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30-ps Time Resolution with Segmented Scintillation Counter for MEG II

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We have developed a timing detector with a \sim 30 ps time resolution for the measurement of \sim 50 MeV/c positron in the MEG II experiment using fast scintillator and SiPM. The adoption of SiPM allows flexible layout of the detector with high segmentation as well as a high precision time measurement due to the intrinsic properties. The detector is composed of 512 fast-plastic-scintillator counters. Six SiPMs from AdvanSiD, connected in series, are attached to each end of the scintillator to gain the photo-sensor coverage. The target resolution is achieved by measuring each particle's time with multiple (on average 9) counters. A systematic R&D for maximizing the single counter time resolution and a series of beam tests to demonstrate the time-resolution improvement with multi-counter measurements were performed, and 30 ps resolution was achieved with 8counter measurement. Now the detector R&D was completed and the construction is under-way. We have built 1/4 of the full detector so far, and a pilot run is foreseen this December using $\sim 10^8$ /s muon beam, whose results will also be reported.

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