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## Advanced Alignment of the ATLAS Inner Detector

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The ATLAS detector is equipped with a tracking system (Inner Detector) built using different technologies: silicon planar sensors (pixel and microstrip) and gaseous drift-tubes, all embedded in a 2T solenoidal field. Quality tracking requires to determine its almost 700,000 geometrical degrees of freedom (DoF) with high accuracy.

ATLAS physics goals require high resolution, unbiased measurement of all charged particle kinematic parameters. These critically depend on systematic effects related to alignment of the tracking system.

ID alignment is based on the official tracking event data model of ATLAS which allows for the full integration into the official tracking realm. In order to eliminate malicious systematic deformations, various advanced tools and techniques have been put in place. These include information from known mass resonances, energy of electrons and positrons measured by the electromagnetic calorimeters, beam-spot and primary vertex constraints, etc. Alignment algorithms are complemented by the extended online and offline monitoring scheme.

An outline of the track based alignment approaches and their implementation within the ATLAS software will be presented. Special attention will be paid to techniques allowing to identify and eliminate tracking systematics. Results from the 2011 LHC proton-proton collision runs at 7 TeV will be reviewed and performance improvement discussed.

### for the collaboration

ATLAS

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