time information are included (time-of-flight (ToF) PET). The measure of the detection time difference between the two photons leads to a higher contrast image and more accurate diagnoses.

We describe the studies for a possible development of a ToF-PET based on Micro Pattern Gas Detector (MPGD). This kind of detector has a very good spatial and time resolution (order of 100 μm and few ns, respectively) and very low price, making it suitable for a full-body scanner. Further improvement in the time precision (suitable goal is to achieve values of the order of 100 ps) could be reached thanks to the Fast Timing MPGD (FTM) design, where multiple layers of MPGD compete in better measuring time information.

In order to detect PET photons, an additional element is needed: the converter. In this material, photon interacts with matter mostly by Compton effect, producing electrons that drift towards the MPGD where the multiplication step will take place.

In these studies, we show PET photon detection using a FTM, in several configurations, working not only with the numbers of the layers of the MPGD but also with the converter material.

Collaboration

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Session Classification: Application to life sciences and other societal challenges - Poster session