e- efficiency and Pi- rejection study of NEEMC

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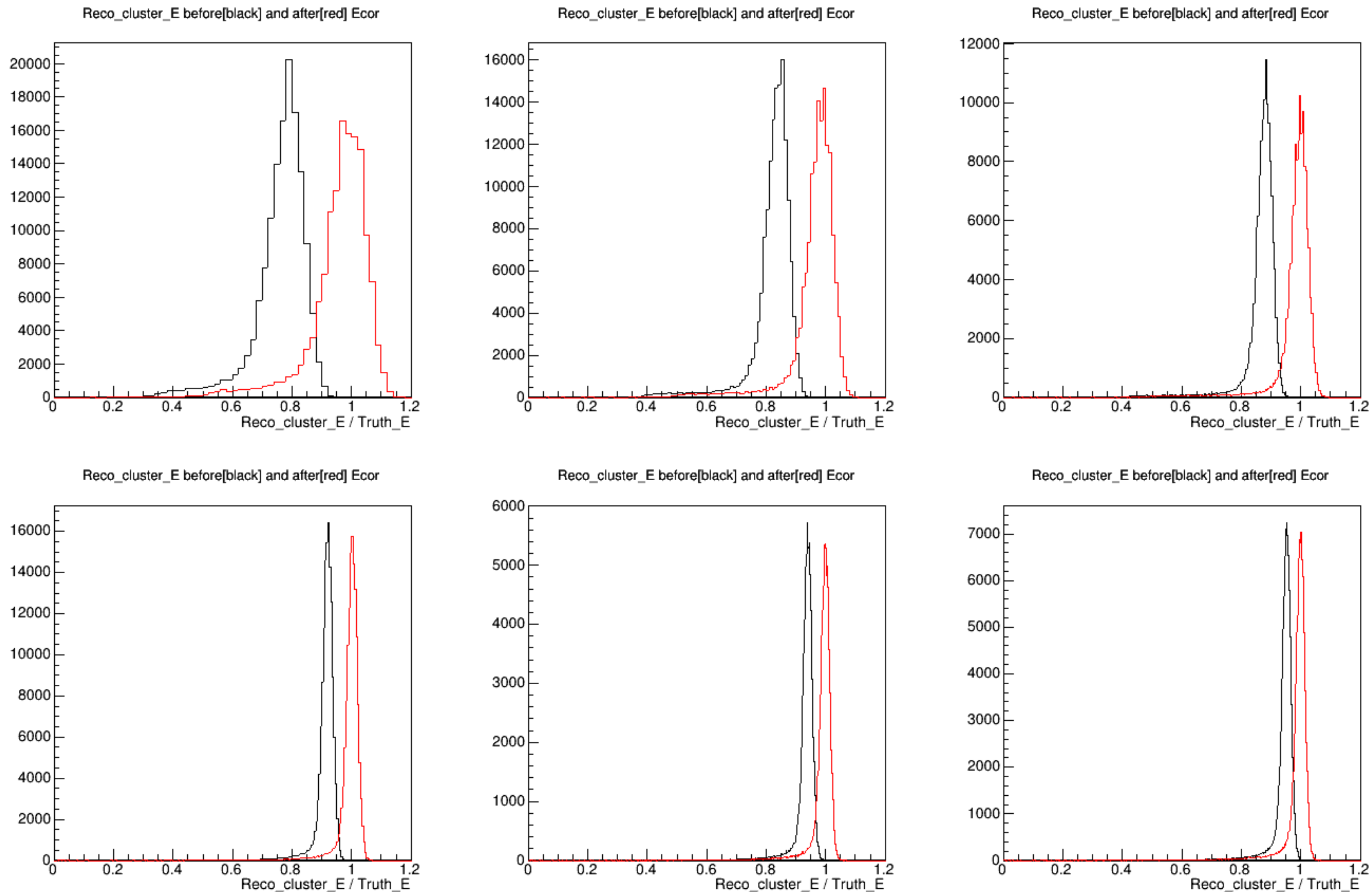
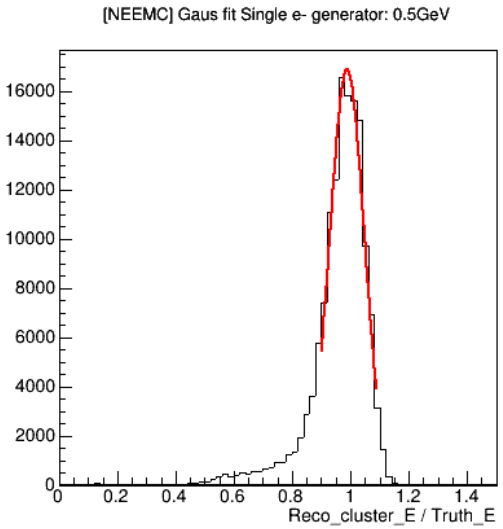
E resolution of NEEMC

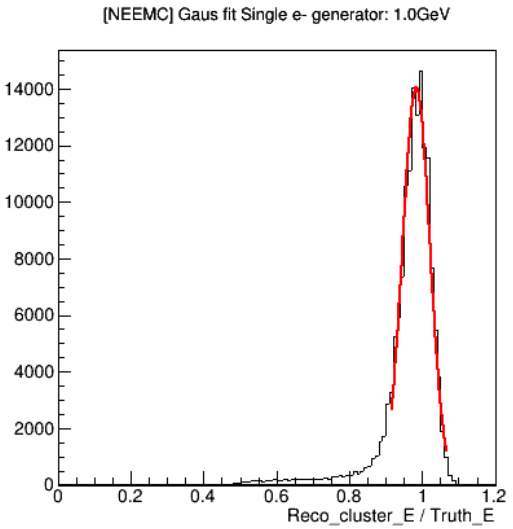
- Single e- generator @ different given energy:
  0.5, **1**, **2**, **5**, **10**, **20** GeV
- Randomly and uniformly generated e- on **theta**: 130^{o} – 177^{o}, **phi**: 0 – 2π
- NEEMC geometry in **theta**: 160^{o} – 177^{o}, **eta**:-1.74 – -3.64, **phi**: 0 – 2π
- **Apply geometry cut to make sure primary electron point to NEEMC**
- **Select the cluster with maximum energy in each single event**

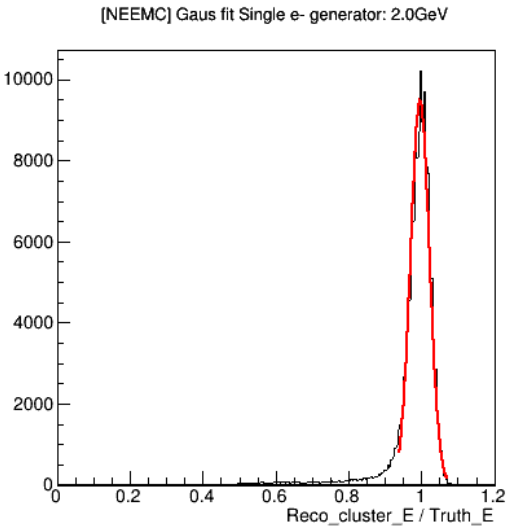


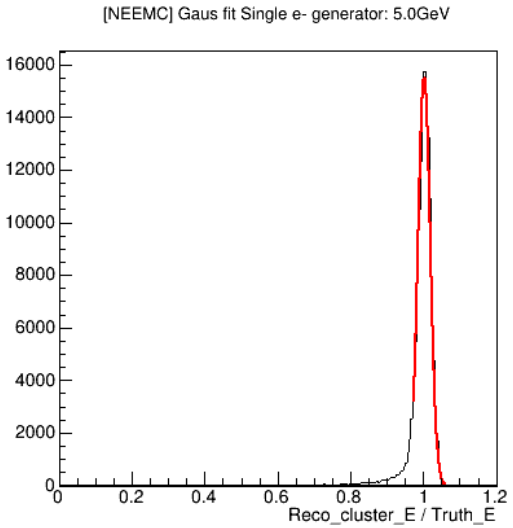
Do the Gaussian fit then correct the energy with linear function

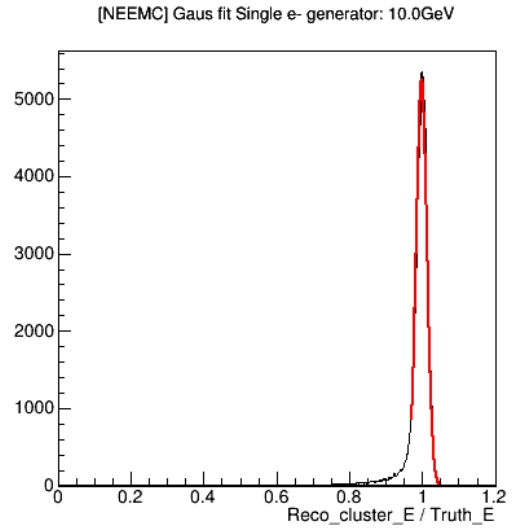
Black[before correction]   Red[after correction]

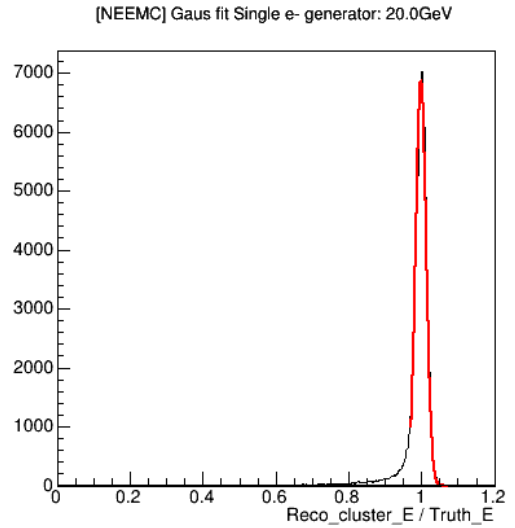




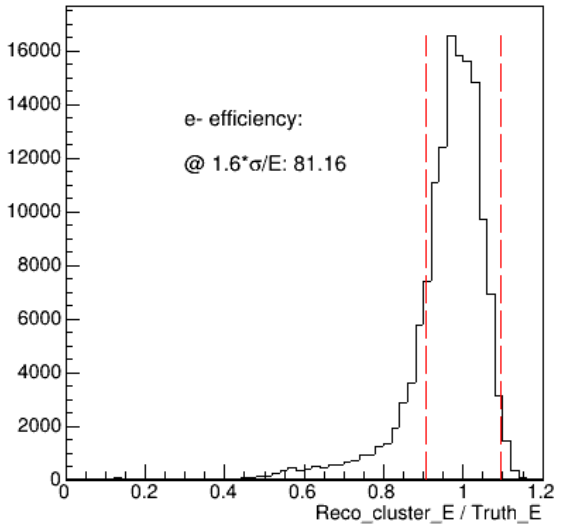


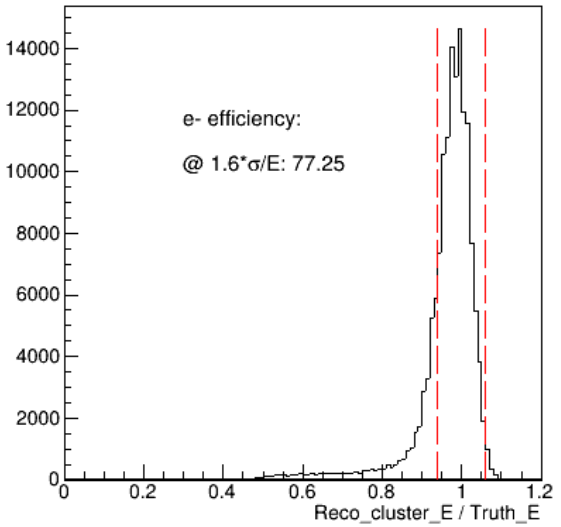


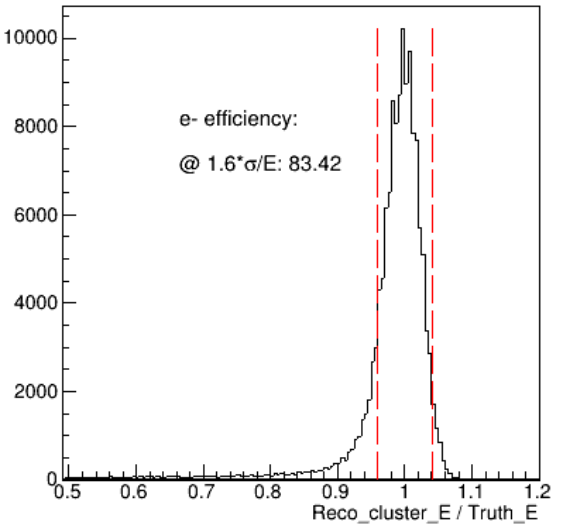


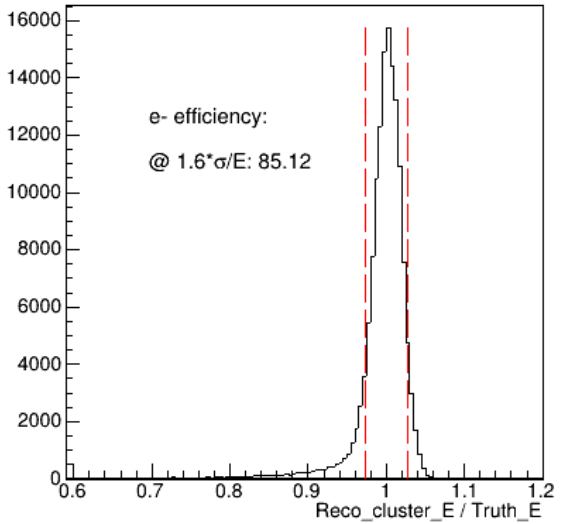


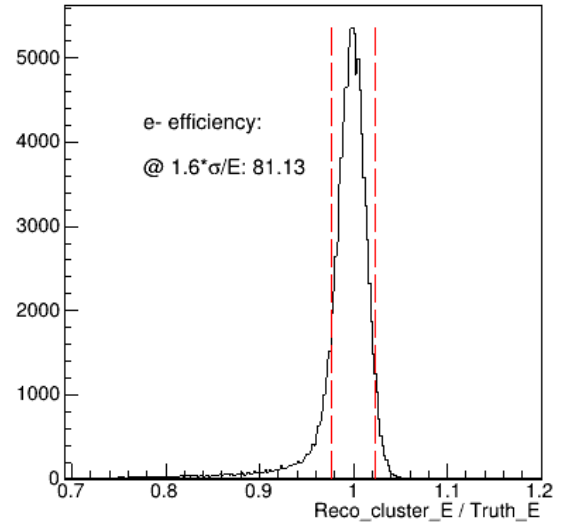
Do the Gaussian fit

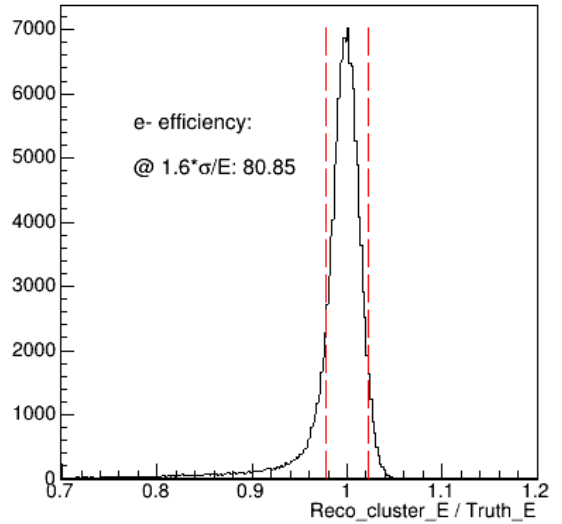










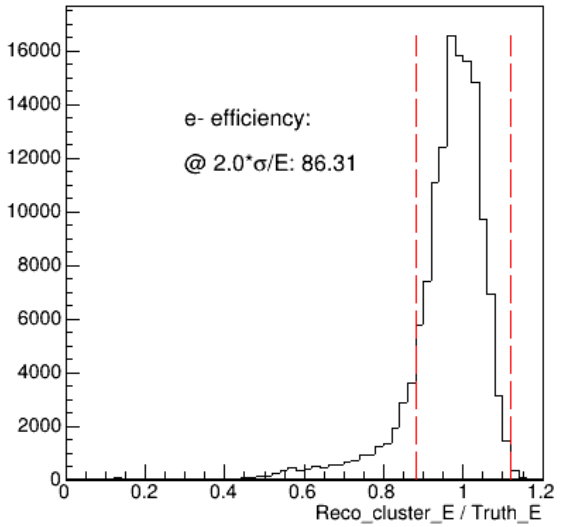


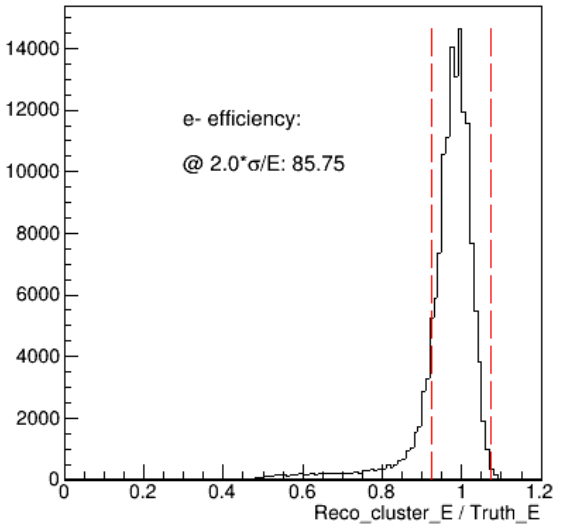
e- efficiency calculation:

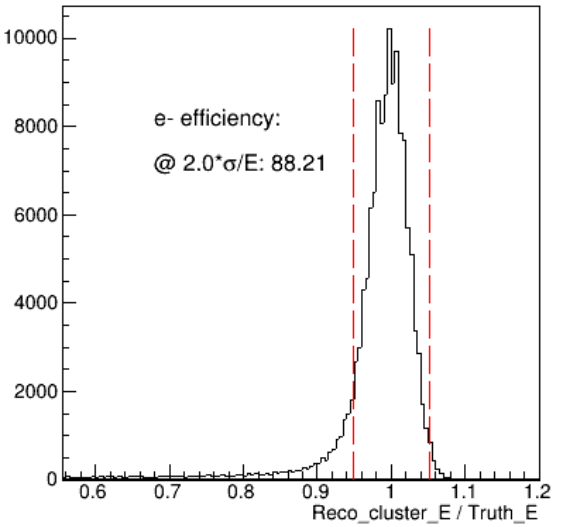
The dash line is **1.0 +/- 1.6*σ_E/E** respectively.

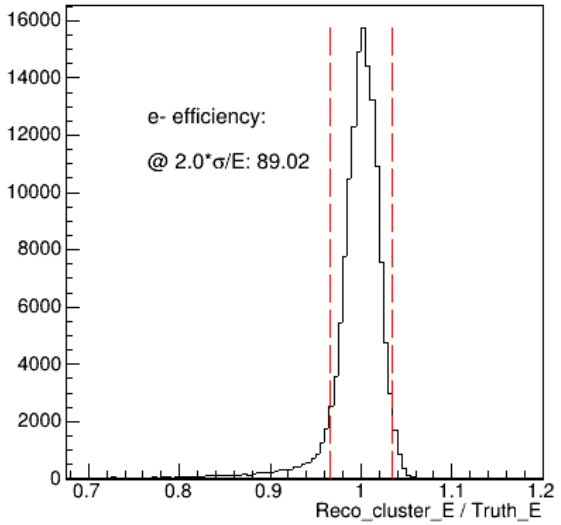
Then, do the integral of bin content between 2 dash lines

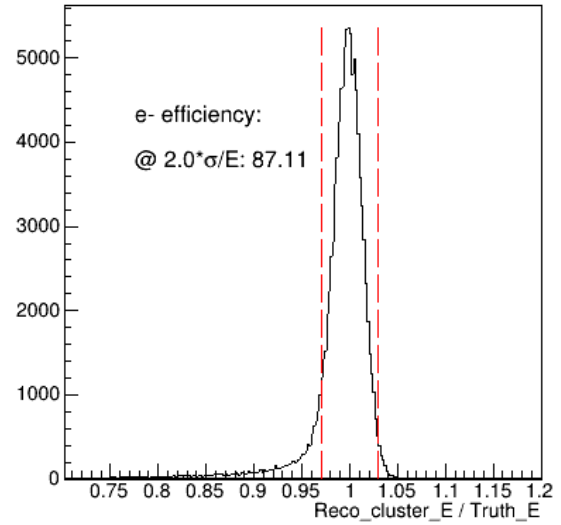
e- efficiency: **Integral(1.0 +/- 1.6*σ_E/E) / total_events**

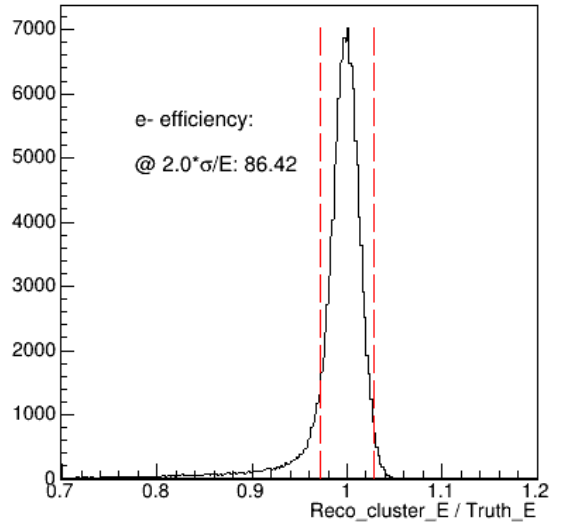












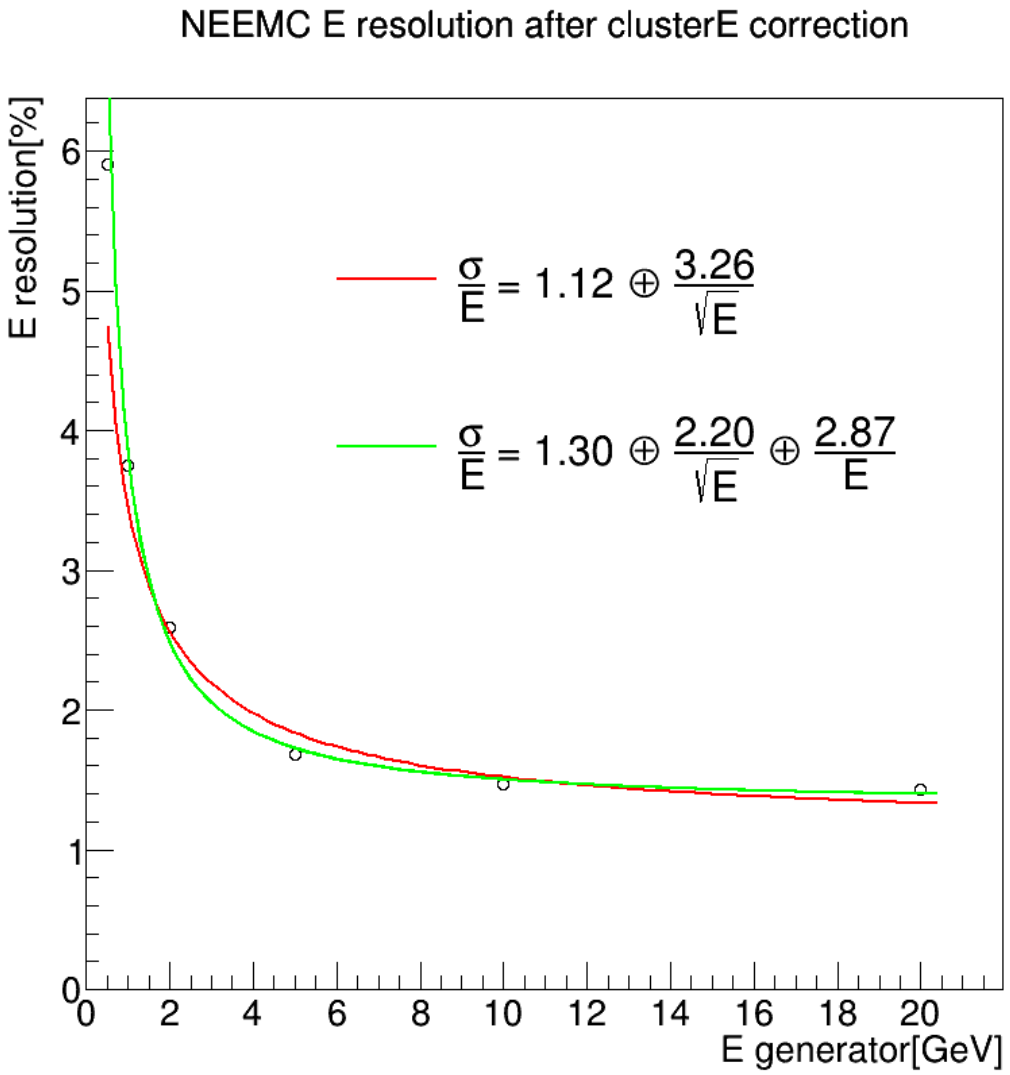
e- efficiency calculation:

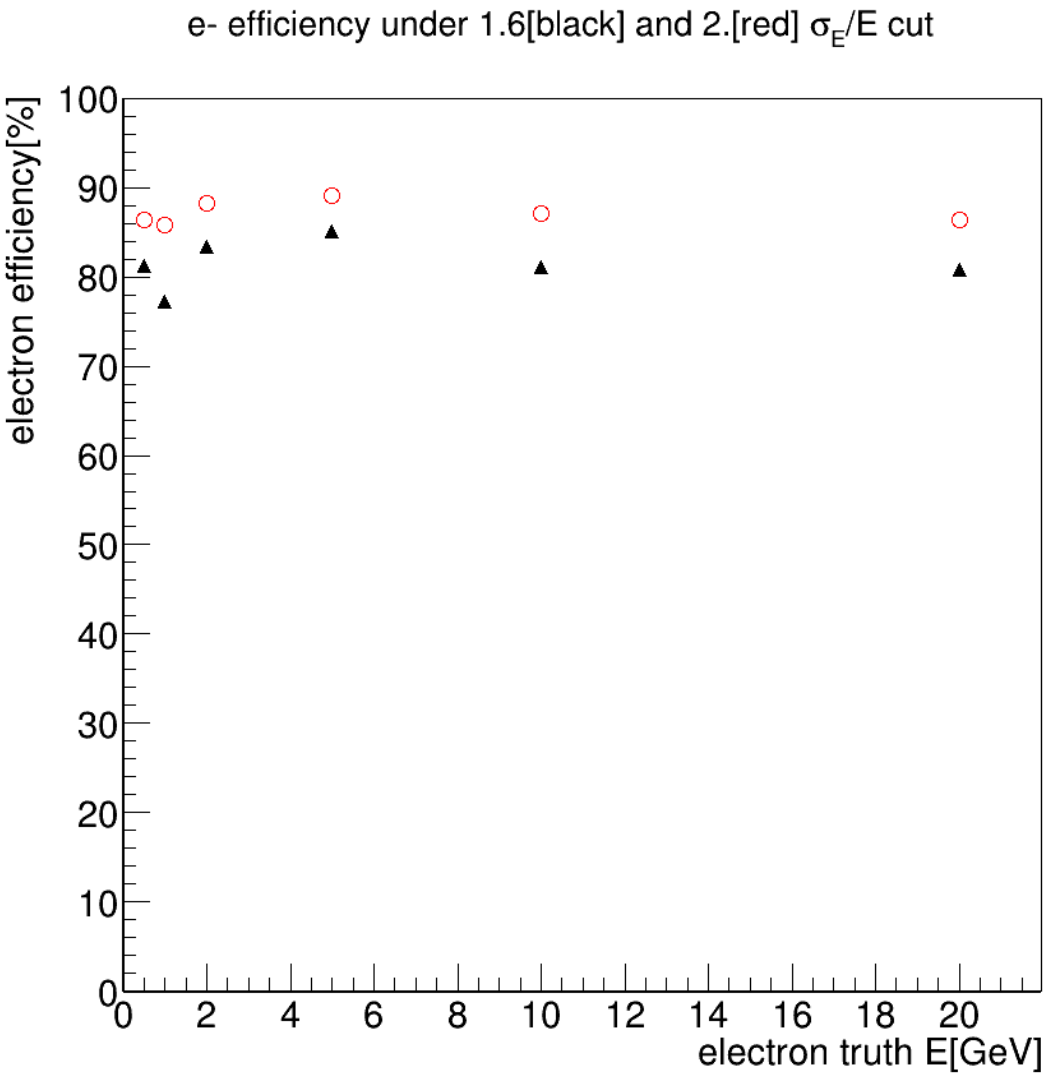
The dash line is **1.0 +/- 2.0*σ_E/E** respectively.

Then, do the integral of bin content between 2 dash lines

e- efficiency: **Integral(1.0 +/- 2.0*σ_E/E) / total_events**

NEEMC E resolution and e- efficiency

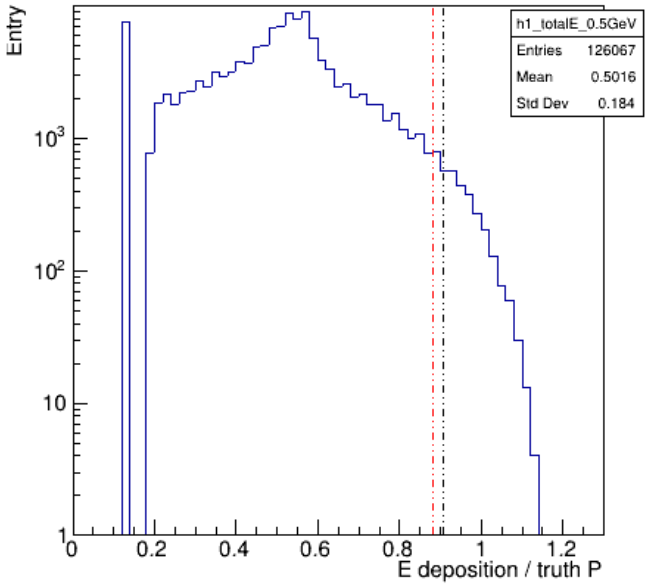




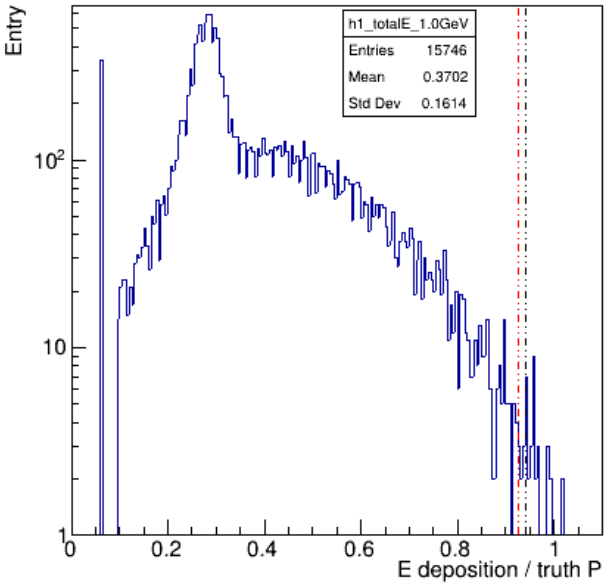
Red dash line: 1 - 2.0*σ_E/E

black dash line: 1 - 1.6*σ_E/E

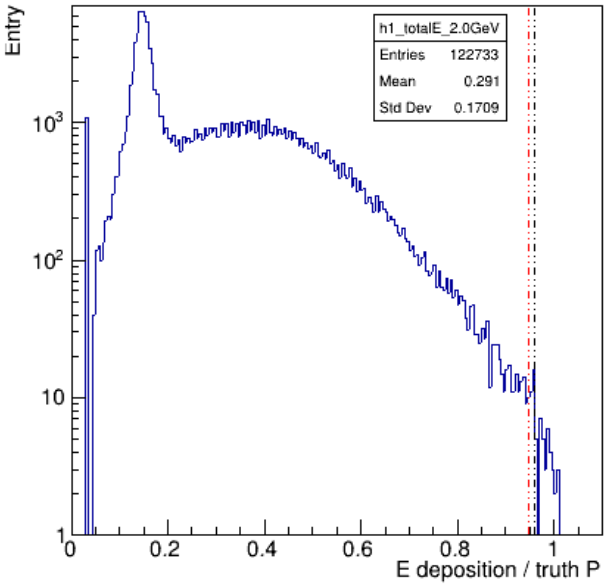
0.5 GeV Pion



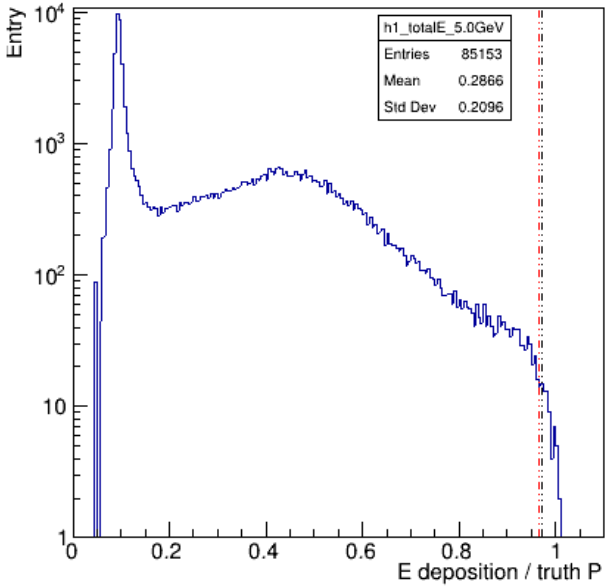
1.0 GeV Pion



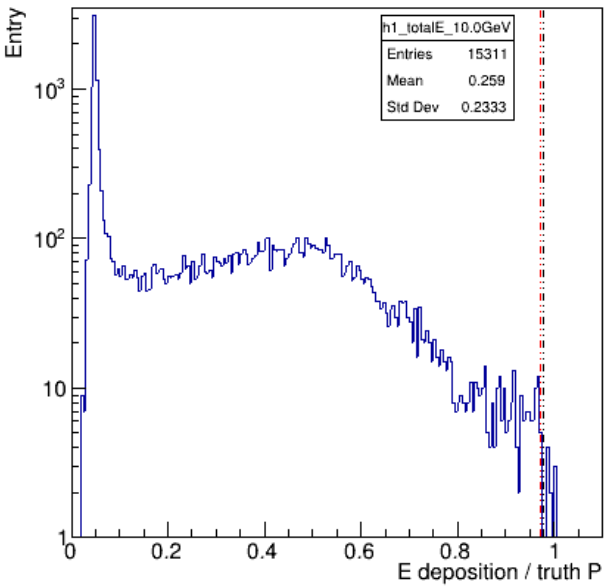
2.0 GeV Pion



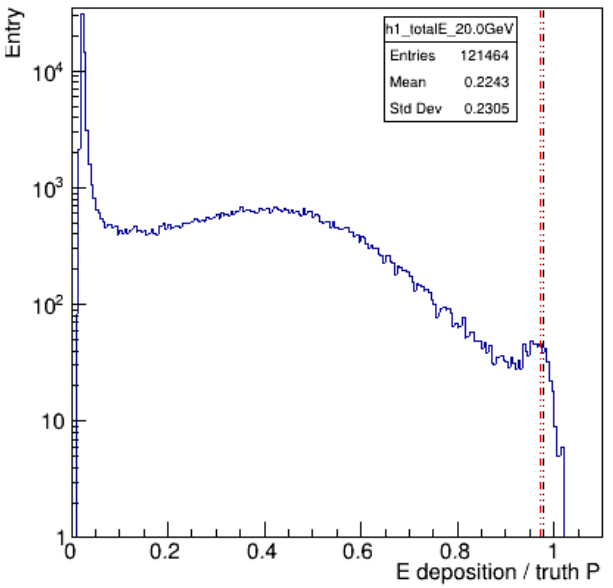
5.0 GeV Pion



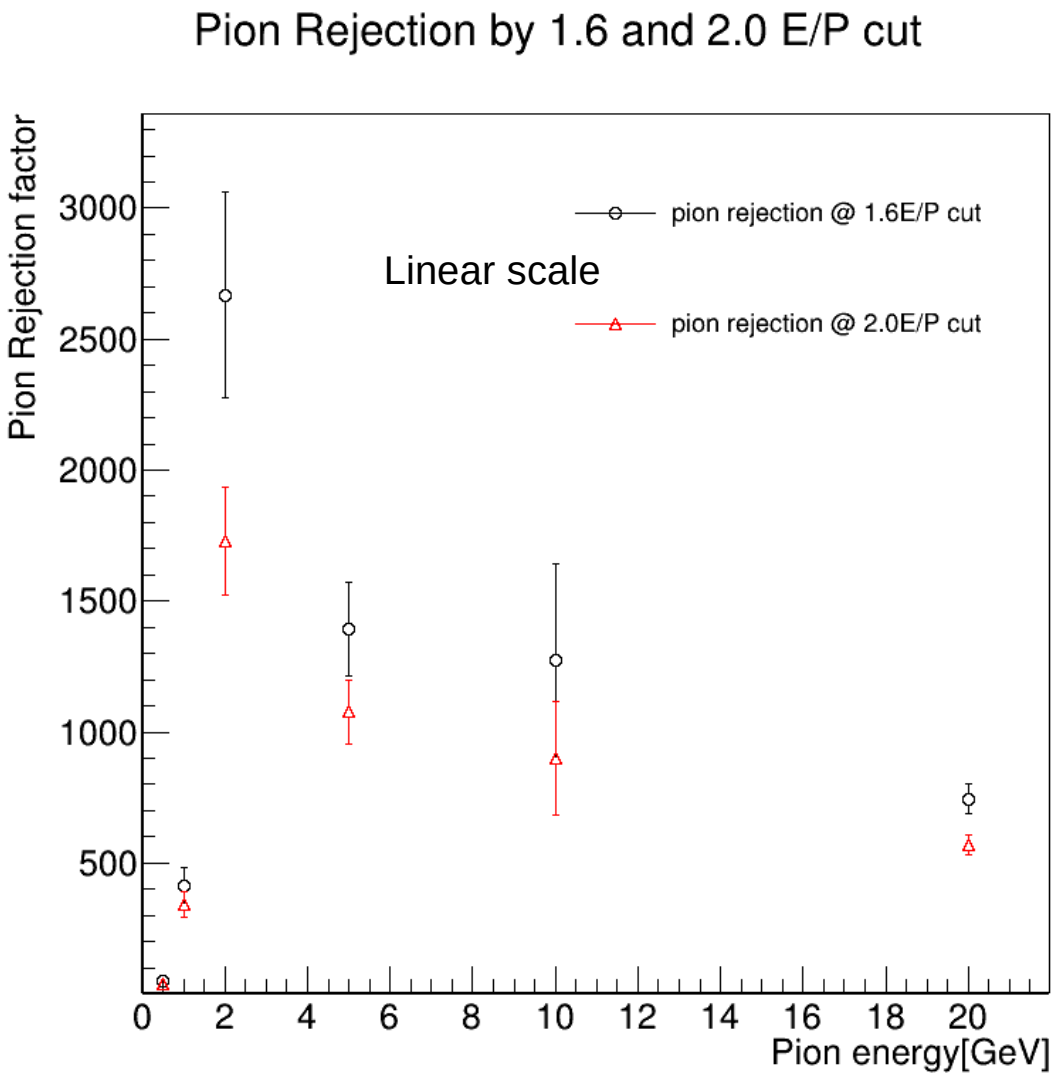
10.0 GeV Pion

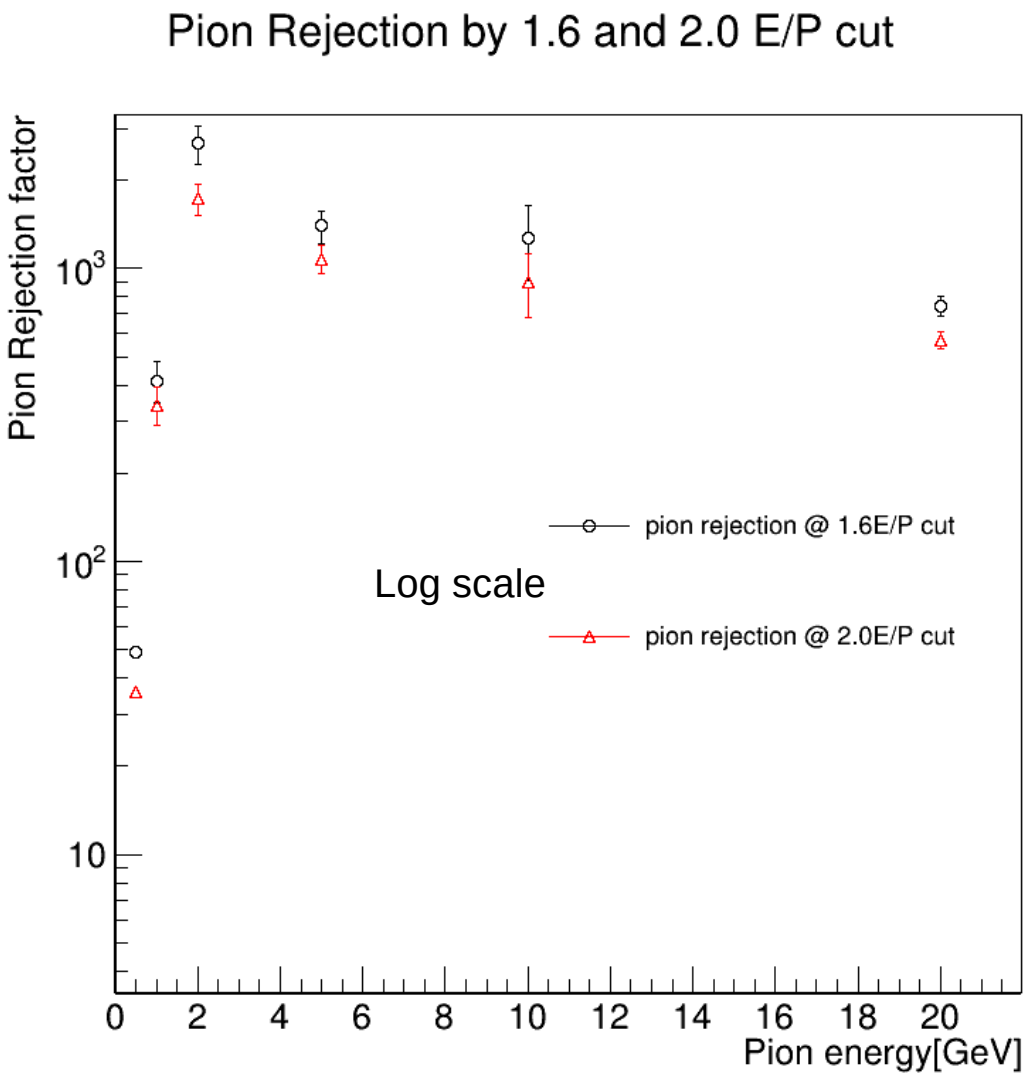


20.0 GeV Pion



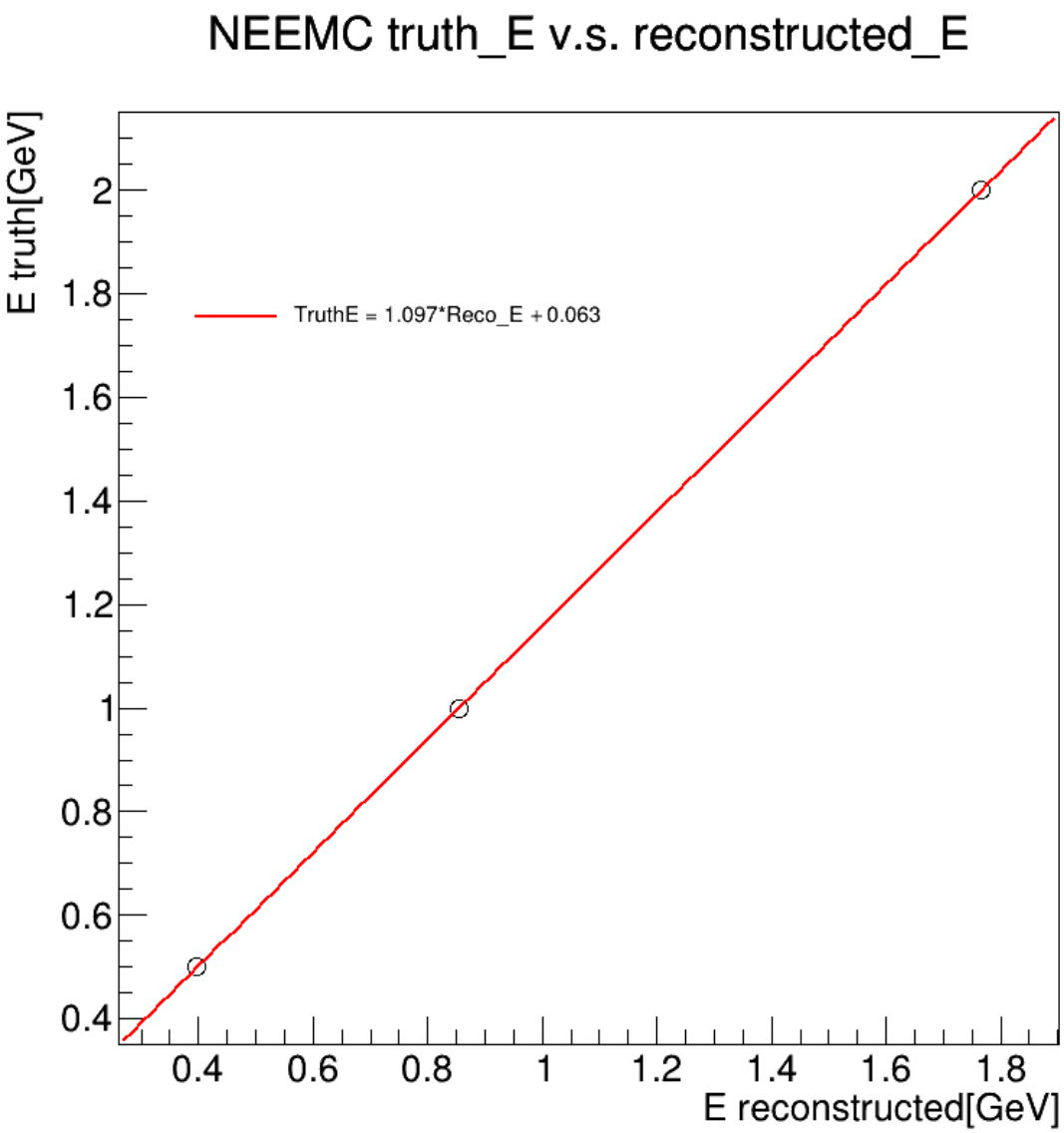
Pion Rejection



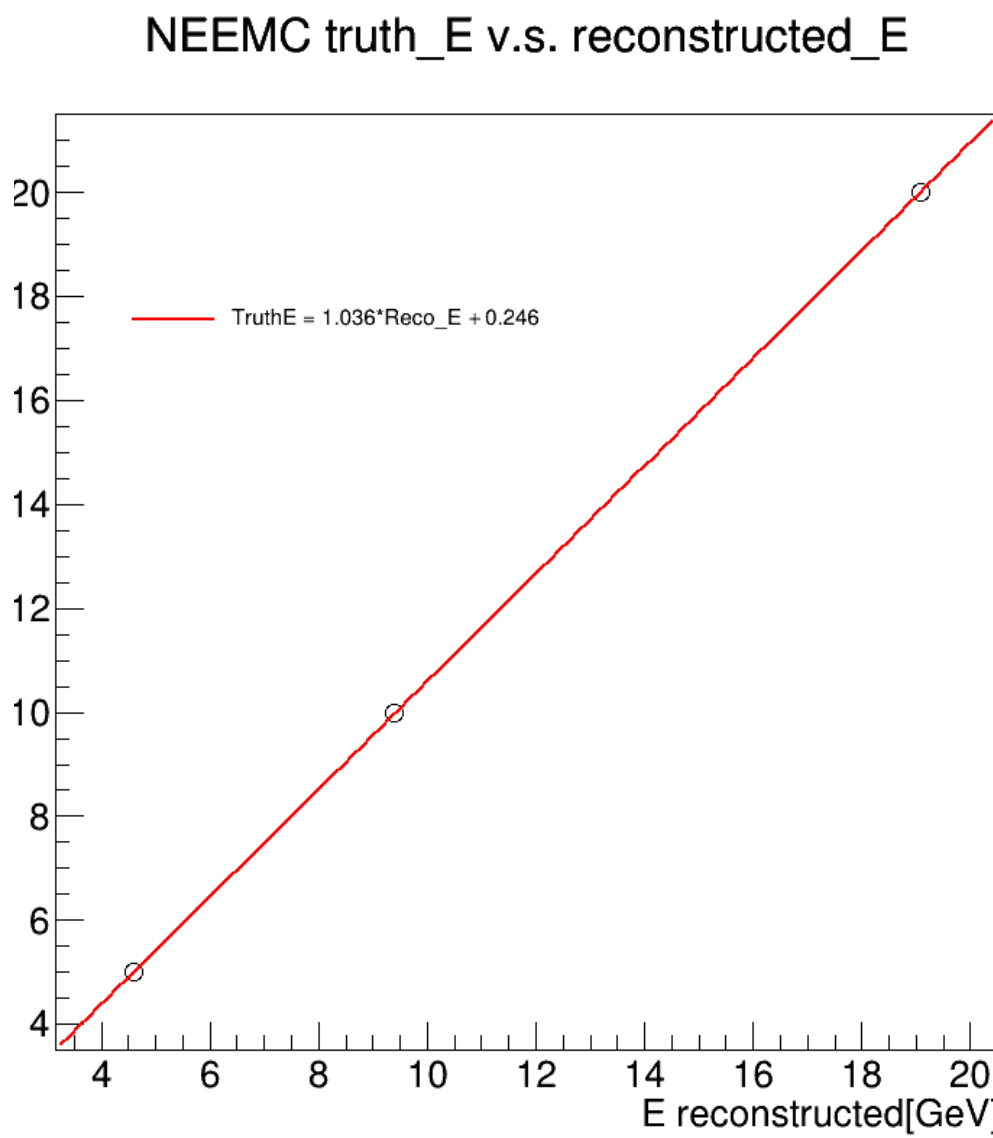


- First look at single particle simulations
- Energy resolution and pion rejection values as expected
- No issue identified so far

Backup



E correction at low energy



E correction at high energy

These 2 lines will perfectly intersect at 3 GeV