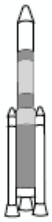

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第２０回 素粒子・原子核物理学
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Additive manufacturing of a 3D-segmented plastic scintillator detector for particle tracking and calorimetry

Thursday 23 May 2024 09:00 (20 minutes)

Plastic scintillator detectors with 3D granularity and sub-ns time resolution are capable of simultaneous particle tracking, identification and calorimetry. Enhancing the performance of future detectors will necessitate larger volumes, possibly combined with even finer segmentation, making the manufacturing and the assembly processing prohibitive, time consuming, expensive and hard to control with the desired precision. The 3DET R&D collaboration recently developed the additive manufacturing technology that opens the door to large-scale production of 3D-segmented scintillating detectors. A novel technique was developed to additive manufacture a monolithic geometry consisting of 3D granular scintillator without the need for additional production steps. A 5x5x5 matrix of optically-isolated scintillating sub-structures made of highly transparent polystyrene, white reflector, and orthogonal 1 mm diameter holes to accommodate wavelength shifting fibers was produced. This talk presents the fabrication of the additive manufactured prototype. The evaluation of the response with data collected by exposing it to both cosmic rays and test beam at CERN will also be reported. 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, with a performance comparable to the current state of the art of plastic scintillator detectors.

Authors: LI, Botao (ETH Zurich (CH)); LI, Botao (ETHZ - ETH Zurich)

Presenters: LI, Botao (ETH Zurich (CH)); LI, Botao (ETHZ - ETH Zurich)

Session Classification: New technologies/New concepts 2