Contribution ID: **100** Type: **not specified**

Alignment of the ATLAS Inner Detector in Run 2

Wednesday, 17 March 2021 12:00 (15 minutes)

The alignment of a detector aims at the description of the detector geometry as accurately as possible, such that the tracking resolution is not degraded by detector misalignments. The algorithm used for the alignment of the Inner Detector (ID) of the ATLAS experiment consists of a minimisation of the track-to-hit residuals in a sequence of hierarchical levels, ranging from the mechanical assembly structures to the local sensors. Following this strategy, a precision in the ID alignment at the level of μm was achieved, despite the difficult conditions of LHC Run 2, where time-dependent movements and deformations affected different detectors during the data taking. The minimisation of the track-to-hit residual alone is not sensitive to some systematic detector deformations that introduce biases in the track parameters while leaving the measured track-to-hit residuals unchanged. For the determination and correction of these so-called weak modes, several dedicated analyses using resonances decaying into muons or electrons are carried out. These techniques allow to minimise the biases in the track parameter through the introduction of track constraints in the alignment procedure. After the alignment campaign, the residual sagitta bias is reduced to less than ˜0.1 TeVˆ{-1}. Biases in the impact parameters are also reduced following similar techniques. Finally it has been measured that the remaining global momentum bias is of 0.9x10ˆ{-3}, and that the ID is free of radial expansions.

Time Zone

Europe/Africa/Middle East

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Session Classification: PD4/PD5: Software & Detector Performance / Tracking Detectors

Track Classification: Physics and Detectors Tracks: PD5: Tracking Detectors