

# Full System of Positron Timing Counter Having Time Resolution under 40 psec with Fast Plastic Scintillator Readout by SiPMs

Monday 18 February 2019 17:30 (20 minutes)

A positron timing counter (TC) required 30-40 ps time resolution for  $\sim 50$  MeV/c positron by the MEG II experiment has been developed. We employed the high segmented design with 512 scintillator plates ( $120 \times 40 \times 5$  mm<sup>3</sup> and  $120 \times 50 \times 5$  mm<sup>3</sup>) attached 6-SiPM-array at the both ends. Pile up is reduced by the segmented design, and multi-counter measurement improves the overall timing resolution.

All the single counters were assembled and their resolutions were under 100 psec in pre-test with Sr source. The construction and installation was also completed in 2017. An engineering run was performed in the end of 2017 at the  $\pi$ E5 muon beam line in PSI, which supplies most intense muon beam ( $7 \times 10^7$  stops/s on a target) in the world. We successfully operated the full system of TC in the MEG II environment and achieved the time resolution under 40 ps with more than 8 counter hits.

The overall resolution for the signal positrons is estimated to be 38.5 ps by weighting with the number of hits distribution of the signal positrons obtained by MC. The time resolution of TC is improved by a factor of 2 from the MEG experiment.

**Author:** Dr NISHIMURA, Miki (KEK)

**Co-authors:** BERG, Felix Anton (PSI - Paul Scherrer Institut); BIASOTTI, Michele (INFN Sezione di Genova, dDipartimento di Fisica, Universit'a degli Studi di Genova); BOCA, Gianluigi (Universita' di Pavia and INFN); CATTANEO, paolo walter (INFN); DE GERONE, Matteo (INFN - National Institute for Nuclear Physics); FRANCESCONI, Marco; GALLI, Luca (INFN); GATTI, Flavio (University and INFN of Genova); HARTMAN, Ueli (Paul Scherrer Institut PSI); HODGE, Zachary (Universitat Bern); KETTLE, Peter-Raymond (Paul Scherrer Institut PSI); NAKAO, Mitsutaka (University of Tokyo (JP)); NICOLO, donato (pisa university); OOTANI, Wataru (ICEPP, University of Tokyo); PAPA, Angela; RITT, Stefan (Paul Scherrer Institut (CH)); ROSSELLA, Massimo (Universita e INFN, Pavia (IT)); SCHMID, Elmar (Paul Scherrer Institut PSI); Dr UCHIYAMA, Yusuke (The University of Tokyo); USAMI, Masashi (ICEPP, The University of Tokyo)

**Presenter:** Dr NISHIMURA, Miki (KEK)

**Session Classification:** Plenary 2