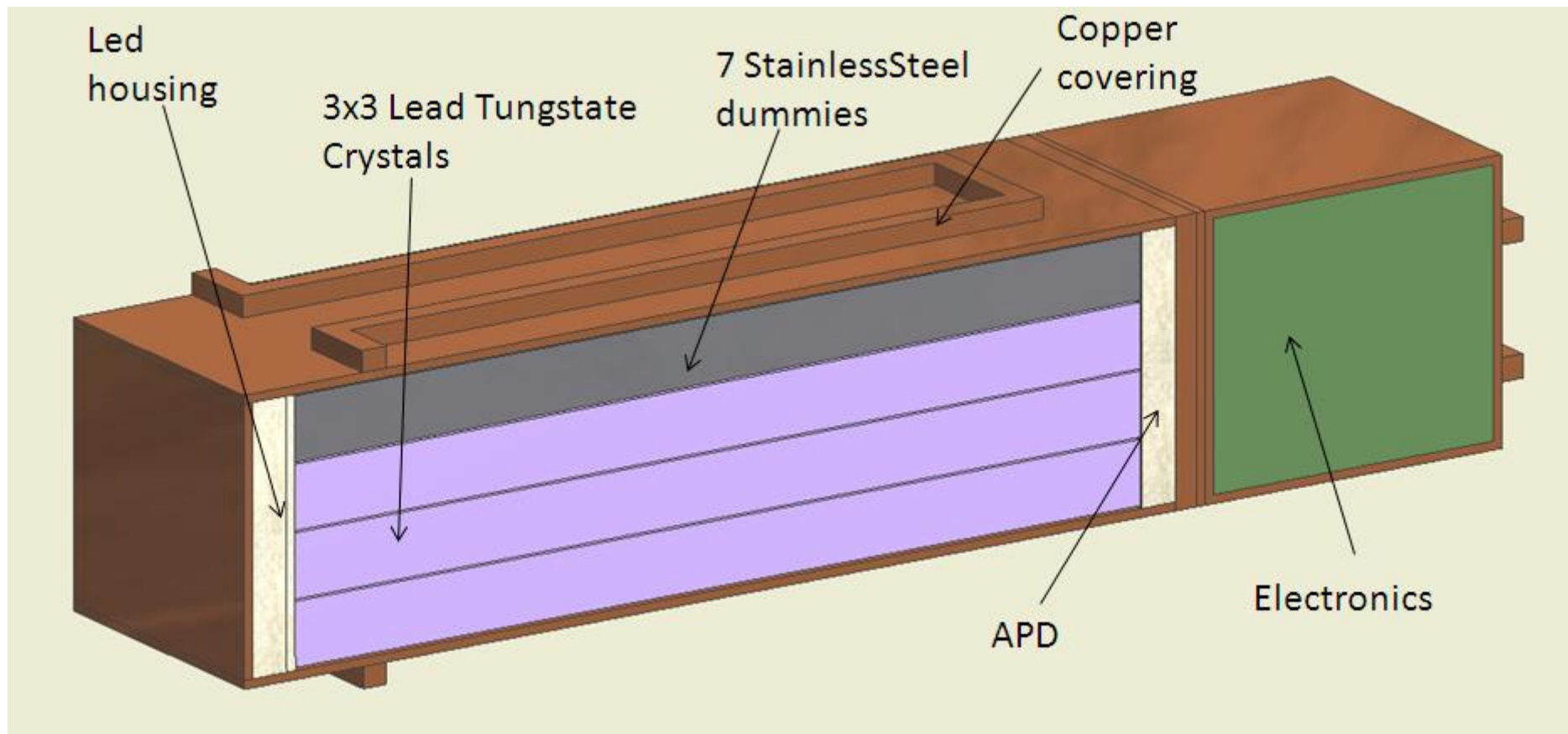


Prototype simulations

The model of the calorimeter prototype for the simulations is show in the following picture:



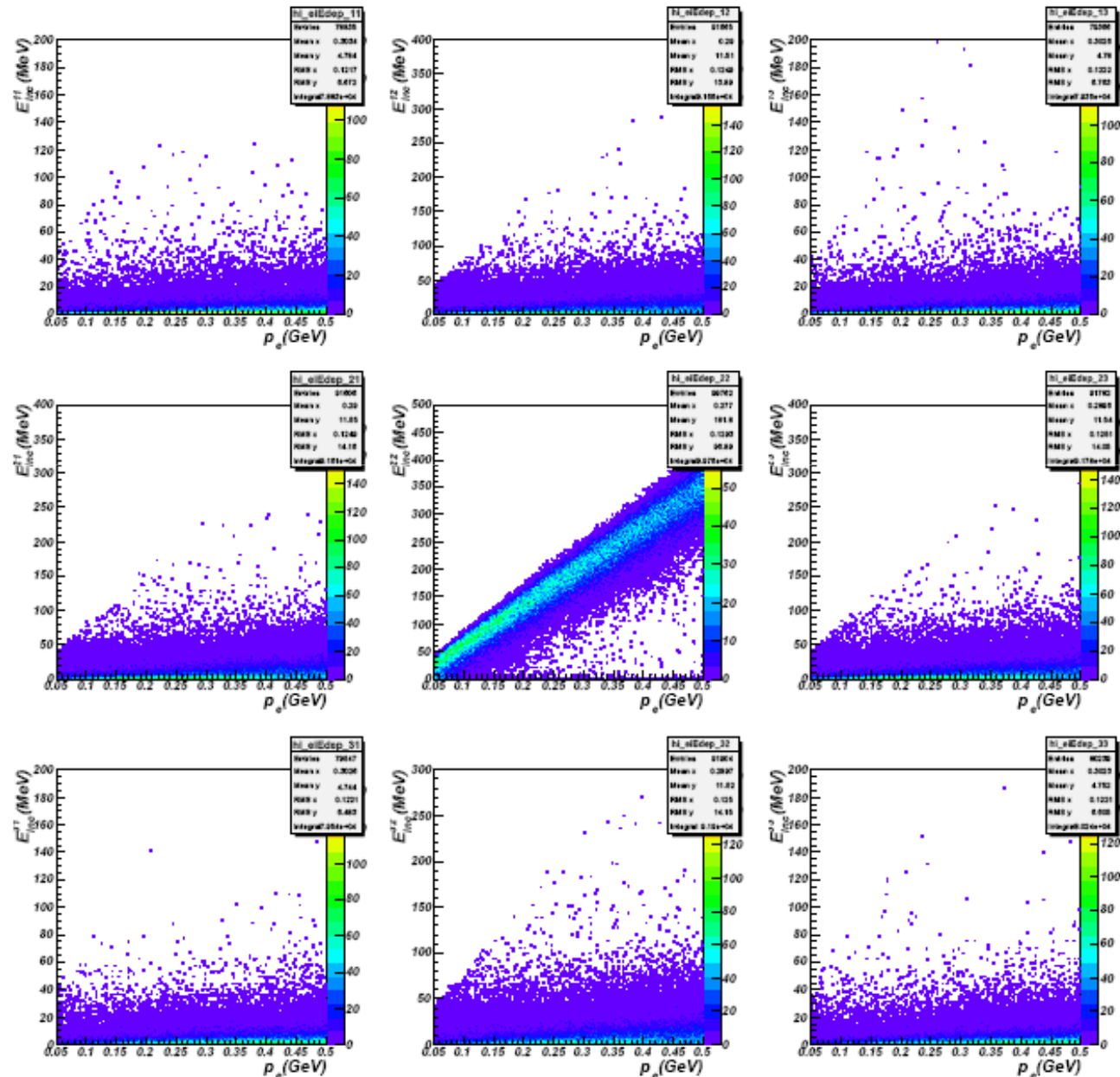
The first simulations consist in:

- simulation of 10000 electrons with 500MeV of energy centered in the central crystal
- simulation of 100000 electrons with energy between 50 and 500MeV centered in the central crystal.

The parameters involved are

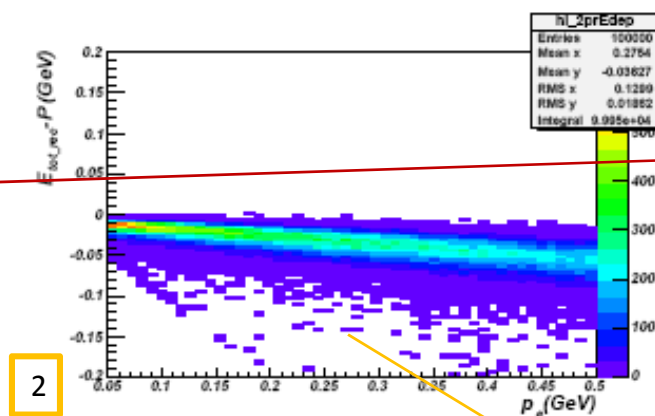
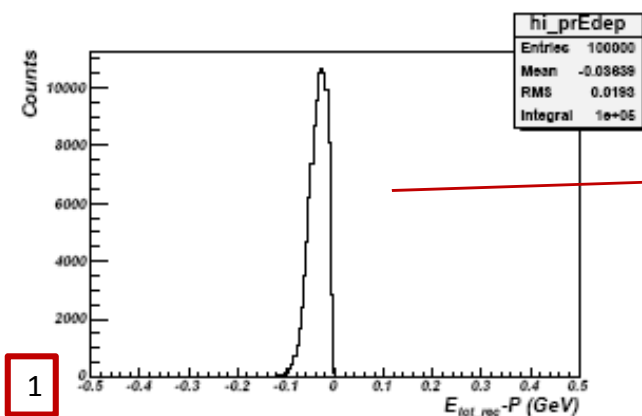
- "iEdep": the deposited energy in the crystals according to GEANT4
- "rEdep": the energy reconstructed from the digitized hits. It includes the following contributions:
 - the energy to light conversion according to the Light Yield of crystals @18°C,
 - Geometrical factors,
 - Quantum efficiency of APD
 - the gain of APD and PREAMP,
 - conversion from charge to ADC channels.

Simulation of 100000 electrons with energy between 50 and 500 MeV centered in the central crystal. In the following picture we report the progress of the deposited energy in each crystal as a function of the energy of the incident electron:



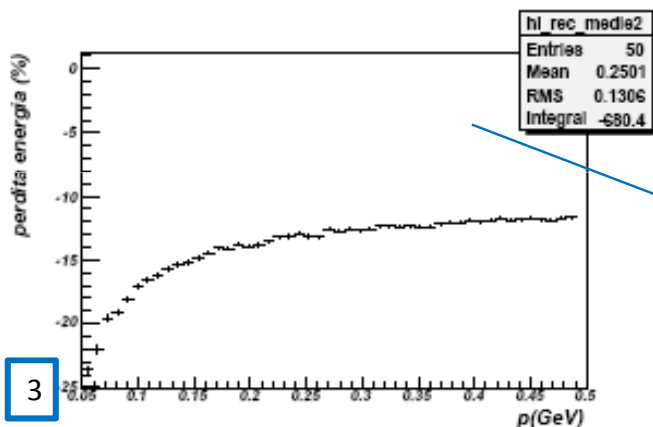
We can note that the central crystal collects 70% of the incident energy. The other 8 crystals collect part of the tails of the electromagnetic shower, corresponding to the 10% of the incident energy. The remaining 20% is lost due to the limited size of the prototype.

To determine the overall energy loss and the resolution, we reconstruct the total energy E_{dep} as the sum of the contribution of each crystal.

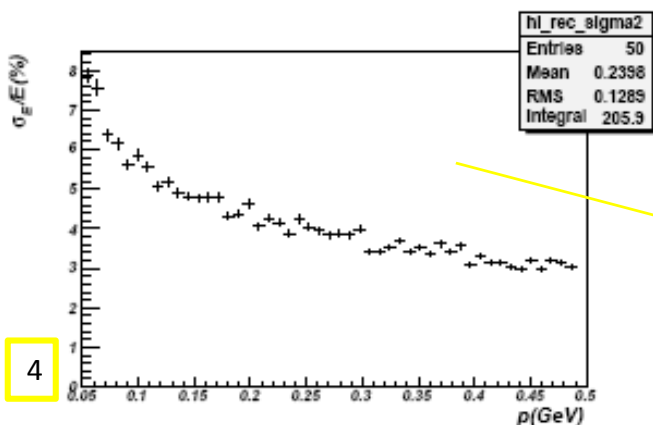


Histogram of the difference between total reconstructed energy and incident electron energy $rEdep_{tot} - P$

$rEdep_{tot} - P$ as function of electron energy P



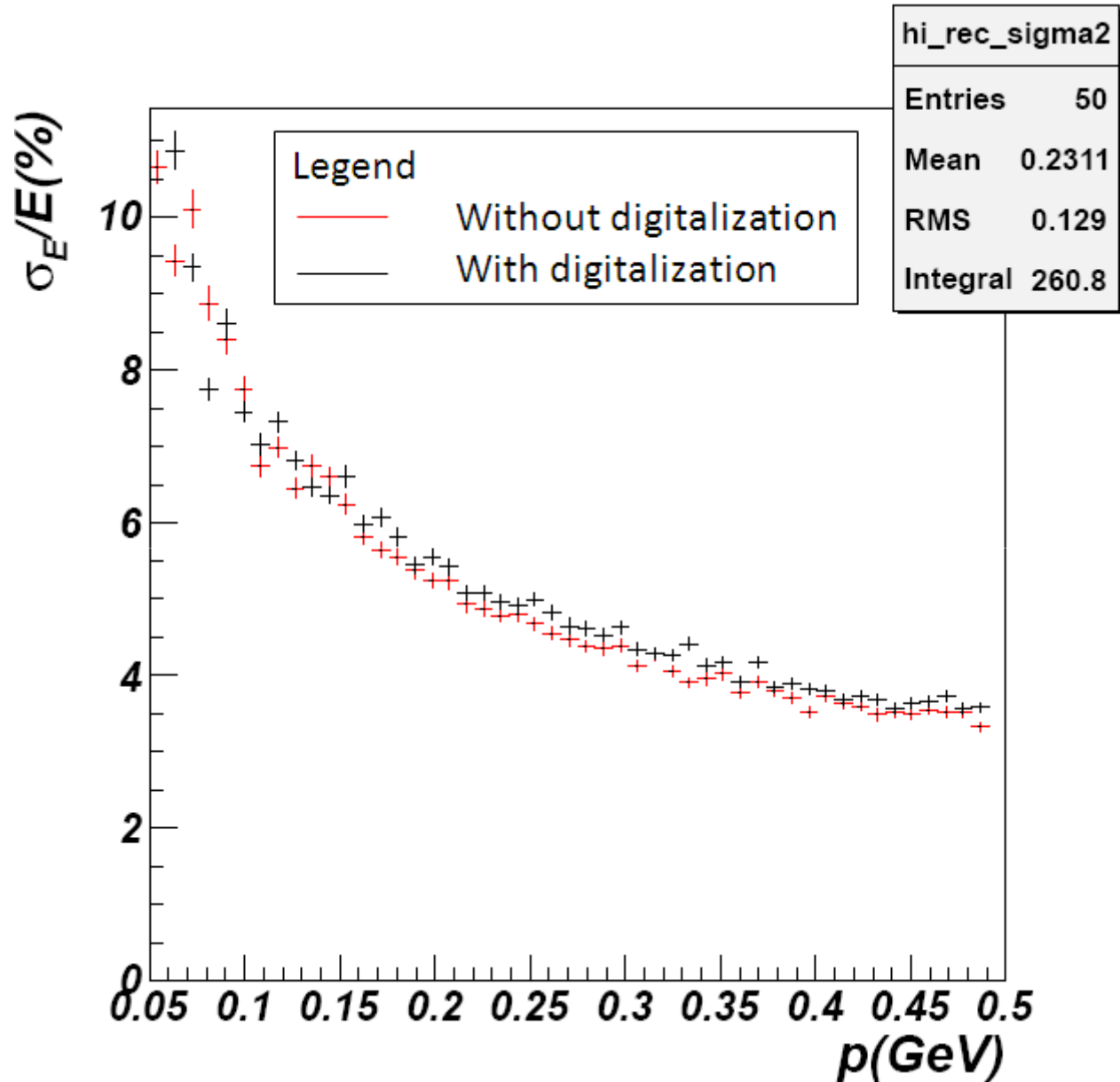
Energy loss (%) $(rEdep_{tot} - P)/P$



Resolution σ_E/E

The obtained resolution is worse than the expected resolution of the FT Calorimeter; this is due to the reduced dimensions of the prototype and to the dominance of the intrinsic fluctuations of the electromagnetic shower.

To verify that the resolution only depend on the fluctuations of the electromagnetic shower and not on the digitalization, we compare the energy resolution in the cases with and without digitalization, with a threshold of 10MeV: the results are comparable.



Conclusion:

The measurements of the prototype will not permit us to determine the resolution of the FT_Calorimeter because of its limited dimensions, but they will be useful for the study of the behavior of the calorimeter itself