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CMS Tracker Alignment: Legacy results from LHC Run 2 and first results from Run 3

Monday 24 October 2022 11:00 (30 minutes)

The inner tracking system of the CMS experiment, consisting of the silicon pixel and strip detectors, is designed to provide a precise measurement of the momentum of charged particles and to perform the primary and secondary vertex reconstruction. The movements of the individual substructures of the tracker detectors are driven by the change in the operating conditions during data taking. Frequent updates in the detector geometry are therefore needed to describe accurately the position, orientation, and curvature of the tracker modules.

The procedure in which new parameters of the tracker geometry are determined is referred to as the alignment of the tracker. The latter is performed regularly during data taking using reconstructed tracks from both collisions and cosmic rays data, and it is further refined after the end of data-taking. The tracker alignment performance corresponding to the ultimate accuracy of the alignment calibration for the legacy reprocessing of the CMS Run 2 data will be presented. The data-driven methods used to derive the alignment parameters and the set of validations that monitor the performance of the physics observables will be reviewed. The first results obtained with the data taken during the year 2021 and the most recent set of results from LHC Run 3 will be presented.

Significance

Extensive review of alignment strategies adopted in Run 2 and new developments for Run 3 in the alignment algorithm in both the online & offline reconstruction software, like high granularity automated alignment & new trigger development

References

Paper submitted to NIMA: https://arxiv.org/pdf/2111.08757.pdf

Experiment context, if any

CMS

Primary author: VAGNERINI, Antonio (Università di Torino)

Presenter: VAGNERINI, Antonio (Università di Torino)

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