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# LHCb RICH Upgrade

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Hadron particle identification (PID) in LHCb is performed by two Ring Imaging Cherenkov (RICH) detectors. The system consists of an upstream detector, the RICH1, and a downstream detector, the RICH2, which use different radiators to provide PID to particles with momentum in the range 2-100GeV. In Run3 the photon detectors are composed by Multi-Anode Photo-Multipliers planes, which have good single photon response and very high active area. For Long Shutdown 3 an upgrade of the current electronics is planned in order to achieve a time resolution of approximately 200 ps to better reject the background. For High Luminosity LHC the RICH detectors will have a very high occupancy and improvements will be needed for the Cherenkov resolution (chromatic dispersion, optical aberrations, pixel size). Having a time-resolute RICH will play a fundamental role and studies are ongoing to improve all these aspects. A good option to replace the MaPMTs are the Silicon Photo-Multipliers: an R&D program is in progress to improve their intrinsic radiation hardness, operating them at a temperature less than  $-50^{\circ}\text{C}$ . Another possibility is to develop an hybrid MCP, which would allow a really high time resolution.

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