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Development of Muon Tomography for the Geometry Validation of the CMS High Granularity Calorimeter

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The high granularity calorimeter (HGCAL) of CMS is planned to operate during the high luminosity operation of the LHC, replacing the existing electromagnetic and hadronic calorimeters at the endcap section. It will enable a detailed investigation of vector boson fusion processes and Lorentz-boosted topologies in forward regions. An extensive validation of the hardware and software components of this state-of-the-art calorimeter is currently in progress.

In this presentation we describe some of the interesting and complex details that need to be included in a high quality simulation of the calorimeter. We have developed a muon tomography technique that is found to be very useful for identifying any problems after changes are made as well as for testing the correctness of the geometry. We discuss how this technique is used to figure out energy loss discrepancies with partial-wafer silicon sensors, incorrect rotation of full and partial-wafer silicon sensors, and validation of GEANT hit positions in the HGCAL scintillator tiles.

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