Simulation of EM CAL Beam Test Module Uniformity

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1 Introduction

We need to know the response of the EM CAL module depending on the incident beam location. To this end, a Geant4 simulation was made. The response in terms of total energy deposit into different WLS fiber configurations ("square", "circle", and "square & circle") for 1, 2, and 6 superlayers were simulated.

2 Results

The total energy deposit in the EM CAL for each beam position is taken for 1000 events using a 4GeV electron beam. The mean total energy for each beam position is then obtained by a gaussian fit. These mean total energy values are then plotted against the corresponding incident beam position. The plots are shown if figures 1, 2, and 3.

3 Notes

It should be noted however that the fiber geometry was not actually constructed in the Geant4 simulation. Instead, the energy deposit (as well as) the track length in the scintillator tile were simply scaled by a factor 0.20 when the simulation step occurs in the fiber region. Light collection efficiency effects were also not yet included for areas near the fiber as well as outside the fiber loop.

Nevertheless, we can see a rather smaller drop in the EM CAL that uses the alternating square and circle fiber configuration compared to when using only square or only circle fiber configuration.
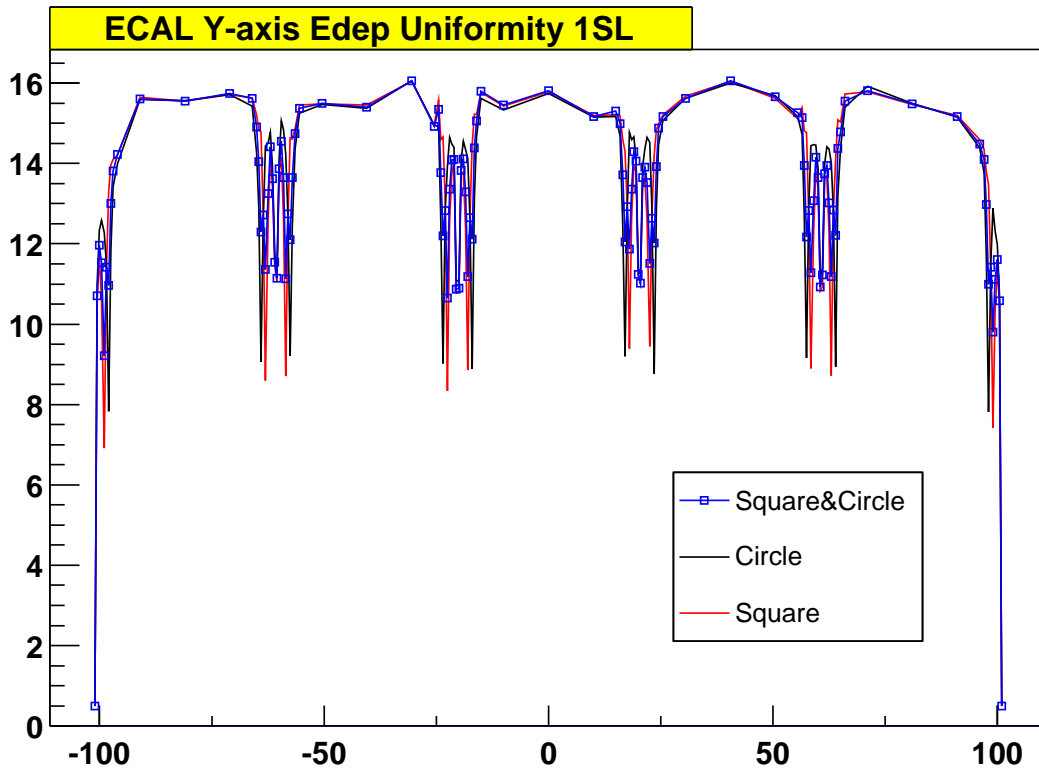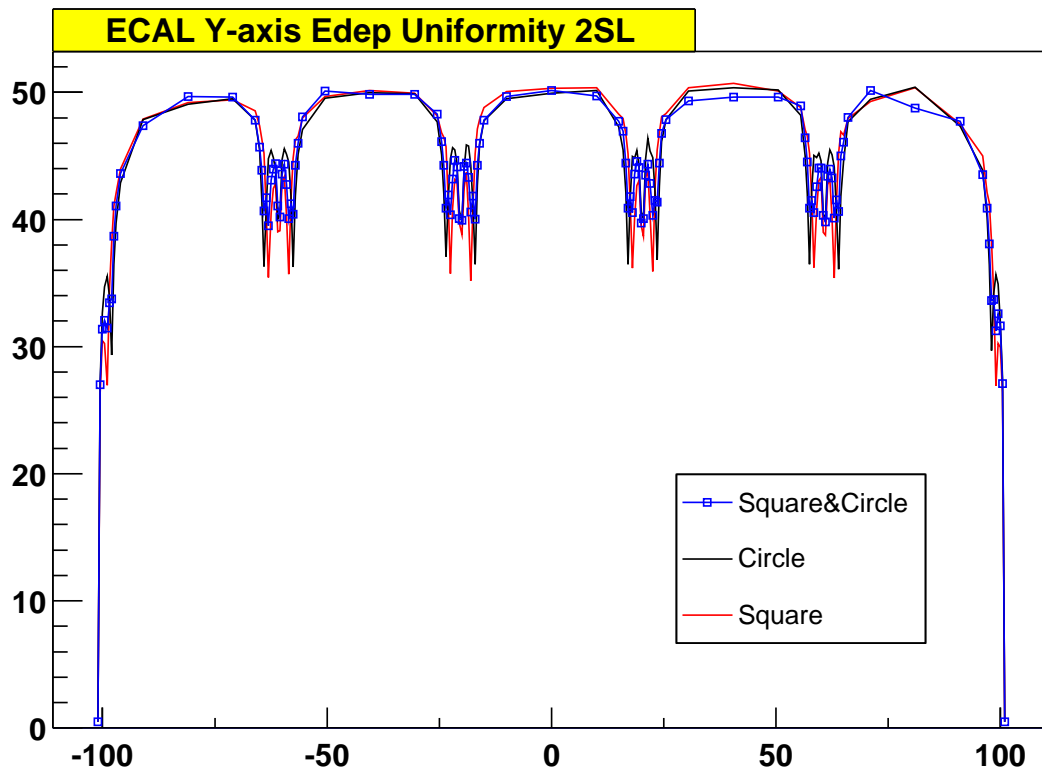
Figure 1: Module uniformity for 1 superlayer.
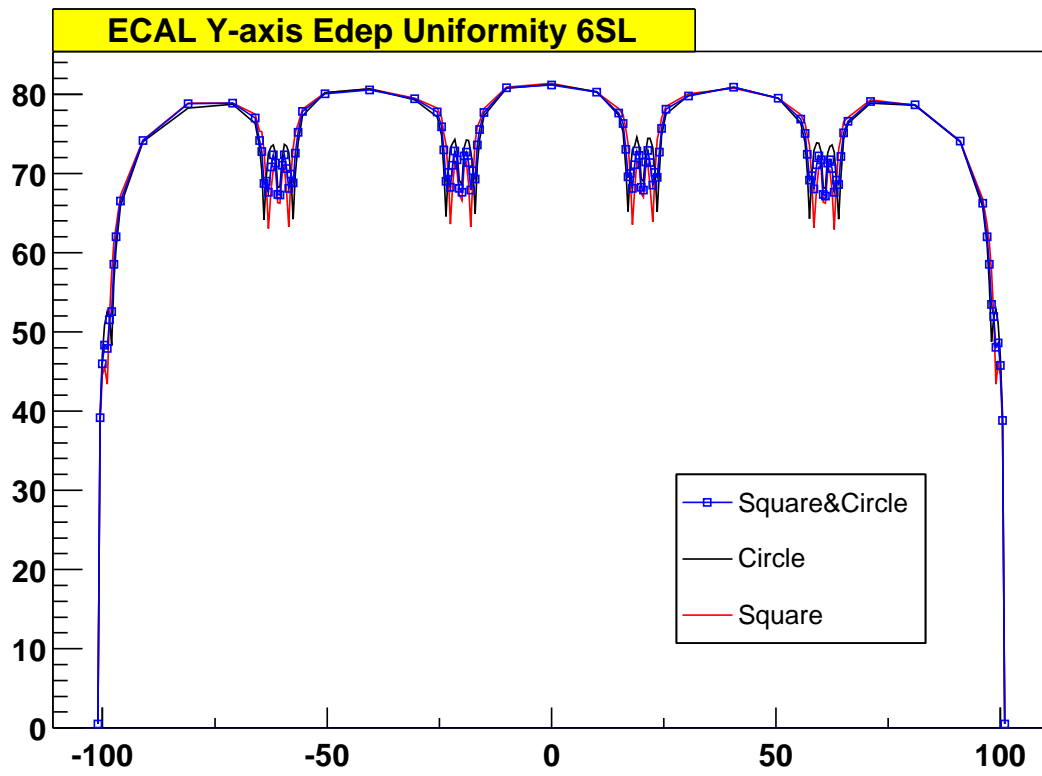
Figure 2: Module uniformity for 2 superlayers.

Figure 3: Module uniformity for 6 superlayers.