Study of nHCal energy and position resolution

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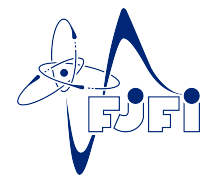
Development and Education



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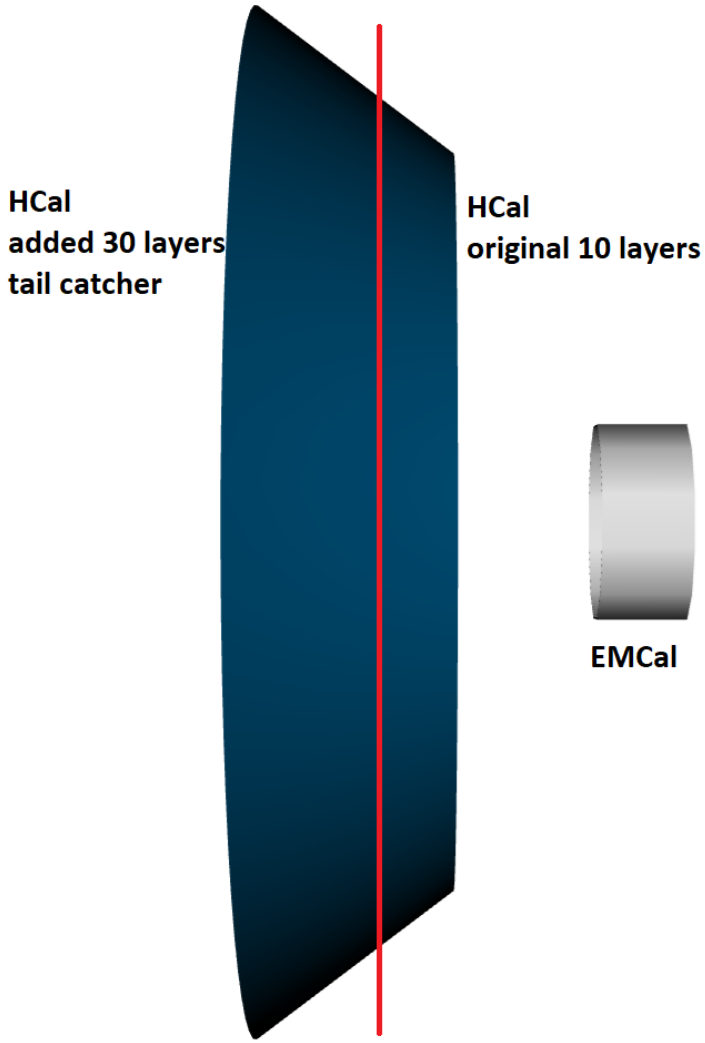
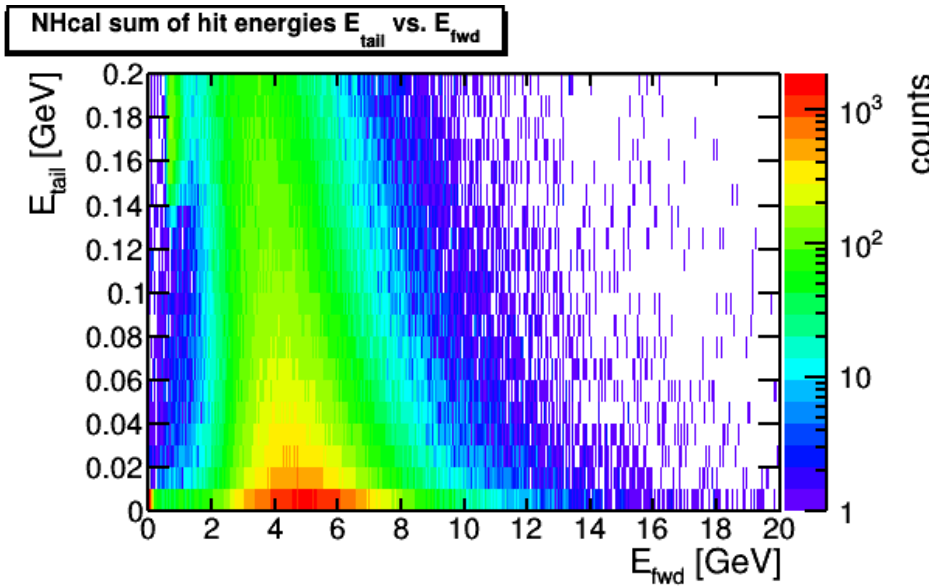
Outline

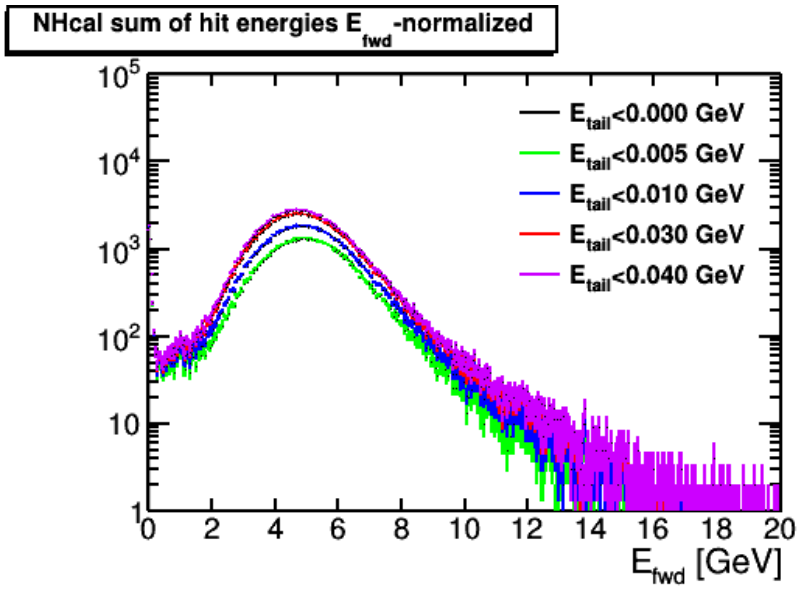
nHCal+EMCal only setup



- Geometry setup:
  - 10 layers of 4 cm steel/4 mm polystyrene
  - 30 layers of 4 cm steel/4 mm polystyrene tail catcher
  - nEMCal for energy sharing study only

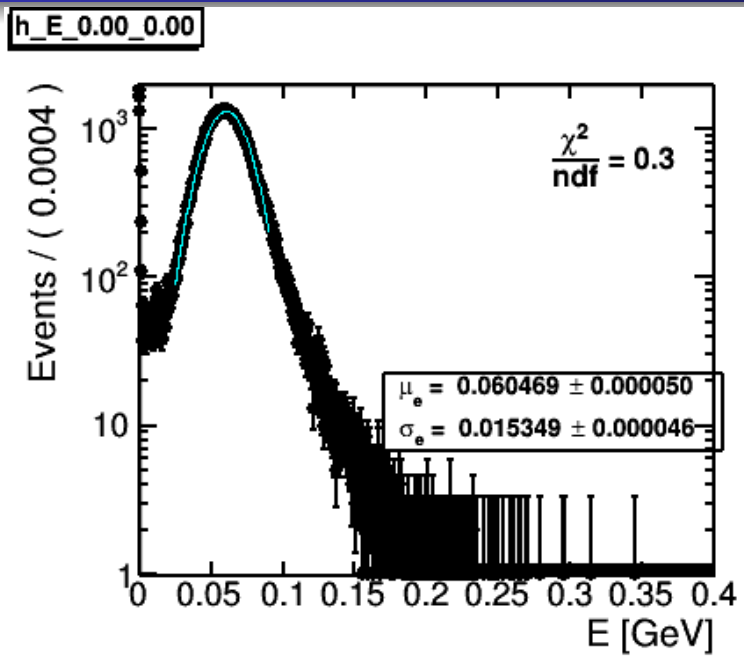
Energy vs. energy in tail catcher

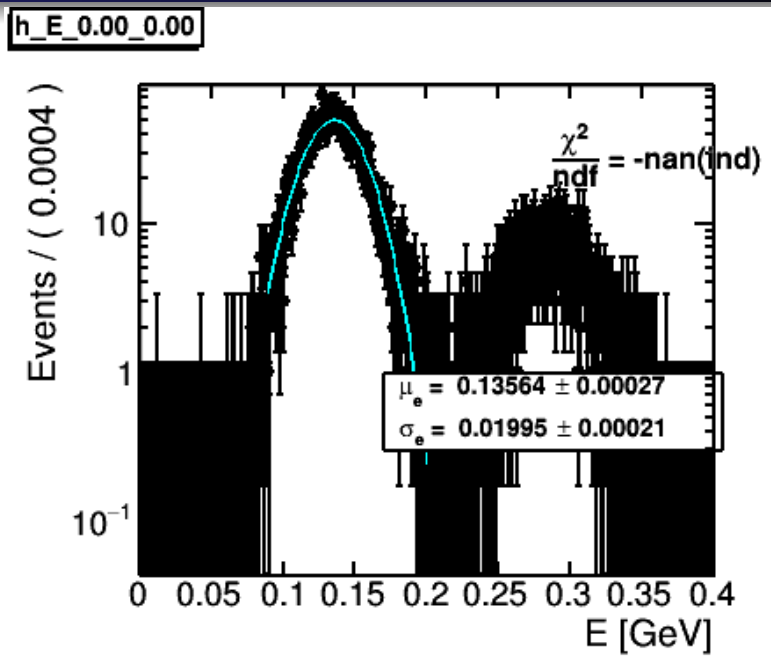


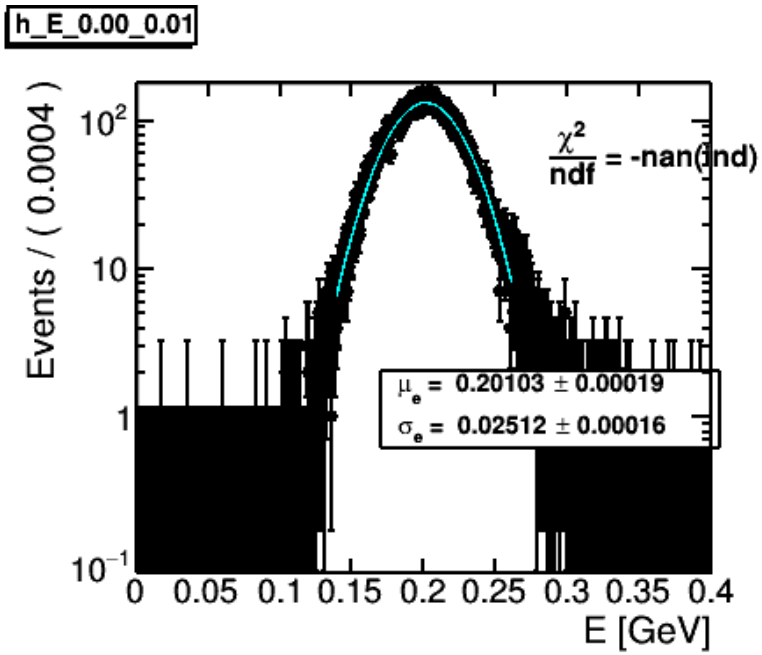


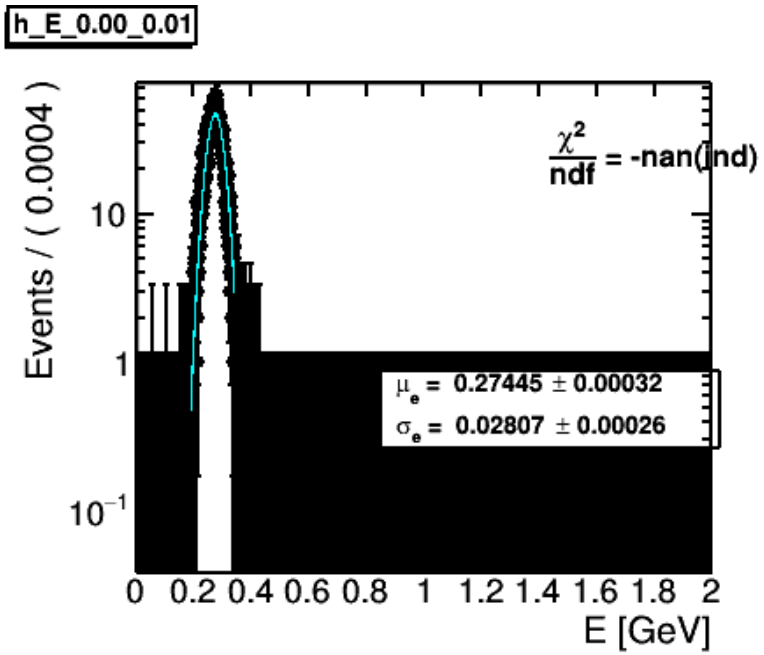
- Generated π^+ at $E = 5, 10, 15, 20\ \mathrm{GeV}$
- Generated π^+ at $E = 5\ \mathrm{GeV}$ shown above
  - Hit in first layer required

E_{fwd} vs. E



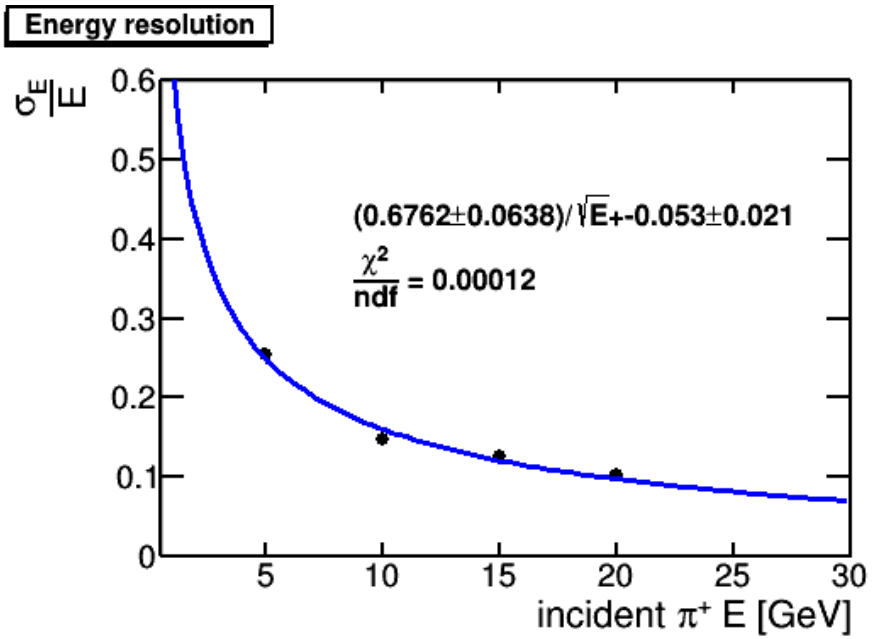






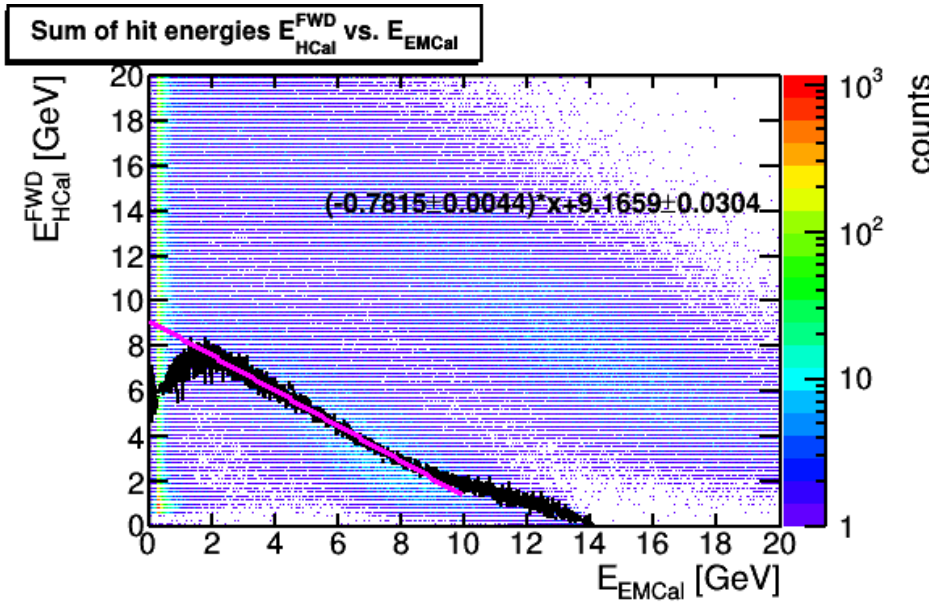
- Fitted gaussians to extract energy resolution

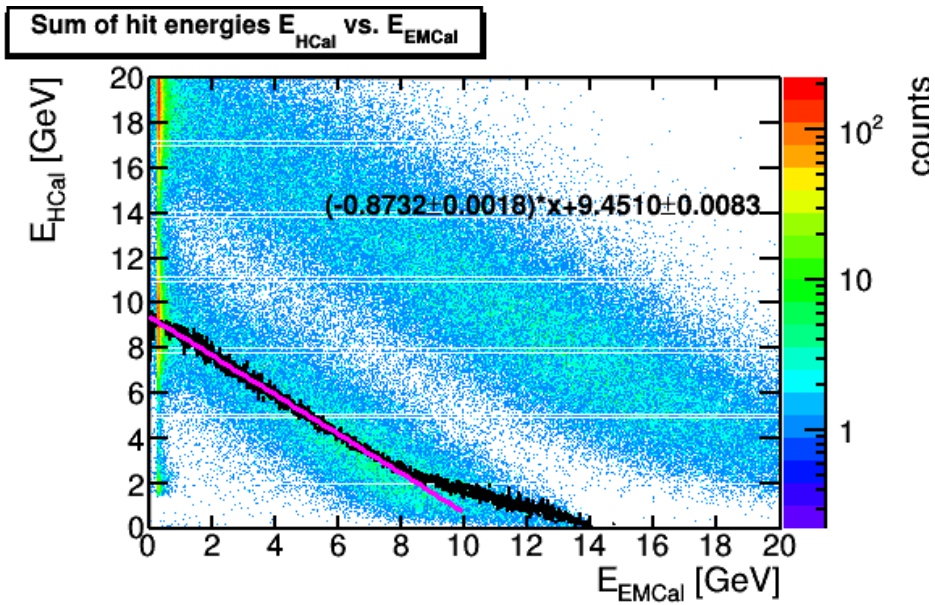
Energy resolution study

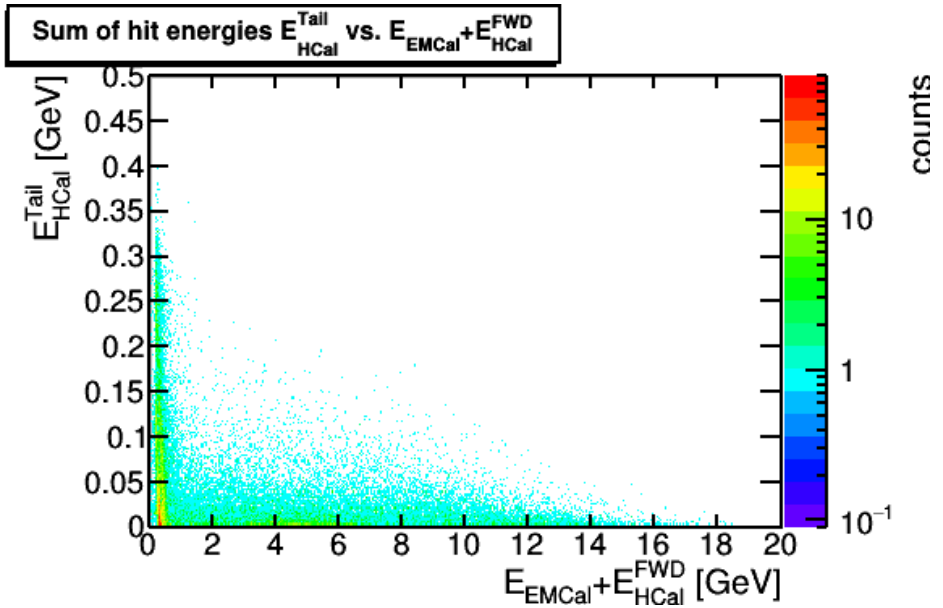


- Fitted gaussians to extract energy resolution

Energy in nHCal vs. nEMCal

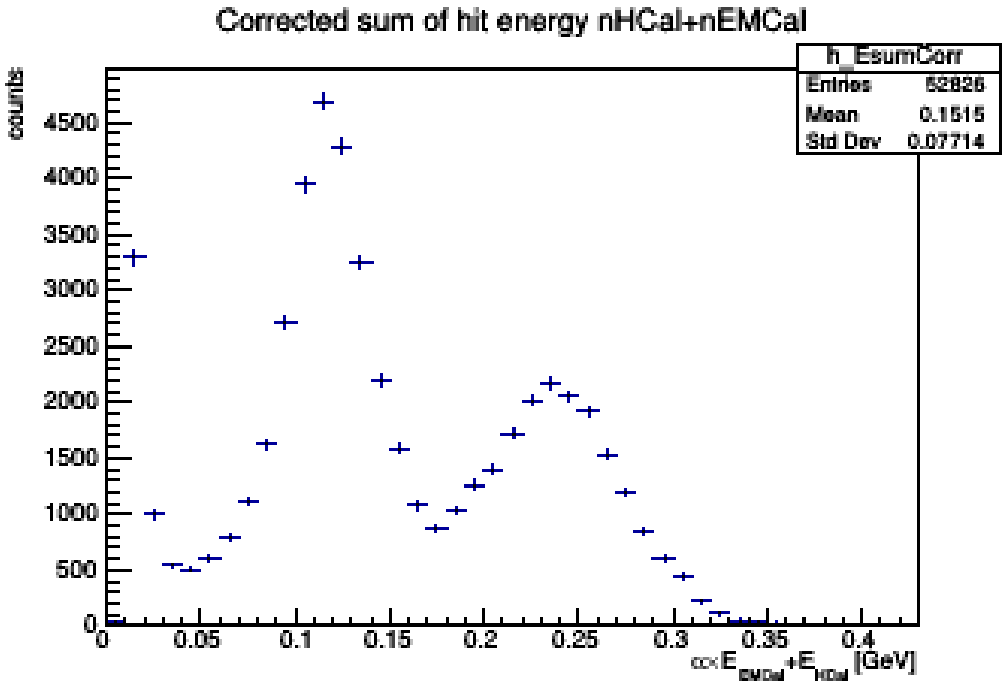






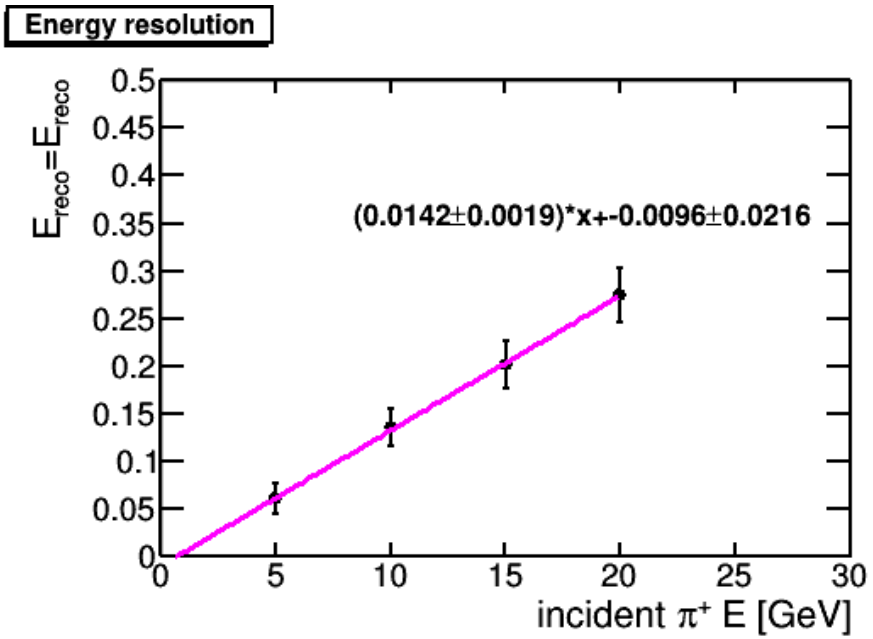
- Fitted straight line to profiles to see the slope

Energy sum nEMCal+nHCal



- Why double peak?
- simulated π^+ at $E = 5\,\mathrm{GeV/c}$

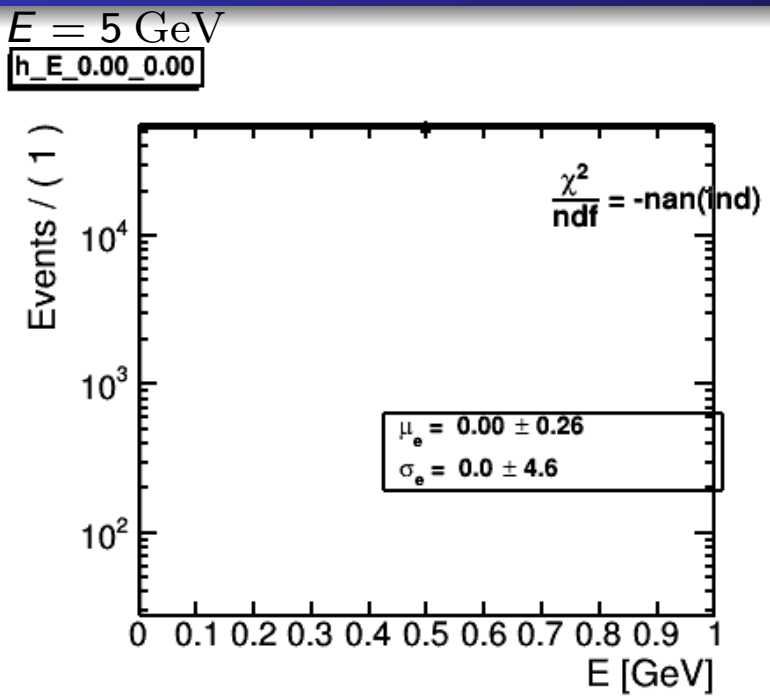
Energy relation



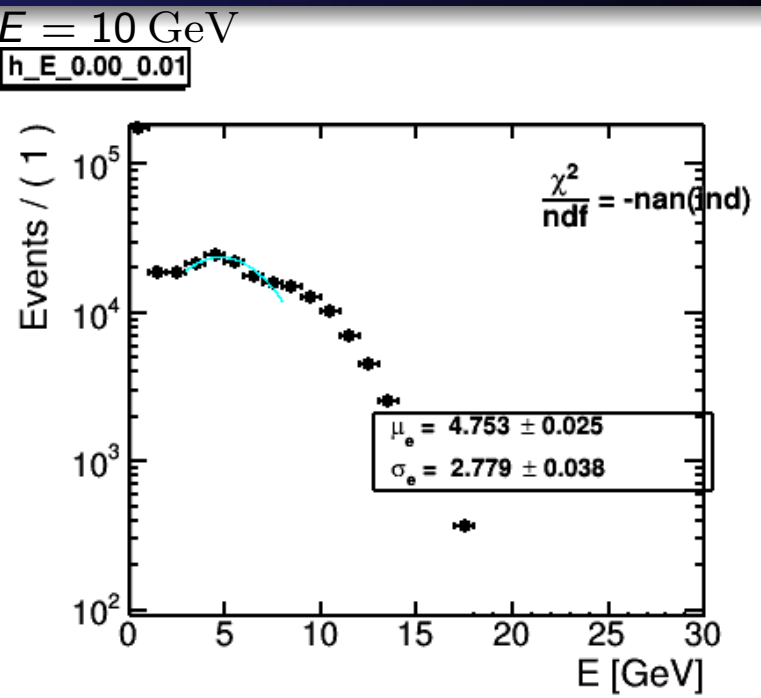
- E_{reco} here is E_{fwd} only

Corrected energy in nHCal+nEMCal

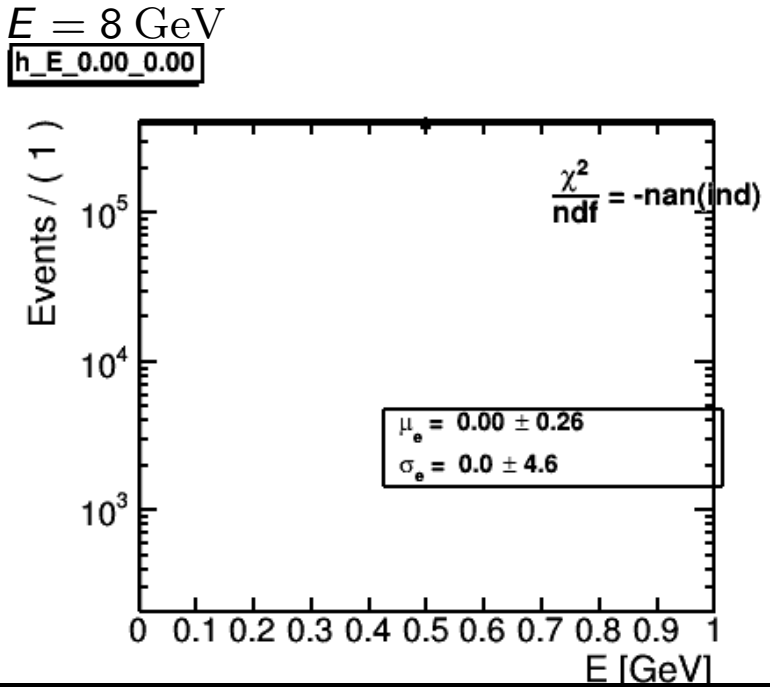
$E = 5$ GeV



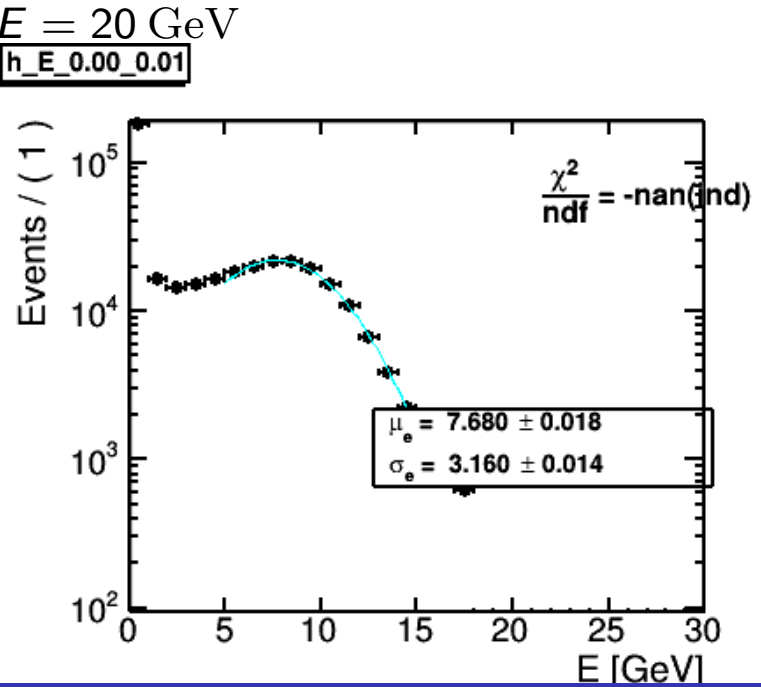
$E = 10$ GeV



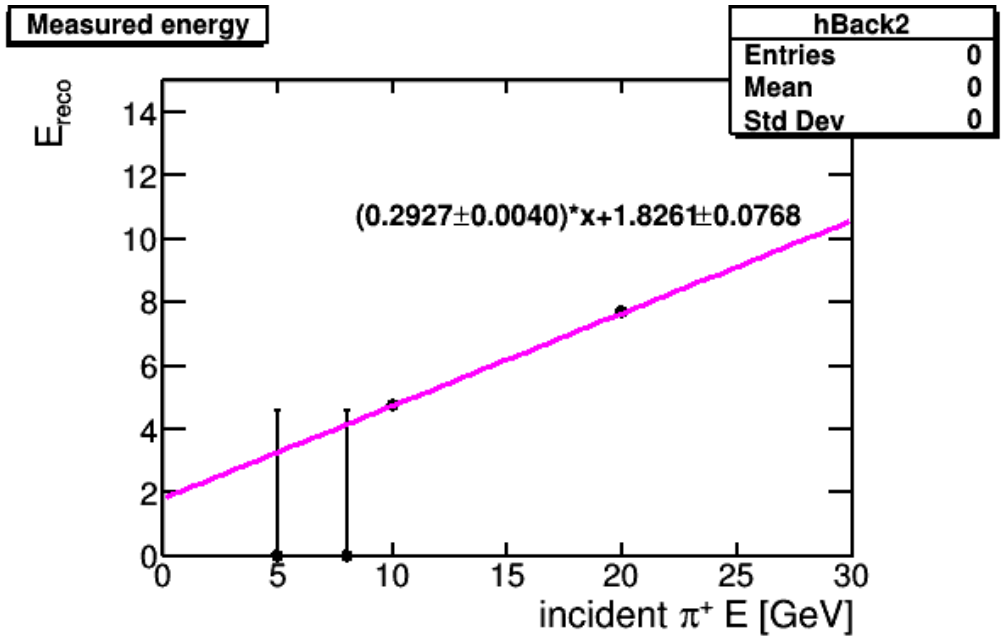
$E = 8$ GeV



$E = 20$ GeV

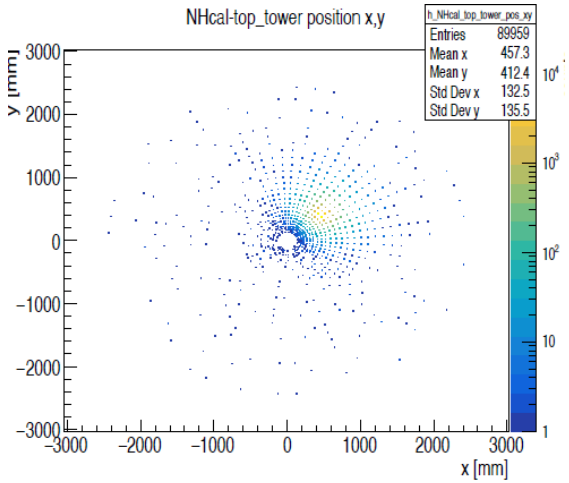


Energy relation

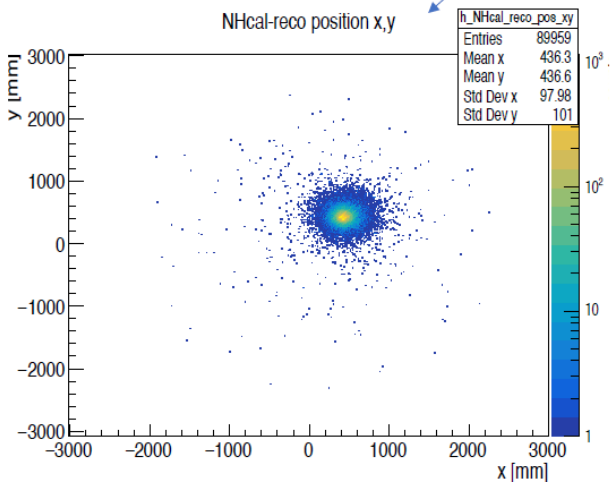


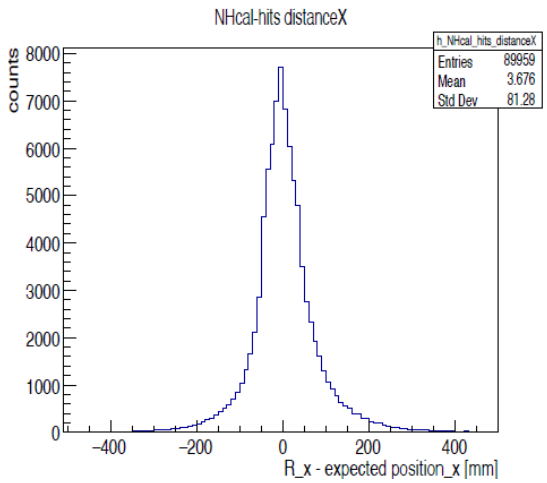
- $E_{reco} = E_{fwd} + \alpha E_{nEMCal}$
- $\alpha = 0.8953$

Position resolution study

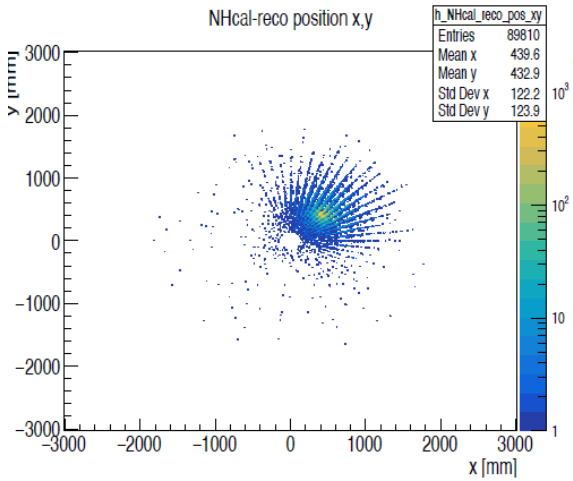


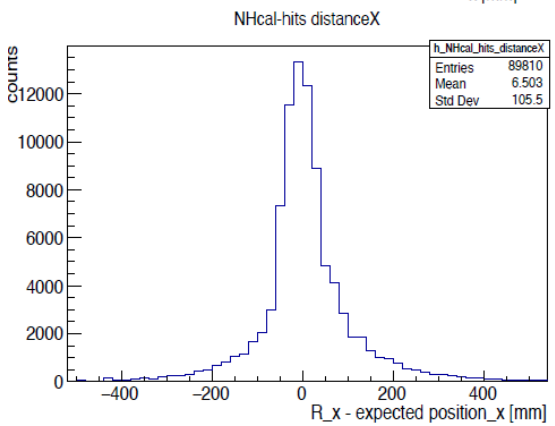
Position distributions made by selecting all hits in an event works very well, as expected, since there is no material in front of the nhcal and the shower is not much wide-spread



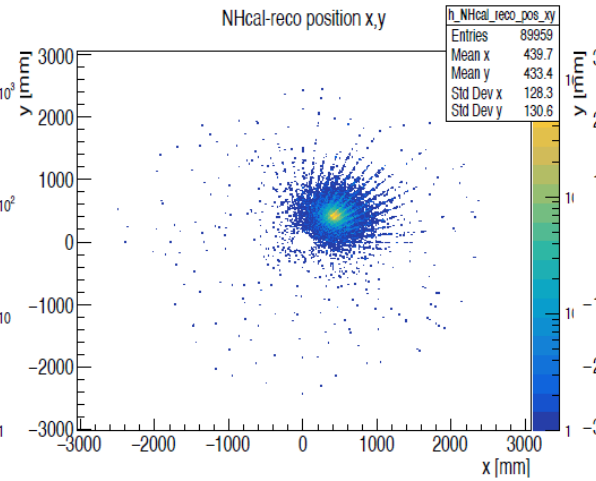


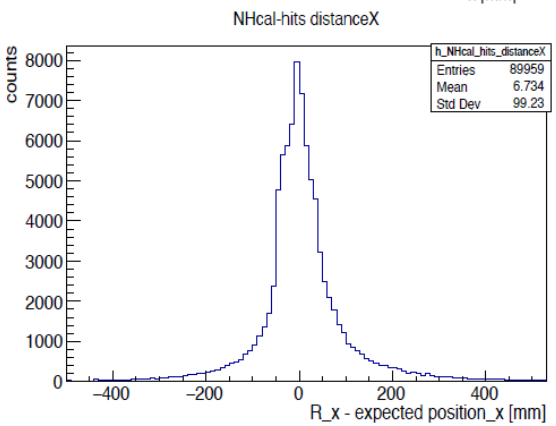
Position resolution study



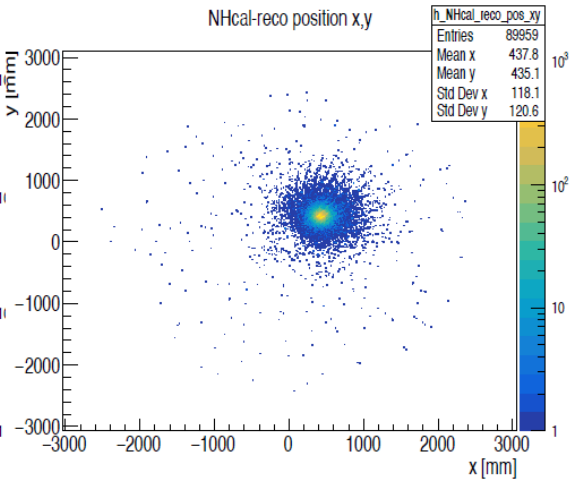


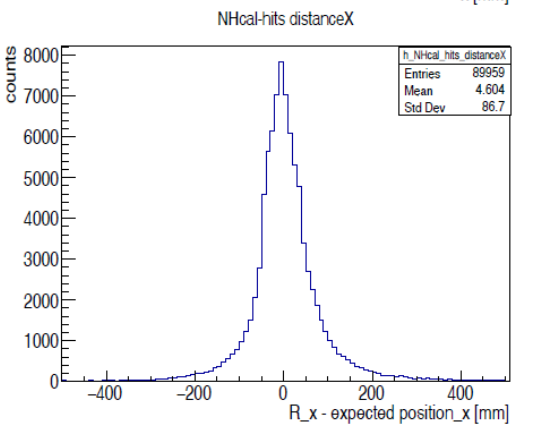
(Top tower r - Hit r) = 10 cm.





(Top tower r - Hit r) = 20 cm.





(Top tower r - Hit r) = 40 cm.

Summary

- Energy resolution and study - first look
- Double peak structure in some distributions?

BACKUP