Status Report

GRAiNITA

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240126

Dual-readout and PSD

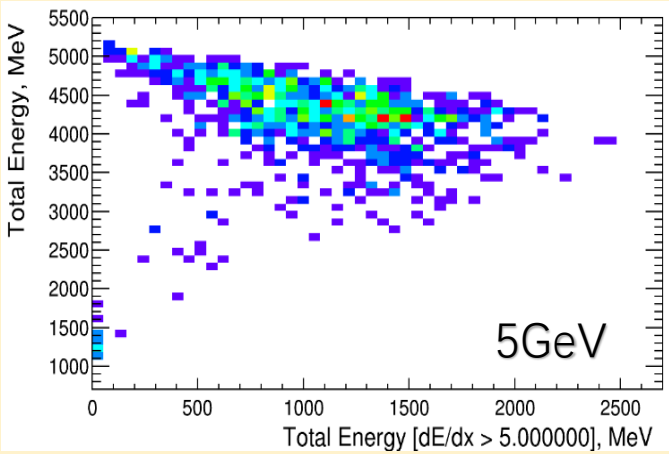
- The dual-readout Calorimetry
  - $E_{shower} = E_{em} + E_{had} \Rightarrow E[f_{em} + (1 - f_{em})\left(\frac{h}{e}\right)]$
  - ➢Measure the Cerenkov and Scintillation signal from fiber/crystal
  - ➢Use the well-determined f_{em} to improve the hadron shower energy resolution.
- The PSD (Pulse Shape Discrimination)
  - ➢Use signal amplitude to separate the scintillation signals.

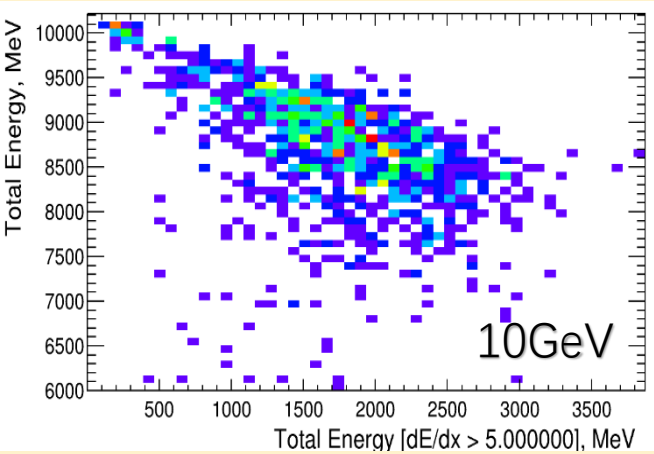
➢For crystal calorimeter

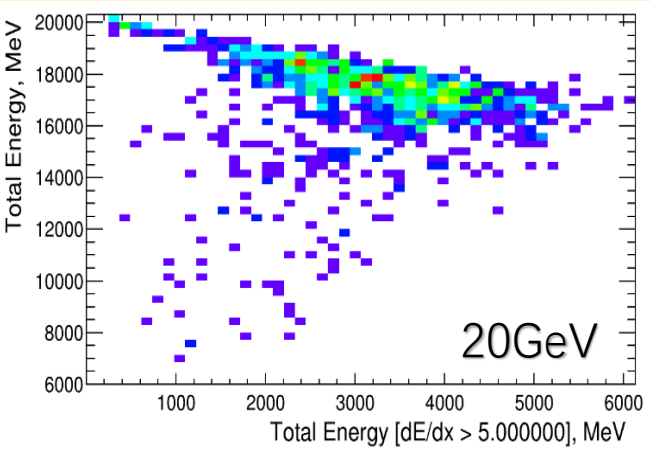
- ➢PSD ⇒ scintillation signals ⇒ E_{had} ⇒ hadron shower energy
- ➢With dE/dx cut, the $E_{dep(\frac{dE}{dx}>5)}$ and $E_{dep(total)}$ have strong correlations
  - ➢Could be used to improve the final reconstructed E_{shower}

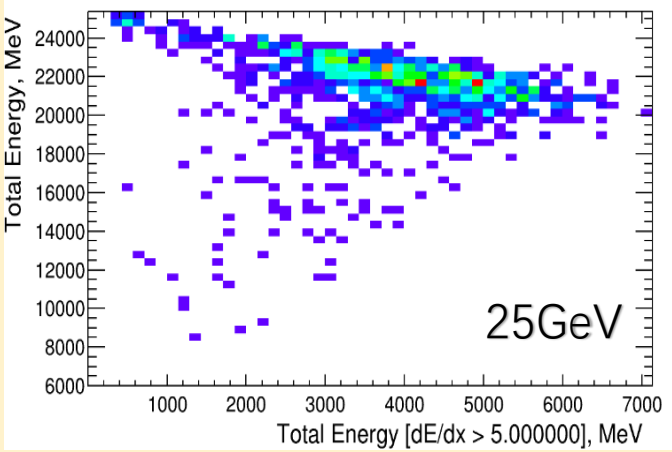
E_{dep}^{h} VS E_{dep}

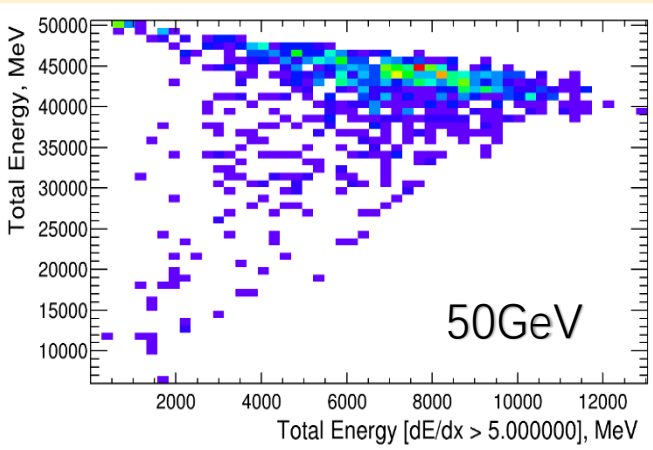
- Some simple simulations are generated with different input energies.
  - Material: ZnWO4, Particle: π^+, Energy: from 5-80 GeV

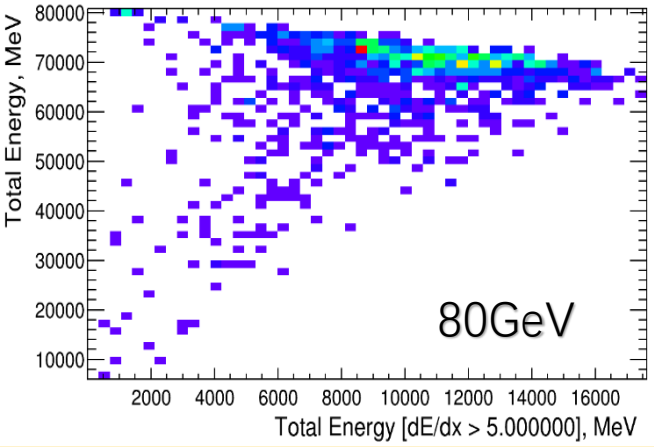






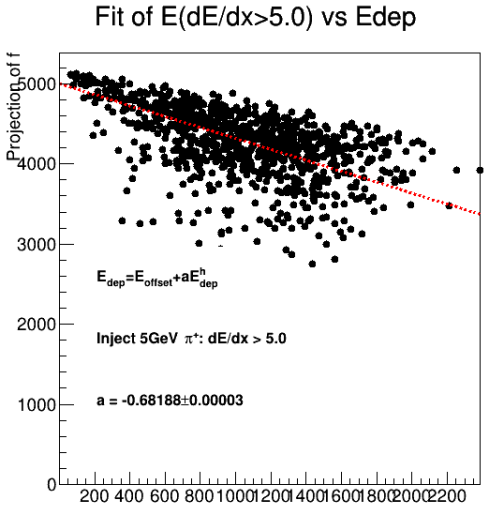


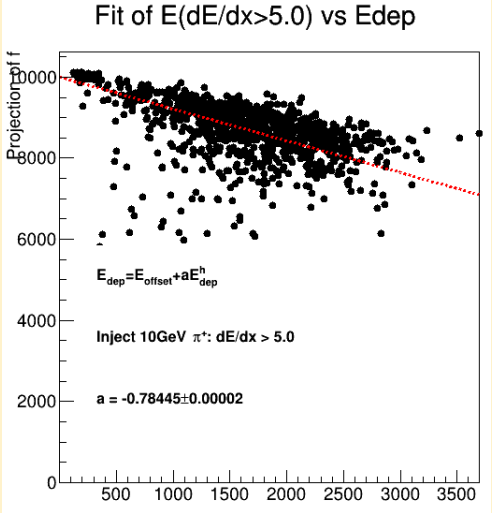


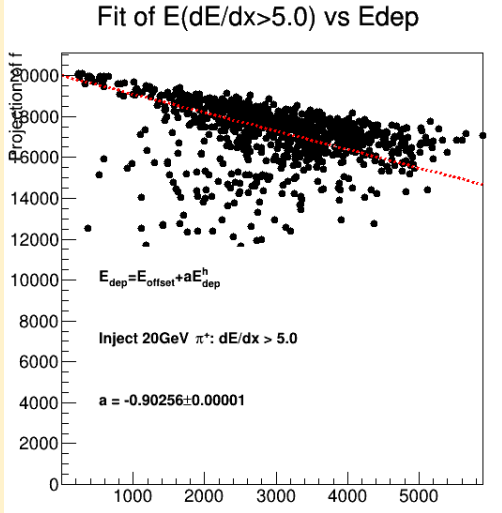


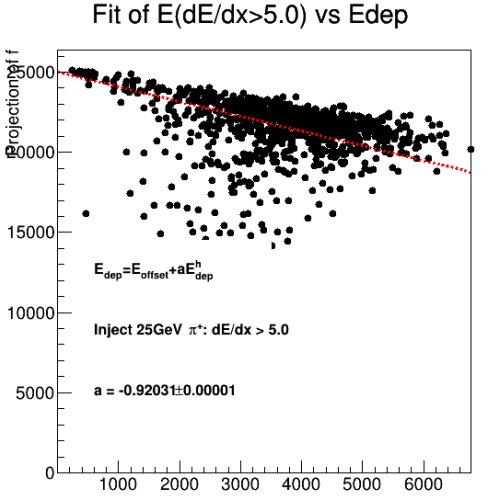
Describe the correlation

- Using a simple function: $E_{dep} = E + aE_{dep}^{h}$
  - Also, $E_{dep} = E_{em} + E_{dep}^{h} \Rightarrow E = E_{em} + (1-a)E_{dep}^{h}$









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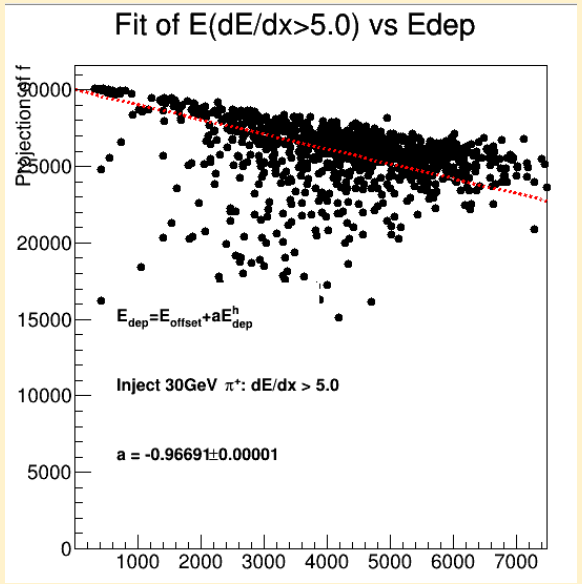

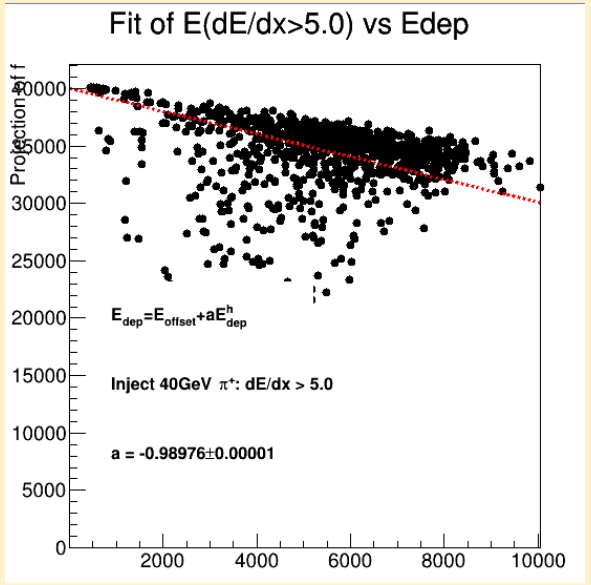

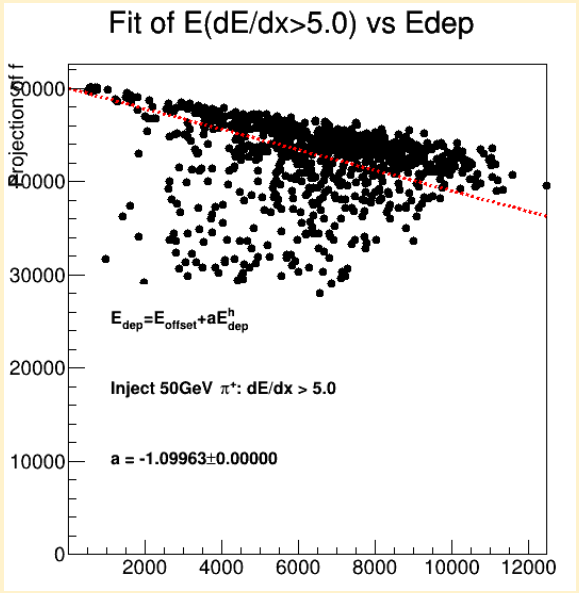

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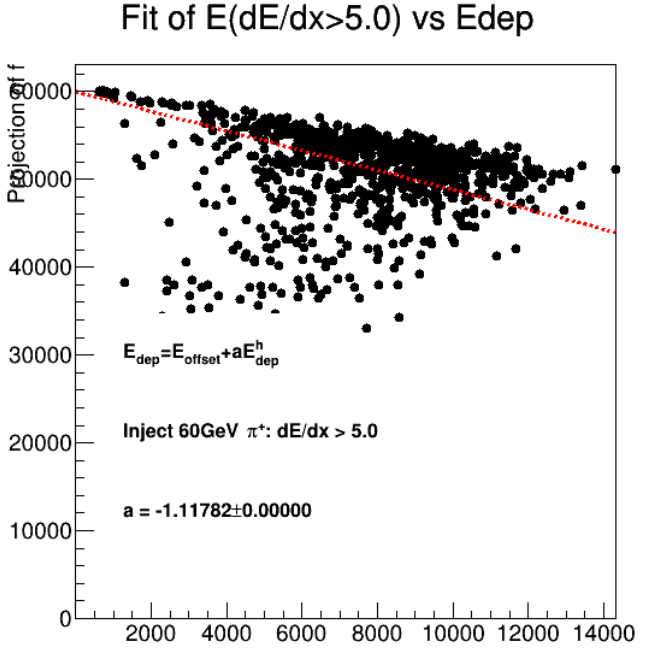
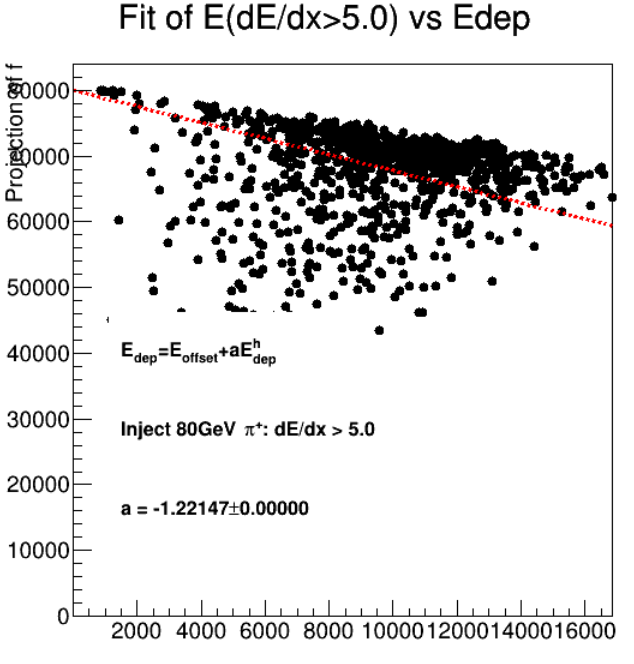
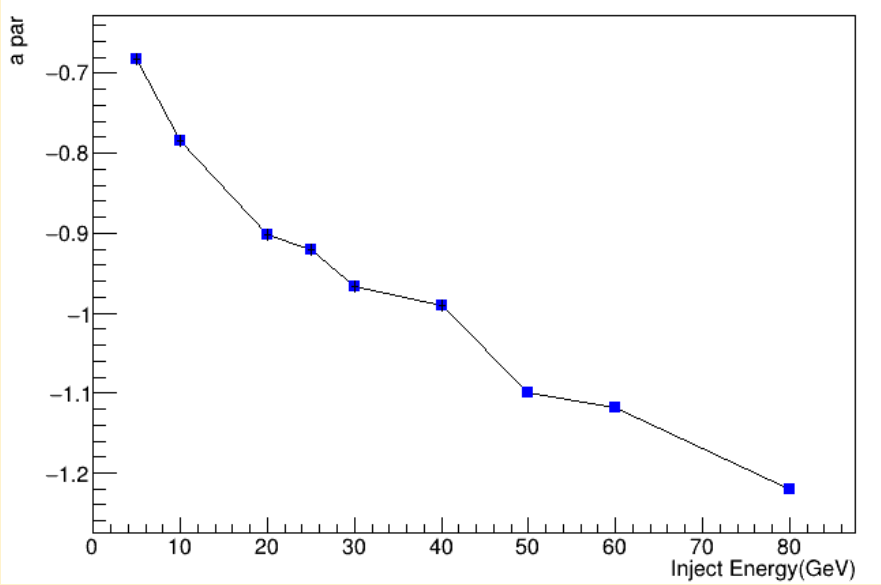
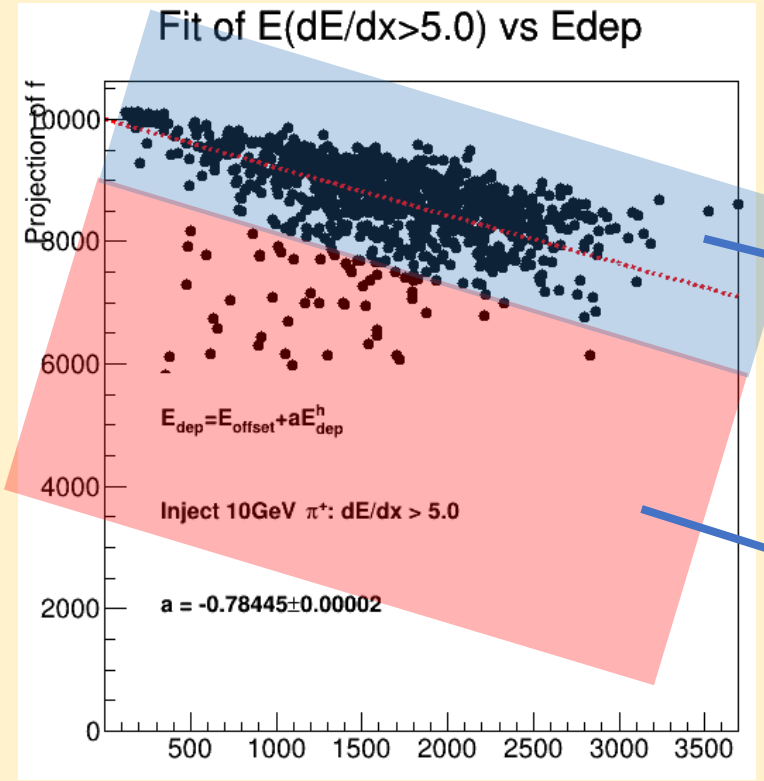
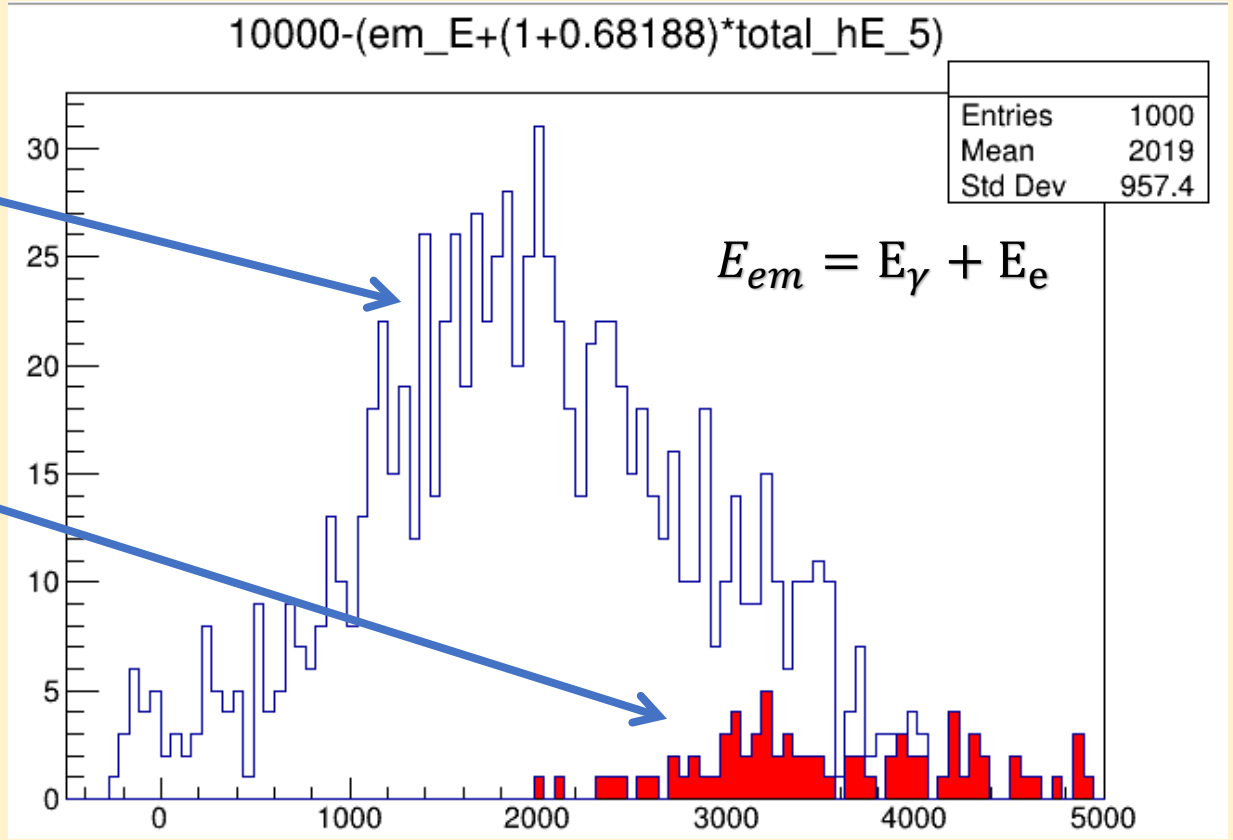






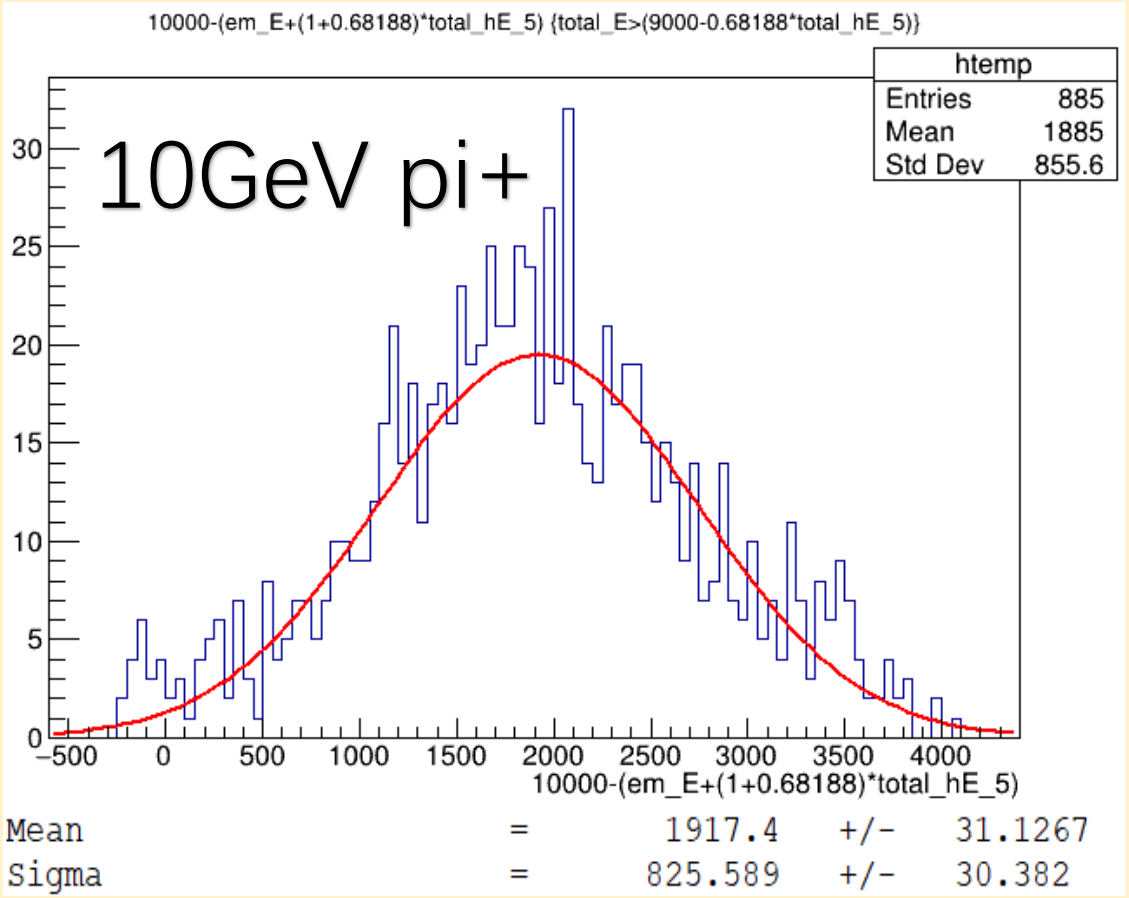
First check on the resolution

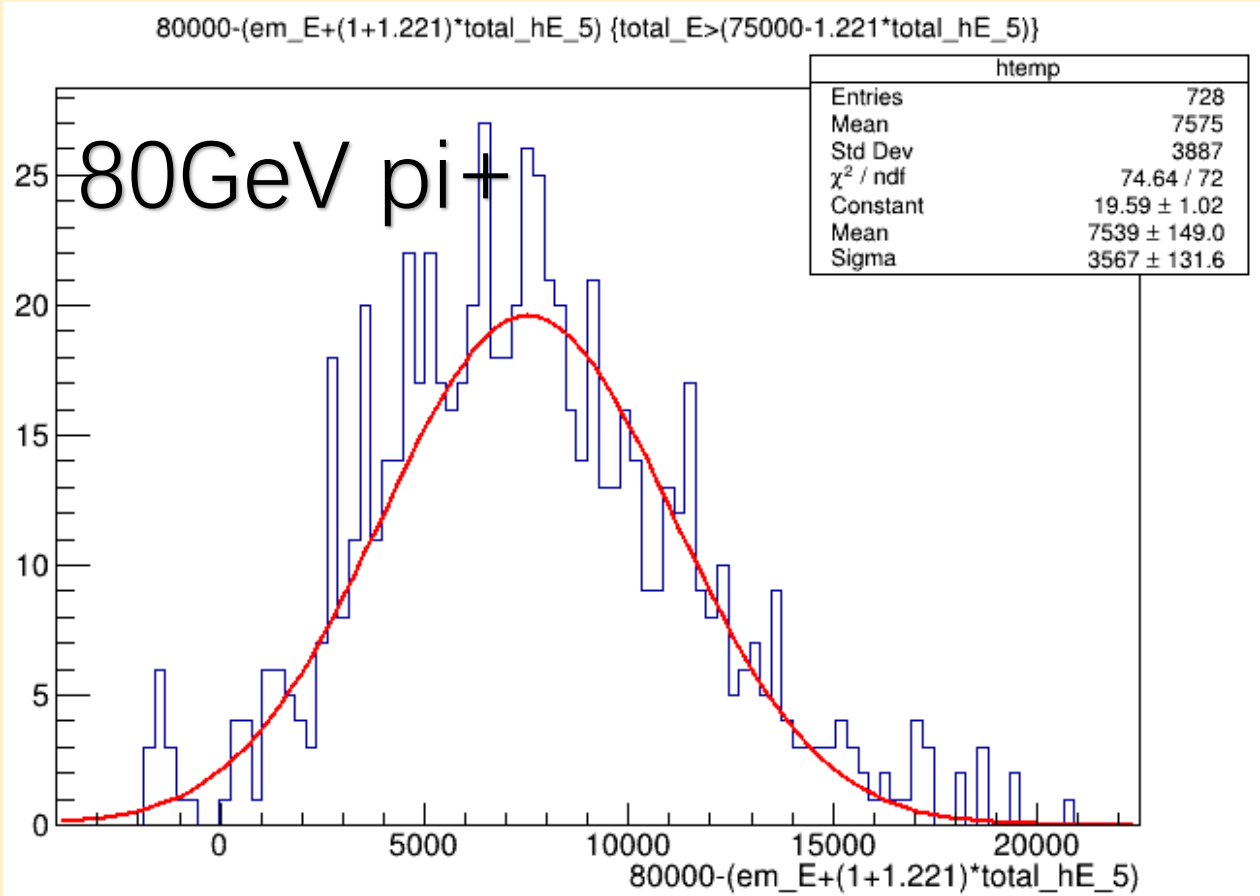




First check on the resolution

- Removing the events with large leakage





The bias...

- The bias may come from $E_{had} \neq E_{dep}^{h}$(or $E_{em} \neq E_{dep}^{l}$)
- If replace E_{em} with E_{dep}^{l}...