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Prototype tests for a DIRC detector at the WASA-at-COSY experiment

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The WASA-at-COSY experiment allows the study of production and decay of eta and eta' mesons in proton-proton reactions with an almost full 4 pi covering detector including a forward spectrometer section. At the moment the Forward Range Hodoscope (FRH) in the forward angle spectrometer region determines the identity of the particles by measuring the energy loss dE-E. Simulations concerning the estimated background have shown, that an additional ring imaging Cherenkov detector in front of the Forward Range Hodoscope would significantly improve the particle identification and the energy resolution as well. Due to the very limited space, available at the intended detector position, the development of a DIRC (Detection of Internally Reflected Cherenkov light) detection system based on Plexiglas (PMMA) radiators is under discussion.

In order to show the feasibility, two different prototypes, consisting of a square PMMA radiatorbar and a PMMA focusing element were tested using the COSY proton beam. One focusing element is based on an internal reflecting polynomial shape surface, the other is based on a mirrored circular shape surface. The photon readout in the focal plane is done by Hamamatsu 64 channel multianode photomultiplier tubes (MAPMT). In addition new MAPMTs with higher quantum efficiency were studied in order to increase the number of detected photons.

The results of the various test measurements will be discussed. Typical Cherenkov pattern obtained in the relevant proton energy range will be presented.

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plenary

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