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Study on Time Offset Effect for Scintillation Detectors with Series-Connected SiPM Readout

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Scintillation detectors read out by silicon photomultipliers (SiPMs) are used in a variety of experiments as a means to detect charged particles. In particular, series connection of SiPMs have recently been attracting more and more attention for precise timing measurement. Series-connected SiPMs yield smaller capacitance than a single SiPM, which leads to narrower signal waveform and better timing resolution.

We have discovered that the signal line of series-connected SiPMs can potentially produce a non-negligible time offset depending on the hit position of the particle. In addition, we have studied the effect of radiation damage to SiPMs, which can have an additional effect on the time offset. In the end, we present a possible method to correct this effect in the case of MEG II pixelated timing counter.

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