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Detailed studies of hadronic showers and comparison to GEANT4 simulations with data from highly granular calorimeters

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The highly granular calorimeter prototypes of the CALICE collaboration have provided large data samples with precise three-dimensional information on hadronic showers with steel and tungsten absorbers and silicon, scintillator and gas detector readout. From these data sets, detailed measurements of the spatial structure, including longitudinal and lateral shower profiles and of the shower substructure are extracted. Recent analyses have extended these studies to different particle species in calorimeters with scintillator readout and steel and tungsten absorbers, to energies below 10 GeV in a silicon tungsten calorimeter and have provided first studies of the shower substructure with gaseous readout and unprecedented granularity of 1 x 1 cm^2 over a full cubic meter. These results are confronted with GEANT4 simulations with different hadronic physics models, and present new challenges to the simulation codes and provide the possibility to validate and improve the simulation of hadronic interactions in high-energy physics detectors.

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