

Additive manufacturing of a 3D-segmented plastic scintillator detector for particle tracking and calorimetry

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3D granularity plastic scintillator detectors combine particle tracking, calorimetry and sub-ns time resolution. Future detectors will aim to larger volumes and finer segmentation, making the manufacturing and the assembly prohibitive. The 3DET is developing additive manufacturing of plastic scintillator, opening the door to large-scale production of 3D-segmented detectors. A monolithic geometry consisting of a 5x5x5 matrix of optically-isolated scintillating voxels made of transparent polystyrene, white reflector, and orthogonal 1 mm diameter holes to accommodate wavelength shifting fibers was produced. We report about the manufacturing process of the prototype and its characterisation after exposure to cosmic rays and test beams at CERN. This work paves the way towards a new feasible, time and cost-effective process for the production of future scintillator detectors, regardless their size and difficulty in geometry.

Alternate track

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