



Contribution ID: 421

Type: **Poster**

A Track Finding Algorithm for a Time Multiplexed L1 Track Trigger for the phase II CMS experiment

Thursday, 28 May 2015 18:32 (0 minutes)

At the HL-LHC, proton bunches will cross each other every 25 ns, producing an average of 140 pp-collisions per bunch crossing. To operate in such an environment, the CMS experiment will need a L1 hardware trigger, able to identify interesting events within a latency of 12.5 μ s. The future L1 trigger will thus make use also of data coming from the silicon tracker to constrain the trigger rate.

The architecture that will be used in future to process tracker data is still under discussion. One interesting proposal makes use of the Time Multiplexed trigger concept, already implemented in the CMS calorimeter trigger for the Phase I trigger upgrade.

The proposed track finding algorithm is based on the Hough Transform method. The algorithm has been tested using a simulated pp collision data. Results show a very good tracking efficiency.

The algorithm will be demonstrated in hardware in the coming months, using the "MP7", which is uTCA board with a powerful FPGA capable of handling data rates approaching 1 Tb/s.

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Session Classification: Front end, Trigger, DAQ and Data Management - Poster Session

Track Classification: S5 - Front End, Trigger, DAQ and Data Management