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Jet mass reconstruction in the CMS level-1 trigger for the HL-LHC

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The High Luminosity upgrade to the LHC (HL-LHC) will increase the rate of proton-proton collisions by a factor of approximately seven, yielding greater statistics for physics analyses but also creating a challenging pileup environment. To exploit the increased luminosity and maintain physics sensitivity, the CMS detector will undergo many significant upgrades, including to its level-1 trigger (L1T) subsystem. A new architecture has been designed which has to reduce the event rate from 40MHz to 750kHz in 12.5 microseconds. This talk is centred on the development and implementation of new algorithms to meet these requirements, specifically those focussed on jets. Jets are strong signatures of interesting physics, thus efficient level-1 jet reconstruction is paramount for the HL-LHC detectors. We will discuss jet mass reconstruction and its practicality as a potential trigger. Physics processes where the jet mass may be useful for tagging fermionic decays of beyond standard model bosons are explored, before then investigating the efficiency for a hypothetical light Higgs decay. Lastly, we look at implementing the trigger in firmware, discussing the potential latency and resource usage.

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