

Coincidence time resolution of ultrafast photomultiplier tube coupled with LYSO crystal

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This manuscript aims to use two ultra-fast photomultiplier tubes (FPMT) coupled with Lu_{1.8}Y₂SiO₅:Ce (LYSO) crystals to perform a coincidence time resolution (CTR) test applied to Time of Flight- Positron Emission Tomography (TOF-PET). The FPMT used in this work refers to a Micro Channel Plate-PMT(MCP-PMT) with rise time of 100ps, TTS of 46ps in a single photon mode. The scintillation light waveform of the LYSO crystal appears “separated” when it is detected by the FPMT. At the same time, it is found that the setting of the timing threshold has a greater impact on the results of the time resolution. The waveform processing algorithm is optimized by interpolation, and the acquired waveform is processed by the method of aspect ratio timing. The whole test is carried out under the radiation background of ²²Na, the sigma of CTR measured by LYSO crystal coupled with FPMT is 40ps. This result is not regarded as the final test result, follow-up work will continue to optimize this result.

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