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## ATLAS Inner Detector alignment towards Run 3

*Thursday 2 June 2022 11:50 (15 minutes)*

The algorithm used in the alignment of the Inner Detector of the ATLAS experiment is based on the track-to-hit residual minimization in a sequence of hierarchical levels (ranging from mechanical assembly structures to individual sensors). It aims to describe the detector geometry and its changes in time as accurately as possible, such that the resolution is not degraded by an imperfect positioning of the signal hit in the track reconstruction.

The ID alignment during Run2 has proven to describe the detector geometry with a precision at the level of  $\mu\text{m}$  [1]. The hit-to-track residual minimization procedure is not sensitive to deformations of the detectors that affect the track parameters while leaving the residuals unchanged. Those geometry deformations are called weak modes. The minimization of the remaining track parameter biases and weak mode deformations has been the main target of the alignment campaign in the reprocessing of the Run2 data. New analysis methods for the weak mode measurement have been therefore implemented, providing a robust geometry description, validated by a wide spectrum of quality-assessment techniques. These novelties are foreseen to be the new baseline methods for the Run3 data-taking, in which the higher luminosity would allow an almost real-time assessment of the alignment performance.

[1] Eur. Phys. J. C 80, 1194 (2020)

### Consider for young scientist forum (Student or postdoc speaker)

Yes

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