04/12/2020

Status of Calorimeter

Software Meeting

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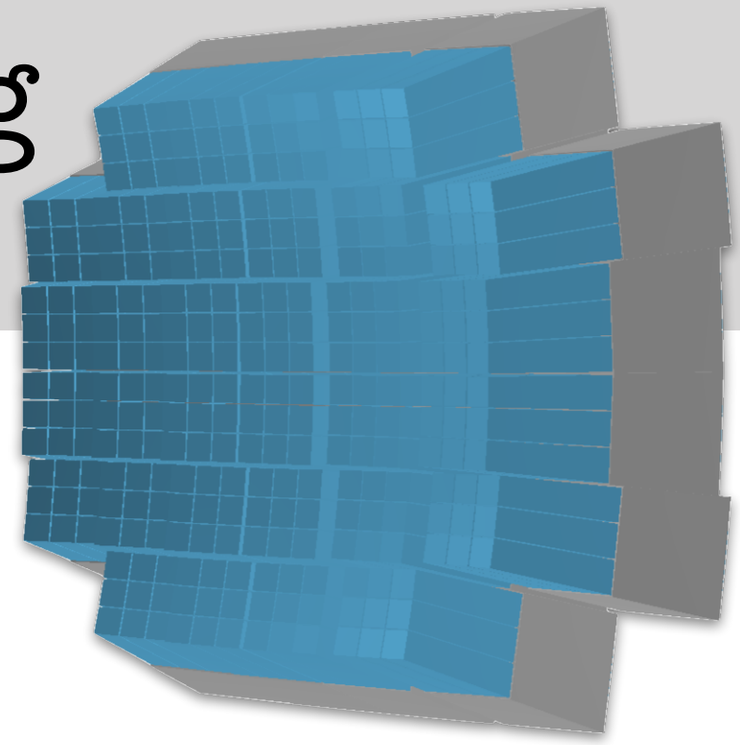
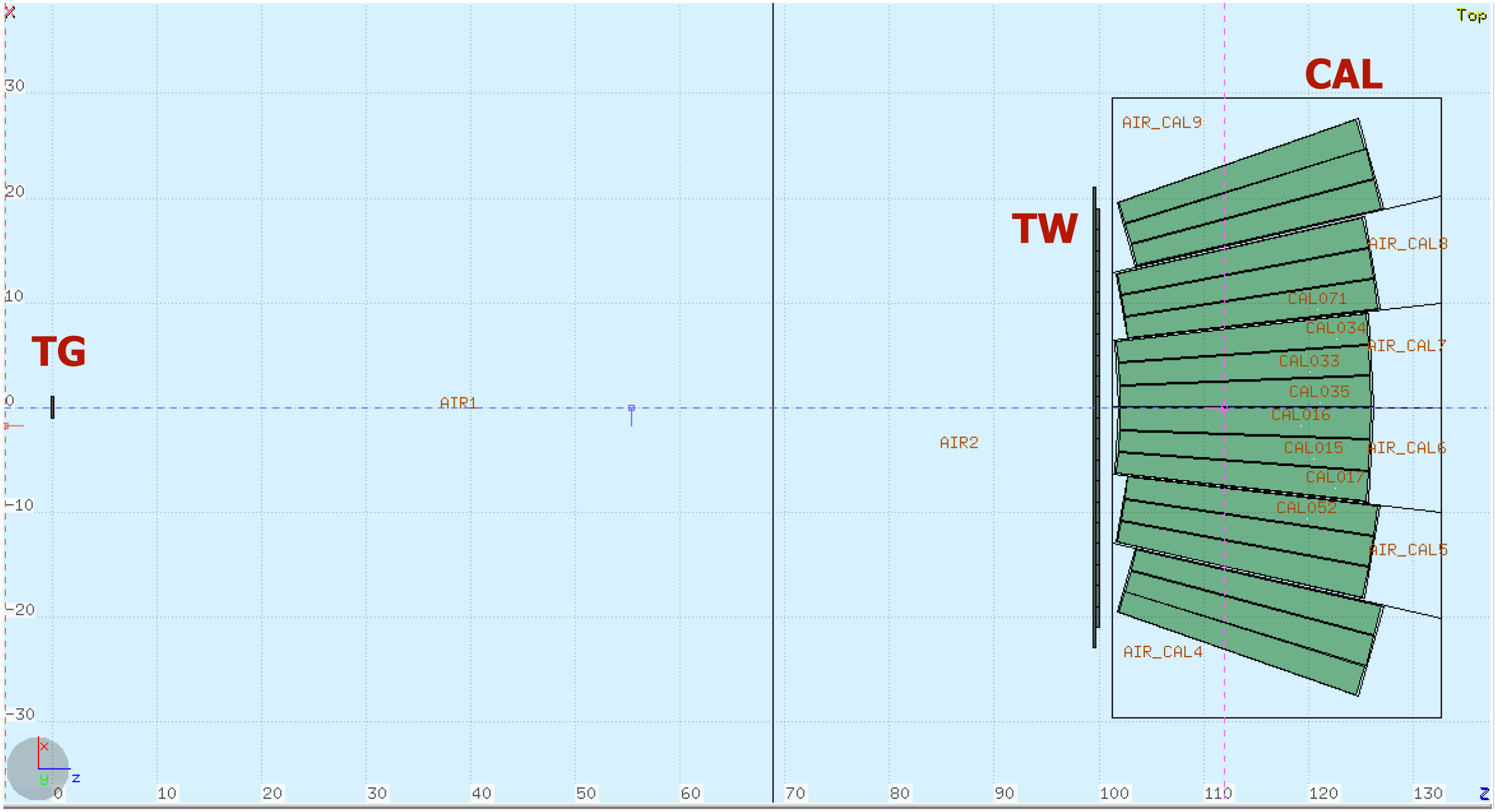


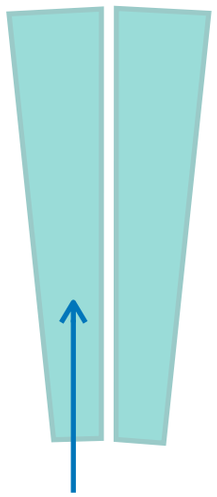
Analysis Goal

- Test of the validity and efficiency of the cluster algorithm
- FLUKA simulation:
  - Target (TG), Tof Wall (TW) and Calorimeter (CAL)
  - ^{12}C @200 MeV/A
  - 10k primaries

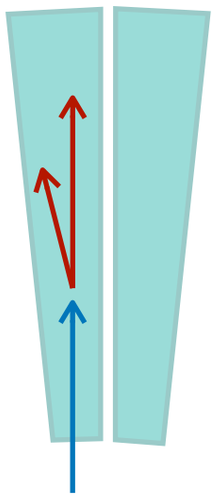


Cluster typologies

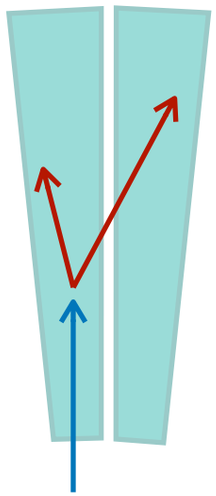
Good Cluster



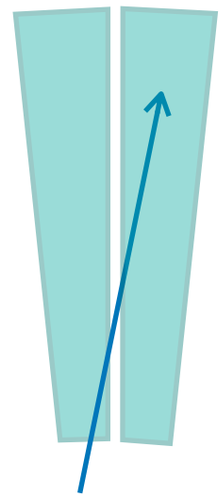
primary fragment hits one BGO



primary fragment w/ secondary fragments in 1 BGO

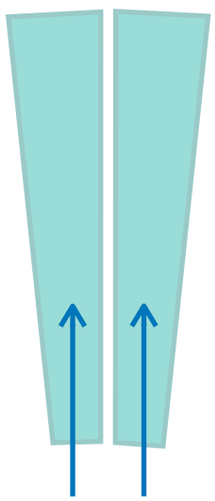


primary fragment w/ secondary fragments in 2 BGOs

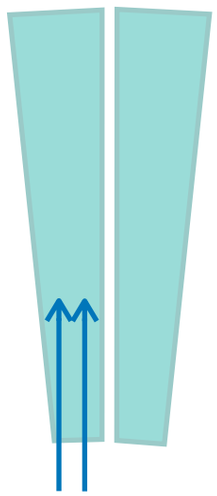


primary fragment hits 2 BGOs

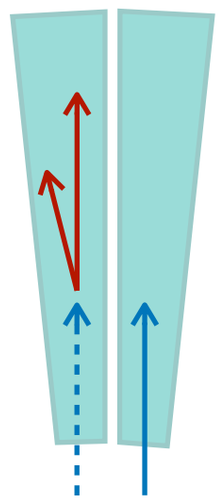
Bad Cluster



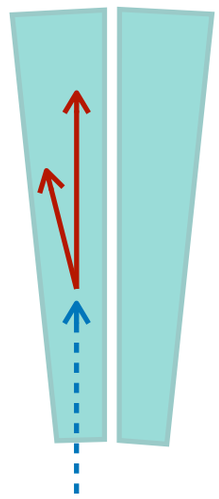
2 primary fragments hit 2 BGOs



2 primary fragments hit 1 BGO



secondary fragments from a primary neutron and a second one primary hit 2 BGOs



secondary fragments from a primary neutron fragment hit 1 BGOs.

Efficiency and purity

$$eff = \frac{\#frag\ reconstructed}{\#frag\ arrived}$$

Fragments created in the target, directed towards to the calorimeter and reconstructed (seen) by the SHOE classes

Fragments created in the target and directed towards to the calorimeter (MC truth)

$$pur = \frac{\#good\ cluster}{\#cluster}$$

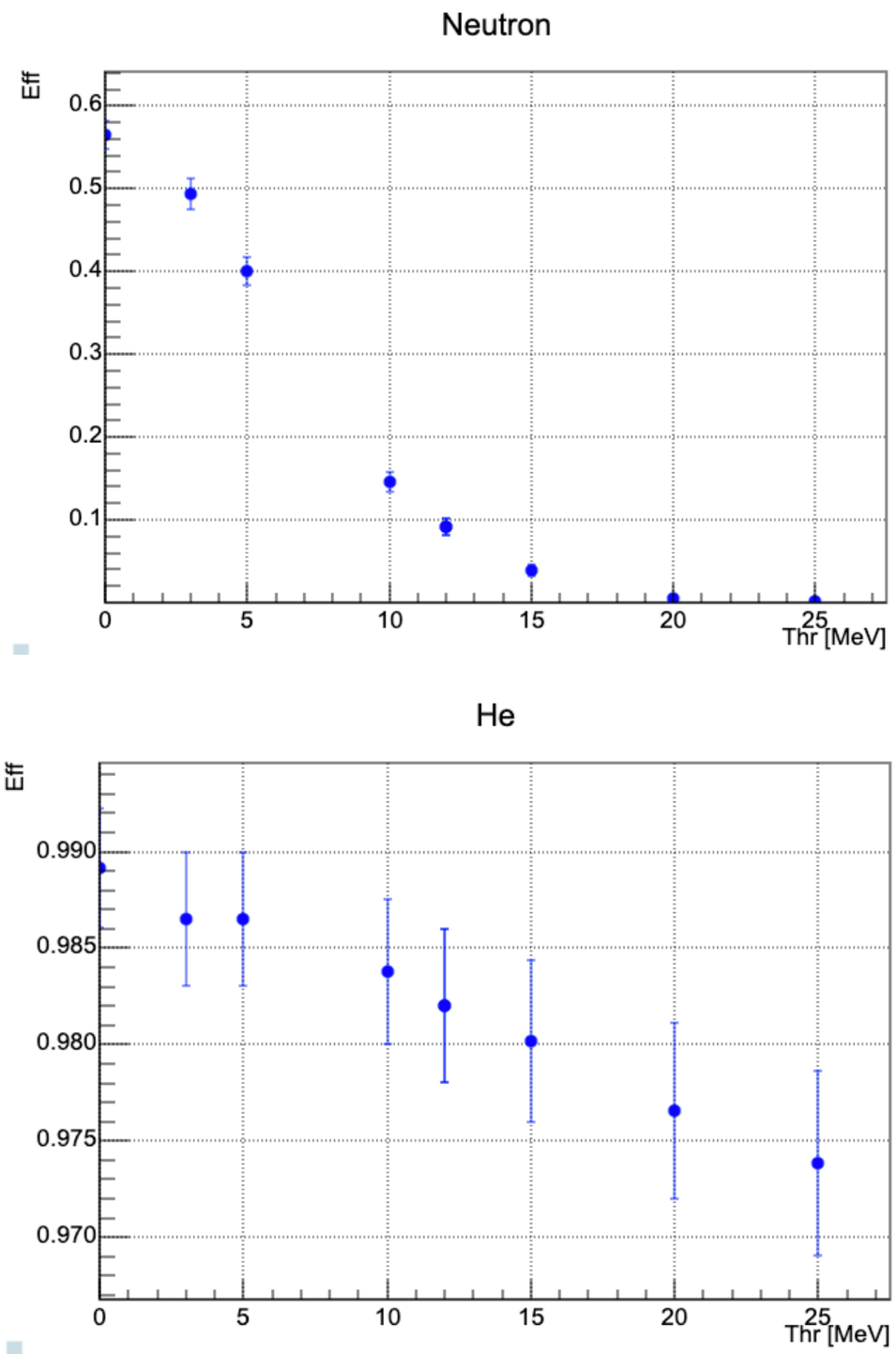
Total number of good clusters

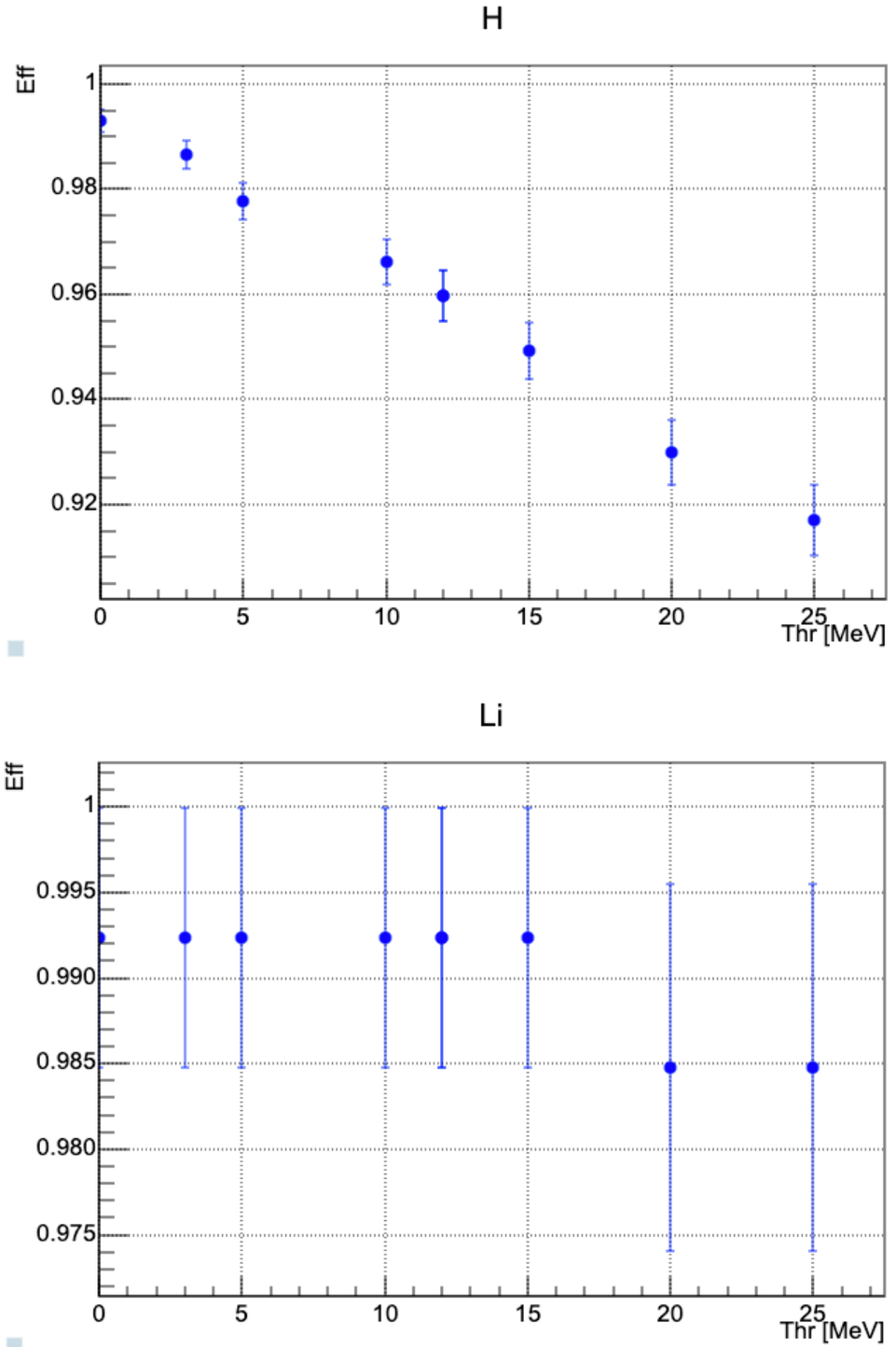
Total number of clusters

The analysis has been performed for different ions (0<Z<6) as function of different value of energy thresholds (0, 3, 5, 10, 12, 15, 20 and 25 MeV).
In particular for Z=1 and Z=2 (where the statistic was higher) also for different kinetic energy intervals of the primary fragments.

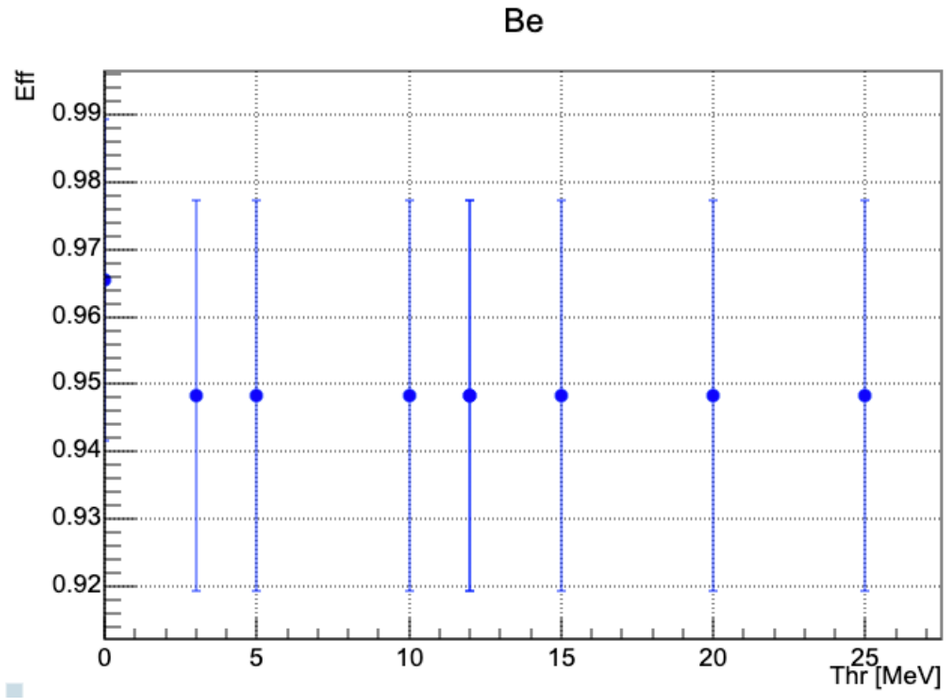
Efficiency (1)

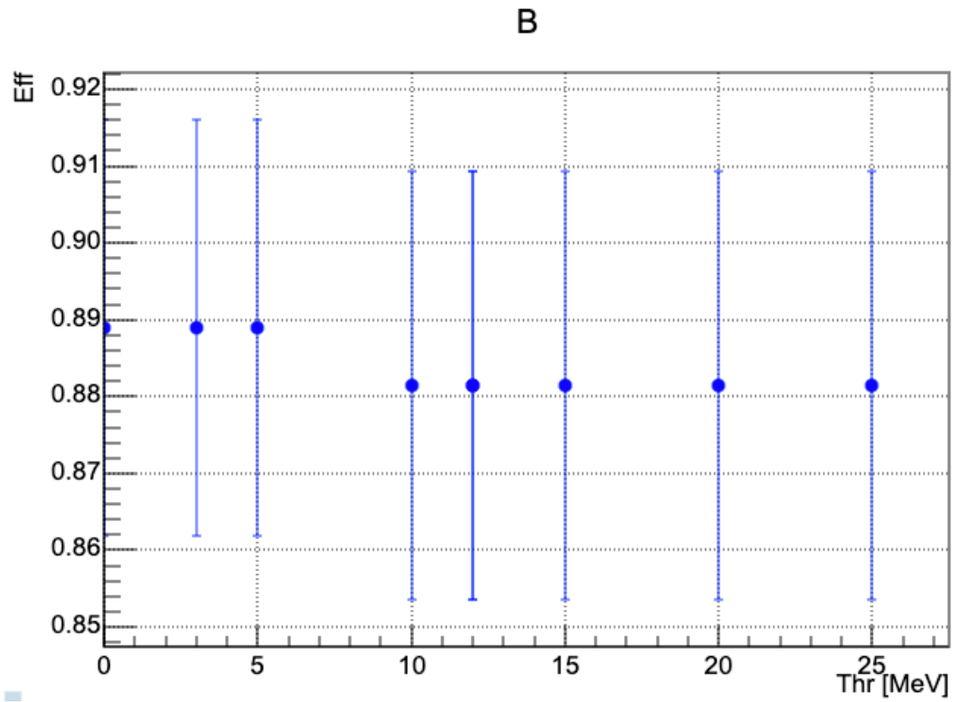
The study shown has been performed taking into account the full kinetic energy interval (0-2.5 GeV) of the primary fragments

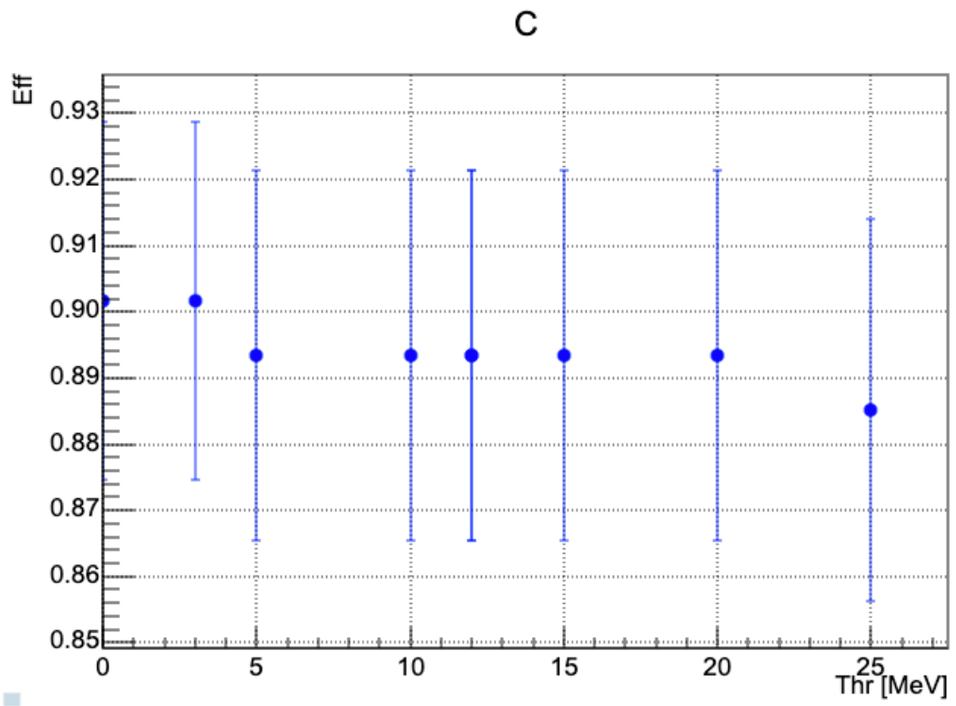




Efficiency (2)







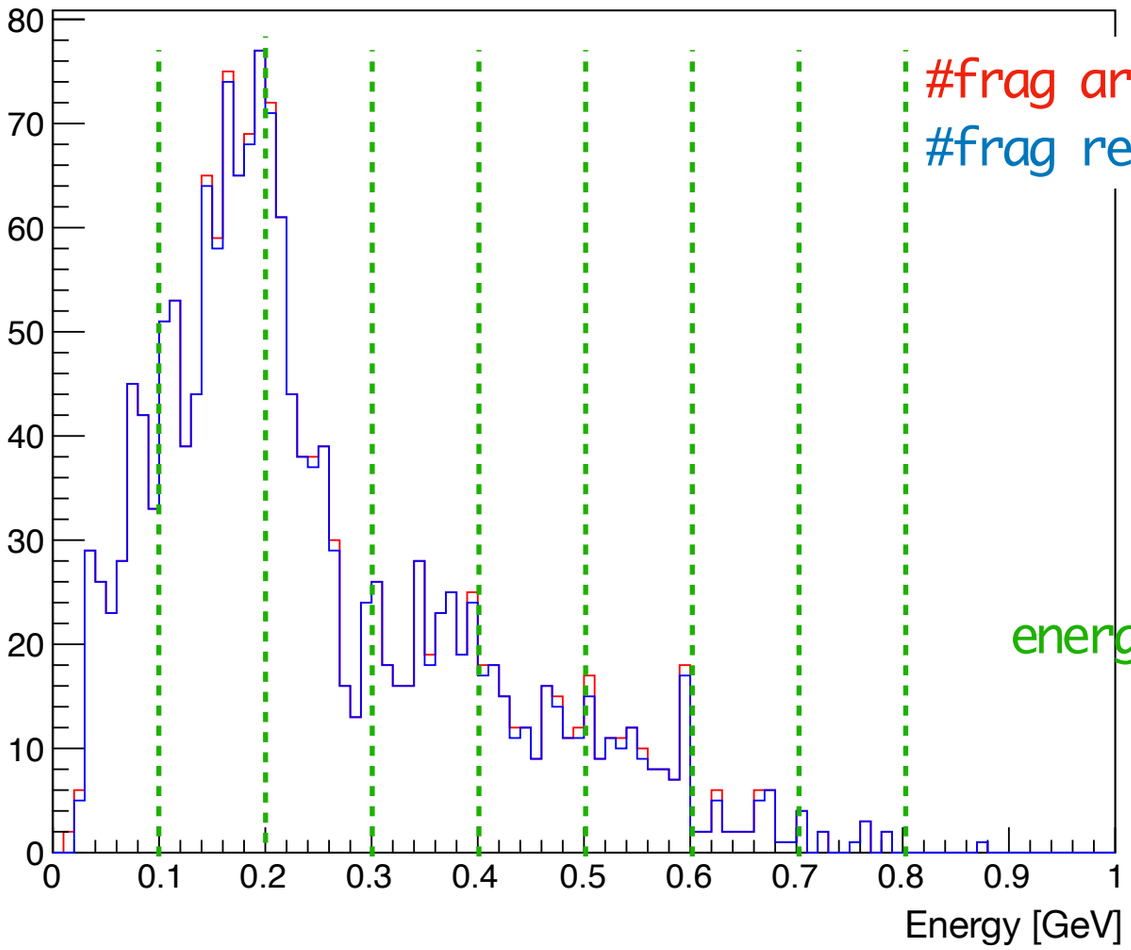
The error bars have been calculated considering binomial distribution:

$$\sigma_{eff} = \sqrt{\frac{(eff) * (1 - eff)}{\#frag\ arrived}}$$

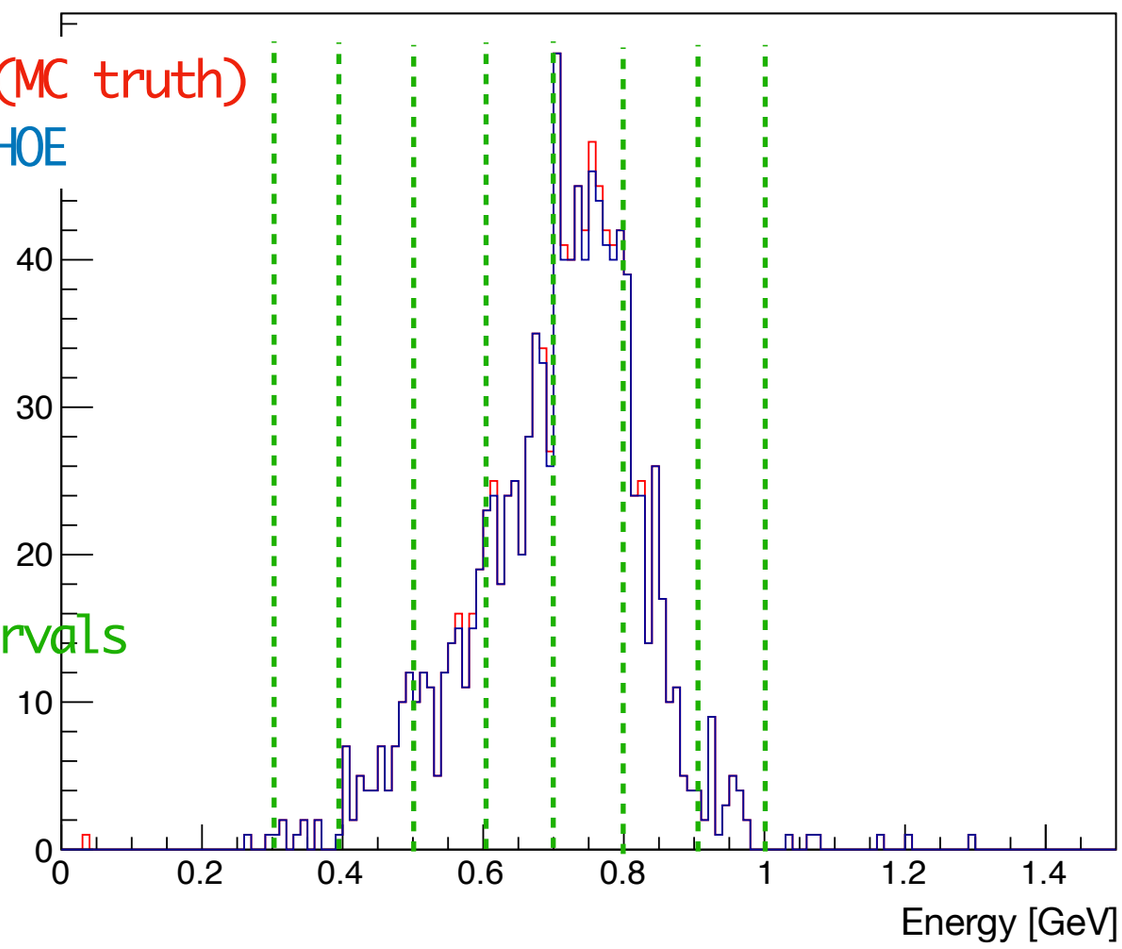
Efficiency (3)

The efficiency has been performed for different kinetic energy intervals for H and He fragments:

H fragments distribution for thr 3 MeV



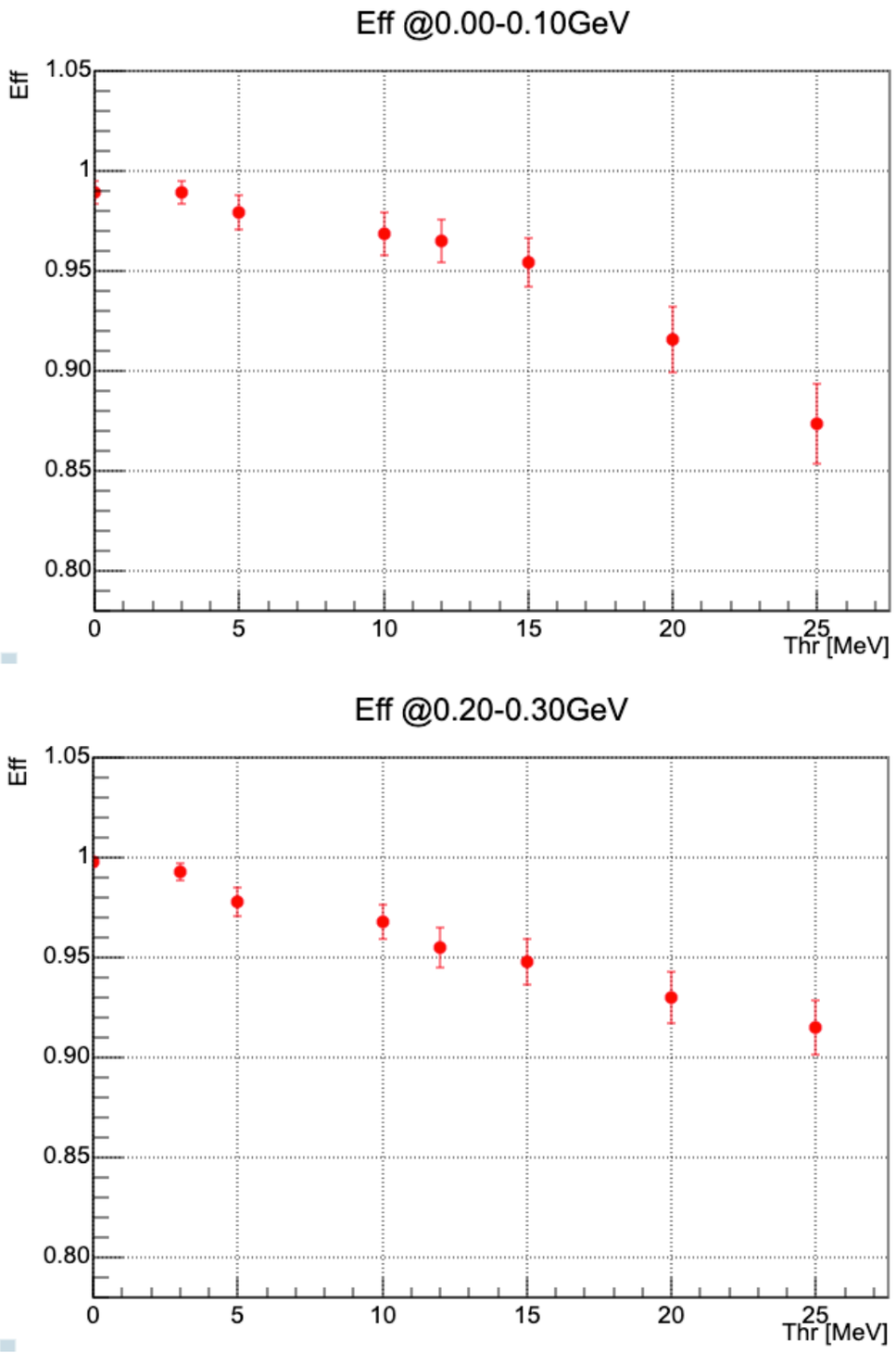
He fragments distribution for thr 3 MeV

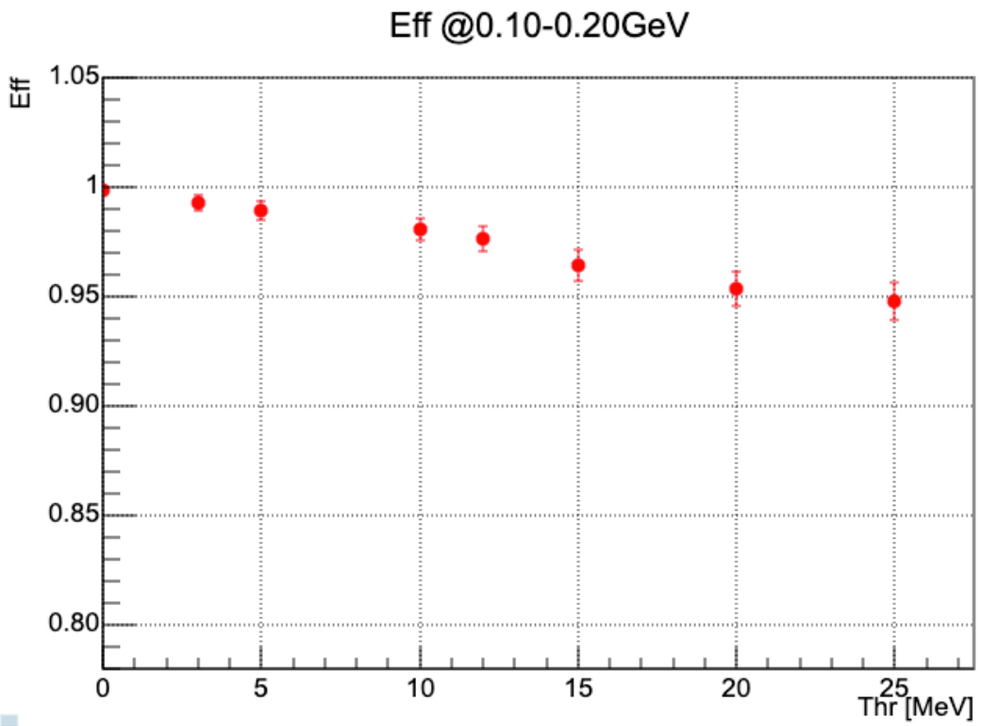


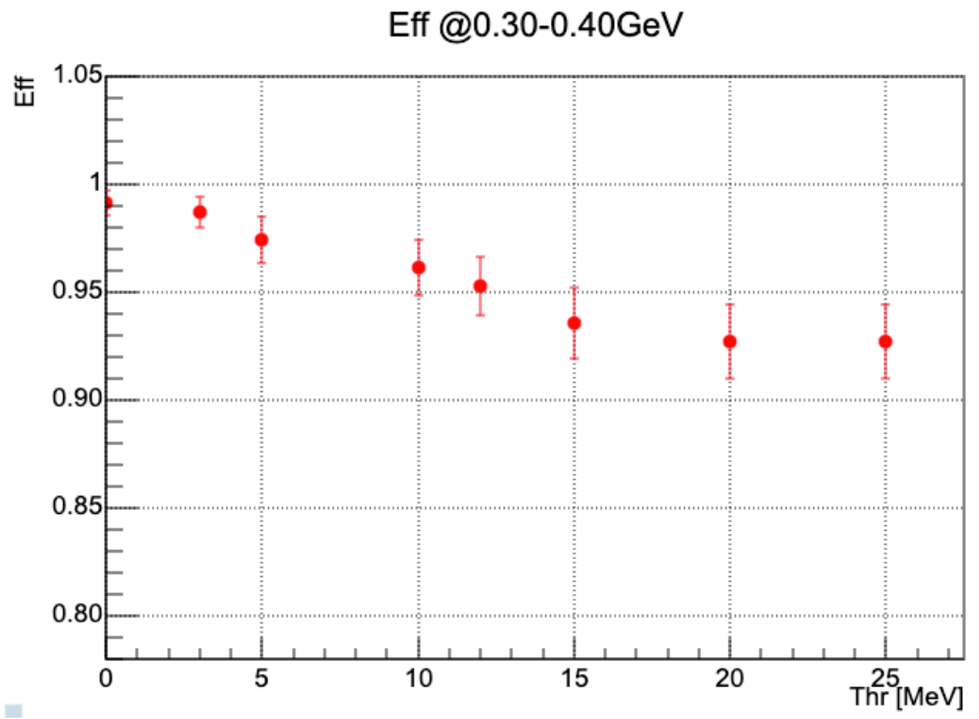
For heavier ions the statistic was insufficient for this analysis

Efficiency (4)

H ions

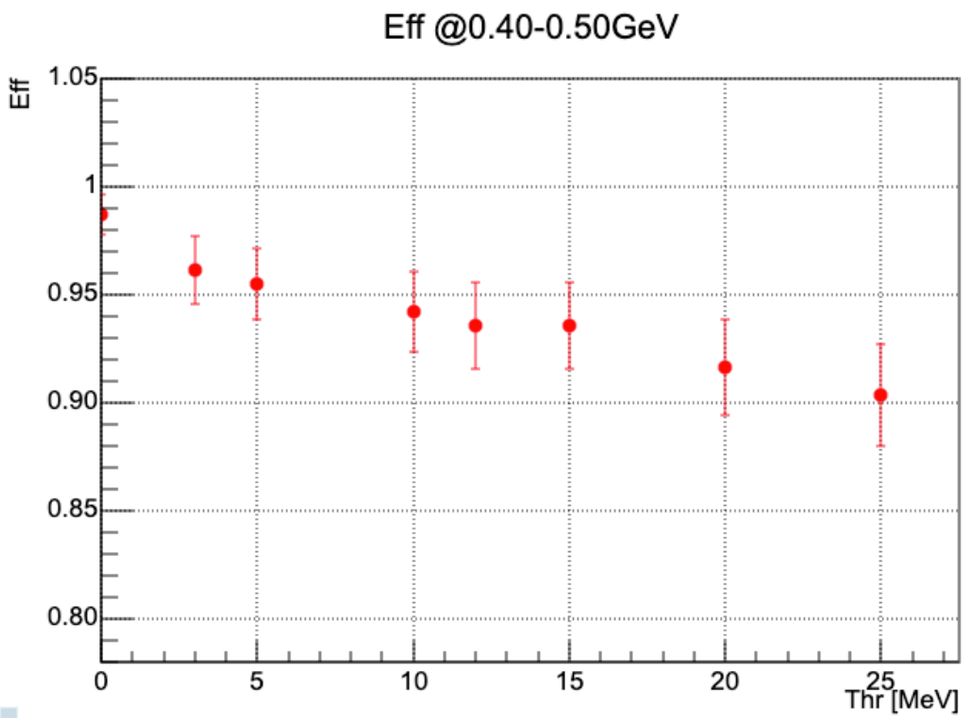


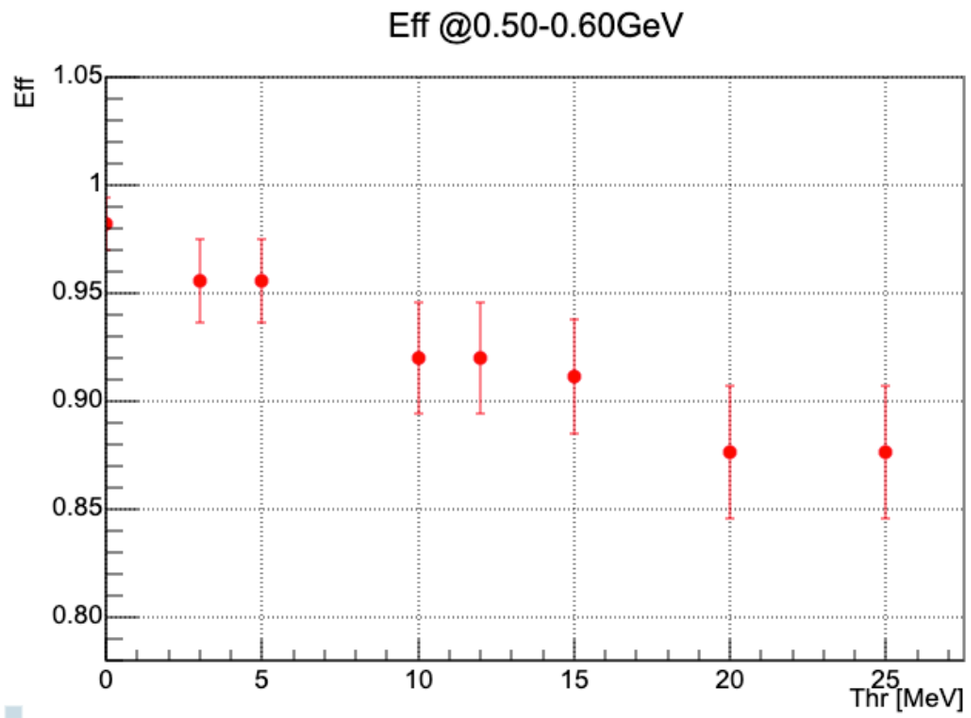


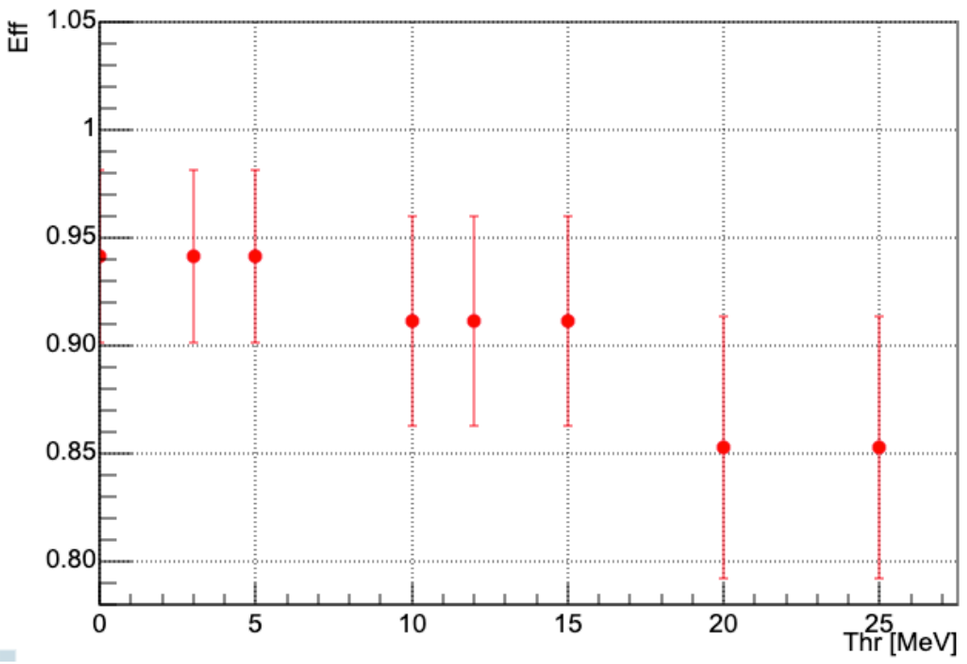


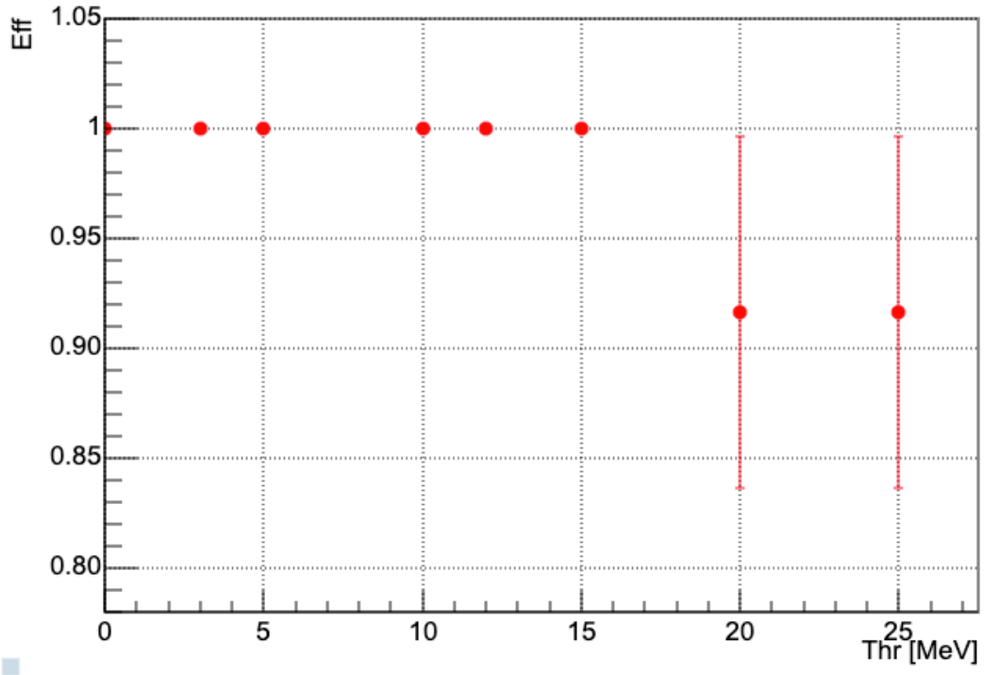
Efficiency (5)

H ions



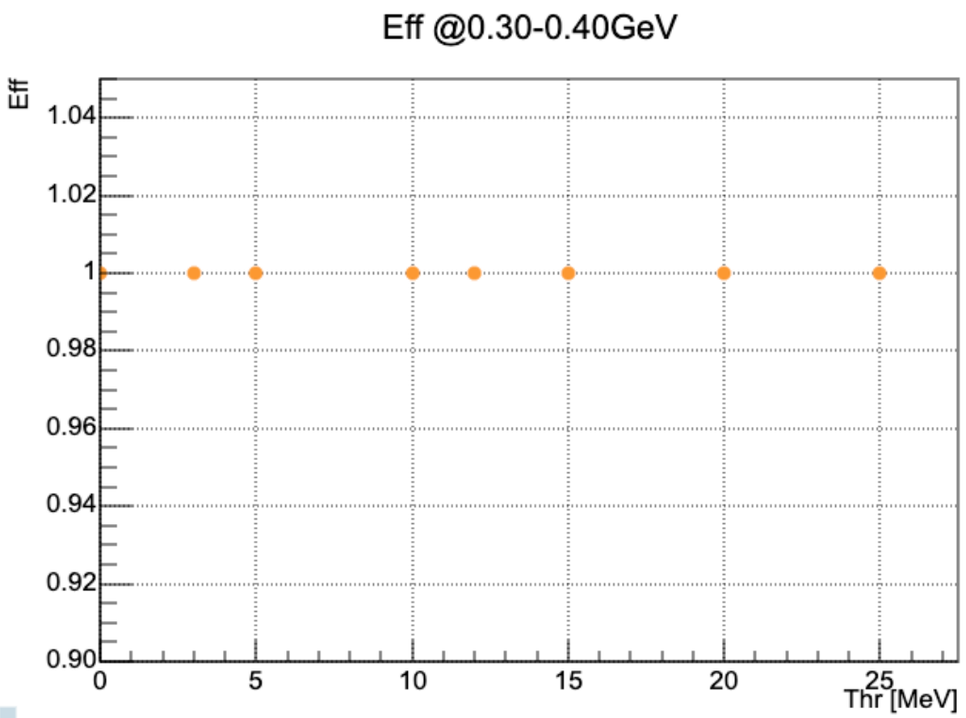


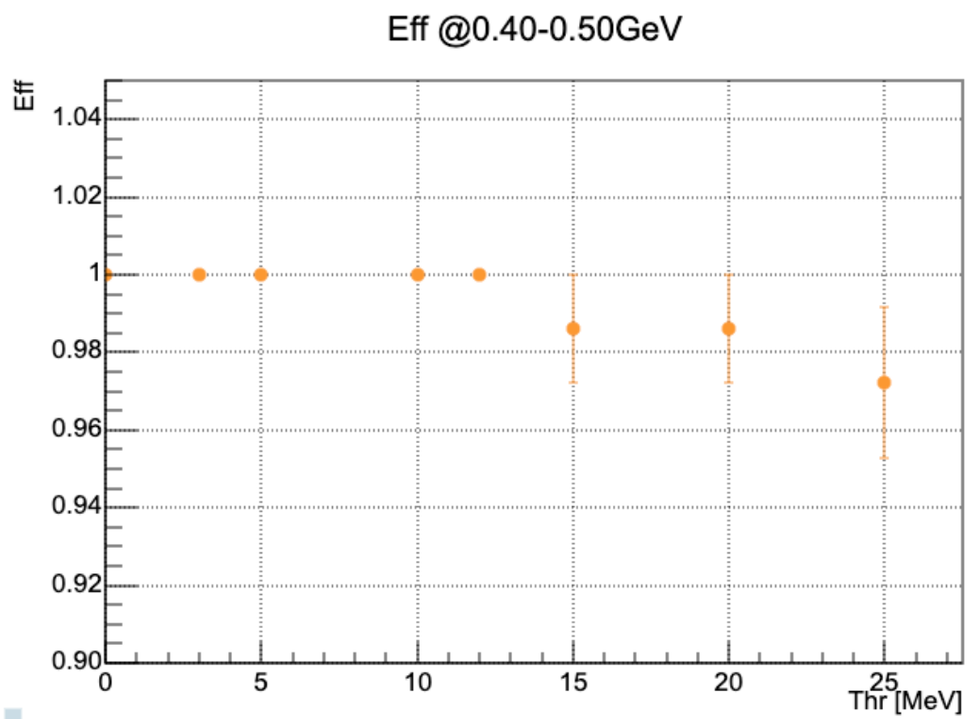


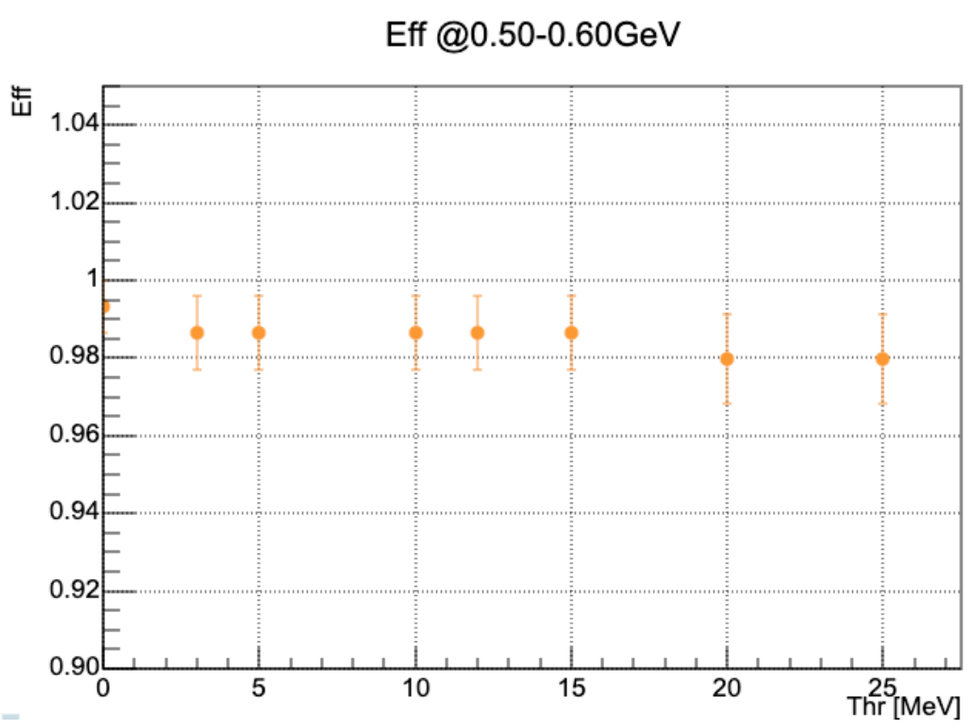


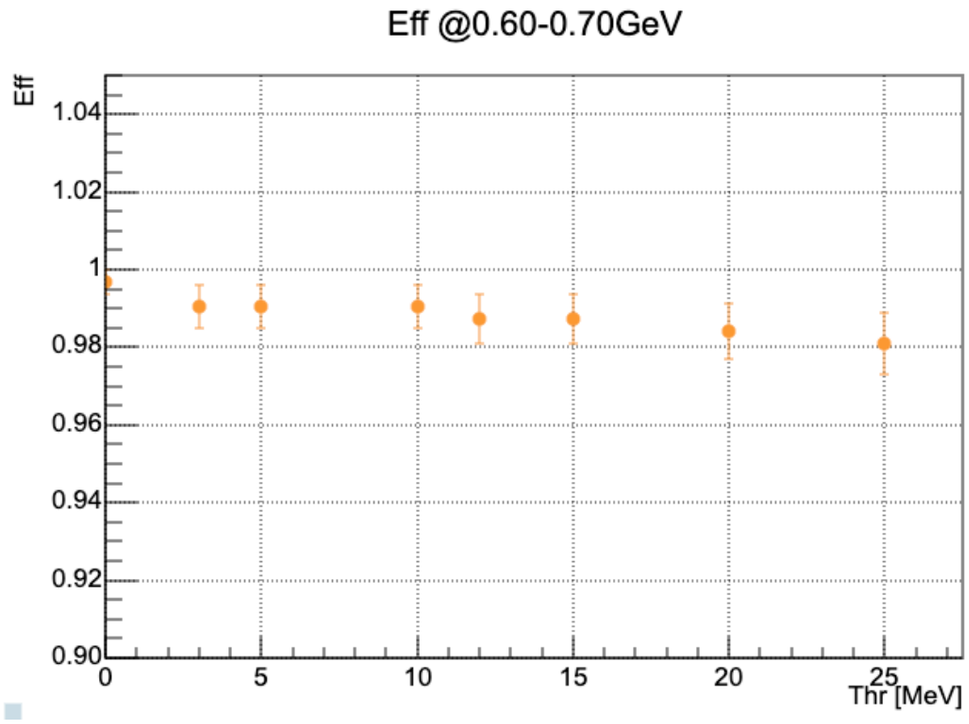
Efficiency (6)

He ions



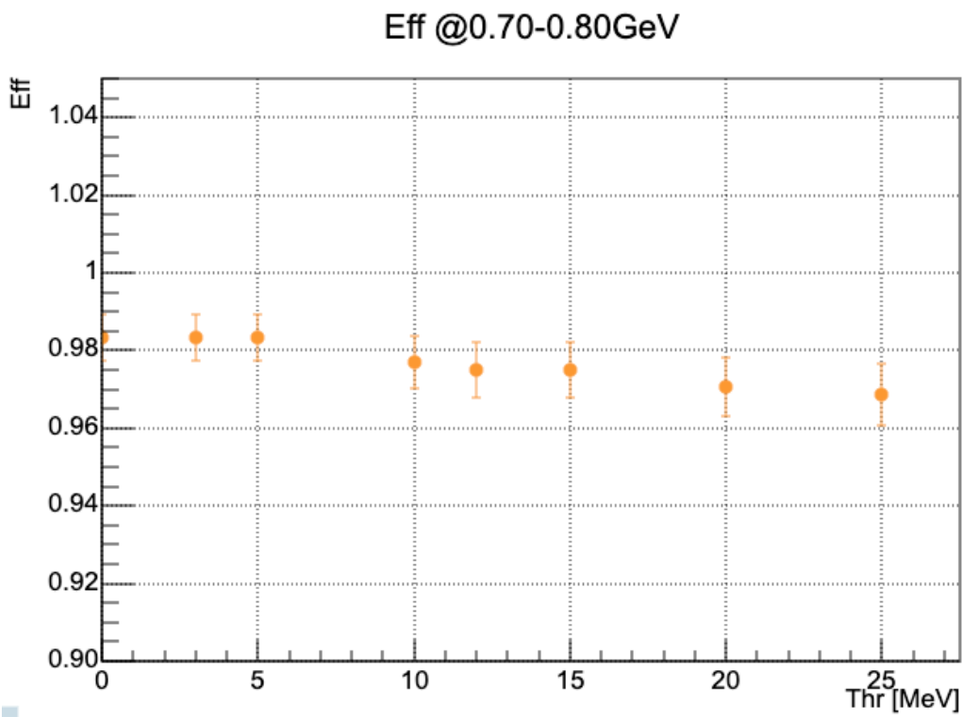


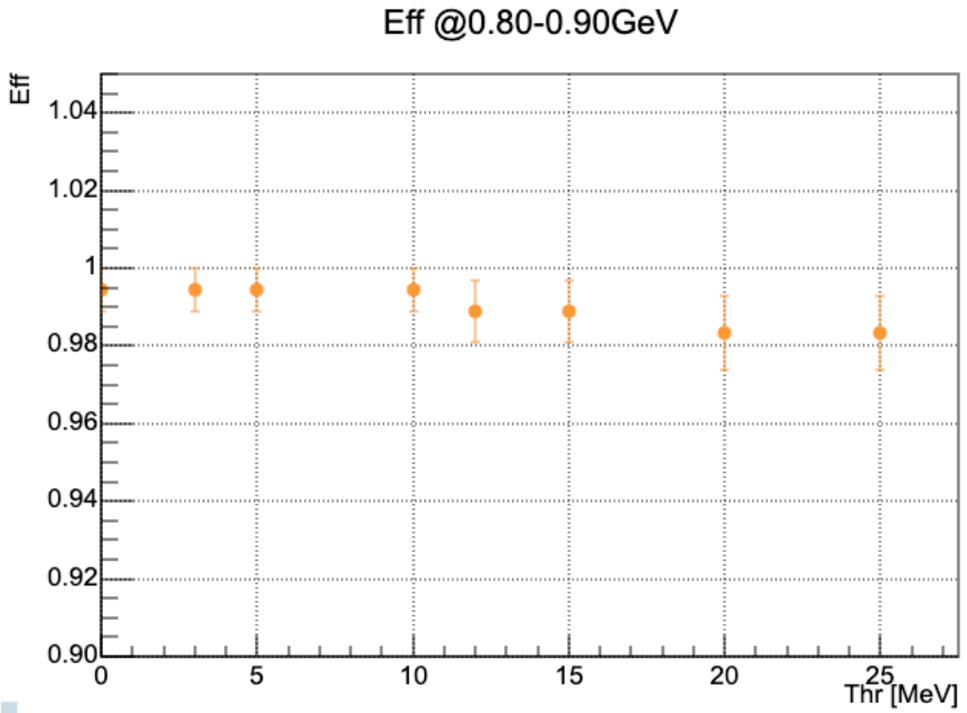


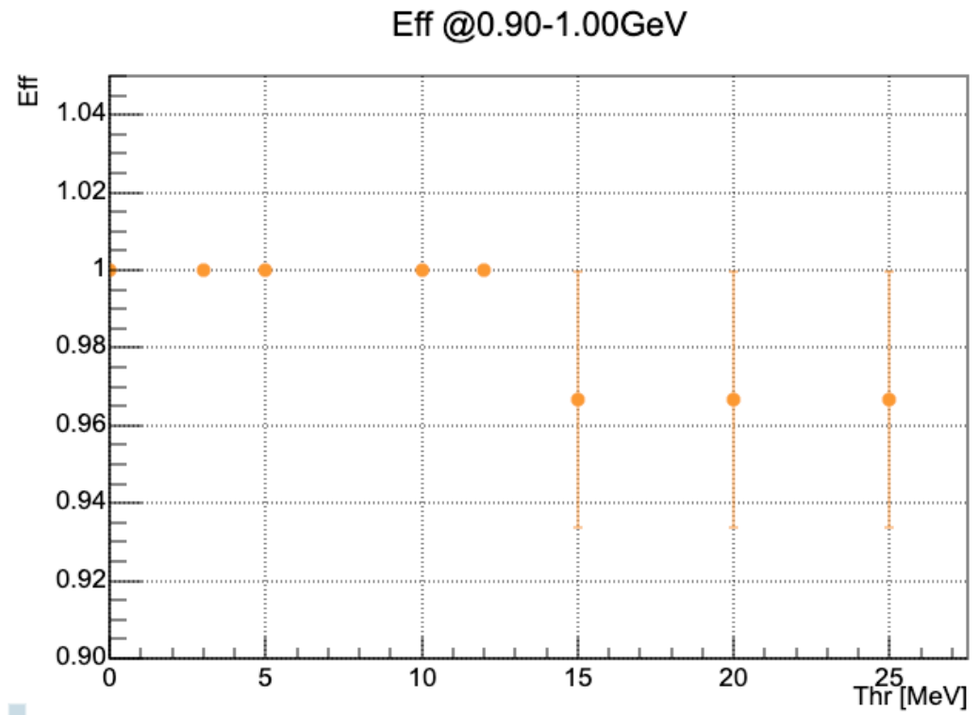


Efficiency (7)

He ions







Conclusion and Comments

Conclusion:

The efficiency has been calculated for different:

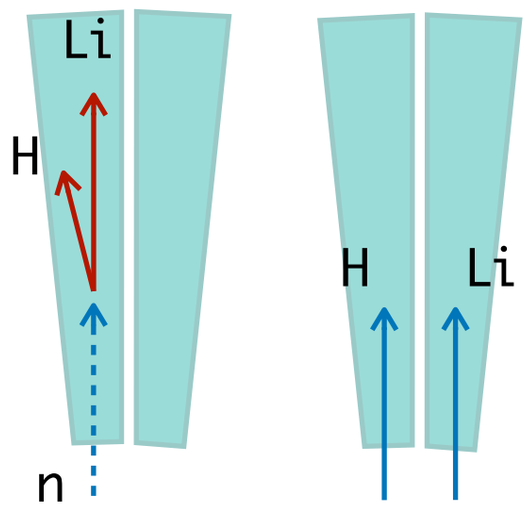
- ions: 0<Z<6
- values of energy thresholds: 0, 3, 5, 10, 12, 15, 20 and 25 MeV
- kinetic energy intervals (only for H and He)

For a better understanding of the best energy thresholds we have still to study the purity for different ions.

Question:

Some bad clusters are misleadings:

$$pur = \frac{\#good\ cluster}{\#cluster}$$



What is the best way to calculate the purity for different ions? Should we take into account this cluster for the denominator for both ions (H and Li)?