Distribution of the Timing, Trigger and Control Signals in the Endcap Cathode Strip Chamber System at CMS

Thursday, 6 September 2007 16:45 (0 minutes)

This paper presents the implementation of the Timing, Trigger and Control (TTC) signal distribution tree in the Cathode Strip Chamber (CSC) sub-detector of the CMS Experiment at CERN. The key electronic component, the Clock and Control Board (CCB) is described in detail, as well as the transmission of TTC signals from the top of the CSC system down to the front-end boards.

Summary

The Cathode Strip Chamber (CSC) sub-detector currently being commissioned at CERN comprises 468 six-layer multi-wire proportional chambers arranged in four stations in the Endcap regions of the CMS. The goal of the CSC system is to provide muon identification, triggering and momentum measurement. The CSC electronic system consists of: (1) on-chamber mounted anode and cathode front-end boards; (2) Trigger and DAQ boards in sixty 9U crates on the periphery of the return yoke of the CMS; and (3) one Track Finder (TF) and four Front-End Driver 9U crates located in the underground counting room. In total, the timing, trigger and command information must be distributed to more than 3500 electronic boards in the entire CSC system.

The top component of the TTC distribution tree within the CSC system is the Clock and Control Board (CCB). It resides in the middle of the peripheral and TF crates and carries the TTCrq mezzanine board with the TTCrx and QPLL ASICs. The TTC clock, Level 1 Trigger and synchronization commands are extracted from the TTCrx ASIC. In local mode the CCB may generate these signals from its internal sources under the VME control. The 40MHz and 80MHz clocks from the QPLL ASIC are transmitted to other boards in the peripheral and TF crates over custom backplane using individual LVDS lines of the same length while the commands are distributed via GTLP bus. Further TTC signal distribution to on-chamber anode and cathode front-end boards is provided from the Trigger and Data Acquisition Motherboards using the LVDS links.

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We describe in detail the  CCB functionality and operating modes as well as
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implementation of the TTC and Trigger Control transmission paths throughout the CSC system. Recent results of the slice and commissioning tests will also be presented

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Session Classification: Poster session