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Long-Lived Particle Triggering with the CMS Hadron Calorimeter

Friday 19 July 2024 09:57 (15 minutes)

We present a novel long-lived particle (LLP) trigger that exploits the Run˜3 upgrade of the Compact Muon Solenoid (CMS) Hadron Calorimeter (HCAL), which introduced a precision timing ASIC, programmable front-end electronics, and depth segmentation to the CMS HCAL barrel. The hardware- and firmware-based trigger algorithm identifies delayed jets resulting from the decay of massive LLPs, and displaced jets resulting from LLPs that decay inside the HCAL. This approach significantly increases sensitivity to LLP signatures with soft hadronic final states, including exotic decays of the Higgs boson. Recent HCAL timing scans produce artificially delayed jets in collision data and are crucial to understanding the detector and trigger performance. Data collected in Run˜3 with the new LLP triggers provides a first look at the capabilities to capture softer events and expand the phase space accessible in LLP searches, which are a compelling direction to probe physics beyond the Standard Model.

Alternate track

I read the instructions above

Yes

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Session Classification: Operation, Performance and Upgrade (incl. HL-LHC) of Present Detectors

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