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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 ATLAS luminometer (LUCID-2), will fulfill such a condition.

In this presentation, two options for LUCID-3 under study are presented: the first is based on photomultipliers (PMT) as for LUCID-2, while the second is based on optical fibers. In the first case, PMTs with a reduced active area are foreseen, placed at a larger distance from the beam-pipe with respect to LUCID-2 or in a region with low particle flux, behind the forward ATLAS absorber. Both solutions aim at reducing the acceptance of the detector to avoid the saturation of the luminosity algorithms. In the second option, optical fibers act 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 installed in ATLAS in Run-3 are discussed together with the first results obtained.

Collaboration

ATLAS

Role of Submitter

The presenter will be selected later by the Collaboration

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