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Time-based global track reconstruction in the CBM experiment

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CBM (“Compressed Baryonic Matter”) is an experiment being prepared to operate at the future Facility for Anti-Proton and Ion Research (FAIR) in Darmstadt, Germany. CBM will explore the high-density region of the QCD phase diagram by investigating nuclear collisions from 2 to 45 GeV beam energy per nucleon. Its main focus is the measurement of very rare probes (e.g. charmed hadrons), which requires interaction rates of up to 10 MHz. A specific feature of the experiment will be the free-running data acquisition fashion, without a hardware trigger. It differs from the traditional event-based approach, and demands taking to account the measurements time-coordinate in track reconstruction, and using smart approaches to cope with an enormous combinatorics.

Physical studies in the CBM experiment are planned to be based on the so called “global” track reconstruction - which means the reconstructed tracks comprise data, obtained from different detectors. Before the authors started their work, the only time-based track reconstruction component, available in the CBM software repository, was an STS-tracks reconstructor L1. The existing CBM global tracking facility Littrack worked only in the event by mode.

Efforts were applied for making the Littrack library be able to work in the time-based mode, as well as to the development of a stand alone time-based solution for creating the global tracks, basing on the already available STS reconstructed track and measured hits in the Time of Flight (ToF) detector.

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