Contribution ID: **102** Type: **oral**

Endcap Disc DIRC for PANDA at FAIR

Tuesday, May 23, 2017 5:24 PM (18 minutes)

The PANDA detector at the future FAIR facility at GSI is planned as a fixed-target experiment for proton-antiproton collisions at momenta between 1.5 and 15\,GeV/c. It will be used to address open questions in hadronic physics. In order to achieve excellent particle identification, two different DIRC detector concepts have been developed. This talk describes the Endcap Disc DIRC detector, which will cover the forward endcap region of the PANDA target spectrometer and to provide a 4σ separation of pions and kaons up to a momentum of 4\,GeV/c for polar angles from 5° to 22°.

The main advantage of the actual design is the compact modular structure.
It consists of a synthetic fused silica radiator disk, which is divided into 4 identical quadrants. The readout system consists of 108 focusing elements with attached MCP-PMTs, which have the task to collect, focus and register the Cherenkov photons produced by the particle traversing the radiator. This new detector concept requires the development of dedicated reconstruction and PID algorithms, which permit an efficient analysis of the measured time-correlated photon patterns.
The performance of a possible online reconstruction system is under investigation with a design for a single Virtex 4 FPGA card calculating the Cherenkov angle from the measured hit pattern and related tracking information for each event with a rate of up to 20\,MHz.

Time- and event-based Monte-Carlo simulations within the PandaRoot framework have been used to analyse and evaluate the PID performance for high momentum particles. In order to determine the future overall performance of PANDA at realistic conditions, the benchmark channel $p\bar{p} \rightarrow f_0\pi^0 \rightarrow K^+K^-$ with suitable background events has been studied by including all tracking information and likelihood values from surrounding detectors. Results from various testbeams during the last years were used to validate the PID performance for the desired momentum range.

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Session Classification: R1-Particle identification(1)

Track Classification: Particle identification