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MPGD-based detectors of Cherenkov photons in COMPASS and for future applications

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The RICH-1 detector of the COMPASS Experiment at CERN has been upgraded in 2016 with four MPGD-based photon detectors covering a total active area of 1.5 m^2. They consist in a hybrid combination of two THGEM layers and a Micromegas and convert VUV photons in a CsI layer on one THGEM. The anode is segmented in square pads of 8 mm pitch and the signal is read out via capacitive coupling by an APV-25 based FEE system. The new photon detectors operated stably with an effective gain of 14000, with a stability better than 5%, and an ion back-flow rate smaller than 3%. They provided about 11 photons per ring at saturation, with a single photon angular resolution of 1.8 mrad. The characteristics and the performance of the COMPASS MPGD-based photon detectors will be described in detail.
An R&D effort to improve this technology to cope with the challenging requirements of the high-momentum hadron PID at the EIC is ongoing. To validate a modular design with high anode granularity (pads of 3x3 mm^2), a prototype has been built and tested in laboratory and in a test beam. The prototype, the results of the tests and the perspectives of this study are illustrated.
A dedicated R&D exploratory study of a new VUV photoconverter, more robust than CsI, has provided promising first results: hydrogenated diamond nanograins have been sprayed on THGEM samples and showed to be compatible with the operation of the THGEM as an electron multiplier.
This R&D programme and the preliminary results are presented and discussed.

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