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Response of a Close to Final Prototype for the Barrel of the PANDA Electromagnetic Calorimeter to Photons at Energies below 1 GeV

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The PANDA detector at the future FAIR facility will be used to study proton - antiproton interaction. The electromagnetic calorimeter (EMC) of the target spectrometer with its expected excellent performance and efficiency for electromagnetic probes over a wide energy range from 10 MeV up to 15 GeV, will be one of the central components to achieve the physics goals. The barrel part of the EMC will consist of more than 11,000 lead tungstate (PWO-II) crystals operated at -25°C to achieve the required performance and efficiency. The most recent prototype PROTO120 represents a larger section of a barrel slice, containing the most tapered crystals and the close to final components. The readout is performed with two rectangular large area APDs per crystal, which are read out separately via the custom made APFEL-ASIC, adapted to the large dynamic range, with low power consumption and an optimized signal shaping. The present contribution will show the response of the PROTO120 to photons in the energy range between 50 MeV and 800 MeV. Furthermore, it will focus on the performance of the ASIC under real experimental conditions and on the analysis procedure including the signal extraction, noise rejection, calibration and the energy and position resolution using the information from both APDs. In addition, the position dependence of the energy resolution within the crystal and the implementation of higher order energy correction algorithms for improvement were studied.

Collaboration

PANDA

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