DCS and SEP for HGCAL at CMS

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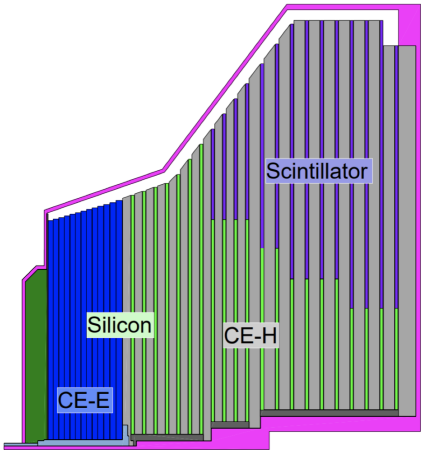
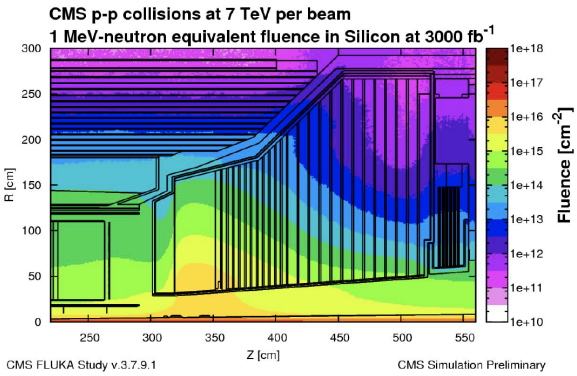
1 Introduction to HGCAL

High granularity calorimeter (HGCAL) is replacing endcap parts of the current electromagnetic and hadronic calorimeters at CMS during the long shutdown 3 (LS3) preceding the start of the High Luminosity era of the Large Hadron Collider (LHC) at CERN. HGCAL project is entering production stage in 2025. New endcap calorimeter consists of electromagnetic (CE-E) hadronic (CE-H) parts. CE-E is equiped with silicon modules, while CE-H has both silicon modules and SiPM-on-tile boards in varying proportion depending on the 1 MeV-neutron equivalent fluence by the end of life in the corresponding position. Areas with larger expected fluence are equipped with silicon sensors due to their radiation hardness, the rest is equipped with SiPM-on-tile detectors in order to increase cost-effectiveness.

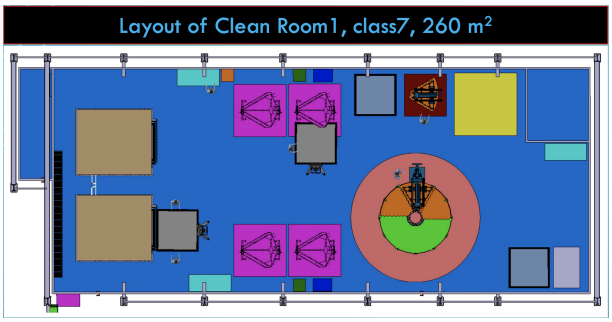


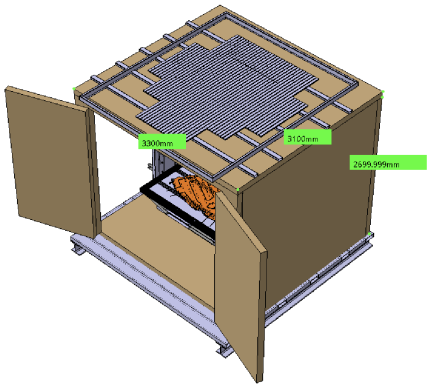


2 Cassette assembly facilities

Silicon modules and SiPM-on-tile boards will be assembled into 30°and 60°cassettes to form hadronic and electromagnetic calorimeter layers respectively. Before inserting assembled cassettes into the endcap structure, they need to be tested in batches with cosmic muons in cold conditions for several weeks. Cassette assembly facilities (CAF) at FNAL and at CERN have recently built cold boxes designed specifically for this purpose.

The goal of the test is to commission the silicon modules and SiPM-on-tile boards after the cassette assembly and to test the whole readout chain including various readout electronics components located on the cassettes.





3 DCS and SEP systems

Cold operation of the cassettes inside cold boxes needs functional detector control (DCS) and subdetector environmental protection (SEP) systems in order to provide operators a convenient way to control and monitor a significant amount of hardware inside and outside the cold box and guarantee the safety of the personnel and detector equipment. Main risk factor for the cold detector operation is humidity and condensation, which could lead to the damage of detector electronics. DCS and SEP systems monitor the conditions of the detector operation, and take actions to protect the equipment and personnel in case dangerous conditions are detected. The experience obtained from development and practical use of such systems for operating CAF at CERN can be used later for designing DCS and SEP systems for the final HGCAL detector at CMS. In this talk I present the design of DCS and SEP systems for HGCAL CAF at CERN and the progress on their development towards the operational CAF.