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Developments for the CMS Phase-2 Track Finding System

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Summary

The CMS experiment at the LHC is designed to study a wide range of high energy physics phenomena. It employs a large all-silicon tracker within a 3.8 T magnetic solenoid, which allows precise measurements of transverse momentum (pT) and vertex position.

This tracking detector will be upgraded with the installation of the High-Luminosity LHC, which will provide up to about 10^35 cm^2 /s to CMS, or 200 collisions per 25 ns bunch crossing. Novel tracking modules that utilize closely spaced silicon sensors have been developed to allow the readout of hits compatible with high pT tracks (> 2-3 GeV) to off-detector trigger electronics. This would allow the use of tracking information at the first-level trigger (L1) of CMS, a requirement to keep the L1 triggering rate below the 750 kHz target, while maintaining physics sensitivity.

This talk presents a concept for an all FPGA-based track finder using a fully time-multiplexed architecture. Various hardware concepts and technologies currently under investigation for use at the CMS Phase 2 tracker off-detector processing system will be presented, including the evaluation of multi-gigabit link performance and slow-control/board-management solutions.

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