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Performance of the new DiRICH based readout chain for MAPMTs in test beam data

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Modern RICH detectors often employ Multianode Photomultiplier tubes (MAPMTs), providing excellent timing properties, good quantum efficiency, fine granularity and low dark noise. The CBM RICH detector, as well as the upgraded HADES RICH detector, will both use, actually even share, Hamamatsu H12700 MAPMTs for spacially resolved Cherenkov photon detection. A new FPGA-TDC based electronic readout chain has been developed for the readout of MAPMTs or MCPs with the 32ch DIRICH readout module as its core component. The signal discrimination, time- and time-over-threshold measurement, as well as digital data handling, are all implemented on a central Lattice ECP5 FPGA, providing a very cost-efficient and powerful solution. Another important aspect is the very low power consumption (12 mW/amplifier, 50 mW per channel, including discrimination, TDC, and data handling).
The new readout chain has been tested at the COSY accelerator, Forschungszentrum Jülich, for the first time under realistic beam conditions, using a small Cherenkov prototype detector. Cherenkov photons were produced by the 600 MeV proton beam passing a solid Cherenkov radiator made of 3 mm quartz. The photons were registered by 12 MAPMTs read out using 24 DIRICH modules, with a total of 768 individual channels. In addition to the readout electronic test, a wavelength shifter (WLS) coating on the MAPMTs was tested.

The poster will present first performance results from the analysis of the COSY beamtime data, focusing in particular on efficiency and timing precision, and the potential suppression of crosstalk and noise by making use of the precise Time-over-Threshold information. In addition, the effect of the WLS coating on efficiency and timing properties is investigated.

Content type

Experiment

Collaboration

TRB- and CBM-RICH collaborations

Centralised submission by Collaboration

Presenter name will be specified later

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