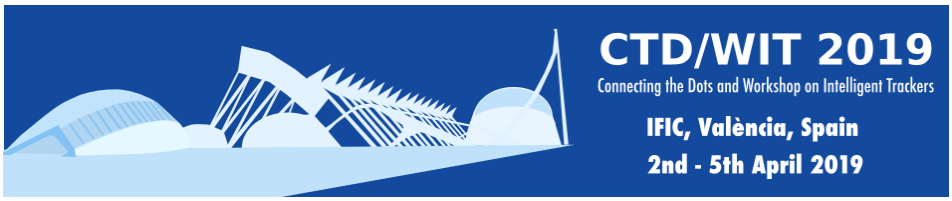


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# Sensor shapes and weak modes of the ATLAS Inner Detector track based alignment

*Wednesday, April 3, 2019 5:20 PM (15 minutes)*

The alignment of the ATLAS Inner Detector is performed with a track-based algorithm. The aim of the detector alignment is to provide an accurate description of the detector geometry such that track parameters are accurately determined and bias free.

A new analysis with a detailed scrutiny of the track-hit residuals allows to study the deformation shape of the Pixels and IBL modules. The sensor distortion can result in track-hit residual biases of up to 10 microns within a given module. Their shape is parametrized with Legendre polynomials and used to correct the hit positioning in the track fitting procedure.

The detector alignment is validated and improved by studying resonance decays (J/psi, Upsilon and Z to mu+mu-), as well as using information from the calorimeter system with the E/p method from electrons. The detail study of these resonances (together with the properties of the tracks of their decay products) allows to detect and correct for alignment weak modes such as detector curls and radial deformations that may bias the momentum and/or the impact parameter. The weak mode correcting maps and their magnitude are then used to realign the detector with increased accuracy.

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**Track Classification:** 3: Advanced usage of tracks