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The LHCb RICH Upgrade II

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The hadron particle identification provided by the RICH system in LHCb over a momentum range of 2.6 – 100 GeV/c has been a key element of the success of the experiment and will remain equally important for Upgrade II. With luminosities expected to up 7.5 times those expected for Upgrade I and 75 times those released in the past, maintaining in Run 5 and beyond the same excellent PID performance expected in Runs 3 and 4 and demonstrated in Runs 1 and 2, asks for a substantial improvement in the precision of the measurements of the space and time coordinates of the photons detected in the RICH. It will require a readout strategy with high-resolution timing information and making significant improvements in the resolution of the reconstructed Cherenkov angle, new optical schemes and very light-weight components and a DAQ network and reconstruction farm capable of handling and reducing the enormous data flow. The reconstruction software will also need a major upgrade to benefit from these improvements to the measurements. The key elements towards the realisation of these improvements will be discussed, with a view to the needed R&D, simulation results and basic principles.

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