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Performance of the ATLAS Tracking and Vertexing in the LHC Run-2 and Beyond

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Run-2 of the LHC has provided new challenges to track and vertex reconstruction with higher centre-of-mass energies and luminosity leading to increasingly high-multiplicity environments, boosted, and highly-collimated physics objects. In addition, the Insertable B-layer (IBL) is a fourth pixel layer, which has been inserted at the centre of ATLAS during the shutdown of the LHC. We will present results showing the performance of the track and vertex reconstruction algorithms using Run-2 data at the LHC and highlight recent improvements. These include a factor of three reduction in the reconstruction time, optimisation for the expected conditions, novel techniques to enhance the performance in dense jet cores, time-dependent alignment of sub-detectors and special reconstruction of charged particle produced at large distance from interaction points. Moreover, data-driven methods to evaluate vertex resolution, fake rates, track reconstruction inefficiencies in dense environments, and track parameter resolution and biases will be shown. Luminosity increases in 2017 and beyond will also provide challenges for the detector systems and offline reconstruction, and strategies for mitigating the effects of increasing occupancy will be discussed.

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