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Full-scale CMS Tracker application of the Kalman Alignment Algorithm

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The Kalman alignment algorithm (KAA) has been specifically developed to cope with the demands that arise from the specifications of the CMS Tracker. The algorithmic concept is based on the Kalman filter formalism and is designed to avoid the inversion of large matrices.

Most notably, the KAA strikes a balance between conventional global and local track-based alignment algorithms, by restricting the computation of alignment parameters not only to alignable objects hit by the same track, but also to all other alignable objects that are significantly correlated. Nevertheless, this feature also comes with various trade-offs: Mechanisms are needed that affect which alignable objects are significantly correlated and keep track of these correlations. Due to the large amount of alignable objects involved at each update (at least compared to local alignment algorithms), the time spent for retrieving and writing alignment parameters as well as the required user memory (RAM) becomes a significant factor.

The full-scale test presented here, i.e., the employment of the KAA to the (misaligned) CMS Tracker, demonstrates the feasability of the algorithm in a realistic scenario. It is shown that both the computation time and the amount of required user memory are within reasonable bounds, given the available computing resources, and that the obtained results are satisfactory.

Submitted on behalf of Collaboration (ex, BaBar, ATLAS)

CMS

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