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LUCID, the ATLAS luminosity detector in LHC Run-3 and its upgrade for HL-LHC

The LUCID-2 detector is the main luminometer of the ATLAS experiment and the only one able to provide a reliable luminosity determination in all beam configurations, luminosity ranges and at bunch-crossing level. During LHC Run-2 ATLAS has measured luminosity with a precision of 0.8%, the most precise ever among all experiments running at a hadron collider. LUCID-2 is now providing ATLAS with the luminosity measurement also in LHC Run-3. Preliminary results on the acquired datasets will be presented, suggesting that a similar precision can be obtained.

The ATLAS physics program at High Luminosity LHC (HL-LHC) calls for a precision in the luminosity measurement of 1%. To fulfill such requirement in an environment characterized by up to 140 simultaneous interactions per crossing (200 in the ultimate scenario), ATLAS will feature several luminosity detectors. At least some of them must be both calibratable in the van der Meer scans at low luminosity and able to measure up to its highest values. LUCID-3, the upgrade of LUCID will fulfill such a condition. In this contribution, two options for LUCID-3 under study are presented: the first is based on photomultipliers (PMT), as for LUCID-2, located farther from the beam-pipe to reduce the acceptance and avoid the detector saturation; the second is based on optical fibers acting as Cherenkov radiators and read-out by PMTs located in a low radiation area. All PMTs will be monitored by a radioactive ^{207}Bi source to ensure long-term stability to better than 1%. An upgrade of the readout electronics will also be needed. The status of the analysis of the data acquired in Run-3 with prototypes of both technologies installed in ATLAS will be presented focusing on the possible final LUCID-3 design.

Secondary track

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