

# 11th International Workshop on Ring Imaging Cherenkov Detectors (RICH2022)



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## Modular RICH Detector Development for the Future Electron Ion Collider Experiment

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Excellent particle identification is an essential requirement for the future Electron Ion Collider (EIC) experiment. Particle identification (PID) of the final state hadrons in the semi-inclusive deep inelastic scattering allows the measurement of flavor-dependent gluon and quark distributions inside nucleons and nuclei. The EIC PID Consortium (eRD14 Collaboration) was formed in 2015 for identifying and developing PID detectors using ring imaging Cherenkov (RICH) and the ultra-fast time-of-flight (TOF) techniques for the EIC experiments with broad kinematics coverage.

To meet the challenge of limited confined space of electron end-cap in the EIC experiments, a compact modular ring imaging Cherenkov (mRICH) detector has been developed that provides  $K/\pi$  separation over a momentum coverage of  $2 \text{ GeV}/c$  to  $8 \text{ GeV}/c$ , and an  $e/\pi$  separation up to  $2 \text{ GeV}/c$  or more. The mRICH detector consists of an aerogel block, a Fresnel lens, photosensor plane and flat mirrors forming the sides of the space between the lens and photosensors. The first prototype of this detector was successfully tested at Fermi National Accelerator Laboratory (FNAL) in April 2016 for verifying the detector work principles. This was followed by a second prototype test in 2018 at FNAL with much improved optical design and photosensor integration, which allowed adaptation of different readout options. In September 2021, the third beam-test was carried at Jefferson Laboratory (JLAB) with the goal of testing mRICH performance with a precision tracking capability.

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