Contribution ID: **19** Type: **Oral presentation**

Beam test performance of the 2S prototype module for the High Luminosity Upgrade of the CMS Strip Tracker.

Wednesday 14 May 2014 14:00 (30 minutes)

The 2S module for the High Luminosity upgrade of the CMS Tracker has recently passed an important milestone, with the first beam test of two versions of the prototype mini 2S modules equipped with both n-on-p and p-on-n strips sensors and read out by two CBC2 ASICs. The first test of the stacked strip sensors concept in beam also provided the opportunity to evaluate the CBC2 readout ASIC in beam and the integration with the bespoke uTCA-based DAQ. The CBC2 correlation logic appears to be working well, and the analysis of the Pt selection cut and of the performance of the system as a function of the particle incident angle is presented. Other recent activities such as the TID irradiation of the CBC2 ASIC are also presented.

Summary

The mini 2S (strip-strip) module for the High Luminosity upgrade of the CMS Outer Tracker consists of a stack of two 5cm Si strip sensors read out by two CBC2 (CMS Binary Chip 2) ASICs. The module is assembled on a high-density hybrid and it is intended to prove the viability and the performance of the stacked sensor concept for selecting high Pt-tracks, as well as a demonstrator for the assembly and component developments.
In November 2013 the 2S prototype module passed an important milestone with the first beam test with 4GeV positrons at DESY. Such test was a first in many ways: the first beam test of the stacked silicon sensors concept, but also the opportunity to test the bespoke, Phase-II oriented uTCA DAQ, the first test of the performance of the CBC2 in beam and the first test with both p-on-n and n-on-p sensors, one of which not tested before.
During one week more than 120M events were recorded and this allowed extensive tuning of the commissioning steps, with trigger and stub latency scans and offset tuning, but also importantly to study the performance of the module with angular and threshold scans. The results from the analysis of these data will be presented: among these turn-on curves for the Pt selection cut, efficiency plots and cluster-width distribution as function of the particle incident angle.
Other recent activities such as the TID irradiation of the CBC2 ASIC are also presented.

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