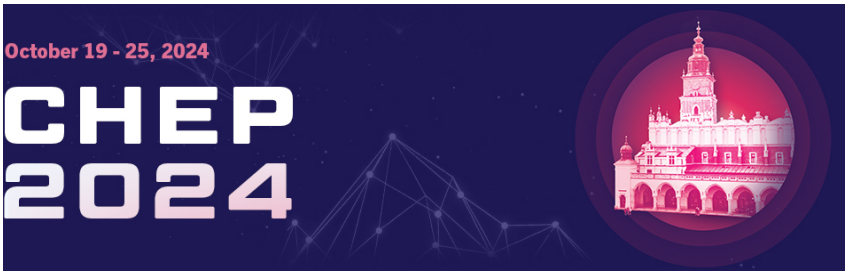

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Application of linear and non-linear constraints in a brute-force based alignment approach for CBM

Wednesday 23 October 2024 16:00 (15 minutes)

The future Compressed Baryonic Matter experiment (CBM), which is currently being planned and will be realised at the Facility for Antiproton and Ion Research (FAIR), is dedicated to the investigation of heavy-ion collisions at high interaction rates. For this purpose, a track-based software alignment is necessary to determine the precise detector component positions with sufficient accuracy. This information is crucial as it enables adequate utilisation of the high intrinsic accuracy of the sensors.

The alignment parameters to be determined are typically translations and rotations of individual sensors in relation to their intended nominal positions. They are usually determined by minimising a χ^2 function of a set of high quality reconstructed tracks.

To complement the available alignment tools, an additional approach is being developed that is based on brute-force χ^2 minimisation. On the one hand, this approach should allow different parameters to be treated individually and, on the other hand, it opens up the possibility of integrating different types of constraints into the minimisation, such as inequality and non-linear constraints.

This contribution presents the latest developments in the application of brute-force alignment within the CBM project. The question of how the results of optical detector measurements, which usually precede software alignment, can be taken into account in this procedure is also addressed.

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