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Track-based alignment of the ATLAS Inner Detector: New extensions and expected performance for the next physics data run

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The Large Hadron Collider (LHC) at CERN is the world's largest particle accelerator, colliding proton beams at
unprecedented centre-of-mass energies. ATLAS is a multipurpose experiment that records the products of LHC
collisions. In order to reconstruct the trajectories of particles produced in these collisions, ATLAS is equipped with a precision tracking system, the Inner Detector (ID). The ID alignment procedure ensures an accurate determination of the position and orientation of the detector's components, such that detector mis-alignments do not degrade the physics performance. During the current shutdown, the ATLAS experiment will upgrade its ID with the installation of a new, additional pixel layer, named Insertable B-Layer (IBL). It will be installed between the existing pixel detector and a new smaller diameter beam-pipe. The IBL will ensure excellent tracking, vertexing and b-tagging performance during the LHC run II phase, but also imposes new challenges to the ID alignment. We report on the track-based alignment approaches, their new extensions, and the expected performance for the next physics data run.

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