Contribution ID: **27**   Type: **not specified**

Thermal and mechanical validation tests of the CMS barrel MIP Timing Detector

The MIP Timing Detector (MTD) is a new sub-detector planned for the phase-2 upgrade of the Compact Muon Solenoid (CMS) experiment at CERN. The MTD will provide new and unique capabilities to CMS by measuring the time-of-arrival of minimum ionizing particles with a resolution of 30-60 ps. This information will help disentangle ˜200 nearly simultaneous pileup interactions occurring in each bunch crossing at the High Luminosity LHC by enabling the use of 4D reconstruction algorithms. A sensor module of the central Barrel Timing Layer (BTL) of the MTD consists of an array of 16 LYSO:Ce crystal bars readout at both ends by Silicon Photomultipliers (SiPMs). The modules are also equipped with Thermoelectric Coolers (TECs) to enable SiPM operation at -45^0C and annealing at 40^0C during technical stops, reducing the SiPM dark count rate caused by radiation damage. A mockup of a BTL cooling tray and the BTL-Tracker Support Tube (BTST) have been set up in the CMS Tracker Integration Facility for thermal and mechanical validation of different components of BTL as well as to test and optimize the final integration of the tray into the BTST. Using our test setup, which is equipped with dual phase CO_2 cooling and closely emulates the final detector conditions, we demonstrated the achievement of target operating and annealing temperatures of the SiPMs within the available TEC power margin. The validation and integration studies of the BTL mechanics is crucial for smooth and efficient assembly of the detector, which has now entered the production phase upon successful completion of the design, characterization and optimization of its sensor modules and electronics.

Author: KRISHNA, Amrutha (Northeastern University (US))

Presenter: KRISHNA, Amrutha (Northeastern University (US))

Session Classification: Poster Session

Track Classification: Upgrades