

## Alignment of the ATLAS Inner Detector tracking system

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The Large Hadron Collider (LHC) at CERN is the world largest particle accelerator. It will collide two proton beams at an unprecedented center of mass energy of 14 TeV. ATLAS is equipped with a charge particle tracking system built on two technologies: silicon and drift tube based detectors, composing the ATLAS Inner Detector (ID). The alignment of the tracking system poses a challenge as one should solve a linear equation with almost 36000 degrees of freedom. The required precision for the alignment of the most sensitive coordinates of the silicon sensors is just a few microns. This limit comes from the requirement that the misalignment should not worsen the resolution of the track parameter measurements by more than 20%. So far the proposed alignment algorithms are exercised on several applications. We will present the outline of the alignment approach and results using real data from cosmic rays and large scale computing simulation of physics samples mimicking the ATLAS operation during real data taking. The full alignment chain is tested using that stream and alignment constants are produced and validated within 24 hours. Cosmic ray data serves to produce an early alignment of the real ATLAS Inner Detector even before the LHC start up. The impact of the alignment on physics measurements will be discussed.

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