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The CMS Level-1 Tau algorithm for the LHC Run II

The CMS experiment implements a sophisticated two-level online selection system that achieves a rejection factor of nearly 10^5 . The first level (L1) is based on coarse information coming from the calorimeters and the muon detectors while the High Level Trigger combines fine-grain information from all sub-detectors. During Run II, the centre-of-mass energy of the LHC collisions will be increased up to 13 or 14 TeV and progressively reach an instantaneous luminosity of $2 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$. To guarantee a successful and ambitious physics program in this intense environment, the CMS Trigger and data acquisition system must be upgraded. In particular the L1 Calorimeter Trigger hardware and architecture will be upgraded, allowing sophisticated algorithms to be deployed, better exploiting the calorimeter granularity and opening the possibility of making correlations between different parts of the detector. In this context, an optimised tau algorithm, implementing an innovative dynamic clustering technique, has been developed for the selection of hadronically decaying taus, which represents a real challenge for an electronics trigger system. The performance of this tau trigger will be demonstrated, both in terms of efficiency and rate reduction. The different handles to control rate in different pile-up scenarios will be described. Finally, the plans for the commissioning with the first Run II data will be presented and the expected impact on the physics potential assessed.

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