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LUCID-3: the upgrade of the ATLAS Luminosity detector for High Luminosity LHC

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The ATLAS physics program at High Luminosity LHC (HL-LHC) calls for a precision in the luminosity measurement of 1%. A larger uncertainty would represent the dominant systematic error in precision measurements, including the Higgs sector. 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 the present official ATLAS luminometer (LUCID-2), will fulfill such a condition. In this presentation, two options under study are presented. The first one is based on photomultipliers (PMT) located at a larger distance from the beam-pipe with respect to LUCID-2 and with a smaller active area. These solutions reduce the acceptance of the detector and avoid the saturation of the luminosity algorithms. The second option is based on optical fibers acting as both Cherenkov radiators and light-guides to route the produced light to the readout PMTs. Both detectors will be monitored continuously with a 207Bi radioactive source deposited on the PMT window and, in the case of the fibers, by additional LED light injected simultaneously on the PMT and at the end of the fiber, to monitor possible ageing of the fiber due to radiation. The prototypes of both options, installed in the detector for the upcoming data taking, are also discussed, together with the first results obtained in Run-3.

In-person participation

Yes

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