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Exploring the structure of hadronic showers and hadronic energy reconstruction with highly granular calorimeters

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Prototype imaging electromagnetic and hadronic calorimeters developed and operated by the CALICE collaboration provide an unprecedented wealth of highly granular data of hadronic showers for a variety of active sensor elements and different absorber materials. In this presentation, we discuss detailed measurements of the spatial and the time structure of hadronic showers to characterise the different stages of hadronic cascades in the calorimeters, which are confronted with GEANT4 - based simulations using different hadronic physics models. These studies also make use of the two different absorber materials, steel and tungsten, used in the prototypes. The high granularity of the detectors is also exploited in the reconstruction of hadronic energy, both in individual detectors and combined electromagnetic and hadronic systems, making use software compensation and semi-digital energy reconstruction. We will report on the performance of these reconstruction techniques for different electromagnetic and hadronic calorimeters, with silicon, scintillator and gaseous active elements.

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