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Validation of Physics Models of Geant4 Versions 10.4.p03, 10.6.p02 and 10.7.p01 using Data from the CMS Experiment

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CMS tuned its simulation program and chose a specific physics model of Geant4 by comparing the simulation results with dedicated test beam experiments. Test beam data provide measurements of energy response of the calorimeter as well as resolution for well identified charged hadrons over a large energy region. CMS continues to validate the physics models using the test beam data as well as collision data from the Large Hadron Collider. Isolated charged particles are measured simultaneously in the tracker as well as in the calorimeters. These events are selected using dedicated triggers and are used to measure the response in the calorimeter. Different versions of Geant4 (10.2.p02, 10.4.p03, 10.6.p02) have been used by CMS for its Monte Carlo production and a new version (10.7) is now chosen for future productions. A suitable physics list (collection of physics models) is chosen by optimizing performance against accuracy. A detailed comparison between data and Geant4 predictions is presented in this paper.

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