Contribution ID: **63** Type: **Talk**

Application of SiPMs and MCP-PMTs in the PANDA PID detectors

Wednesday, 13 June 2018 11:45 (20 minutes)

PANDA is a hadron physics experiment at the FAIR facility at GSI which will employ a high intensity antiproton beam of up to 15 GeV/c to do high precision studies of, among others, objectives like charmonium spectroscopy and search for gluonic excitations. These measurements require a robust and compact PID system with excellent timing capabilities placed inside a magnetic field of >1 Tesla. For charged tracks above a Cherenkov threshold of $\beta > 0.68$ DIRC-type detectors will be used, while for slower particles time-of-flight (TOF) detectors were chosen.

Due to the harsh boundary conditions in the focal plane vicinity of the PANDA Cherenkov detectors (DIRC) microchannel-plate (MCP) PMTs were identified as the only suitable photon sensors. After solving a long-standing aging problem these devices are currently the best-performing photon sensors for cases when single photon detection with a sub 100 ps time resolution is required inside strong magnetic fields. Due to serious radiation hardness issues readout efforts with digital SiPMs were abandoned for this type of detector.

For slow particles a new TOF detector (PANDA barrel TOF) with <100 ps time resolution built of a large array of small 5 mm thick scintillating tiles and read out by analogue SiPMs will surround the interaction point in about 0.5 m distance. In this case every traversing particle will produce thousands of photons in the scintillator and each readout sensor will be faced with multiple (~100) photons. Under these circumstances the radiation hardness of the SiPMs is of lower importance. After a period of R&D work and several improvements of the scintillator/SiPM configuration a time resolution of ~50 ps was obtained almost independently of the hit position of the traversing particle. In this talk the various R&D steps towards the final configuration and their results will be presented and discussed. We started with small (30x30x5 mm^3) tiles read out by single SiPMs at opposite side, tested long and thin (~120x5x5 mm^3) scintillating rods with the same readout, and finally ended up with long and wide (~120x30x5 mm^3) scintillating tiles readout by four serially connected SiPMs at the opposite sides.

Primary author: Dr LEHMANN, Albert (Erlangen University)

Co-author: Mr BÖHM, Merlin (Universität Erlangen(UErl))

Presenter: Dr LEHMANN, Albert (Erlangen University)

Session Classification: Miscellaneous and Others

Track Classification: Miscellaneous and others