GPU-based Online Track Reconstructions for the ALICE TPC in Run 3 with Continuous Read Out

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In LHC Run 3, ALICE will increase the data taking rate significantly to 50 kHz continuous read out of minimum bias Pb-Pb collisions.

The reconstruction strategy of the online offline computing upgrade foresees a first synchronous online reconstruction stage during data taking enabling detector calibration, and a posterior calibrated asynchronous reconstruction stage.

Many new challenges arise, among them continuous TPC read out, more overlapping collisions, no a priori knowledge of the primary vertex and of location-dependent calibration in the synchronous phase, identification of low-momentum looping tracks, and a distorted refit to improve track model entropy coding for a total TPC compression factor of 20.

The tracking algorithm for the Time Projection Chamber (TPC) will be based on a Cellular automaton and the Kalman filter.

The reconstruction shall run online, processing 50 times more collisions than today, while yielding results comparable to current offline reconstruction.

Our TPC track finding leverages the potential of hardware accelerators via the OpenCL and CUDA APIs in a shared source code for CPUs and GPUs for both reconstruction stages.

We give an overview of the status of Run 3 tracking including track finding efficiency, resolution, treatment of continuous read out data, and performance on processors and GPUs.

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