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Performance of a highly compact electromagnetic calorimeter for future electron-positron colliders

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The FCAL Collaboration is presently designing and testing electromagnetic sampling calorimeters foreseen for the forward region of future detectors at electron-positron colliders. Two calorimeters, LumiCal and BeamCal, are foreseen for a precise and instant measurement of the luminosity, respectively. For the integrated luminosity, obtained from the rate of low angle Bhabha scattering events, a precision of better than 10^{-3} is required from the physics program. The precise measurement of electromagnetic showers on top of background favours highly compact calorimeter designs. BeamCal sensors have to withstand high radiation doses. The performance of a LumiCal silicon-tungsten prototype was studied in several test-beam campaigns at DESY using electrons with energies between 1 and 5 GeV. The results demonstrate an effective Moliere radius of about 8mm, a shower position resolution of 0.44mm and excellent linearity of the response. The results are in a good agreement with the MC simulation.

Recently, a dedicated multi-channel ultra-low power ASIC for the LumiCal readout was used in test-beam studies for the first time. Preliminary results will be presented. In addition, an ASIC with a dual readout scheme for the BeamCal is being developed.

Also, results on radiation hardness studies of different sensor candidates will be reported.

First author

Veta Ghenescu

Email

ghenescu@spacescience.ro

Collaboration / Activity

FCAL Collaboration

Primary author: Dr BUGIEL, Szymon (Institut Pluridisciplinaire Hubert CURIEN (IPHC))

Co-author: Dr GHENESCU, Veta (Institute of Space Science)

Presenter: Dr BUGIEL, Szymon (Institut Pluridisciplinaire Hubert CURIEN (IPHC))

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