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## The SiPM readout plane for the ePIC-dRICH detector at the EIC: overview and beam test results

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The dual-radiator RICH (dRICH) detector of the ePIC experiment at the future Electron-Ion Collider (EIC) will make use of SiPMs for the detection of Cherenkov light. The photodetector will cover  $\sim 3 \text{ m}^2$  with  $3 \times 3 \text{ mm}^2$  pixels, for a total of more than 300k readout channels and will be the first application of SiPMs for single-photon detection in a HEP experiment. SiPMs are chosen for their low cost and high efficiency in magnetic fields ( $\sim 1 \text{ T}$  at the dRICH location). However, as they are not radiation hard, careful testing and attention are required to preserve single-photon counting capabilities and maintain the dark count rates (DCR) under control over the years of running of the ePIC experiment.

We present an overview of the ePIC-dRICH detector system and the current status of the R&D performed for the operation of the SiPM optical readout subsystem. Special focus will be given to recent beam test results of a large-area prototype SiPM readout plane consisting of a total of up to 2048  $3 \times 3 \text{ mm}^2$  sensors. The photodetector prototype is modular and based on a novel EIC-driven photodetection unit (PDU) developed by INFN, which integrates 256 SiPM pixel sensors, cooling and TDC electronics in a volume of  $\sim 5 \times 5 \times 14 \text{ cm}^3$ . Several PDU modules have been built and successfully tested with particle beams at CERN-PS in October 2023 and in May 2024. The data have been collected with a complete chain of front-end and readout electronics based on the ALCOR chip, developed by INFN Torino.

### Primary experiment

ePIC-dRICH Collaboration at the EIC

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