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DHCAL with Minimal Absorber: Measurements with Positrons

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The CALICE Digital Hadron Calorimeter (DHCAL) is a highly-granular 1m^3 large prototype, based on Resistive Plate Chambers (RPCs) with digital readout of $1 \times 1 \text{ cm}^2$ pads. In special tests, 50 of its active layers were exposed to low energy particle beams, without interleaved absorber plates. The thickness of each layer corresponded approximately to 0.29 radiation lengths or 0.034 nuclear interaction lengths, defined mostly by the copper and steel skins of the detector cassettes. The results of the measurements performed at the Fermilab test beam with positrons in the energy range of 1 to 10 GeV will be presented and compared to simulations based on GEANT4. It is found that the default GEANT4 simulation of electromagnetic showers is not able to reproduce the measurements of the energy resolution and the detailed shower shapes. With the use of the so-called 'Option 3' or '_EMY' good to excellent agreement is obtained.

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