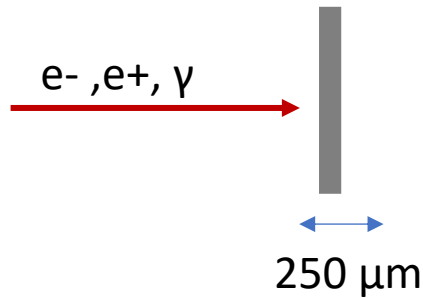


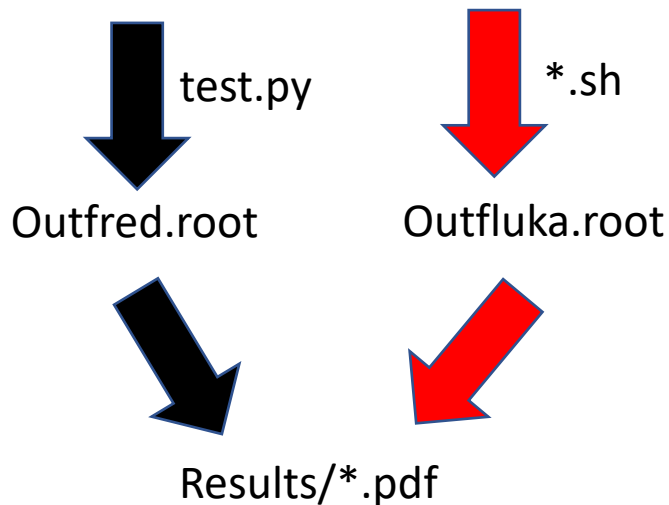
FRED benchmark

Giacomo Traini, Gaia Franciosini, Patrizia De Maria

Physics process benchmark



- Target: H,C,O,Ca,Au
- Energies: 0.1MeV, 0.5MeV, 1.0MeV, 5.0MeV, 10.0MeV, 50.0MeV, 100.0MeV, 200.0MeV



What we look at:

- Interaction counters vs energy
 - γ : photoelectric, Compton, pair production, coherent scattering
 - e^- : Moeller, Bremsstrahlung
 - e^+ : Bhabha, Bremsstrahlung, Annihilation
- For each interaction we plot the **energy** and **angular** distribution of interest

815 plots...

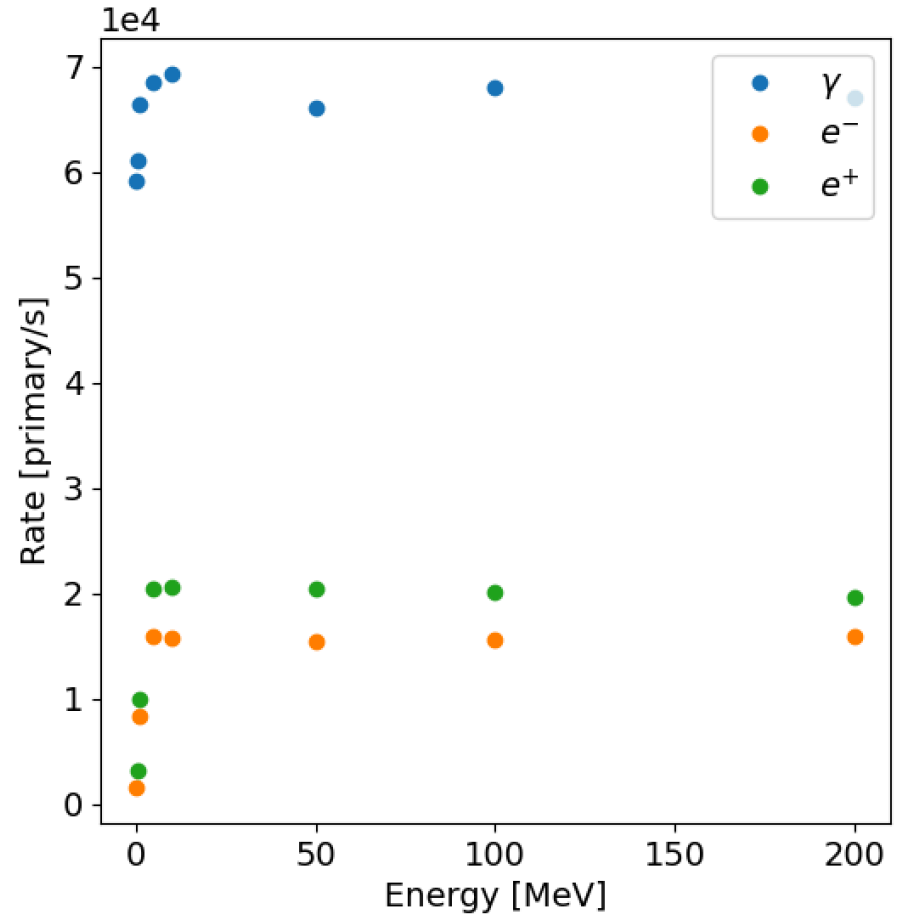
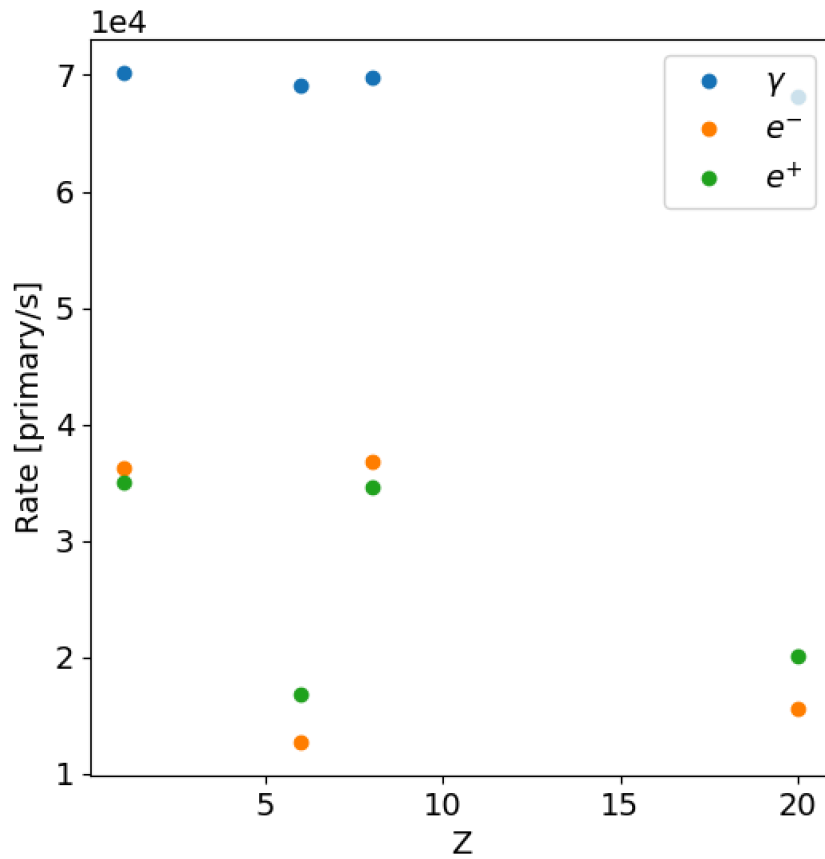
Faults

- Fred randomly crash @ 0.1 MeV for all the material

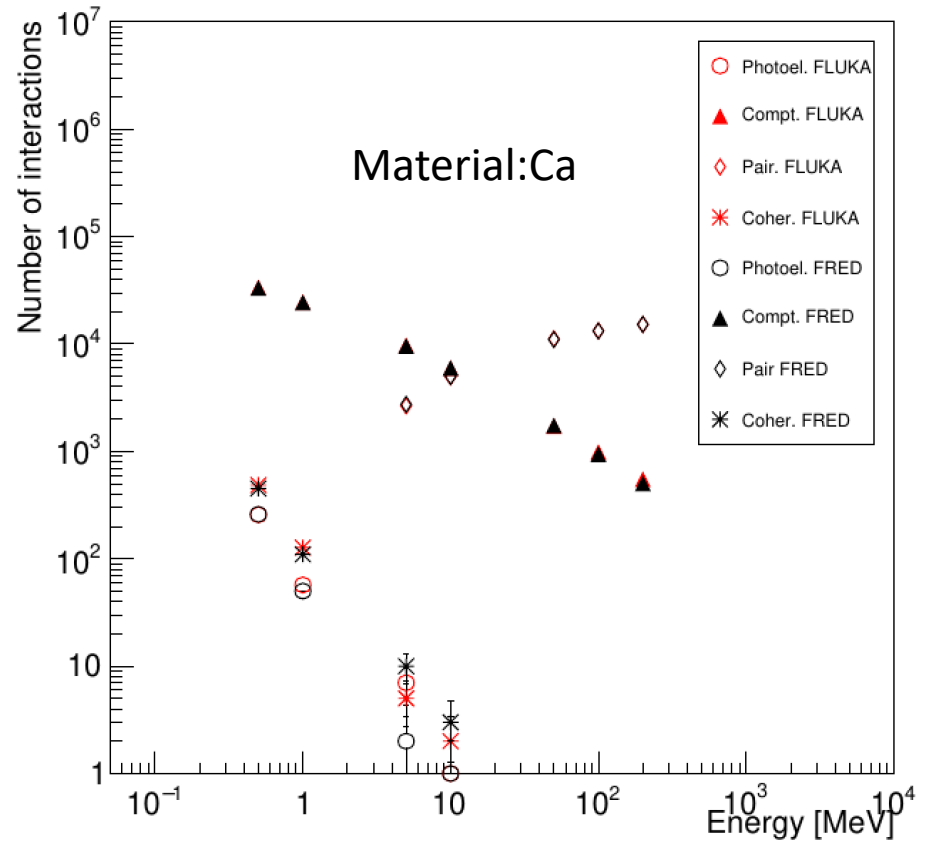
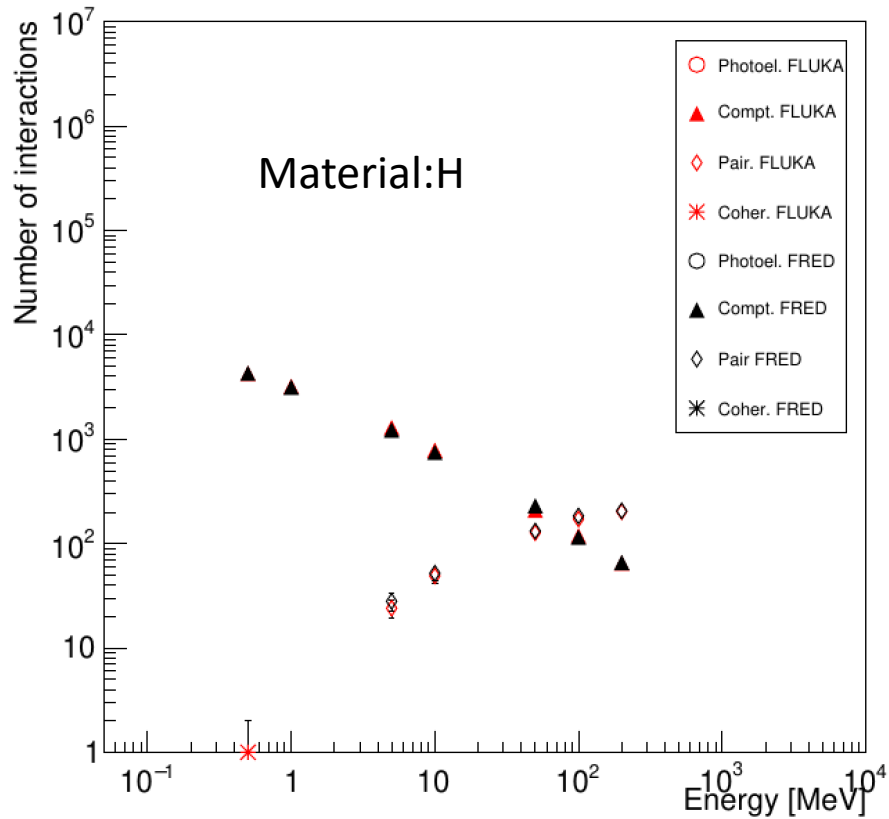
```
Start tracking now:
##### 10% tracked
##### 20% tracked
##### 30% tracked
##### 40% tracked
##### 50% tracked
#Error: some parts still need fixing: locatePoint called with igeom<0
[igtraini@lisa out]$
[igtraini@lisa out]$
```

- Fred randomly crash on Au @ all energies
NaN in DopplerEffect()

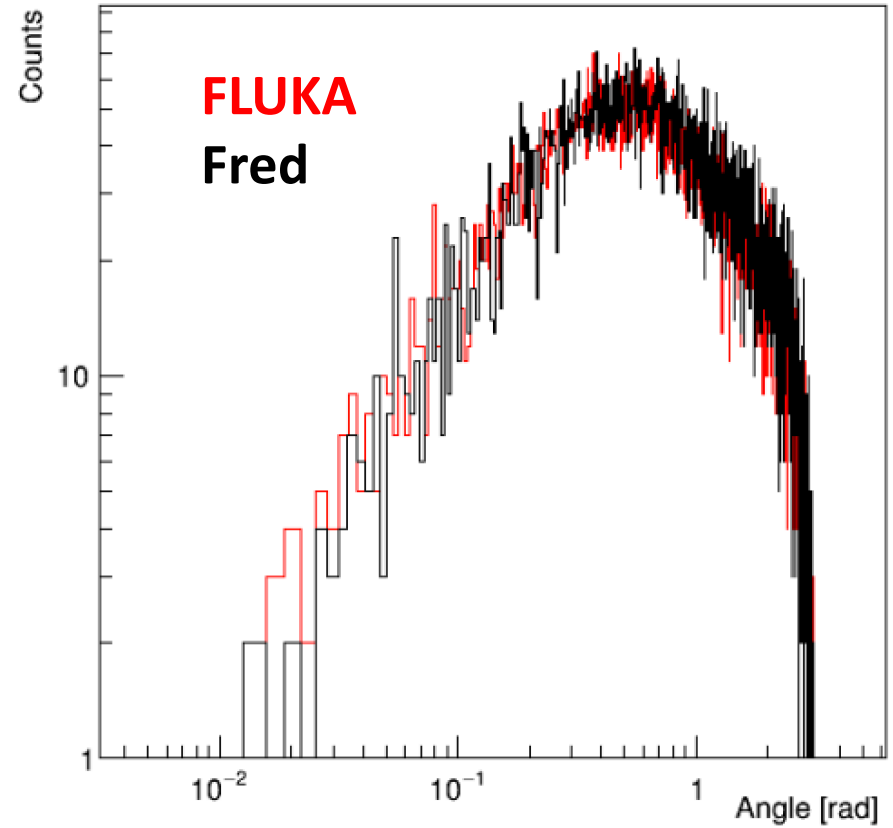
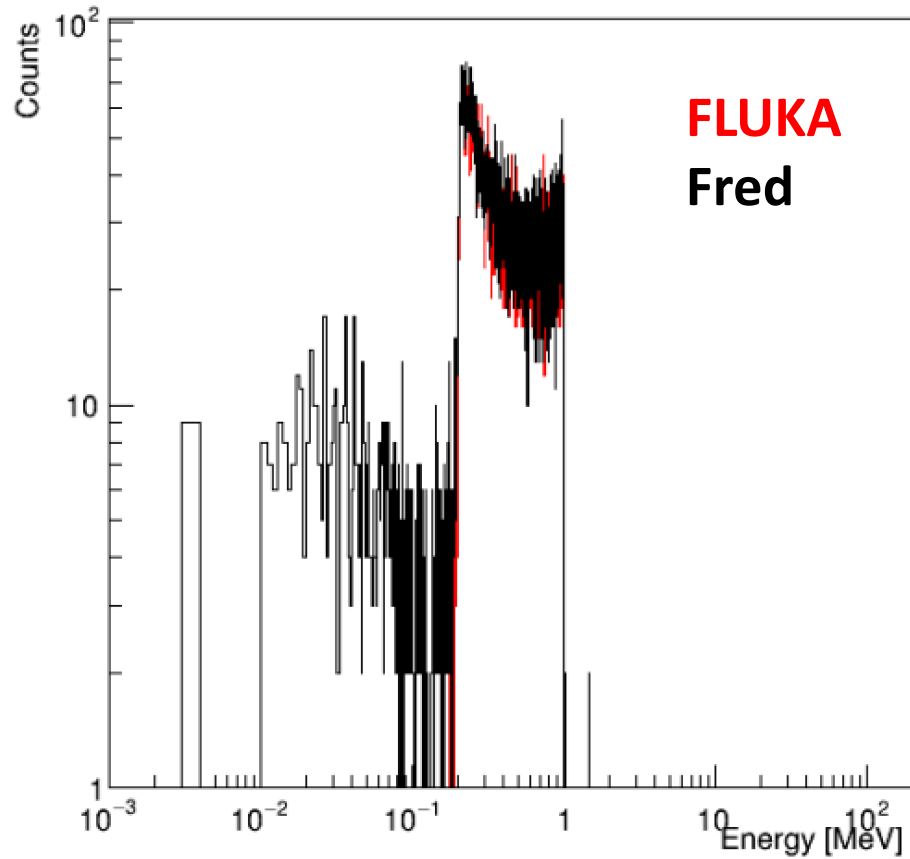
Processing time



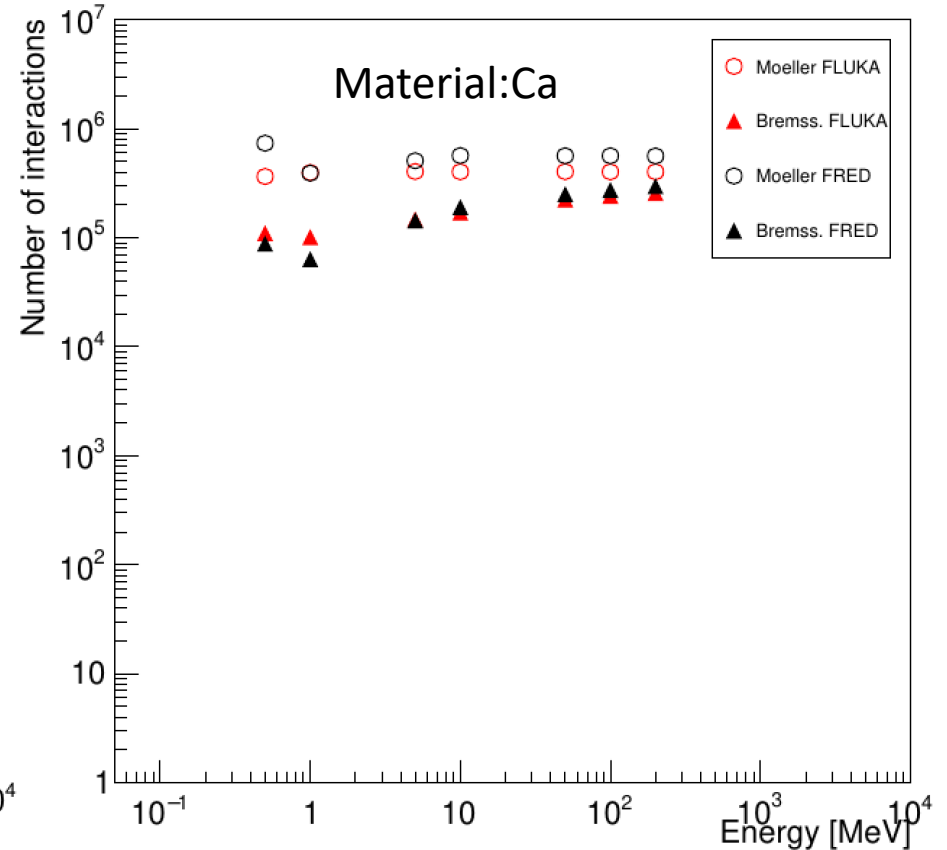
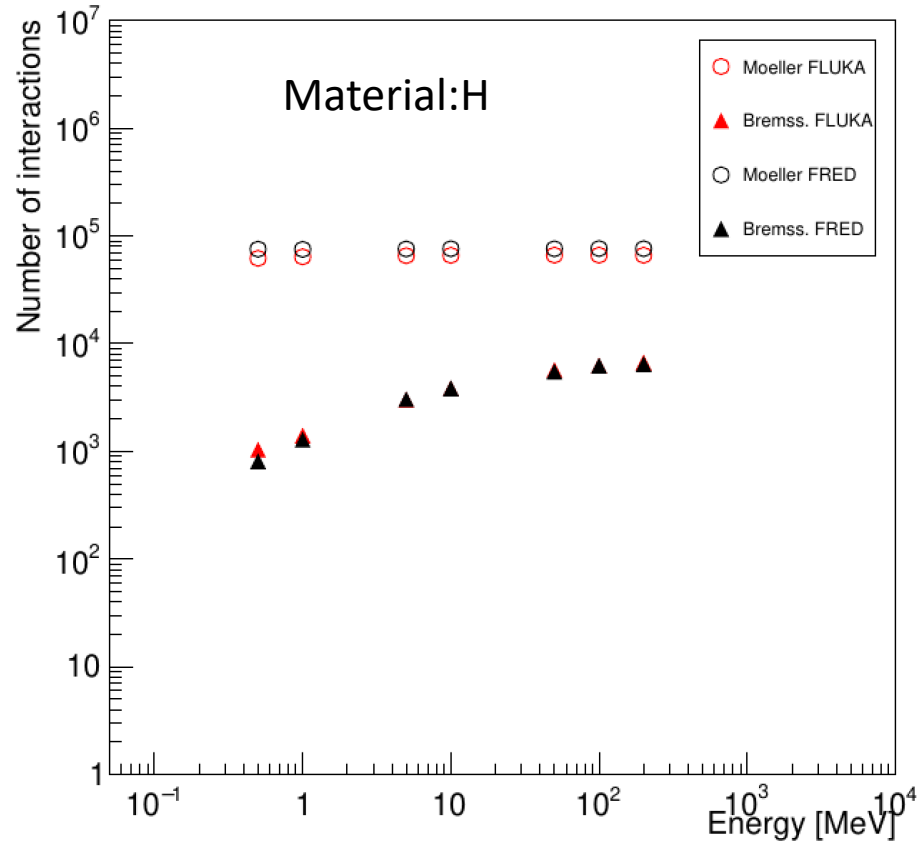
γ cross section



Example: Compton @ 1 MeV

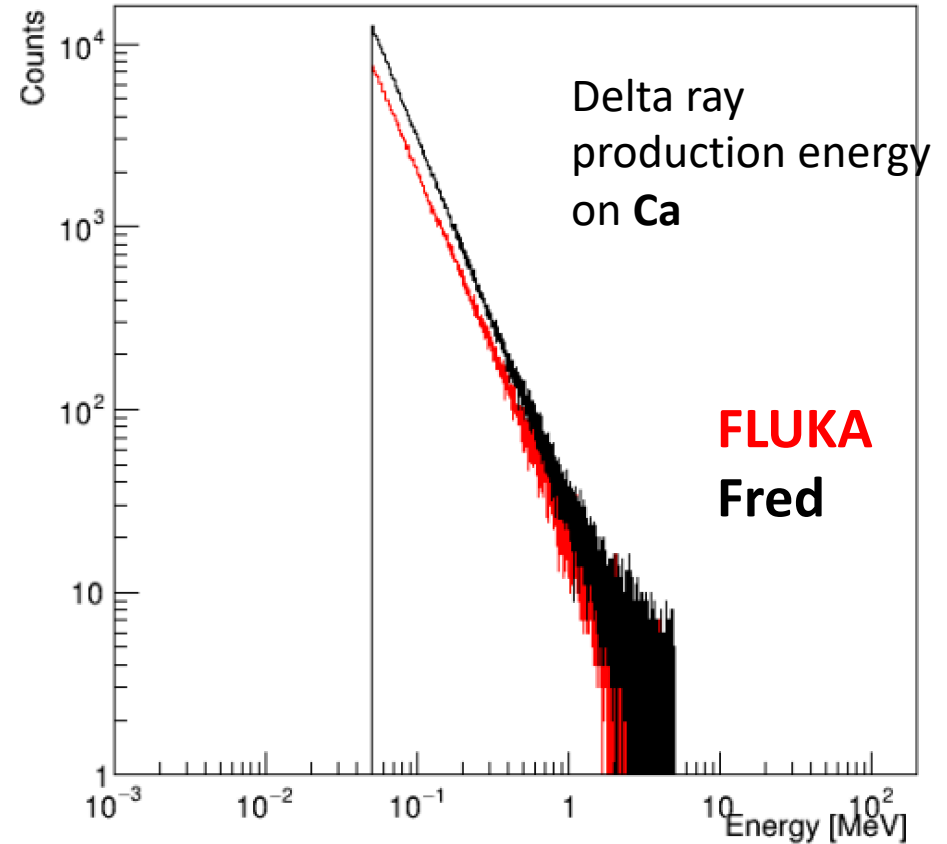
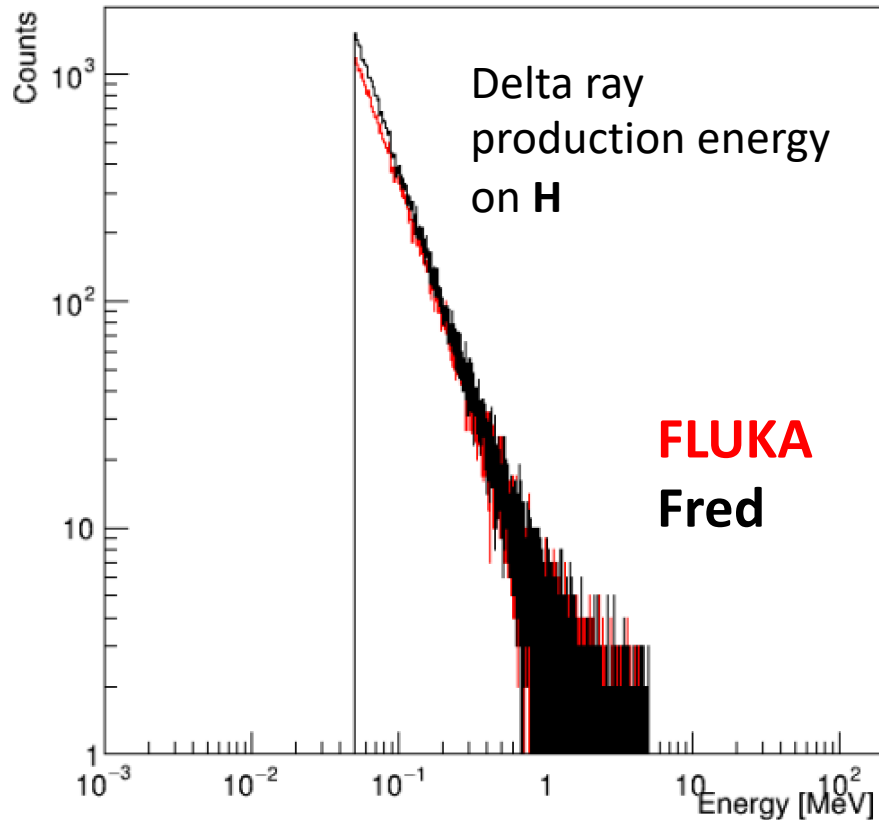


e- cross sections



- Delta ray production overestimated in Fred
- Dependence on Z

Delta ray production

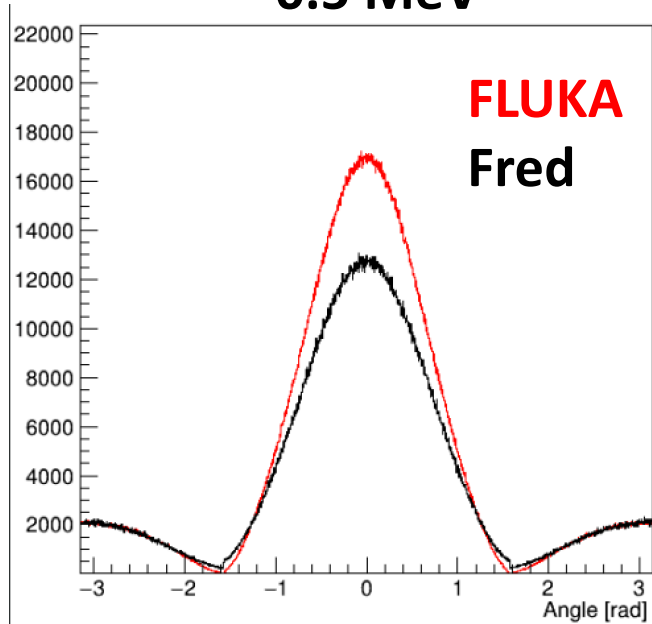


- It is not a threshold issue
- It seems to be related to cross section implementation

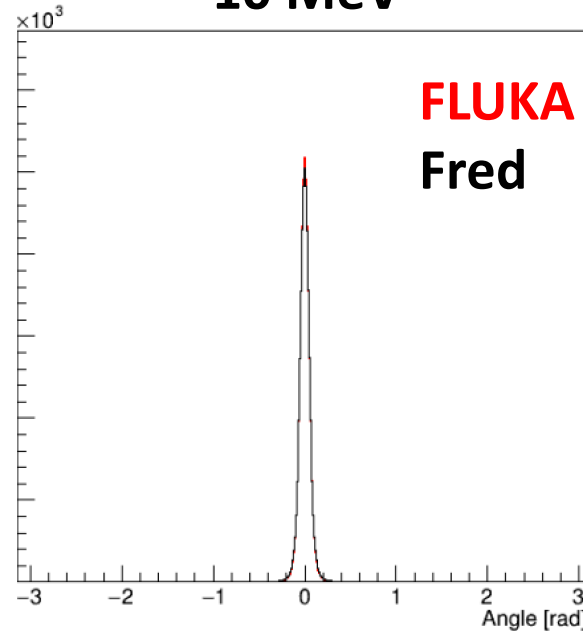
e⁻ : Multiple scattering

Material: Ca

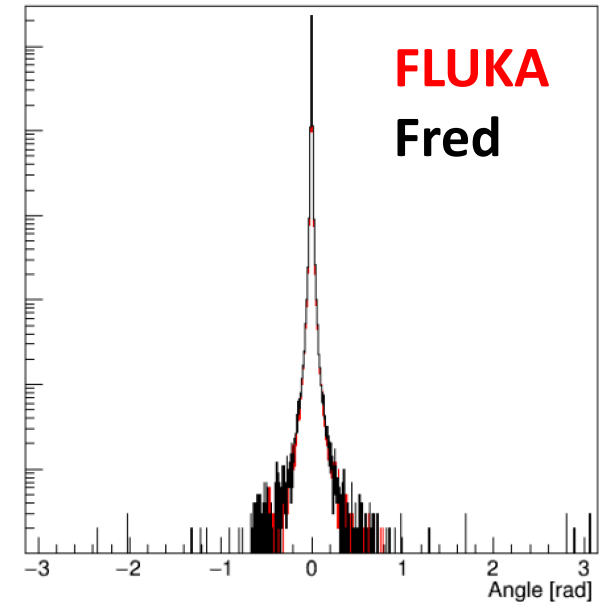
0.5 MeV



10 MeV

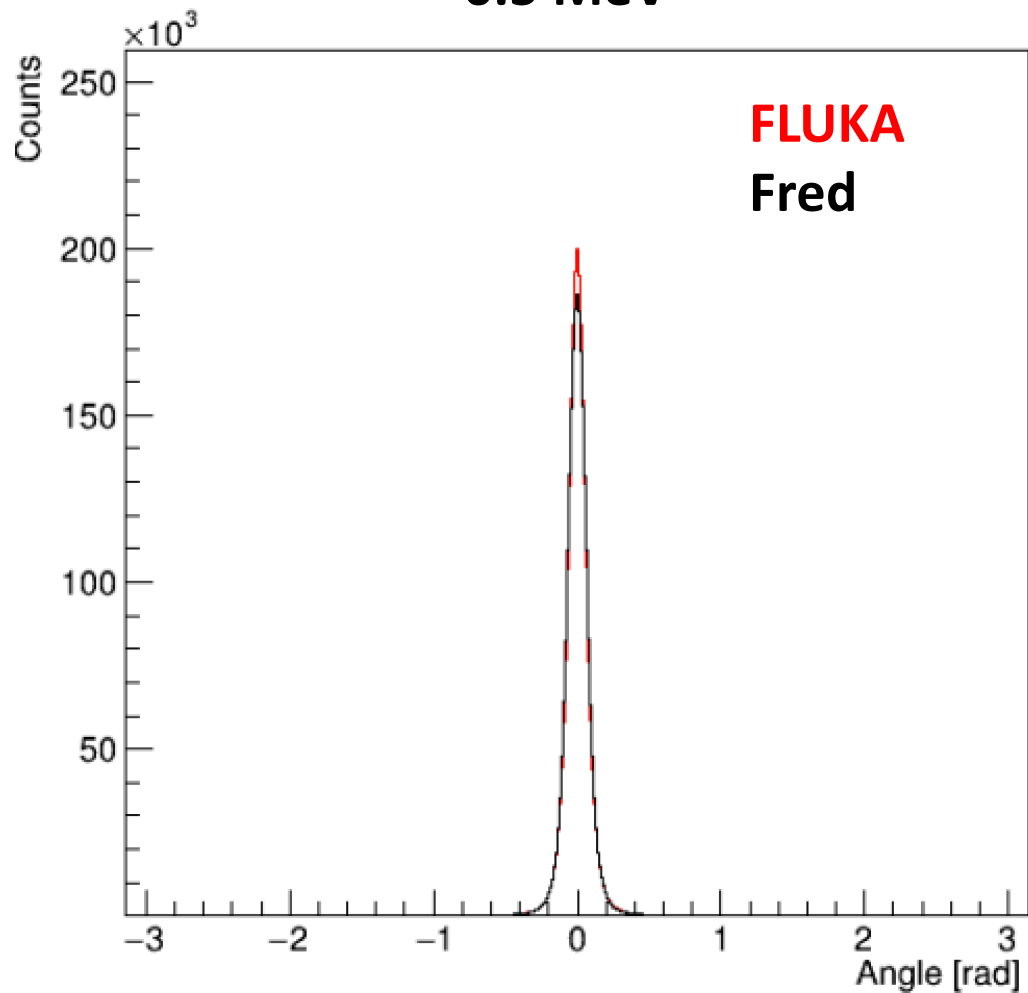


100 MeV



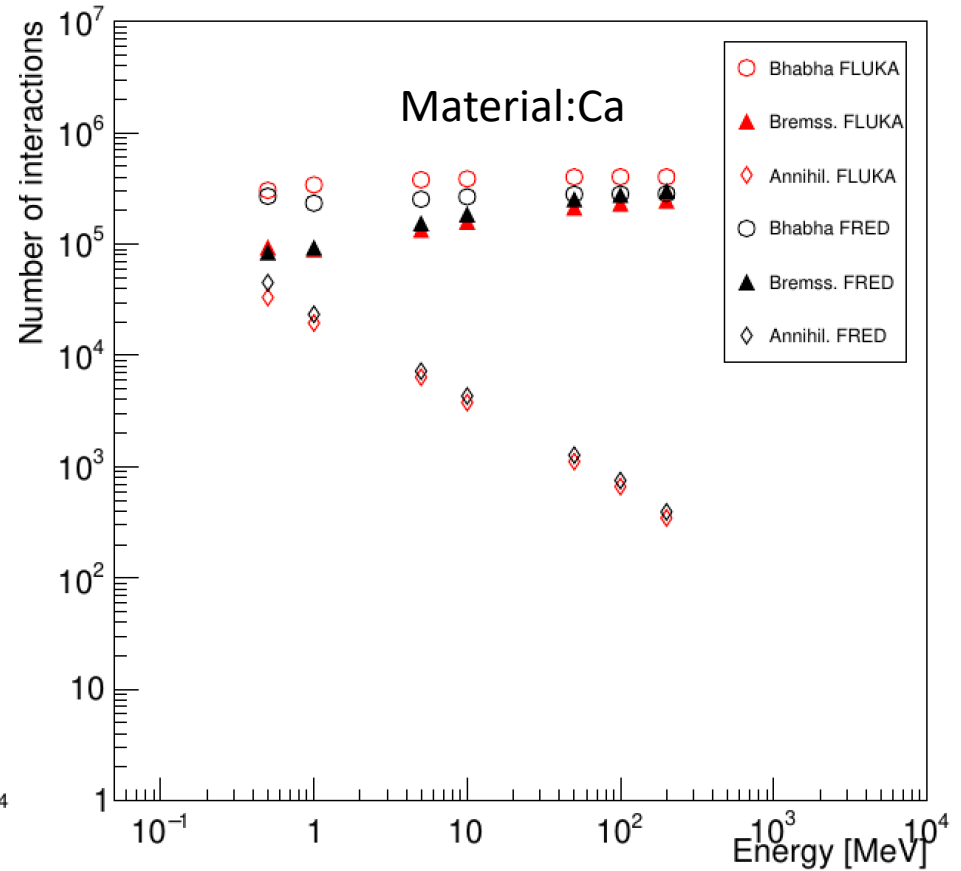
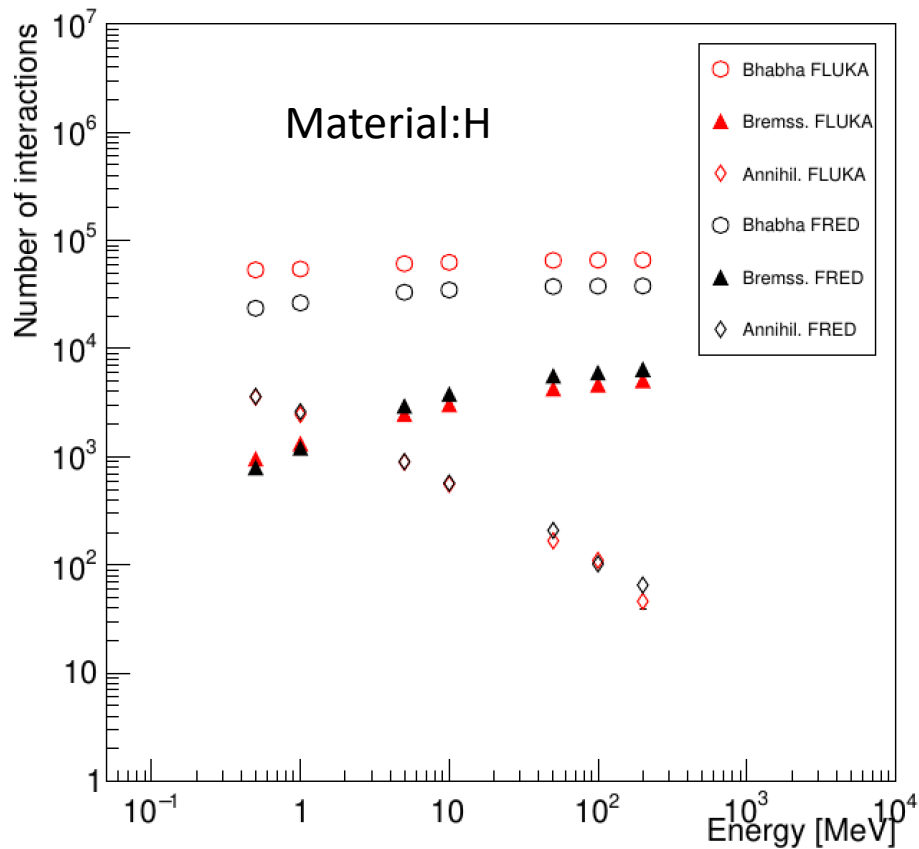
- Discrepancy @ low energies: model failure? dE/dx mistake?

0.5 MeV



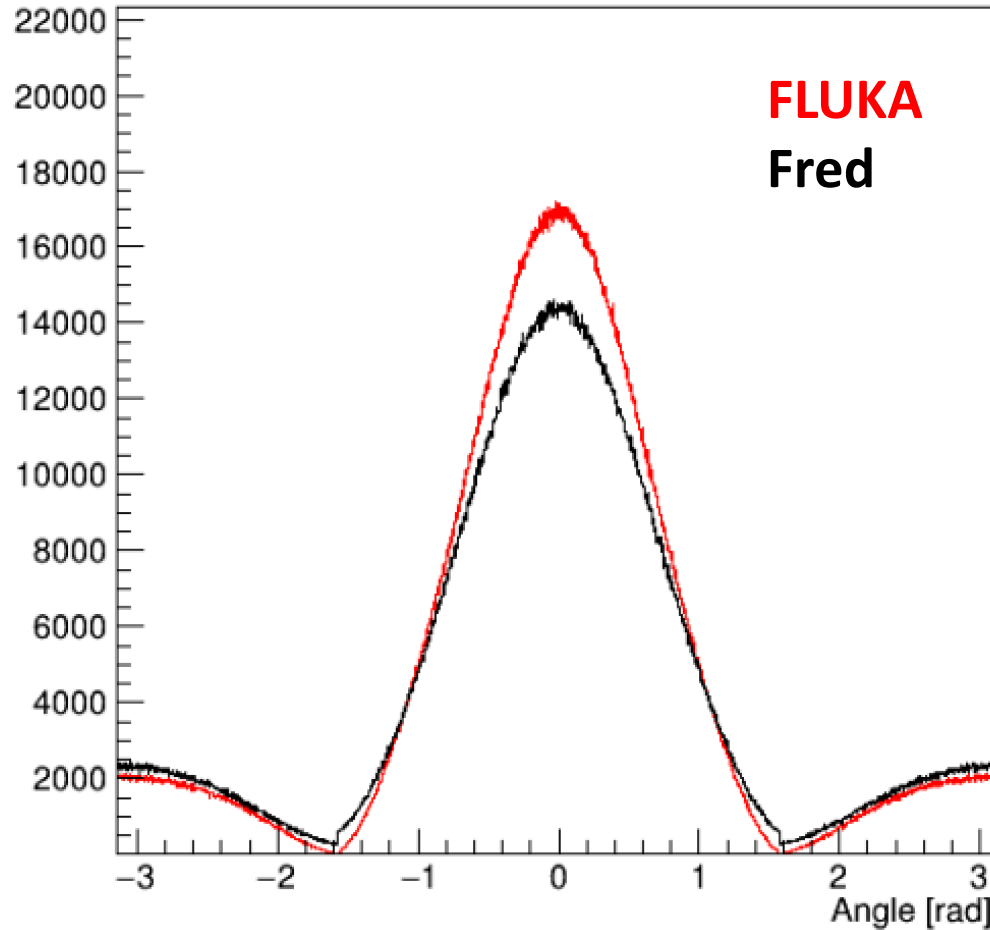
- Effect of target material not well modelled?

e+ cross sections



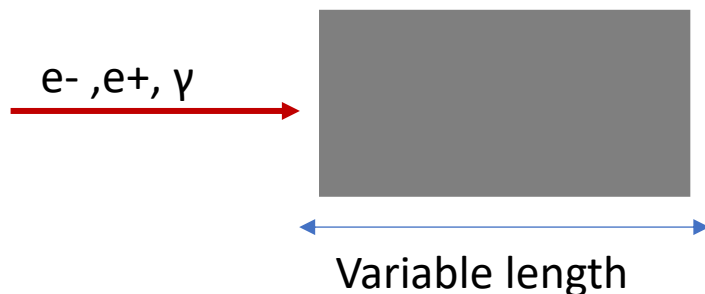
- Delta ray production underestimated in Fred
- Dependence on Z

0.5 MeV



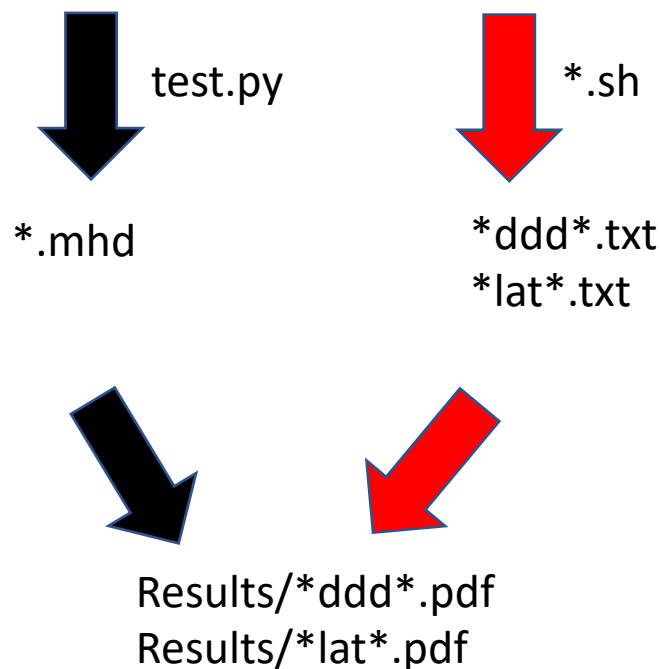
- Same behaviour observed for electrons...

Dose benchmark process



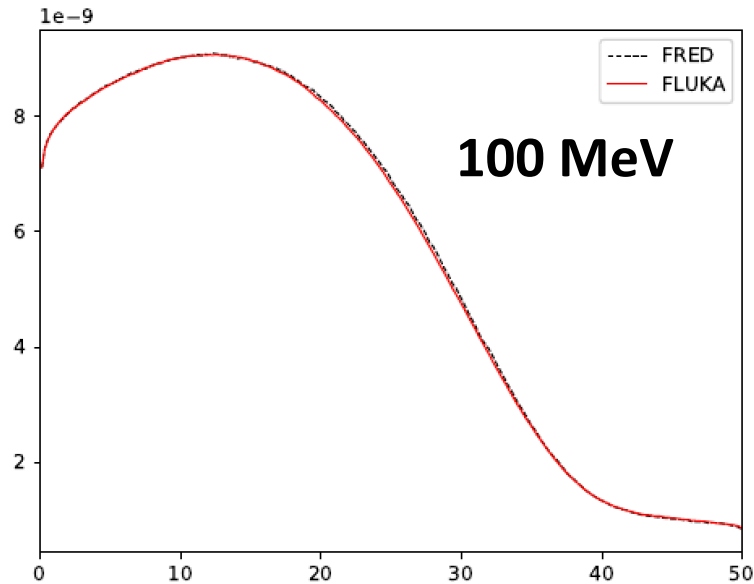
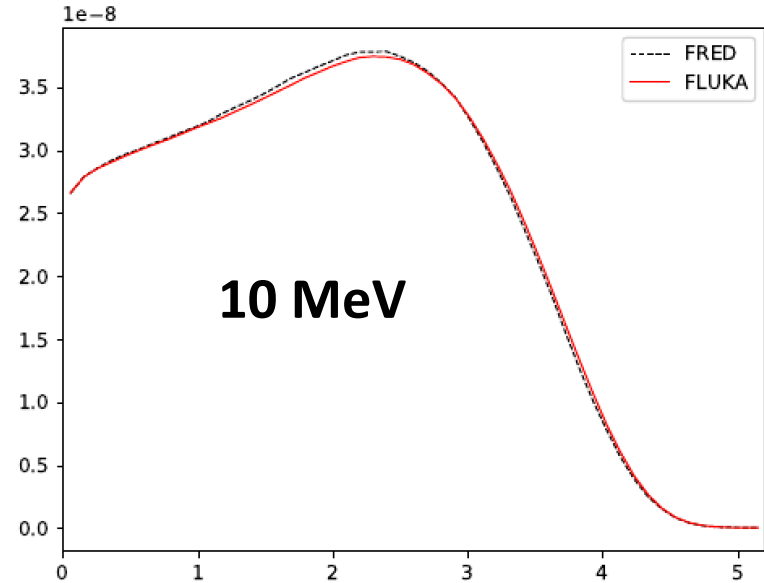
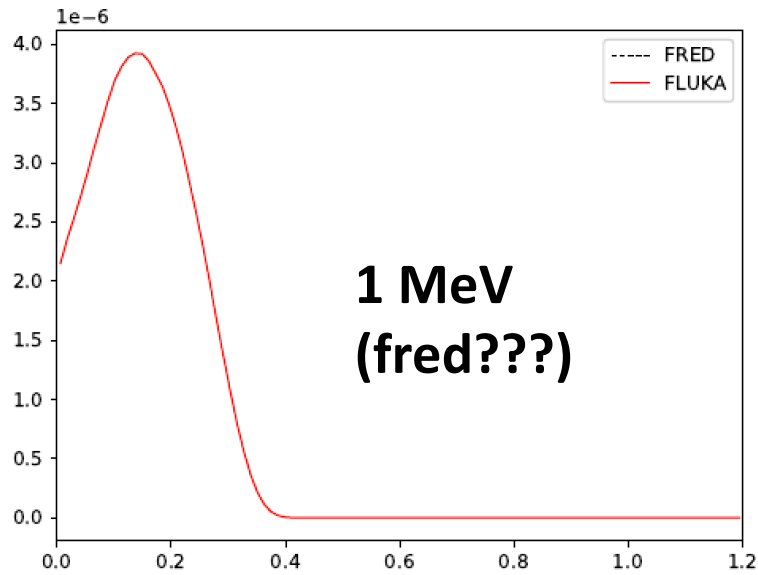
- Target: water, C, Ca, PMMA, Air
- Energies: 1.0MeV, 10.0MeV, 100.0MeV

- A “measure” of the fluka/fred discrepancy is registered on a file
- Not available for this presentation

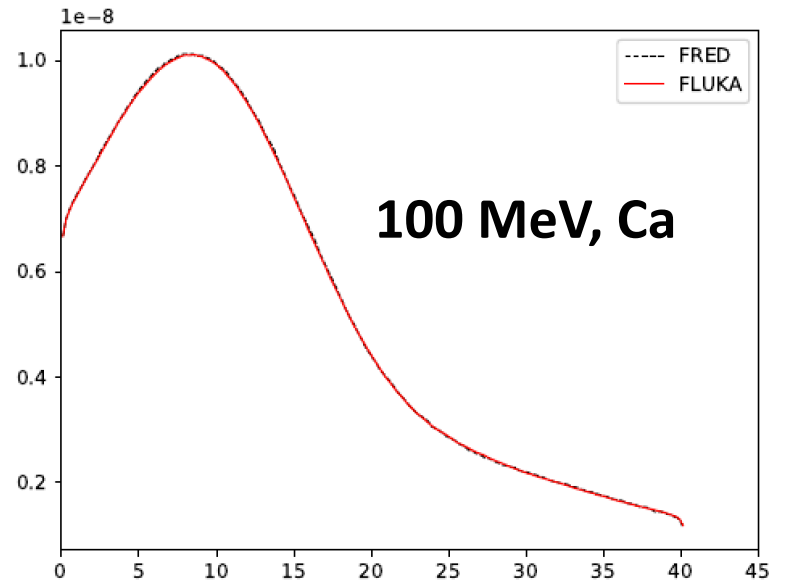
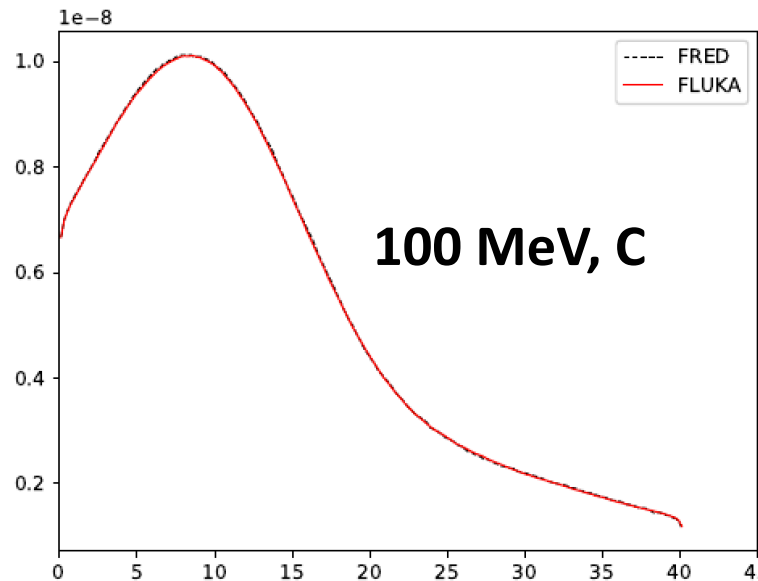
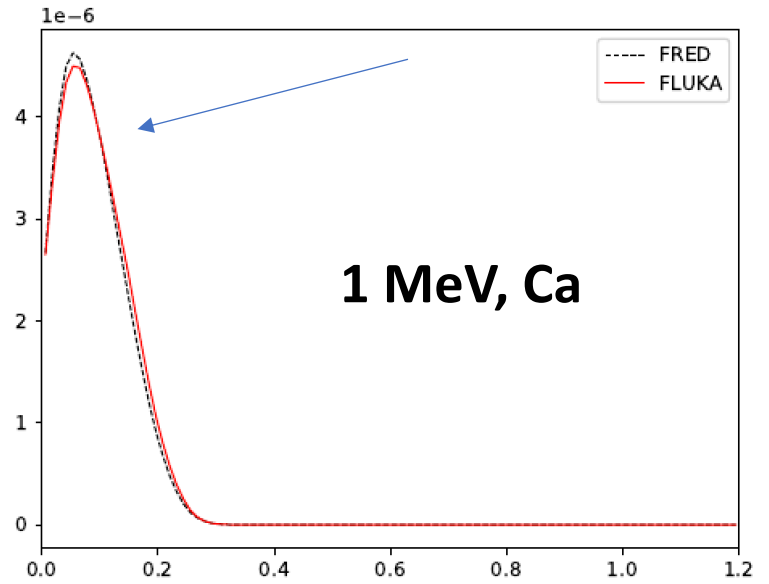
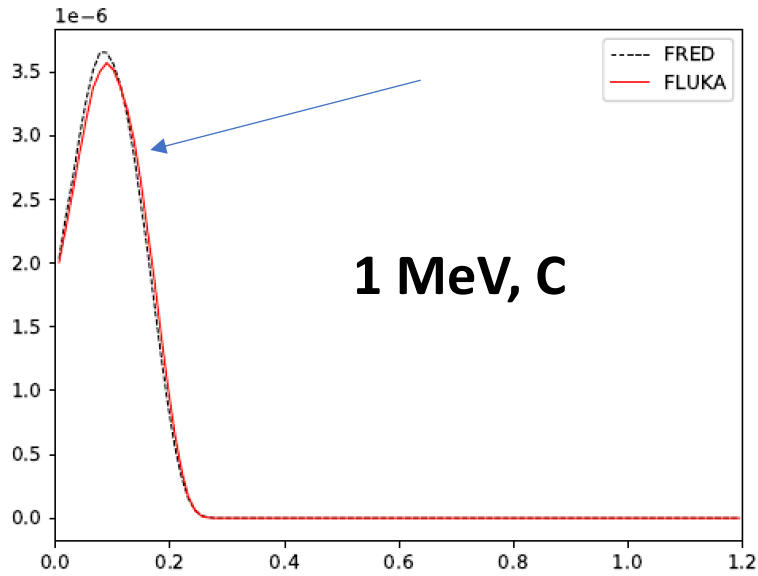


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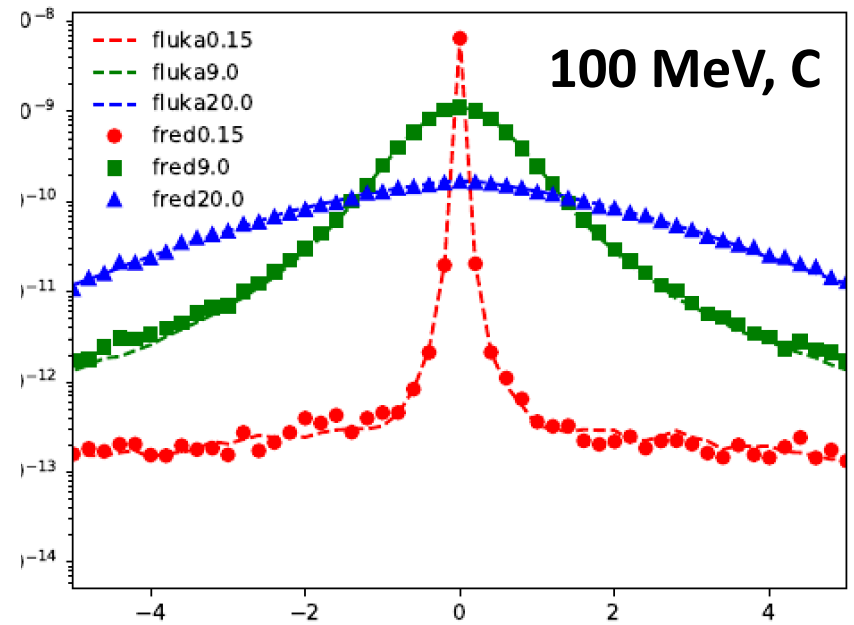
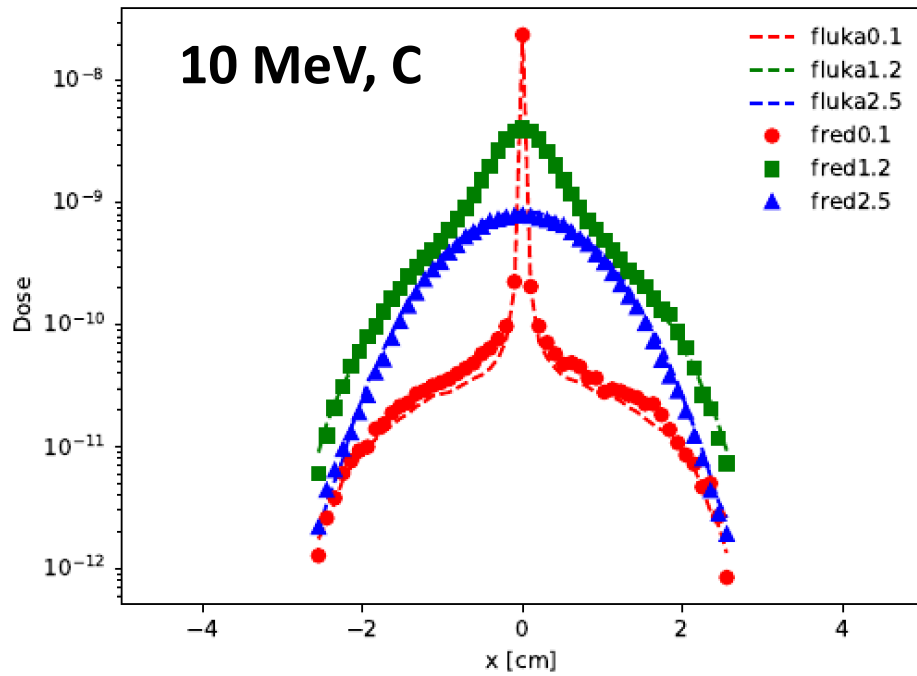
e- on PMMA (ddd)



Issue at low energy?



e- lateral profiles



To do

- Implement some safety control in the flow
- Fix faults (Au, low energy)
- Investigate on the reason of the delta production discrepancy
- Start to optimize the code to improve time consumption