Contribution ID : **522** Type : **Oral presentation**

Time of Flight detectors with SiPMT array readout

Friday, 4 July 2014 16:45 (20)

Scintillator based time-of-flight detectors (TOF) may attain good timing performances (eg the MICE TOF detectors and the MEG timing counter with 50 ps time intrinsic resolution), but may have problems for operation inside external magnetic fields. Even fringe fields of a few hundred Gauss may be a problem and complicate magnetic shieldings need to be devised. This is due to the conventional readout with fast photomultipliers. Alternative readout solutions may be based on large-area SiPMT arrays. These devices are insensitive to magnetic fields up to several Teslas, but may have problems due to their intrinsic noise and gain variation with temperature. Systematic tests have been done to study this option both in laboratory with a home-made laser system tuned to simulate the response to cosmic rays and in testbeam with electrons. Available SiPMT arrays from SenSL (ArraySM-4-3035-CER and ArraySB-4-30035-CER, blue extended), Advansid(ASD-SiPM3S-4x4A) and Hamamatsu (S11828-3344 and S12642 with the new TSV technology) have been studied. Results are promising and competitive with conventional solutions with fast PMT readout (Hamamatsu R4998 photomultipliers. as an example). Results on obtained timing resolutions and rate effect dependence will be reported, together with future prospects.

Summary

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Session Classification : Detector RD and Performance

Track Classification : Detector RD and Performance