



Contribution ID: 185

Type: **Oral Presentation**

The Next Generation Scintillator-based Electromagnetic Calorimeter Prototype and Beam Test

Saturday 11 June 2011 16:40 (20 minutes)

We are studying next generation scintillation detectors for future collider experiments. For precise energy measurement of energetic jets in future experiments, particle flow algorithm with fine granular scintillator strip calorimeter will play an important role. To establish the technology of the calorimeter, we are studying the properties of small plastic scintillator strips with size of $(10-5) \times 50 \times 3$ mm, which is a fundamental component of the calorimeter. As a part of this R&D study, small extruded plastic Scintillator of size $10 \times 45 \times 3$ mm and a tungsten plate with 3.5 mm thick are sampled together to Fabricate a Scintillator base electromagnetic calorimeter prototype. The Prototype has a stack of 30 layers, having dimension of 20×20 cm. The Scintillator strips in successive layers aligned in orthogonal to achieve effective 1×1 cm segmentation. The total number of channels is 2160 for readout. The scintillation light produced in plastic Scintillator strips enters the wavelength shifting(WLS) fiber placed inside the plastic Scintillator are guided to the sensitive photo detector 1600 pixel MPPC (Multi Pixel Photon Counter) with a sensitive region of 1×1 mm². The electromagnetic calorimeter performance has been studied with test beam during summer 2008 and 2009 at Fermilab. We have injected 1-30 GeV electron and 60 GeV Pion beams and measured energy resolution and linearity of response toward input energy. In this presentation we will present obtained performance of the calorimeter prototype.

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Session Classification: Calorimetry

Track Classification: Calorimetry