



Contribution ID: 780

Type: **Parallel session talk**

Fully 3D-printed plastic scintillator particle detector prototypes

Thursday, 24 August 2023 10:30 (15 minutes)

Particle detectors made of plastic scintillator with three dimensional granularity and sub-ns time resolution are capable of simultaneous particle tracking and calorimetry. However, large-scale detectors with fine granularity require great efforts on the manufacturing and assembly processing, which can be prohibitive, time consuming, expensive and hard to control with the desired precision. The 3DET collaboration recently developed the additive manufacture technology enabling the large-scale production of optically-isolated 3D-segmented scintillating detectors.

In this talk we present the measurement results on the first fully 3D-printed scintillating particle detector prototype. A novel technique was developed to 3D-print both scintillator and white reflector, together with mm diameter holes with sub-0.1 mm tolerance hosting the WLS fibers for reading out, without need of any post-processing. A light yield analogous to one of the conventional plastic scintillator detectors and a few percent light crosstalk were obtained. We will present the first comparison on the optical performance between the standard scintillator and the 3D-printed prototypes. The possibility of adopting inorganic scintillator was also studied. This work is the milestone, for the first time, demonstrate that the 3D printing of particle detectors is getting ready for future particle physics experiments.

Collaboration / Activity

3DET collaboration

Primary authors: RUBBIA, André (ETH Zurich); LI, Botao (ETH Zurich, neutrino physics, Rubbia's group); SGAL-ABERNA, Davide (ETH Zurich); Mr WEBER, Tim (ETH Zurich); Dr KOSE, Umut (ETH Zurich)

Presenter: LI, Botao (ETH Zurich, neutrino physics, Rubbia's group)

Session Classification: T12 Detector R&D and Data Handling

Track Classification: Detector R&D and Data Handling