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Status of the Development of Large Area Photon Detectors based on THGEMs and Hybrid MPGD architectures for Cherenkov Imaging Applications

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We report about the development status of large area gaseous single photon detectors based on Thick Gaseous Electron Multipliers (THGEMs) for RICH applications. The R&D programme includes: characterization of THGEM structures of multiple active areas; study of the aspects related to single photon detection; optimization of front-end electronics; engineering towards large area detectors; evolution from triple-layer THGEM configurations to hybrid architectures comprising THGEMs and Micromegas. The most recent achievements within this R&D programme consist of the following 3 topics: First, assembly and study of hybrid photon detectors with active areas of 300 mm x 300 mm, where THGEMs act as CsI support and pre-amplification stage, and Micromegas as a multiplication stage. This configuration was successfully operated in laboratory conditions and at a CERN PS T10 test beam, achieving effective gains in the order of 10^5 and good time resolution (7 ns); Second, gain and thickness characterization of 300 mm x 600 mm single layer THGEMs; Third, investigation of the detector performance when coupled to APV25 Front-End chips, resulting in noise levels lower than 1000 electrons and single photon detection efficiencies higher than 90%.

The status of the R&D programme and the recent progresses are presented, as well as prospects of future 600 mm x 600 mm active area hybrid detectors envisaging the upgrade of COMPASS RICH-1 at CERN in 2016.

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