

The TOTEM T1 detector electronic system

Friday 19 September 2008 09:50 (25 minutes)

Totem is an experiment located at CERN and devoted to the measurement of the proton-proton elastic and total cross section at LHC. TOTEM and CMS foresee a program of common measurements on diffractive physics.

This presentation will be focused on the design of T1 detector, devoted to the measurement of the inelastic rate, made of Cathod Strip Chambers.

We will present the complete electronic readout chain of the Cathode Strip Chambers: the anode and cathode front-end boards, the readout-control card and the trigger unit. Key features of this system are high radiation tolerance and data path, slow control, fast command and trigger compliant with the CMS standards.

Summary

The TOTEM T1 detector is a dual arm telescope, made by Cathode Strip Chambers (CSC), located in the very forward regions of the CMS detector at LHC. Each telescope arm is composed by 5 CSC planes spaced 0.5 meters apart. Each CSC is read-out by one plane of wires (anodes) and by two planes of strips (cathodes), thus giving three coordinates for each particle interacting with the detector.

Detailed studies have been carried out in order to characterize the signals coming out from the CSC and to choose the most suitable electronics for reading them out. In total about 11000 anodes and 16000 cathodes signals will be handled.

After a brief introduction to the design of the detector, an overview of the entire DAQ chain will be given and a more detailed description of the anode front-end card (AFEC), cathode front-end card (CFEC) and the read-out card (ROC) circuits will then follow.

The electronics system has been developed keeping into account the hostile environment from the point of views of both radiation and magnetic field. Dedicated VLSI circuits have been extensively used in order to optimize space and power consumption.

A key component of this system is the ROC. It receives the slow control and configuration data from the standard CMS slow control system, collects data and trigger information provided by VLSI custom chips and forward them to the counting room using optical links.

A dedicated T1 trigger card in the counting room will allow the generation of T1 trigger primitives to be sent to the global trigger logic, permitting both individual TOTEM and TOTEM/CMS integrated runs.

Extensive tests have been carried out on the complete system to characterize both the chambers and the electronics.

Primary author: Dr MINUTOLI, Saverio (INFN - Genova)

Co-authors: MAGRI', Antonio (Universita' di Genova); Dr ROBOTTI, Enrico (INFN - Genova); Dr FERRO, Fabrizio (INFN - Genova); CAPURRO, Filippo (Universita' di Genova); Dr LO VETERE, Maurizio (Universita' di Genova); Dr MUSICO, Paolo (INFN - Genova); CERCHI, Stefano (INFN - Genova)

Presenter: Dr MINUTOLI, Saverio (INFN - Genova)

Session Classification: Parallel Session B6 - Programmable Logic, boards, crates and systems