

Ongoing Development in a Proximity-Focusing RICH Detector for ePIC at the Electron-Ion Collider (EIC)

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1 **Abstract**

2 The Electron–Ion Collider (EIC) will enable precision studies of the
3 strong interaction in nucleons and nuclei. Its primary general-purpose
4 detector, ePIC, is designed to support a broad physics program, which
5 relies on robust particle identification capabilities. In the electron-
6 going endcap, a proximity-focusing Ring Imaging Cherenkov detector
7 (pfRICH) provides charged-particle identification, enabling pion–kaon
8 separation up to momenta of 7 GeV/c.

9 The pfRICH features a cylindrical vessel with aerogel tiles mounted
10 on the face nearest the interaction point as the Cherenkov radiator.
11 Conical mirrors along the vessel walls focus Cherenkov photons onto
12 the photosensor plane on the opposite face, maximizing photon col-
13 lection. The baseline photosensors are High-Rate Picosecond Photon
14 Detectors (HRPPDs) developed by Incom, which offer large-area cover-
15 age with fine pixelation, high quantum efficiency, low dark count rates,
16 and excellent spatial and timing resolution. At Brookhaven National
17 Laboratory (BNL), mirror test stands are used to measure reflectiv-
18 ity and uniformity, with feedback to achieve high reflectivity ($\geq 90\%$)
19 across 300–600 nm to preserve photon yield. Additionally, HRPPDs
20 have been evaluated in a pfRICH-like configuration under magnetic
21 fields at BNL to verify their performance in ePIC.

22 This talk will present the pfRICH detector design, ongoing mirror
23 evaluation studies, and preliminary results from HRPPD magnetic-
24 field performance tests at BNL.