Data quality checks for electrons

"June data"

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WUPPERTAL

Overview of my tasks:

1. High gain and low gain hit distribution:

- Check the HG/LG intercalibration.
- Look to the hit energy distribution for HG and LG for all memory cells.
- Check if the intercalibration factor wokrs well for all memory cells.

2. Check the quality of electrons data " june2018":

- Check the compatibility of the data in the nfs with the runs in the google sheet.
- Reconstraction for electron data for all the energies: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 GeV.
- Look to the ahc_energySum and ahc_nHits distributions.
- First analysis to check the good and bad runs.

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- Comparaison between the data and MC.

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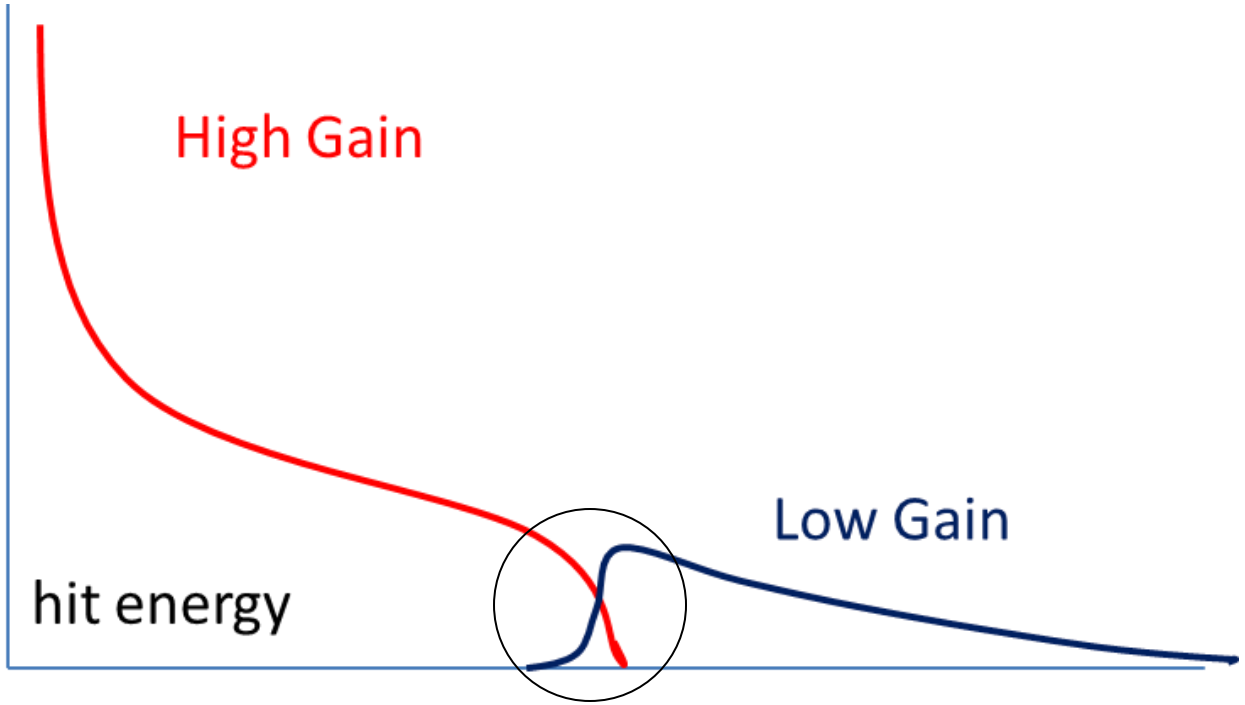
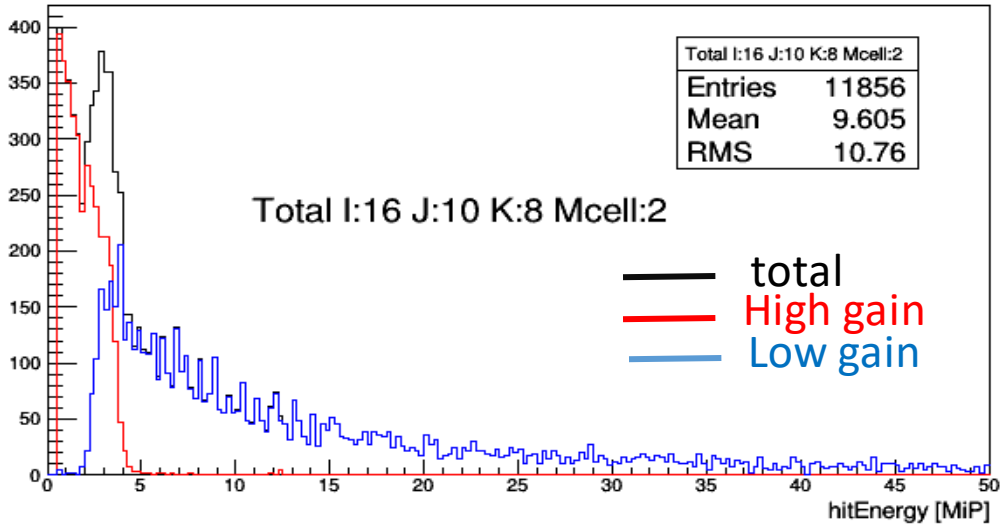
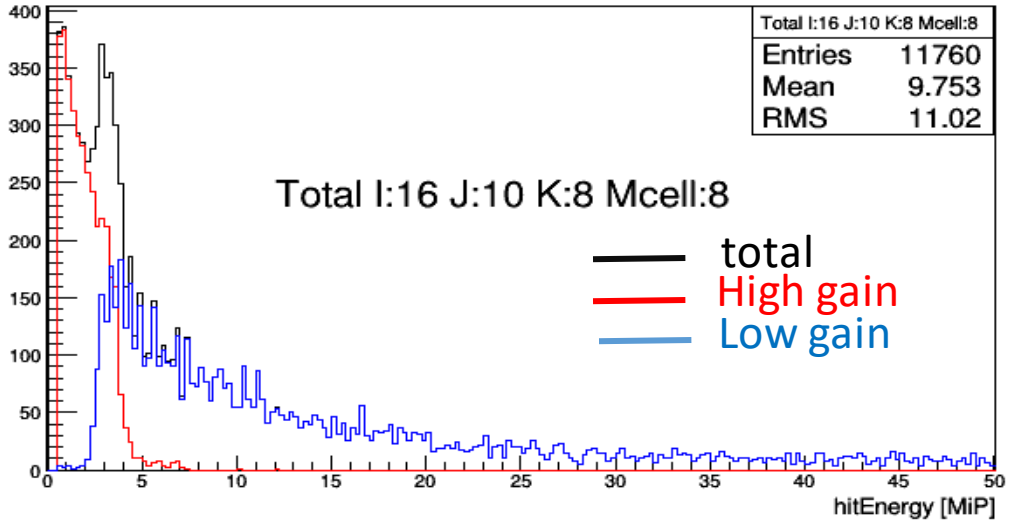
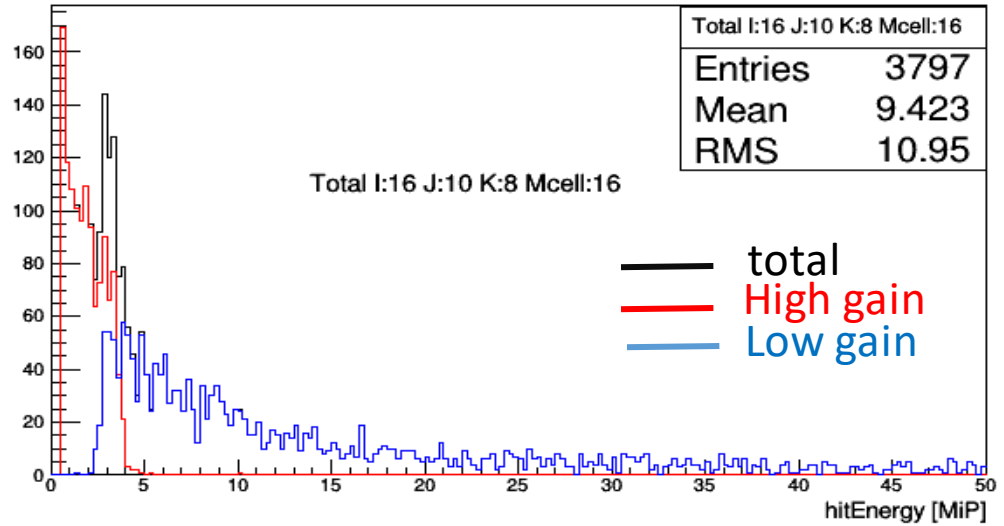


Hit energy spectra with HG and LG per m. cells.

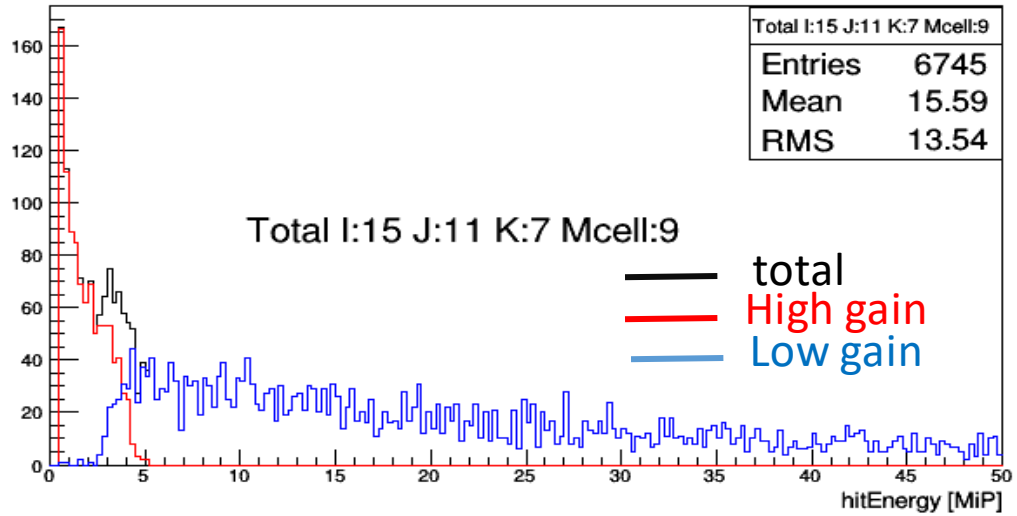


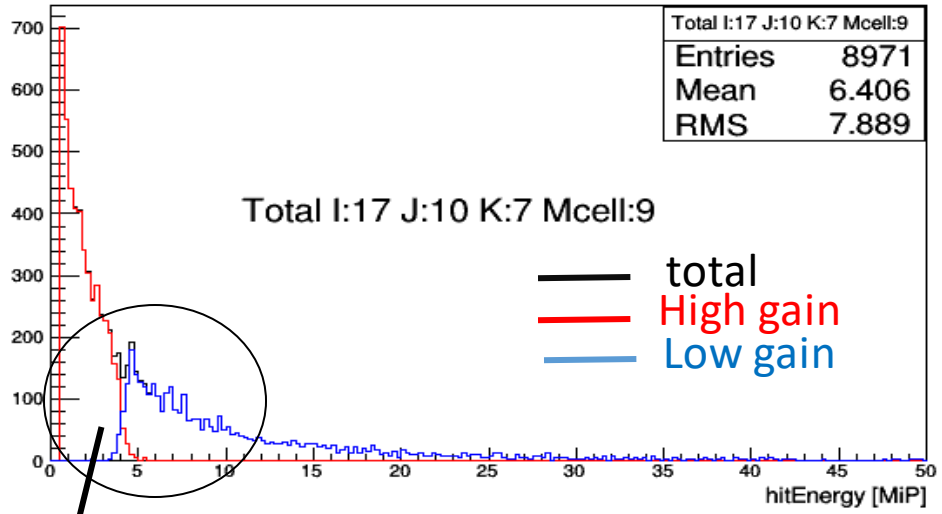


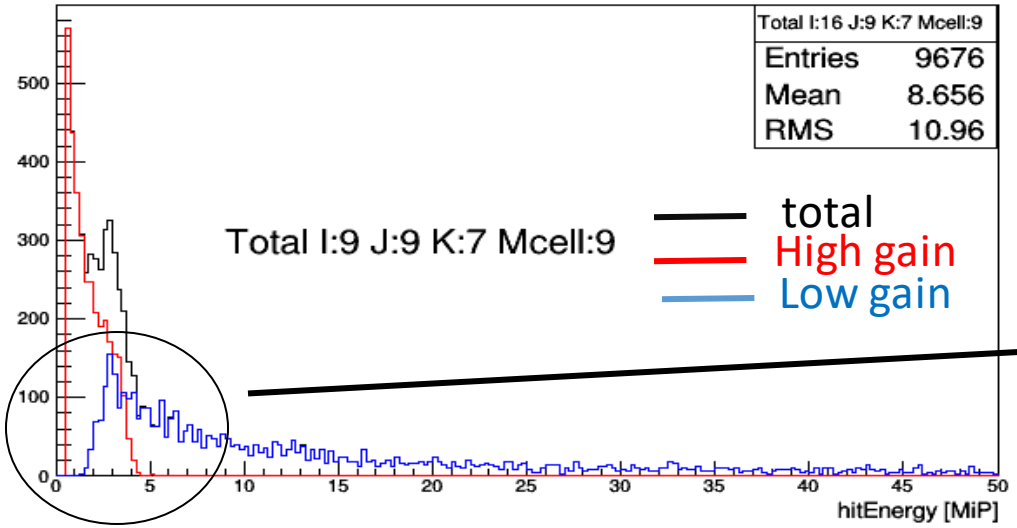


- HG/LG Intercalibration is done only per channel but not per each m. cell
- Variation of the overlap between HG and LG variate with the m. cells.

Hit energy spectra with HG and LG per m. cells for different channels.

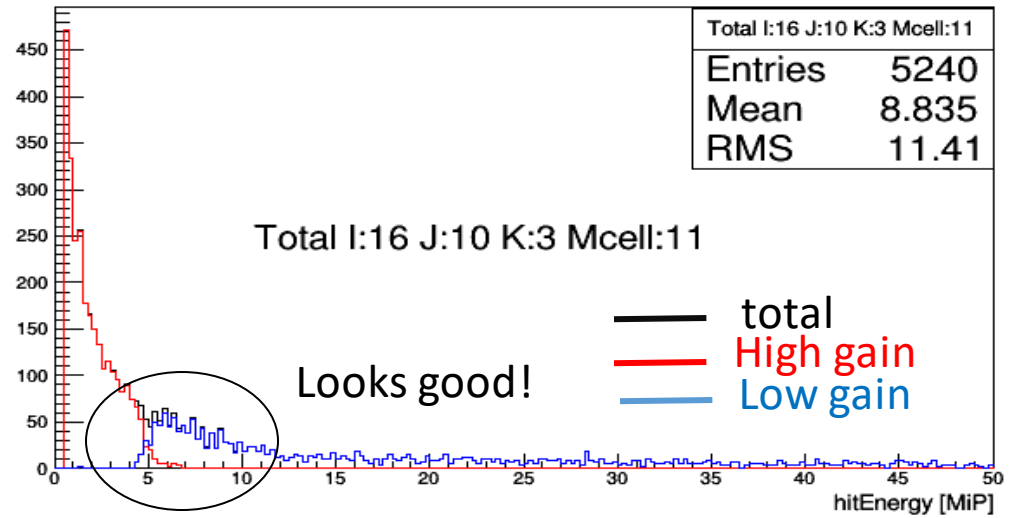


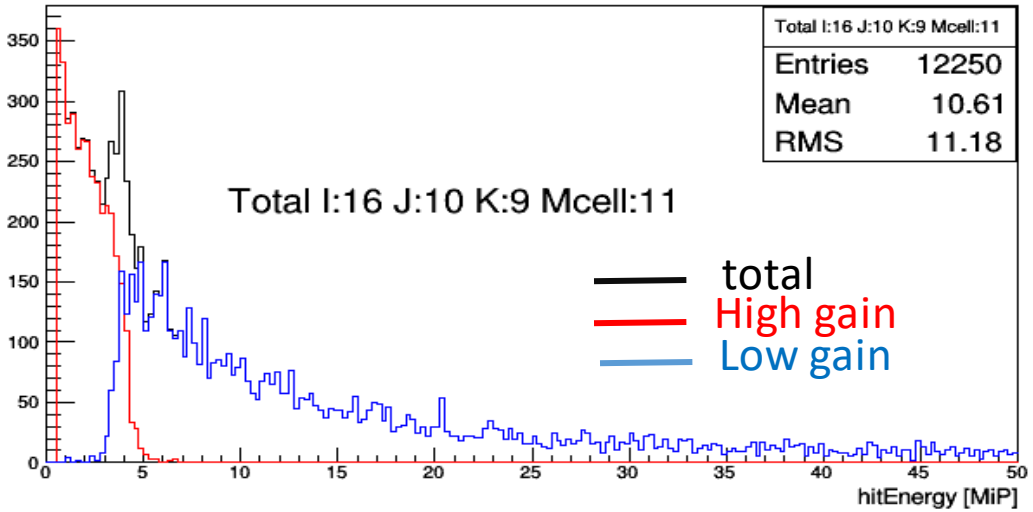


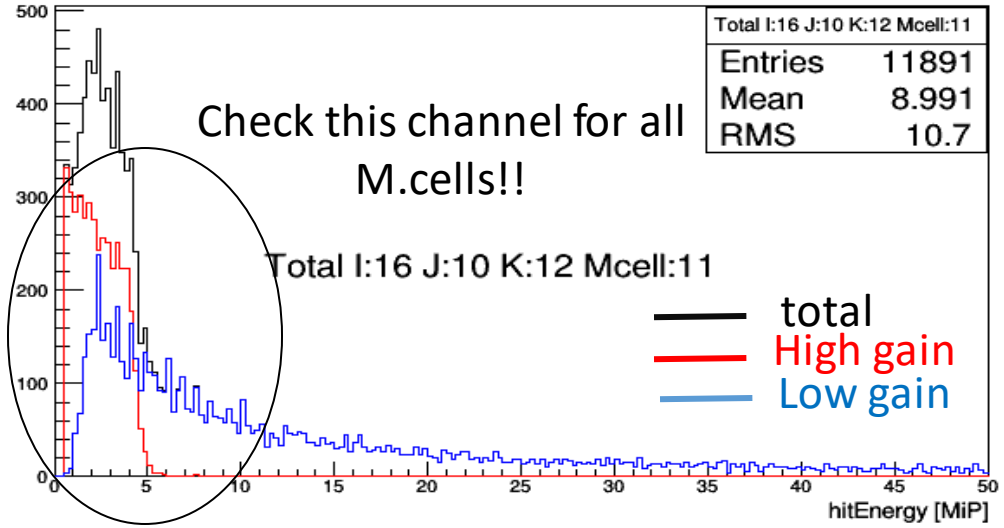


- Gain Intercalibration looks good for this channel.
- LG hit energy spectra peak in to the overlap area between HG and LG.

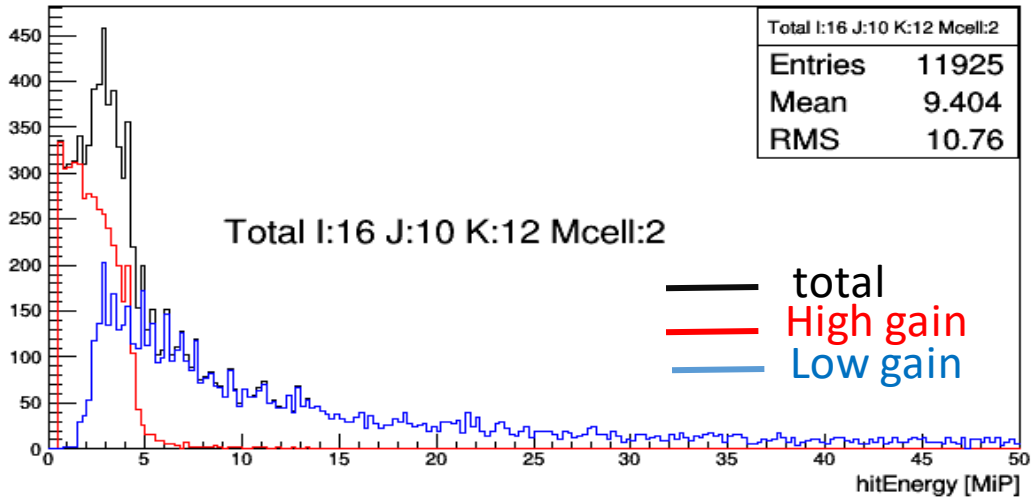
Hit energy spectra with HG and LG per m. cells for different layers.

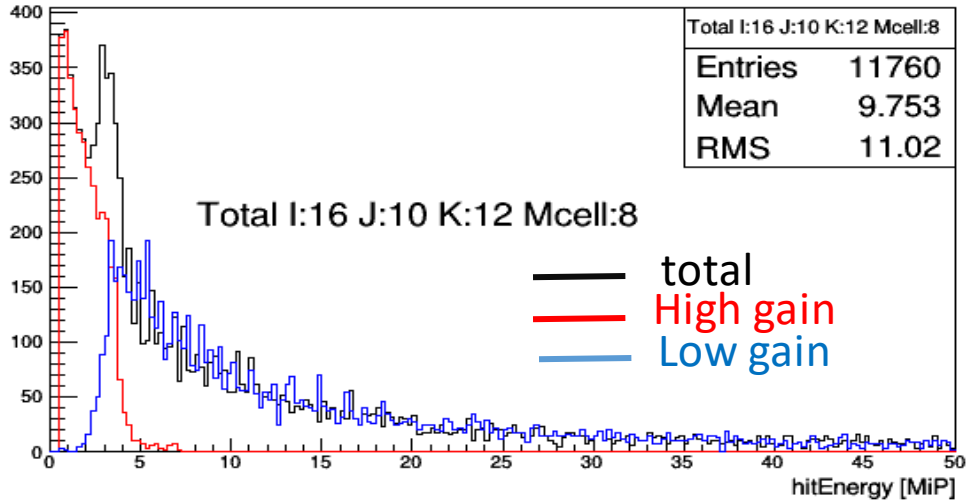


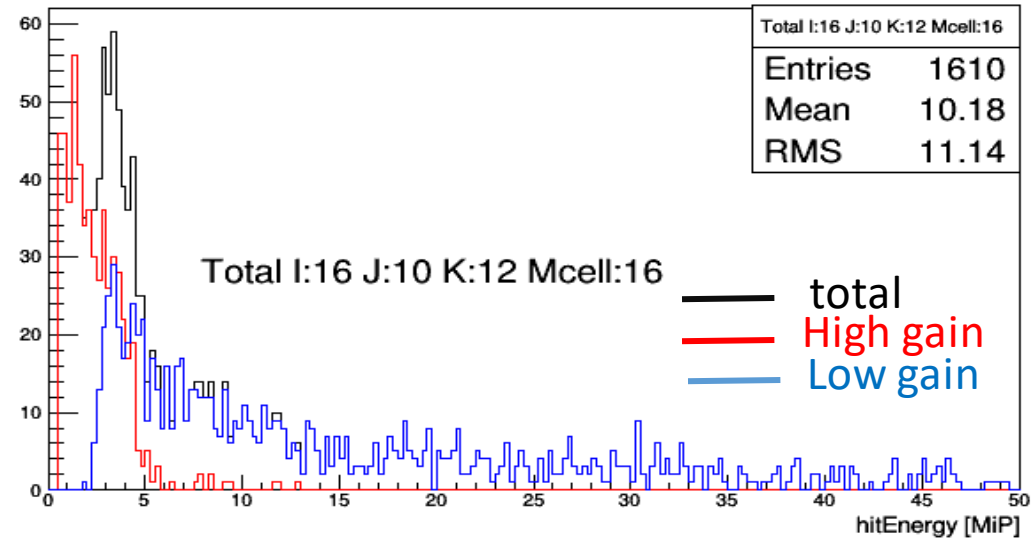




Hit energy spectra with HG and LG for different m. cells.





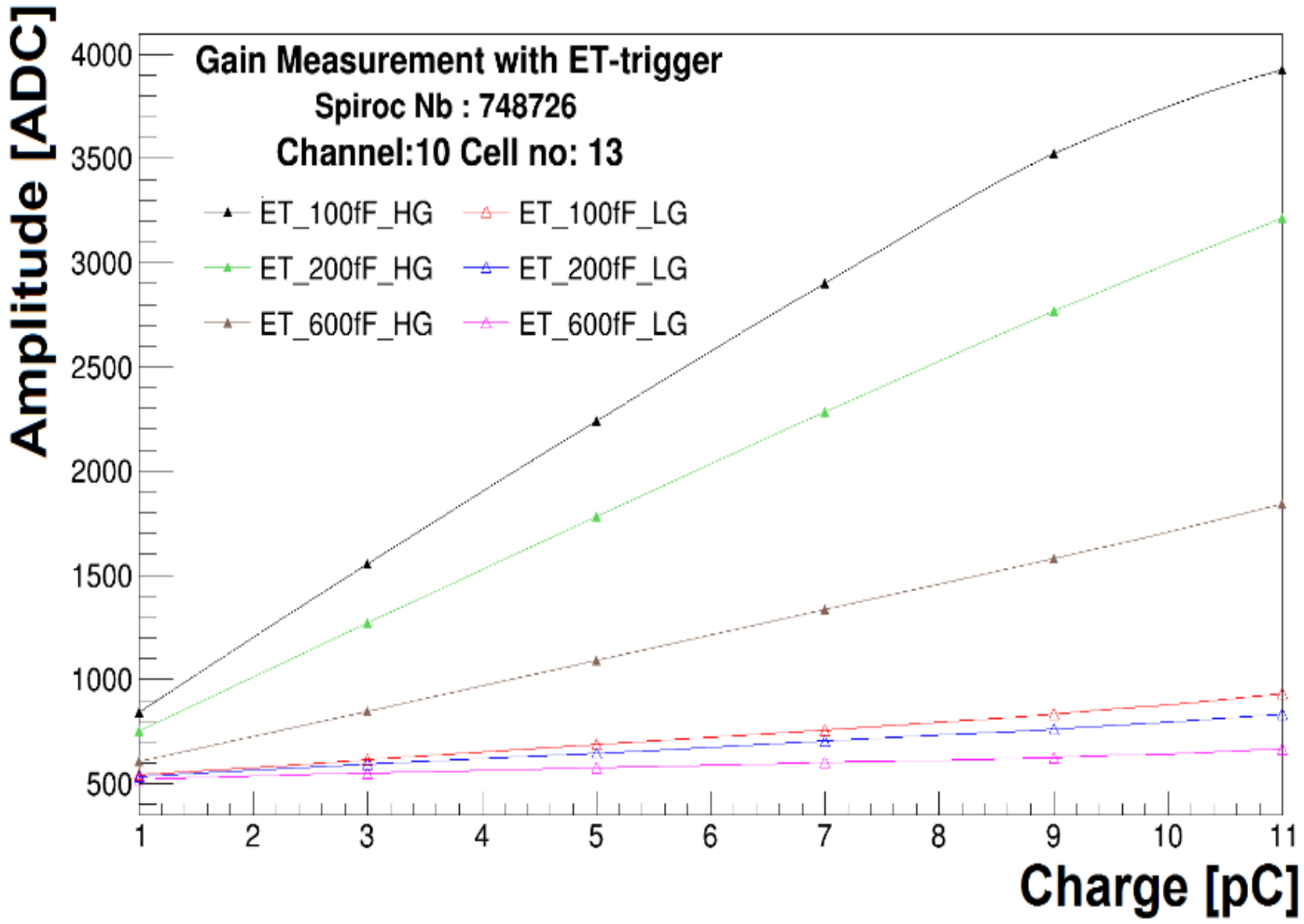


- The hit energy spectra and the overlap area variate between memory cells.

Pedestal variation between LG and HG.

- By looking to random channels which had more statistics, we find out that using the IC factor per channel was not successful for all memory cells.
- The pedestal for LG was estimated the same as HG, which is probably not the case.
- As a first step we should get the pedestal for LG from muons data.
- Check the variation of the pedestal between HG and LG.
- If the variation will be present even by correcting the LG and HG offset, then in this case we will need the IC factor for each memory cell.
- An idea how to correct the variation of LG and HG offset by using the data of the chip testing!!

LG and HG offset from the data of the chip testing.



From the chip testing we have :

- The gain measurement for HG and LG.
- Offset of LG and HG from the linear fit.
- From the offset we can correct the pedestal variation from HG to LG.
- Chip testing was done without power pusling, is the pedestal variate with PP?!!

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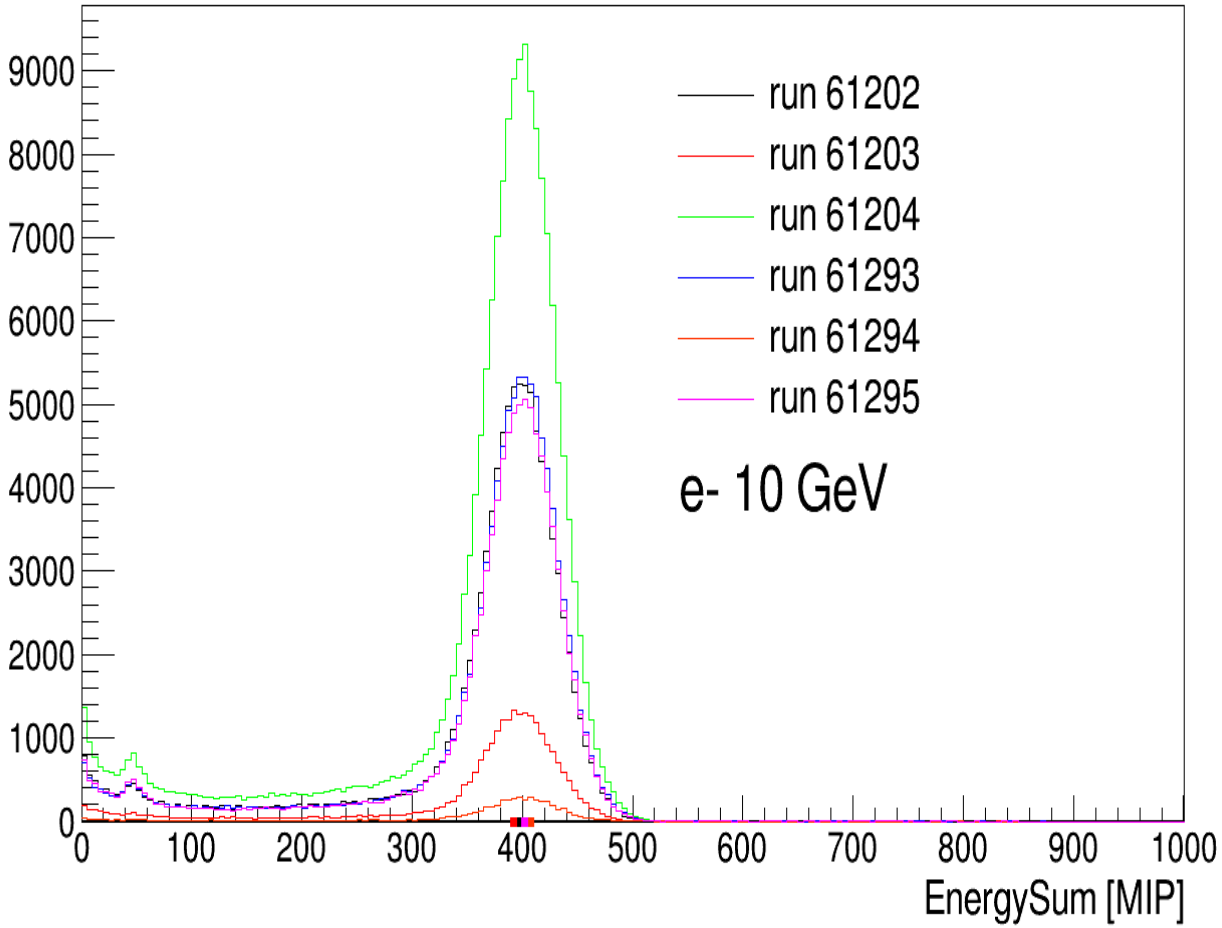
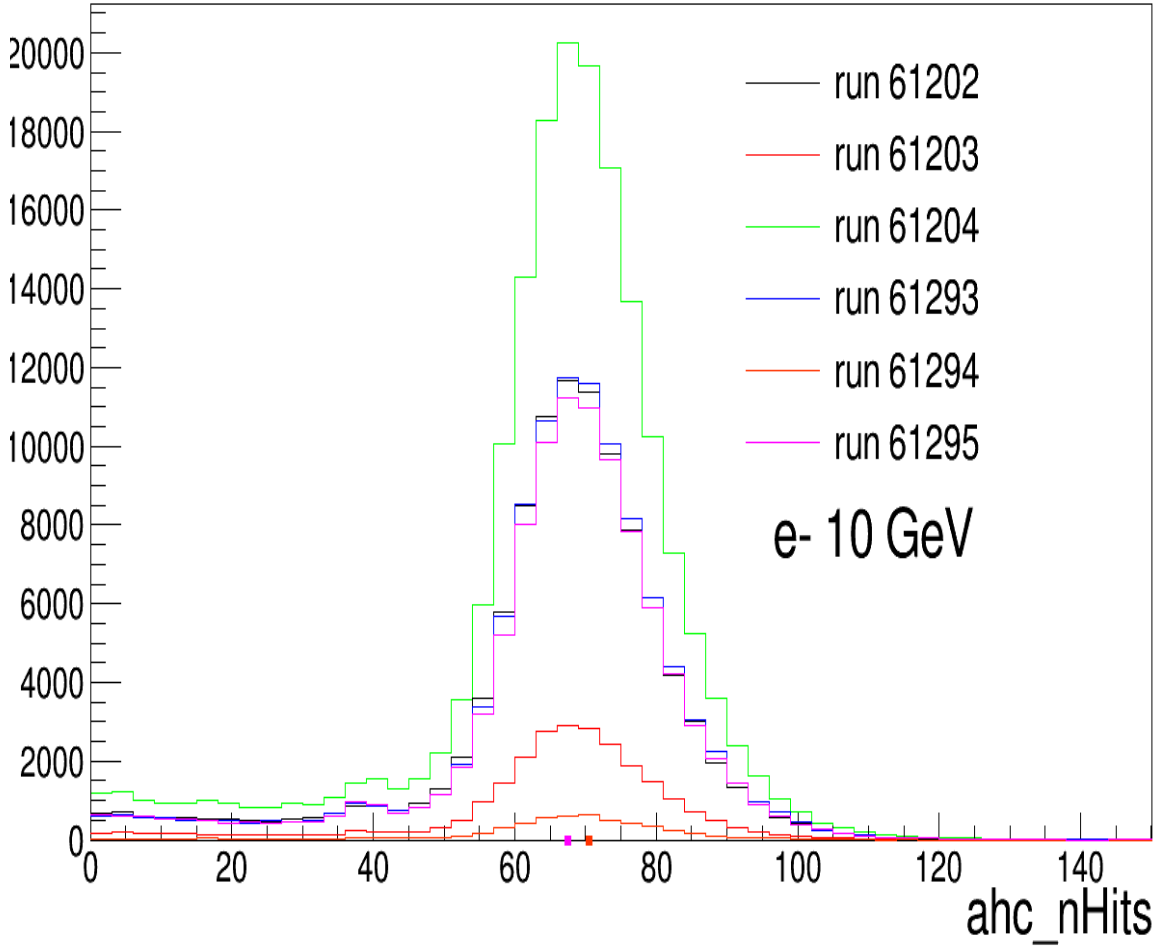
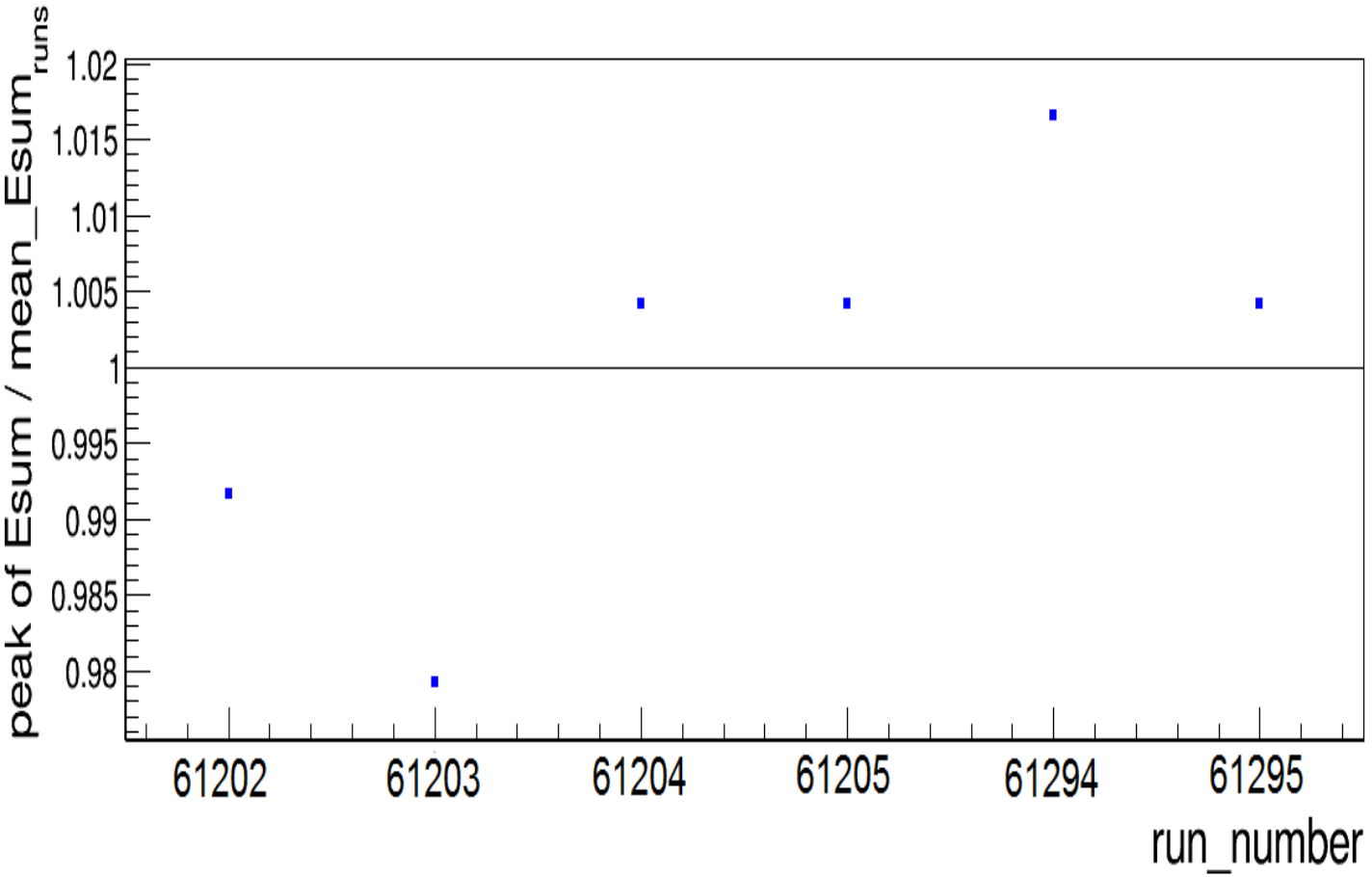
Energy_sum and hits distributions : 10 GeV





Variation fo the energy_sum for all the runs : e- 10GeV

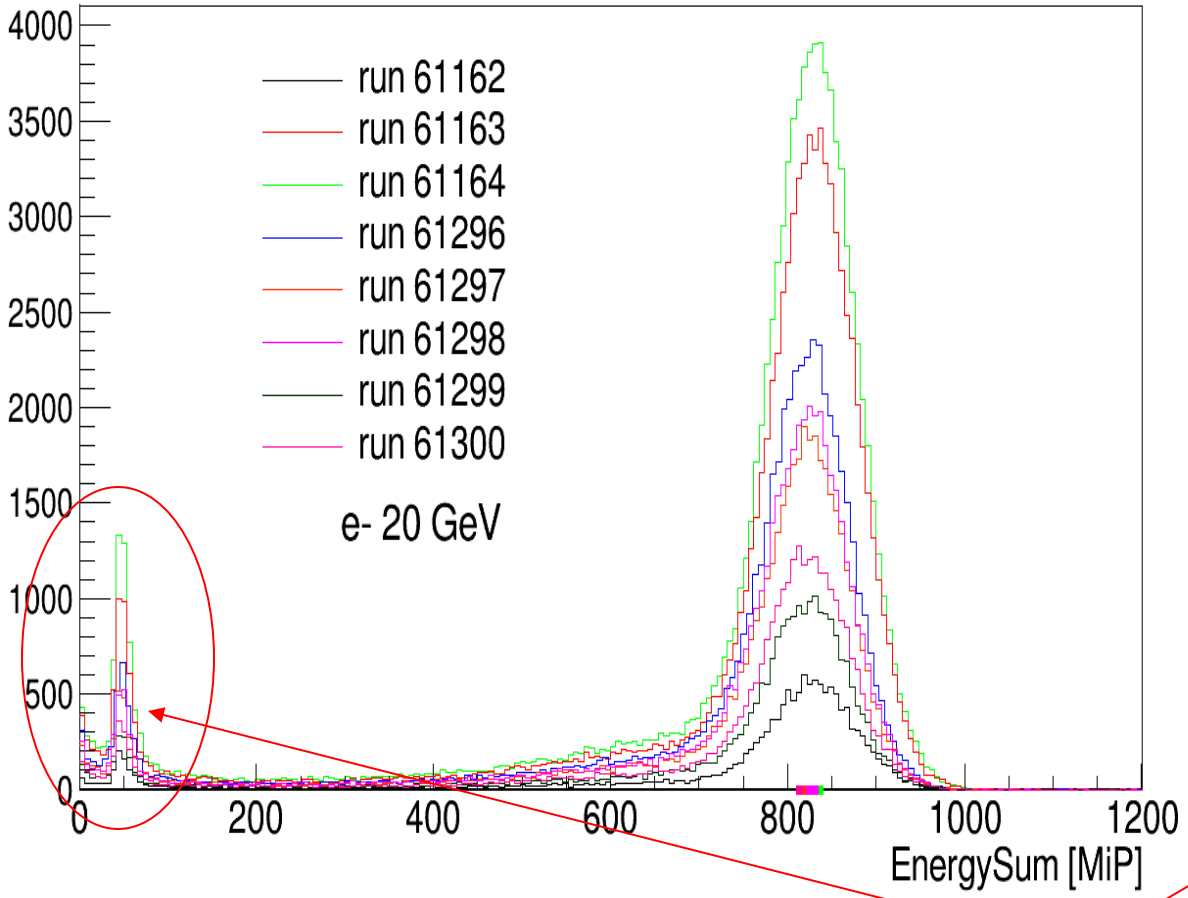
Ratio = (peak of Esum) $_{\text{Each run}}$ / (mean_Esum) $_{\text{All runs}}$

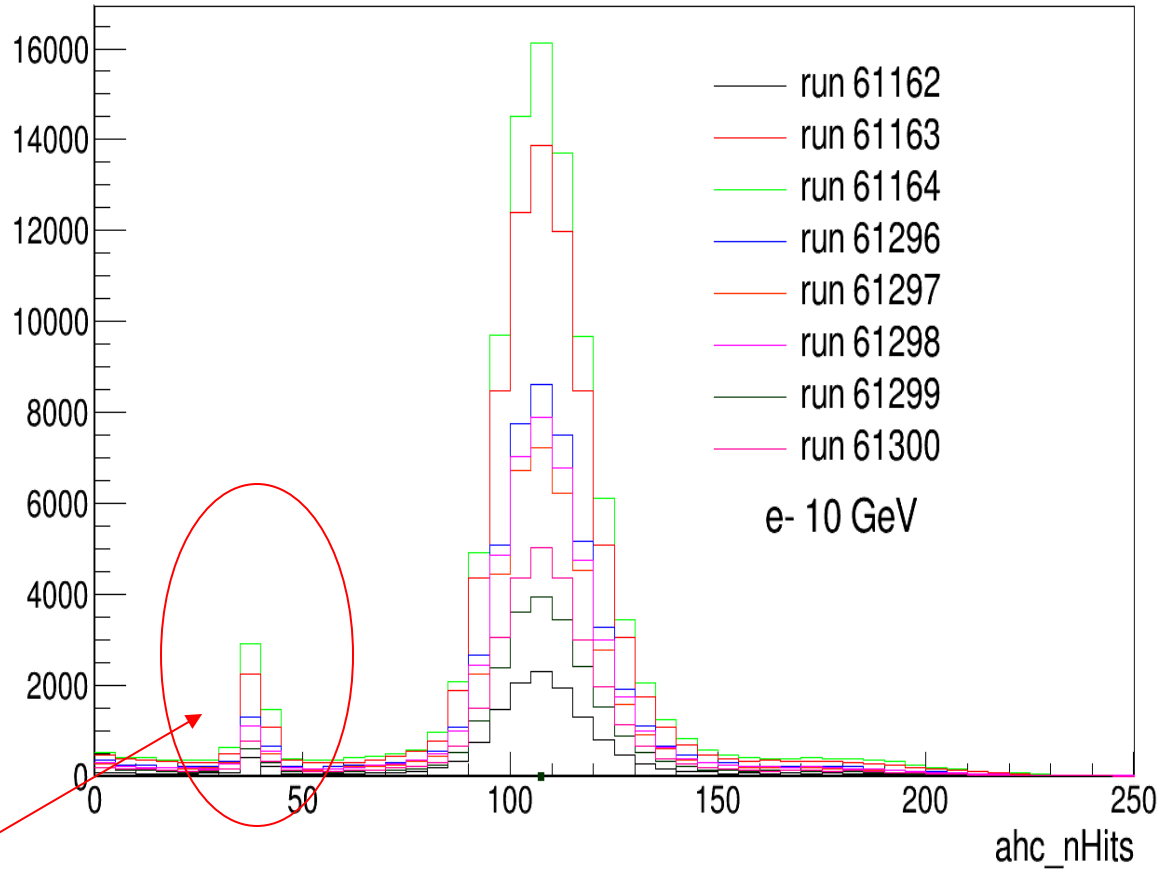


e- 10 GeV:

- The peaks of the Esum are within 2% from the mean over all runs.
- All the runs of 10 GeV looks quite good.

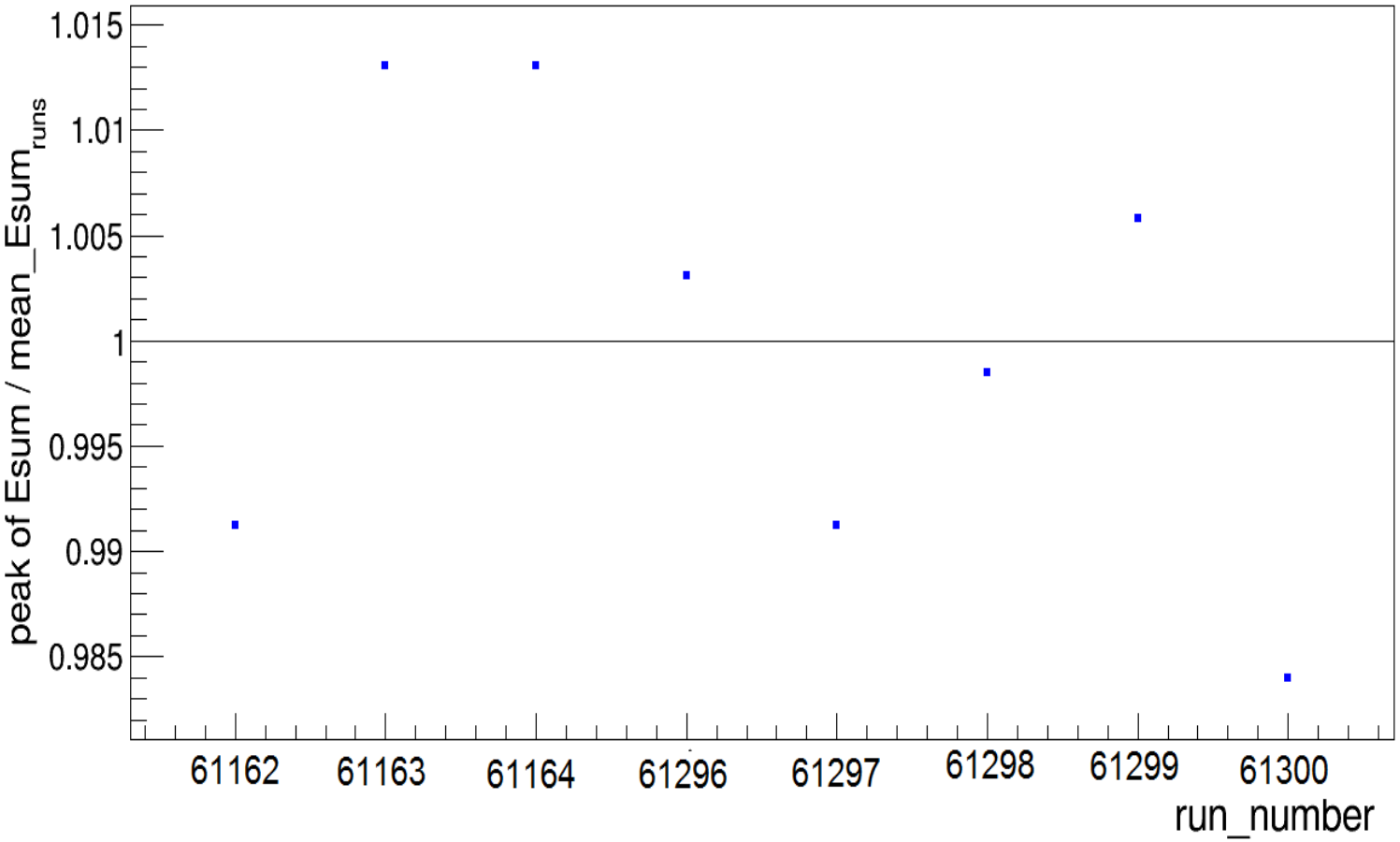
Energy_sum and hits distributions : 20 GeV





Muons contamination

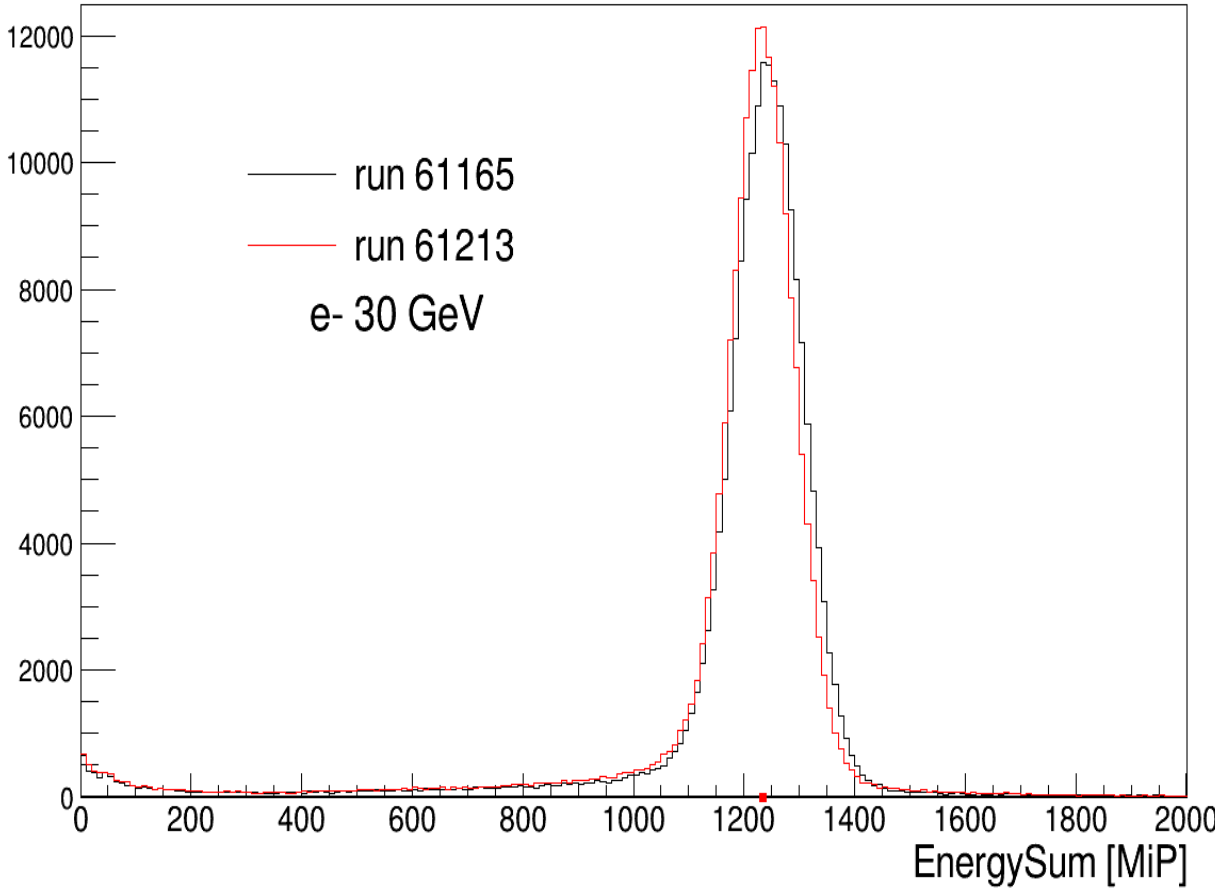
Variation fo the energy_sum for all the runs : e- 20GeV

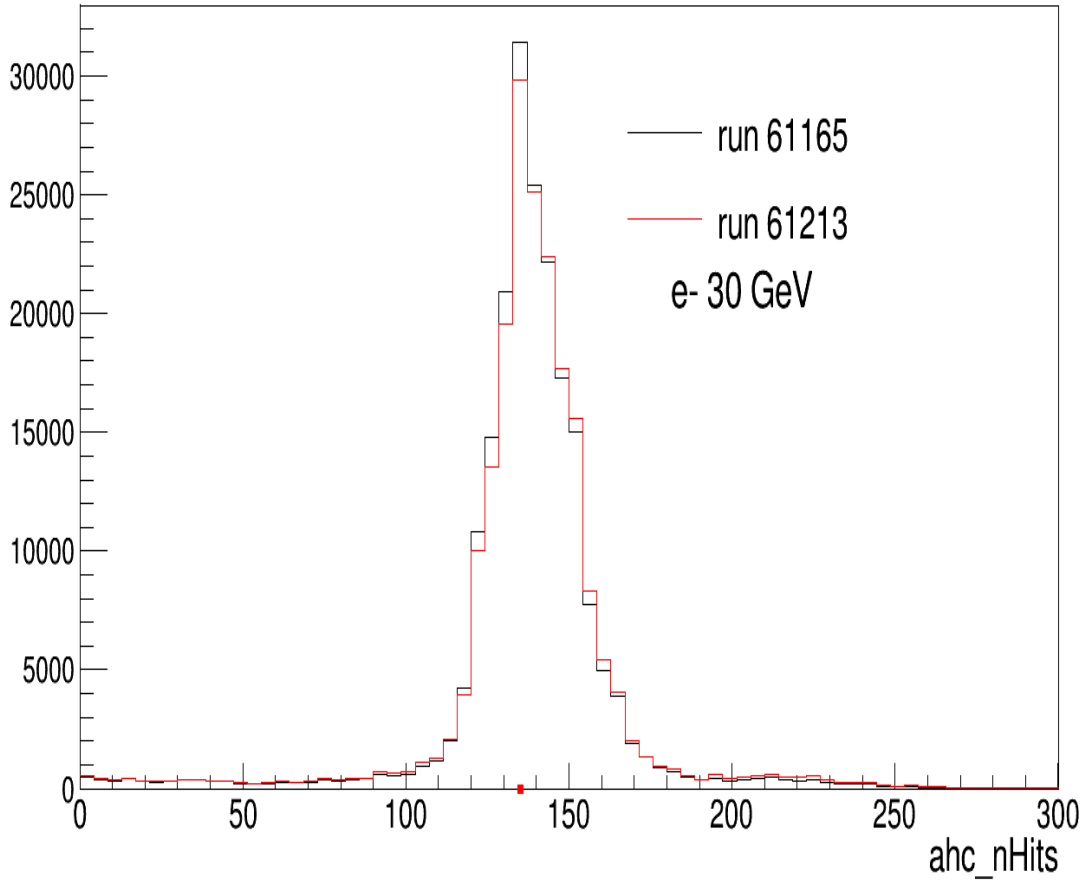


e- 20 GeV:

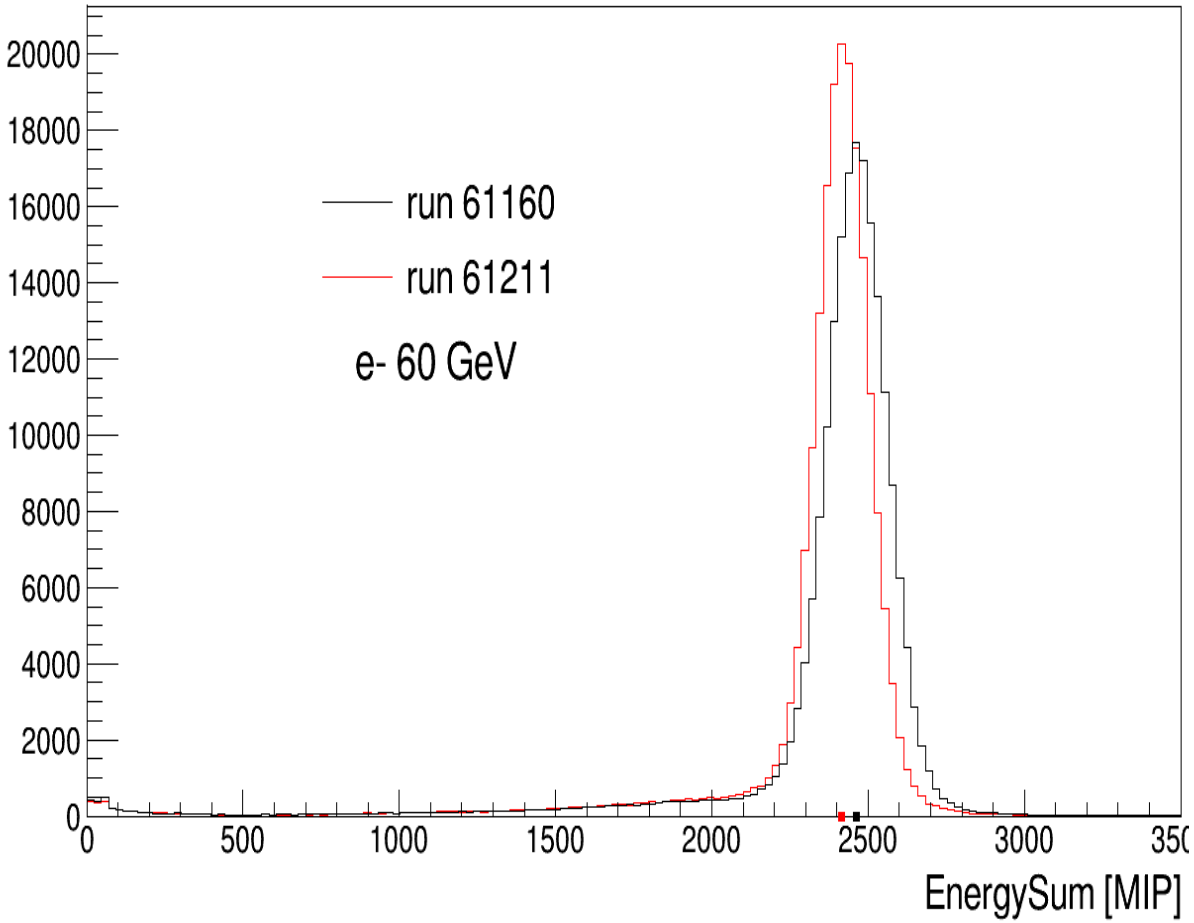
- The peaks of the Esum are within 1.6% from the mean over all runs.
- All the runs of 20 GeV looks quite good.

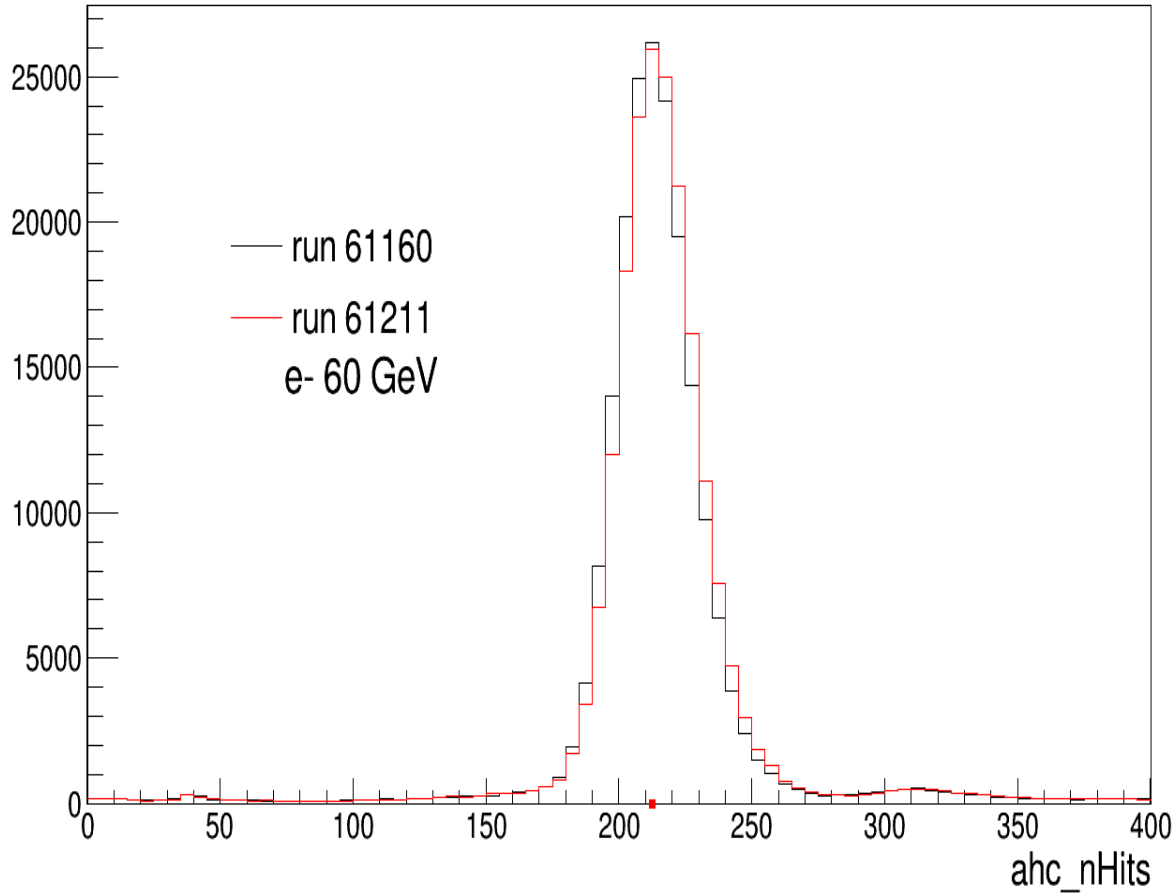
Energy_sum and hits distributions : 30 GeV





Energy_sum and hits distributions : 60 GeV





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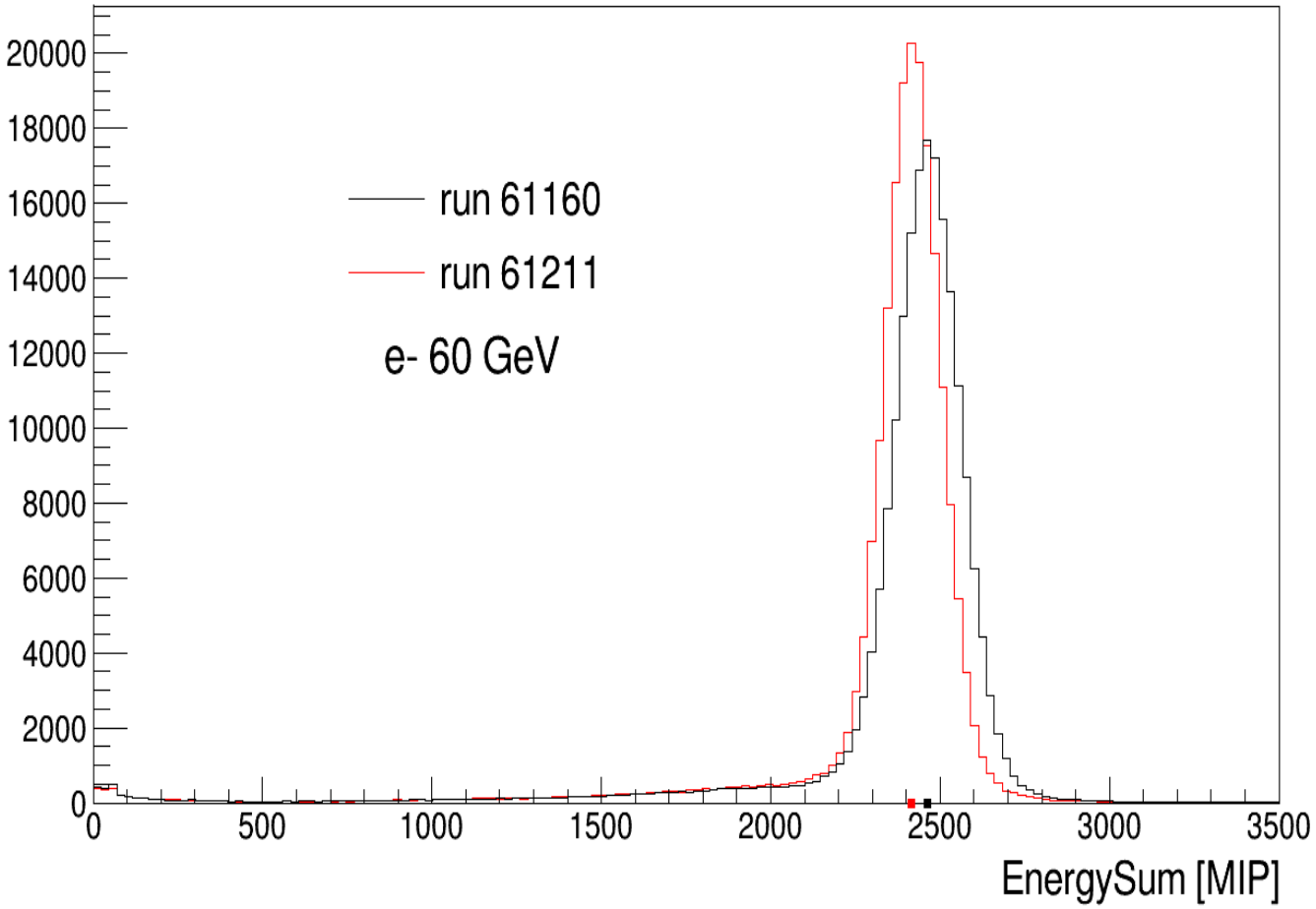


- Detector position " center ":

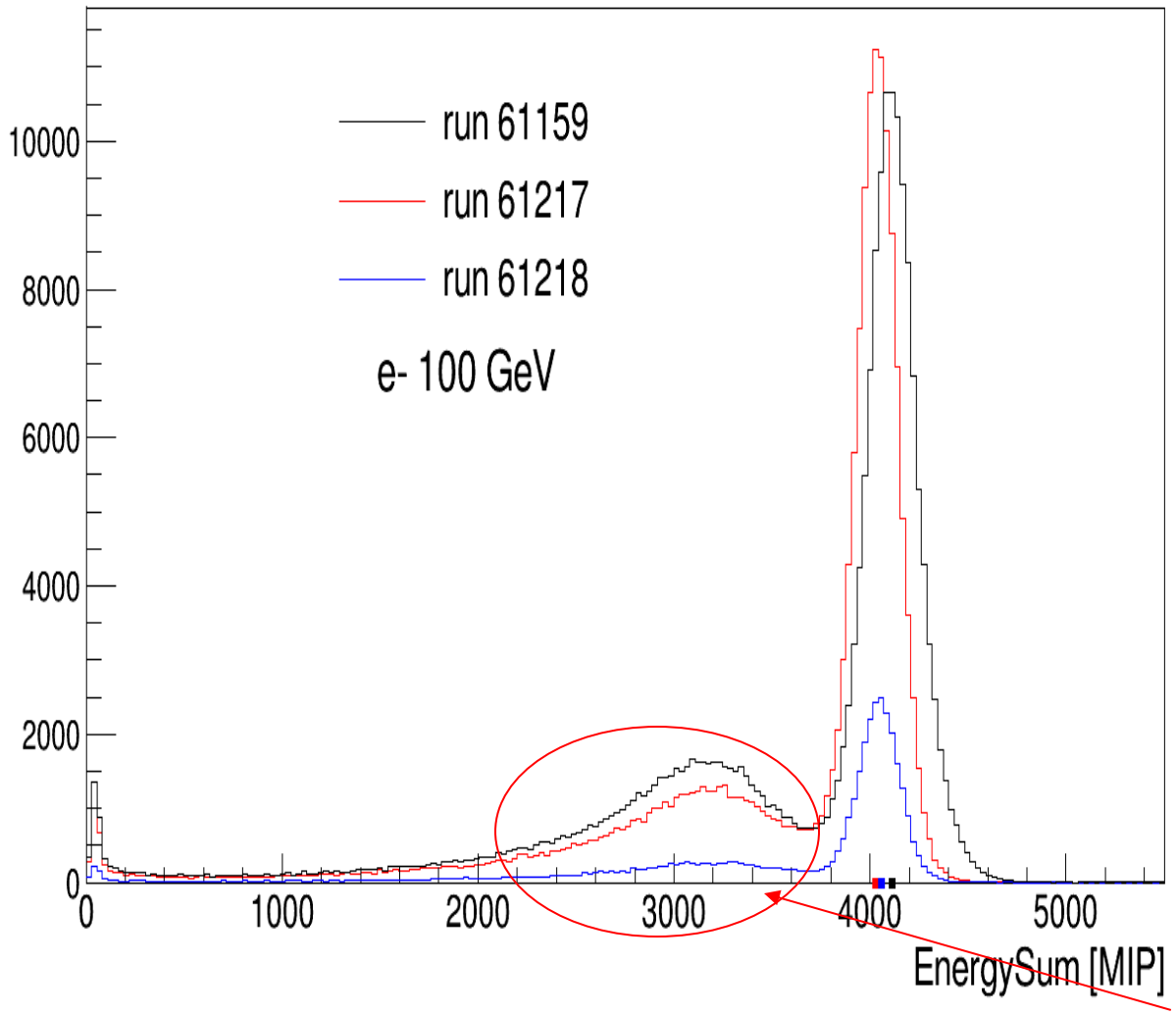
  61160: pos[mm]: x= 613.3, y= -620.9
  61211: pos[mm]: x= 652.6, y= -579.5

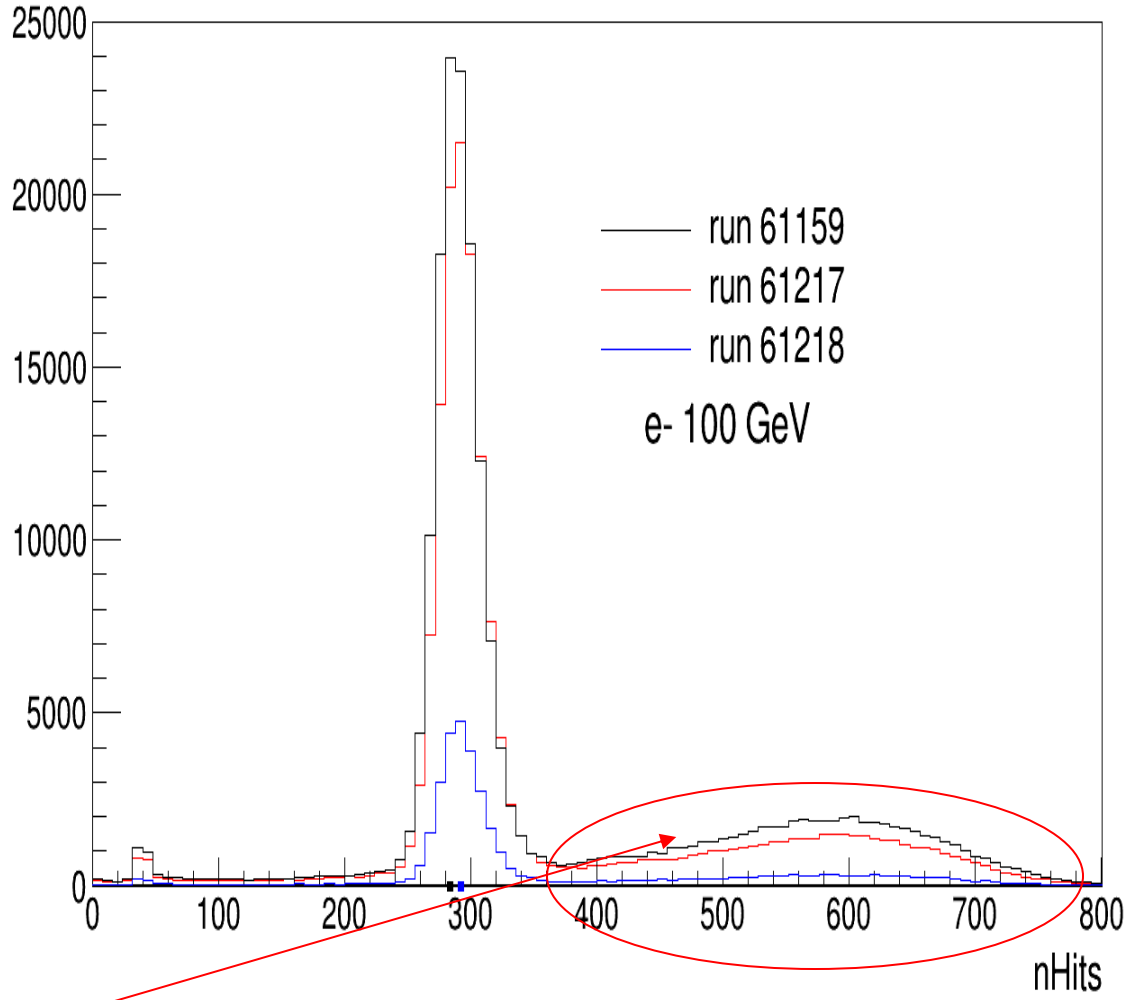
- The center position was shifted by :

  40 mm in x
  49 mm in y

- This shift was observed in all the energies.

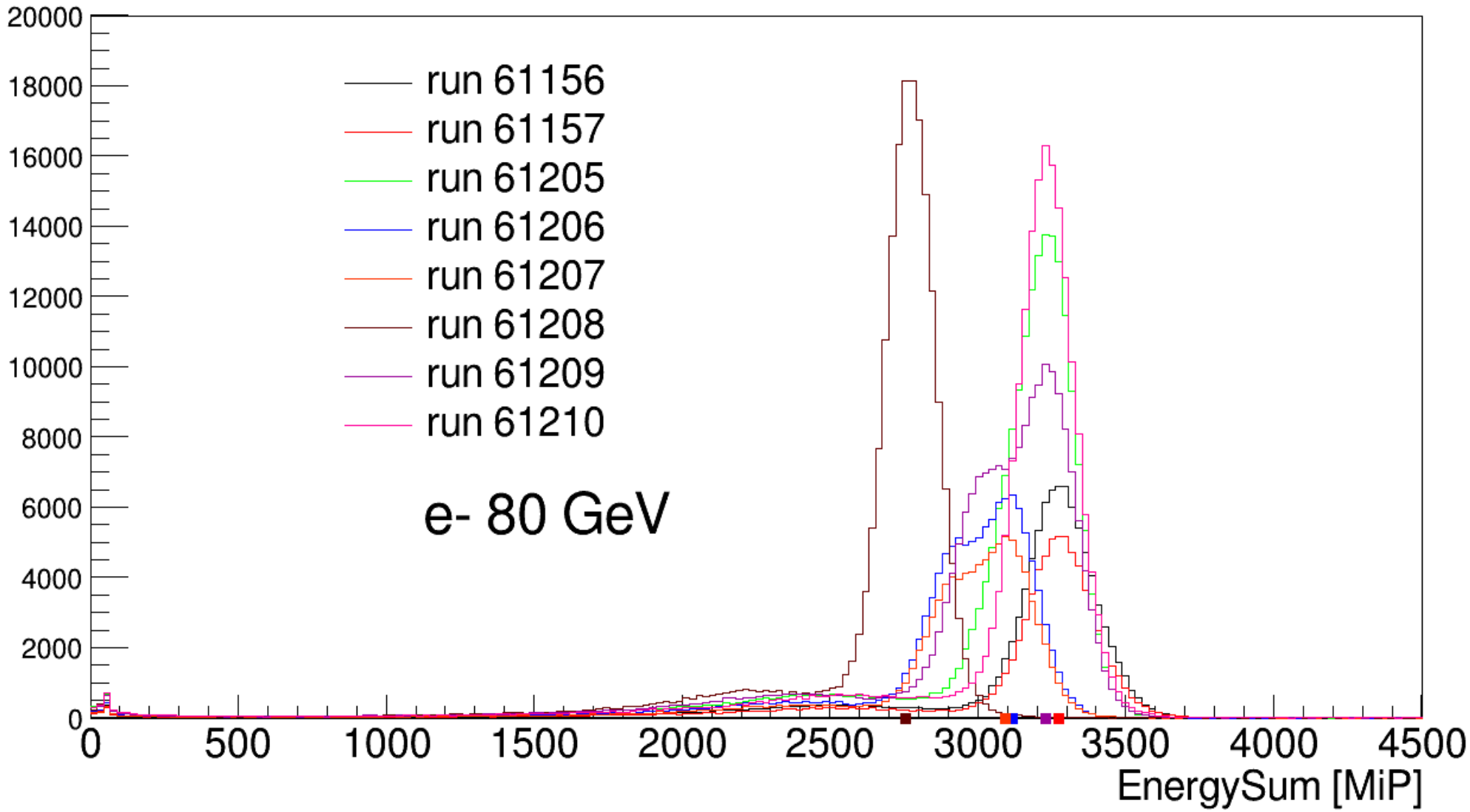
Energy_sum and hits distributions : 100 GeV



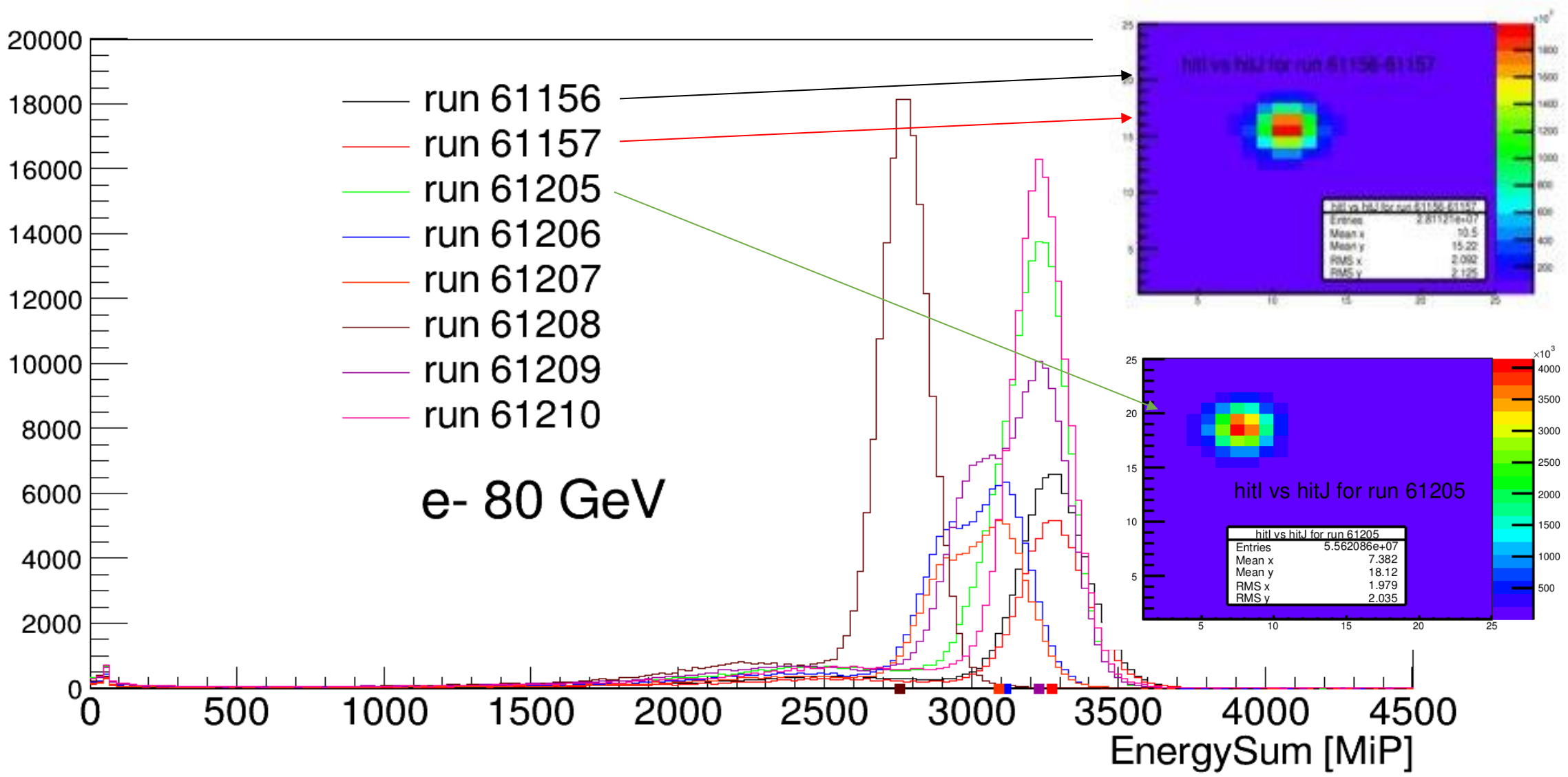


Hadrons contamination

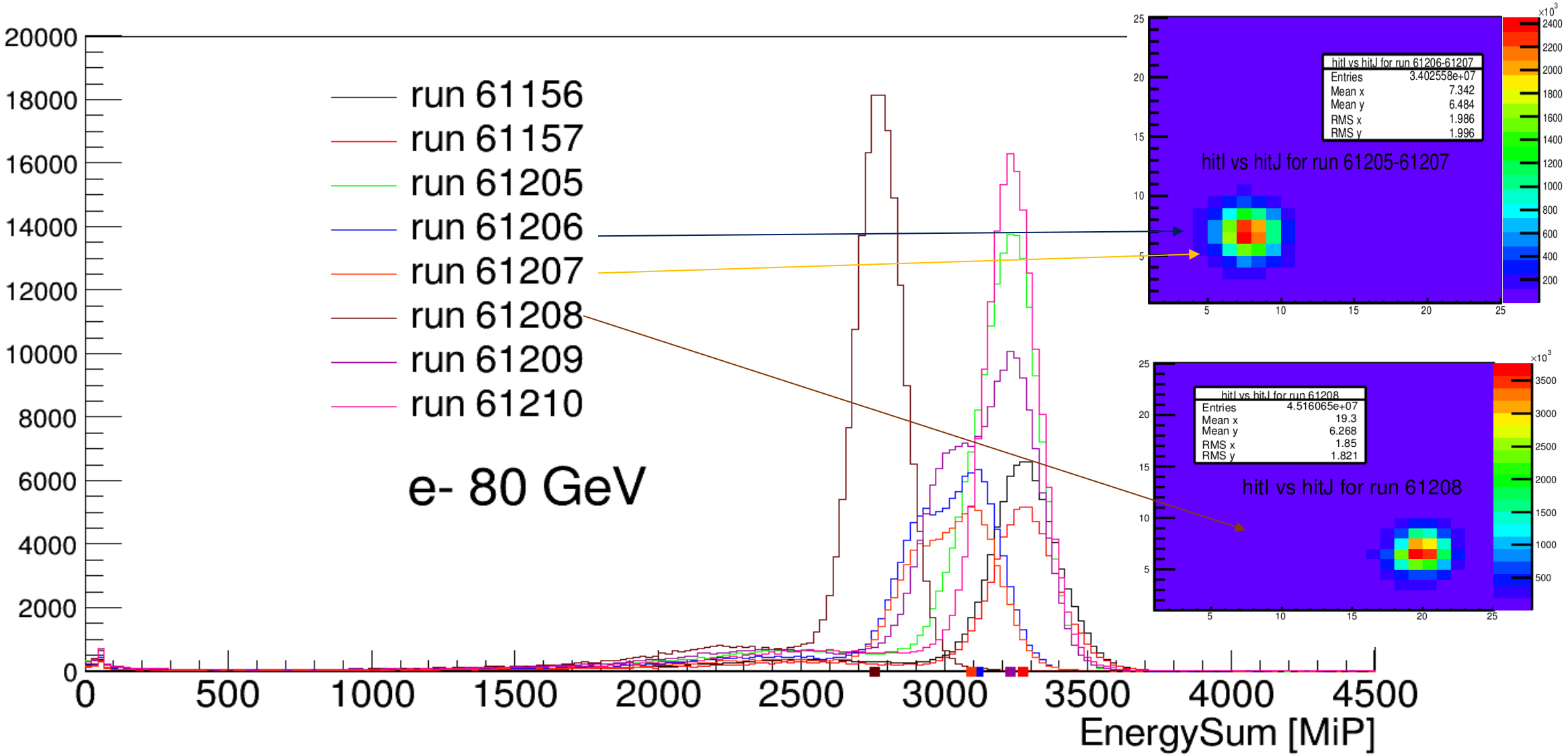
Energy_sum for different detector position : 80 GeV



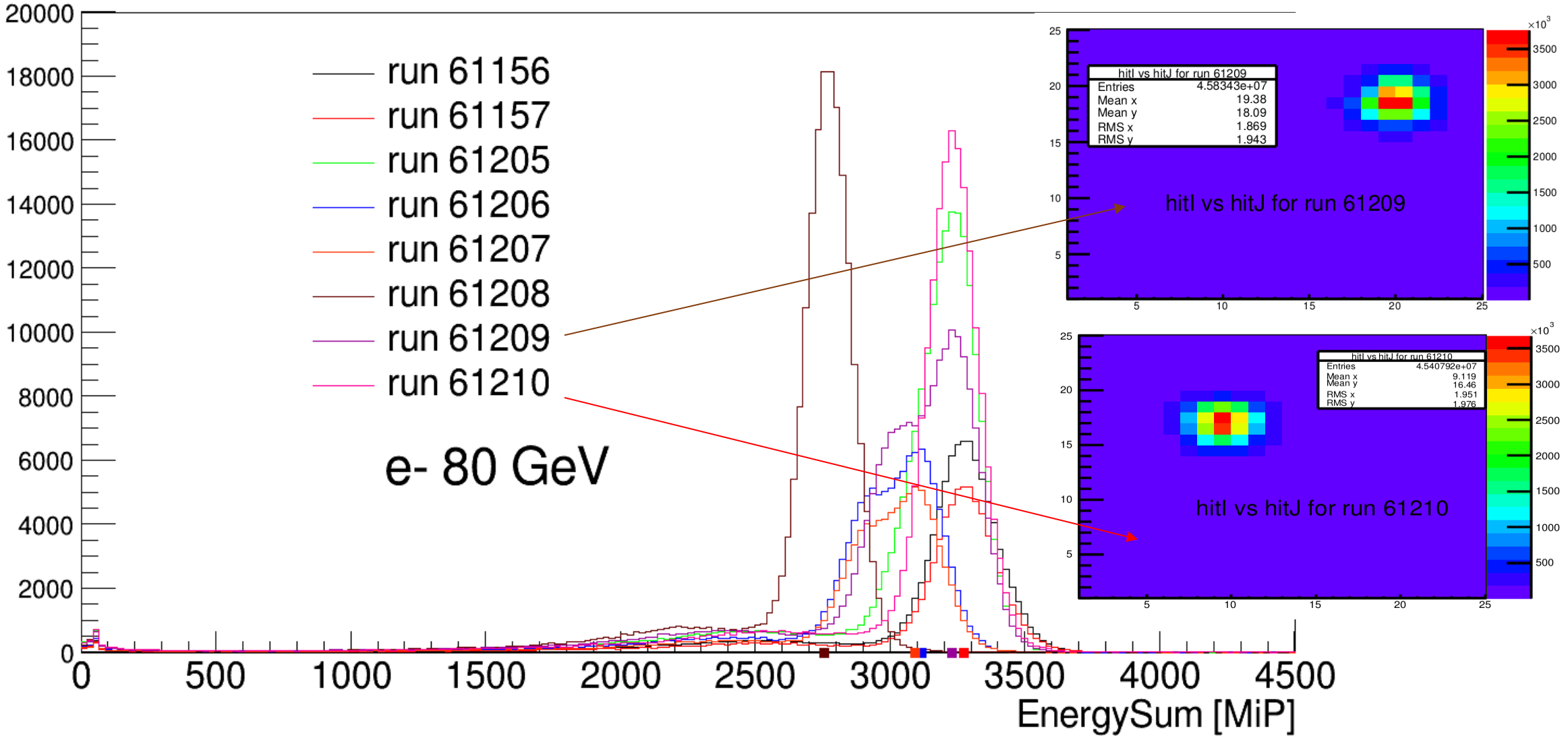
Energy_sum for different detector position : 80 GeV



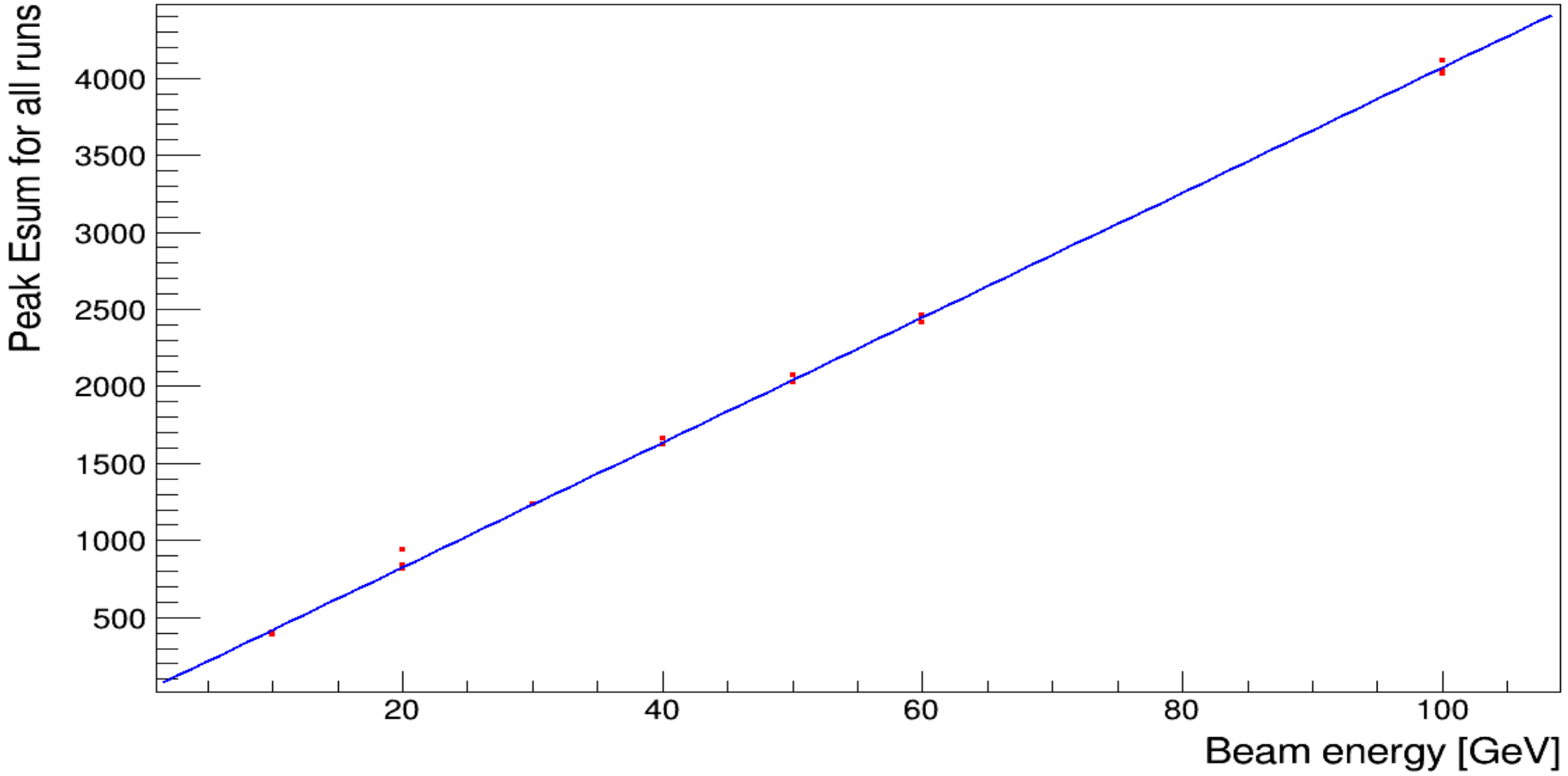
Energy_sum for different detector position : 80 GeV



Energy_sum for different detector position : 80 GeV



Peak of EnergySum vs beam energy : (linear fit)



Outlook:

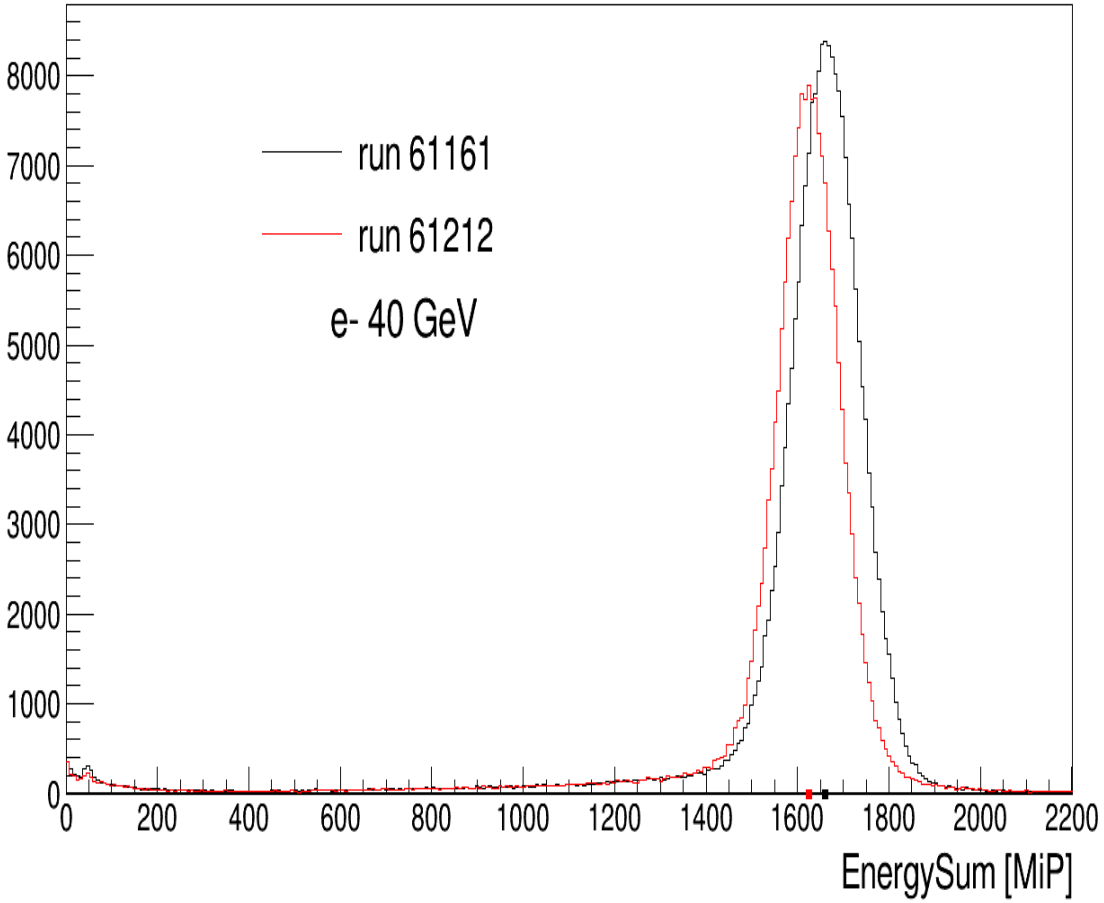
- The reconstraction of all the data os done and they are in the nfs : /nfs/dust/ilc/group/flchcal/AHCAL_Testbeam_SPS_June2018/reco_rootfiles/Electron/
- All the runs are good, except the 80 GeV I need to check more which runs are in the center.
- The flag of good and bad runs will be stored in the google sheet.
- Start running the simulation.
- Compare the MC with the data.

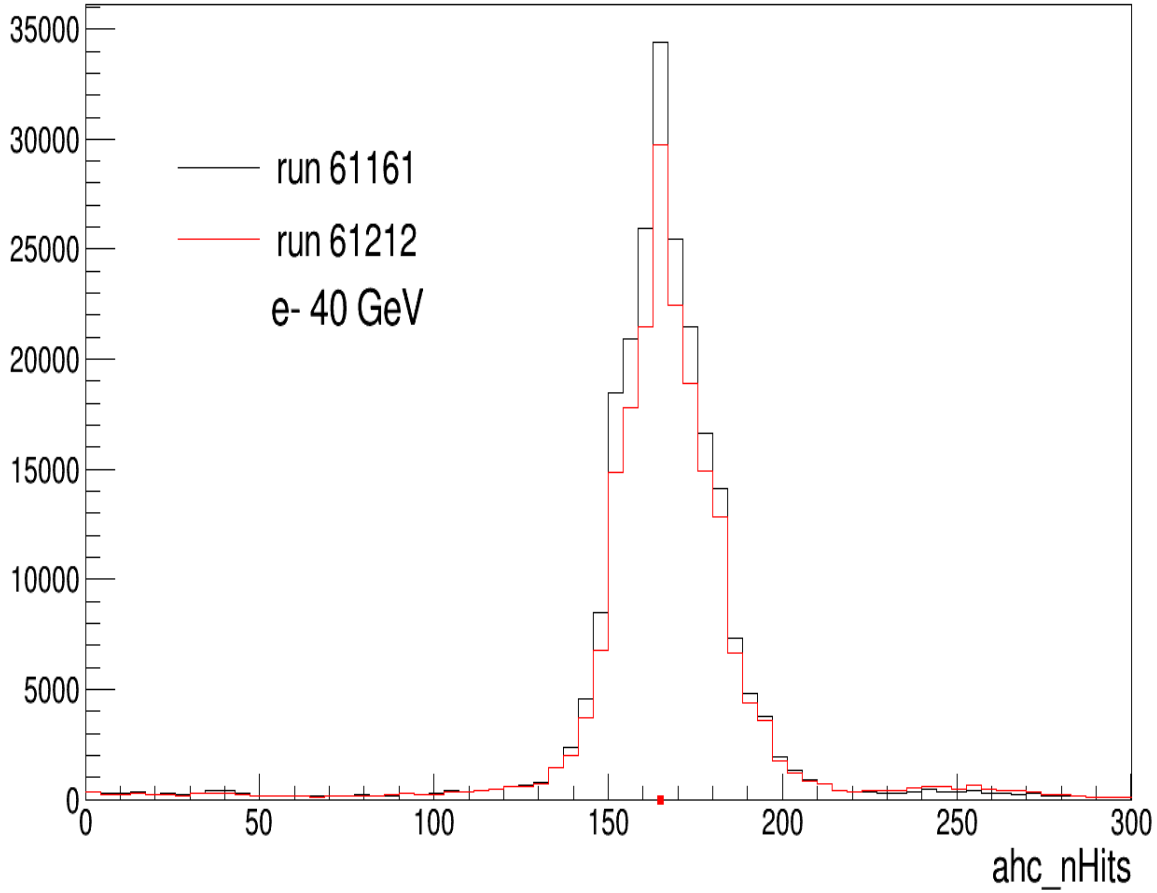
THANK YOU FOR YOUR ATTENTION

ANY QUESTIONS?

BACK UP

Energy_sum and hits distributions : e- 40 GeV





Energy_sum and hits distributions : e- 50 GeV