Contribution ID: 8

Time response evaluation of fast photomultiplier tubes for LaBr3(Ce) crystal readout

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In the framework of the HISTARS (HIE-ISOLDE Timing Array for Reaction Studies) project at ISOLDE/CERN, it is planned to install a gamma-ray array specifically designed for fast-timing measurements of nuclear states populated in reactions. State-of-the-art inorganic scintillators, such as LaBr₃(Ce) [Vedia2015,Vedia2017,Fraile2020] or CeBr₃ [Picado2017], are commonly used due to their excellent properties for both time and energy resolution. These scintillators are typically coupled to fast photomultiplier tubes (PMTs) or silicon photomultipliers (SiPMs), which ensure high count rate capabilities and fast response, while maintaining good energy resolution, making them ideal for the challenging conditions of such experiments.

In this work, we have characterized four different head-on PMTs with bialkali photocathode by Hamamatsu in combination with a $LaBr_3$ (Ce) crystal with the shape of a truncated cone 1.5" in height and with bases of 1.5" and 1" in diameter. Among the chosen PMTs a customized version of the 2-inch 8-stage bialkali photocathode R9779 in the assembly H10570 is used as a reference. The other three, newer PMTs, are a 1.5-inch 8-stage R13408, and a 2-inch 8-stage R13089 model, in two different assemblies, H13719-Y006 and H13719-Y007.

We report on the time response at 511 keV and Co-60 photon energies using a fast digitizer module. Digital processing data techniques and a genetic algorithm [Sanchez-Tembleque2019] were employed for time pick-up. Results on energy resolution, linearity, and time walk will also be presented.

References

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