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A novel SiPM-based aerogel RICH detector for the future ALICE 3 apparatus at LHC

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The ALICE collaboration is proposing a new apparatus, ALICE 3, to investigate the Quark Gluon Plasma properties for the LHC Runs 5 and 6. The measurements planned to address ALICE 3 physics goals require to identify charged particles over eight units of pseudorapidity ($|\eta| < 4$) and to achieve a better than 3σ e/π , π/K and K/p separation up to above 2 GeV/c, 10 GeV/c and 16 GeV/c, respectively. In this context, studies for the development a Ring Imaging Cherenkov (RICH) detector are ongoing. The state of art detector concept for the ALICE 3 barrel ($|\eta| < 2$) RICH consists in a proximity-focusing layout, using aerogel ($n = 1.03$ at $\lambda = 400$ nm) as Cherenkov radiator and a layer of Silicon Photomultipliers (SiPMs) for the photon detection. A first small-scale prototype was successfully tested on beam in October 2022 and 2023. The barrel RICH specifications and expected performance, as well as beam test results will be presented.

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