

Connecting The Dots 2023



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Kalman filter for muon reconstruction in the CMS Phase-2 endcap calorimeter

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At the High Luminosity phase of the LHC (HL-LHC), experiments will be exposed to numerous (approx. 140) simultaneous proton-proton collisions. To cope with such harsh environments, the CMS Collaboration is designing a new endcap calorimeter, referred to as the High-Granularity Calorimeters (HGCAL).

As part of the detector upgrade, a novel reconstruction framework (TICL: The Iterative CLustering) is being developed. The framework uses a hierarchical approach to build physics objects out of energy deposits and employs a wide range of both classical and machine learning algorithms, for different tasks in the reconstruction chain. Even though TICL is under continuous development, it has already shown outstanding performance in particle shower reconstruction.

In this contribution, the development of a dedicated muon reconstruction within TICL is discussed. Such dedicated reconstruction is crucial for HGCAL, especially for inter-cell calibration and for expanding the global muon reconstruction to regions with pseudorapidity >2.4 . The Kalman Filter (KF) algorithm is particularly suited to tackle this challenge, and it has already been tested and used extensively in many particle physics experiments for track reconstruction, including CMS. The performance of the KF algorithm for muon reconstruction in HGCAL under various conditions will be presented for the first time, as well as its capabilities and limitations as a tool for inter-cell calibration.

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