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Fine Segmented Scintillator ECAL

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The idea of using scintillator strips coupled with Pixelated Photon-Detector(PPD) has provided the ILD an electromagnetic calorimeter(ECAL) option with a lower cost. In the FNAL 2009 beam test, it was found that the prototype calorimeter of 30 layers could meet the stringent requirements of the ILD. Following this, efforts has been made to develop a more feasible ECAL in terms of performance, size and cost. With a more compact readout electronics and improved PPD, 2 layers of embedded front end electronics technological prototype was fabricated using 3 layers of $180 \times 180 \text{mm}^2$ ECAL base unit(EBU), in which each EBU has 144 channels of $45 \times 5 \text{mm}$ scintillator strip coupled with the improved PPD. The two layers are arranged orthogonally and by using the Strip Splitting Algorithm(SSA), we could create a fine granularity of $5 \times 5 \text{mm}^2$ for the Particle Flow Algorithm application. The layers were tested at DESY and the results of this beam test shall be presented. In addition, various studies has been made on the scintillator strip in order to further improve the ScECAL's performance such as to reduce the dead volume by PPD etc. The findings of these studies shall also be discussed and compared with the simulation results.

Summary

The ScECAL technological prototype shows no significant problems operating in a multilayer configuration and the SSA works well. The results from the beam test shows good energy deposit, low noisy or dead channel ratio and good scintillator uniformity. By modifying the scintillator strip shape and configuration, these performance can be further improved.

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