Type: Poster

New fitting concept in ATLAS muon tracking for the LHC Run II

Tuesday 10 July 2018 16:40 (20 minutes)

Muons with high momentum – above 500 GeV/c – are an important constituent of new physics signatures in many models. Run-2 of the LHC is greatly increasing ATLAS's sensitivity to such signatures thanks to an ever-larger dataset of such particles. The ATLAS Muon Spectrometer chamber alignment contributes significantly to the uncertainty of the reconstruction of these high-momentum objects. The proper treatment of measurements during tracking and the correct propagation of the alignment effects is extremely challenging. Recently, an innovative approach that imposes Gaussian constraints on ensembles of detector hits was implemented. It provides a significant improvement to high-momentum tracking without increasing the CPU budget. Furthermore, it allows for the verification of the expected alignment quality using high-statistics collision data. A detailed discussion of the algorithmic realization is given, the expected performance gains are presented and prospects for further applications of the approach are outlined.

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Session Classification: Posters

Track Classification: Track 6 – Machine learning and physics analysis