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Performance of the new tracker and timing ATLAS detectors at HL-LHC for pile-up suppression

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The High-Luminosity LHC (HL-LHC), currently foreseen to start towards 2029, will operate at an instantaneous luminosity of up to 7.5 × 1034 cm−2 s−1, corresponding to an unprecedented average number of proton-proton collisions per bunch crossing of up to 200. Efficient techniques to identify and suppress jets originating from pile-up interactions are critical to achieve the physics potential of the HL-LHC.

The ATLAS Inner Detector for the HL-LHC Run 4 will be upgraded to a full-silicon Inner Tracker (ITk). Thanks to the extended coverage of ITk, the techniques to tag and suppress pile-up currently in use will be applicabile also to the high eta region, however, with expected worse performance compared to that in the central region, due to the higher amount of material and the harsher environment.
The High-Granularity Timing Detector (HGTD), that that will be installed in the forward region for Run 4, will improve the pile-up suppression in that region through timing information at the 30-50 ps level.

In this talk an overview of the ITk and HGTD sub-detectors
will be given, with focus on their performance on the pile-up suppression for the reconstruction of high level objects.
Also, the impact of a possible additional timing detector in the central region,
enabling 4D Tracking beyond the Run 4 will be discussed.

Collaboration

ATLAS

Role of Submitter

I am the presenter

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