Status Report

GRAiNITA

Yingrui Hou, Stephane Monteil, Mykhailo Yeresko

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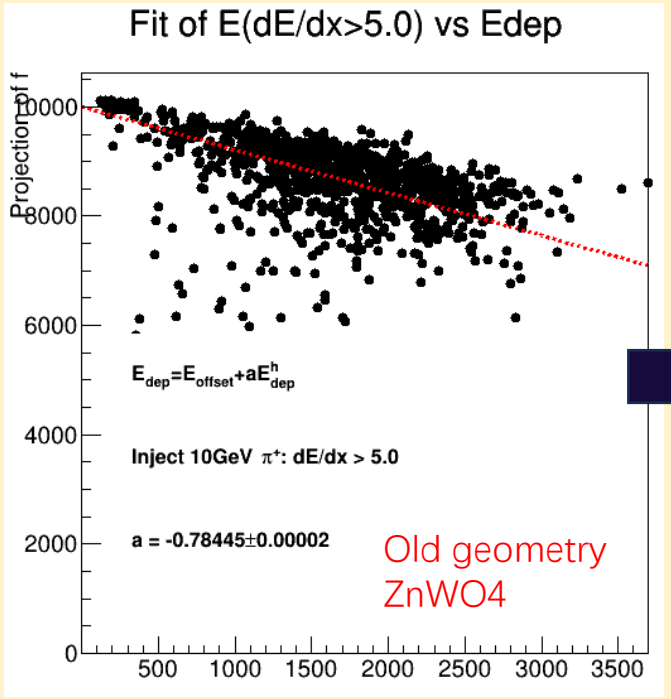
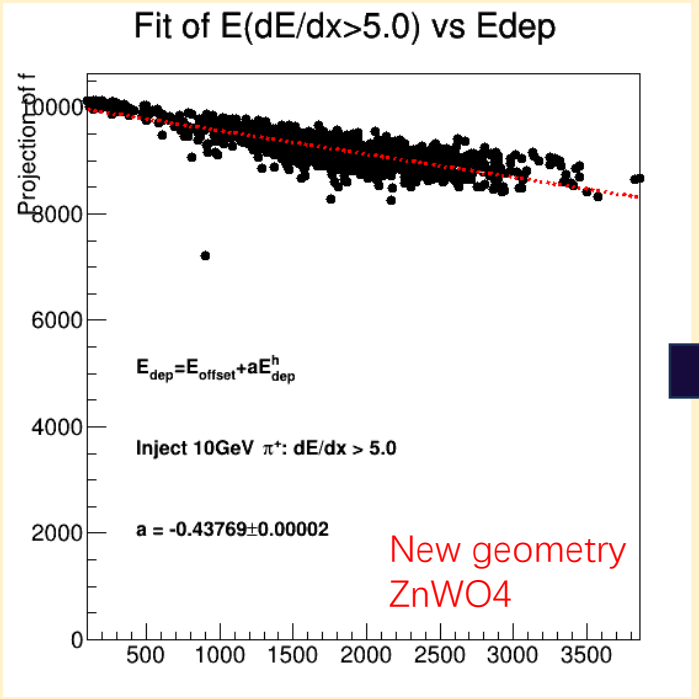
Update from the last meeting

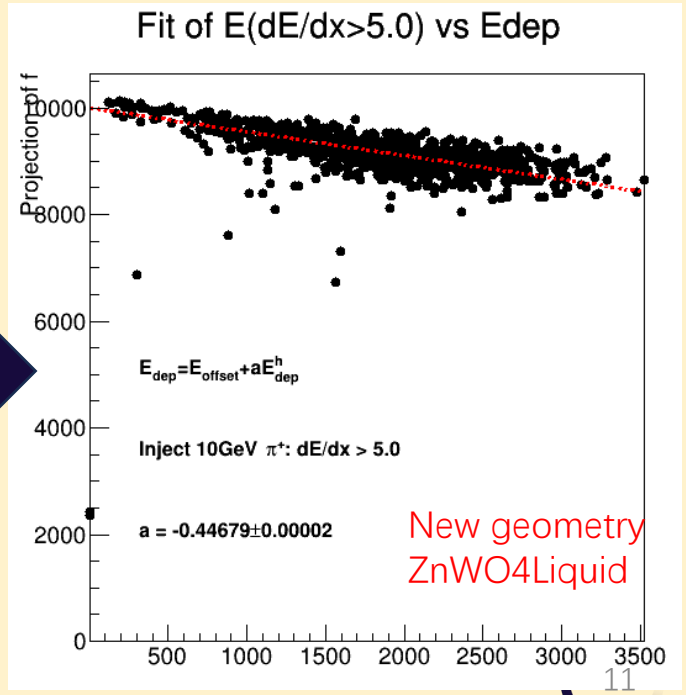
- Geometry:
  - Enlarge the size of the detector in the simulation and move the particle gun from the center to make sure the showers are produced inside the detector.
    - XYZ: 0.5m*0.5m*0.5m => 1m*1m*2m
    - Gun position: (0,0,0) => (0,0,-1m)
- Material:
  - Try materials with liquid as Jacques suggested
  - ZnWO4 => 0.55 ZnWO4 + 0.45 CH2I2 (volume 1:1, density 5.47 g/cm3)
- Add the energy loss of the input particle (before interaction)
- Try different input particles (proton, π^-) with different energies.

Geometry & Material

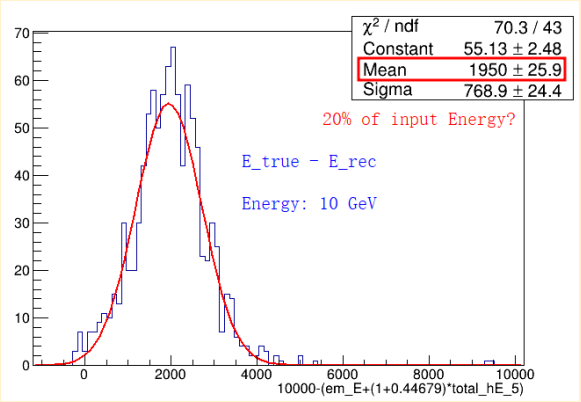
- After changing the geometry, the correlation between E_{dep} and E_{dep}^{h} is improved.
- Slightly worse after changing the material.
  - The E_{offset} is fixed to the generated energy

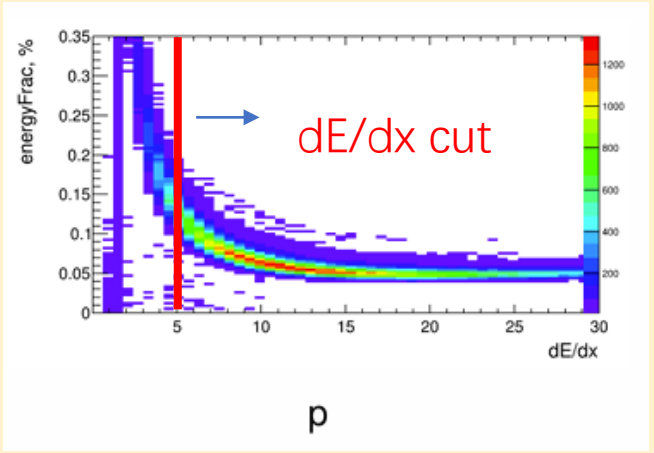


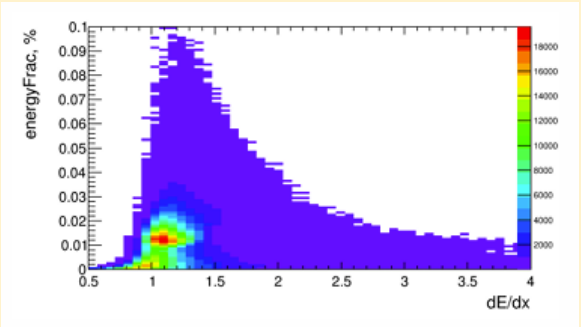


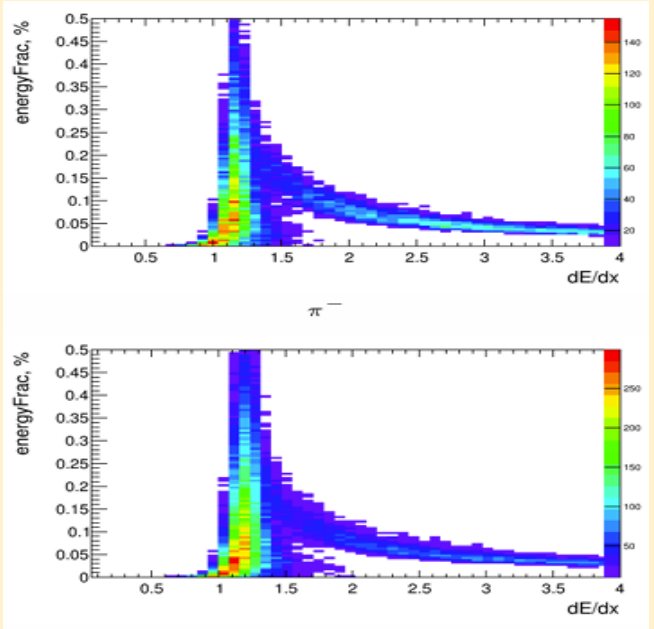


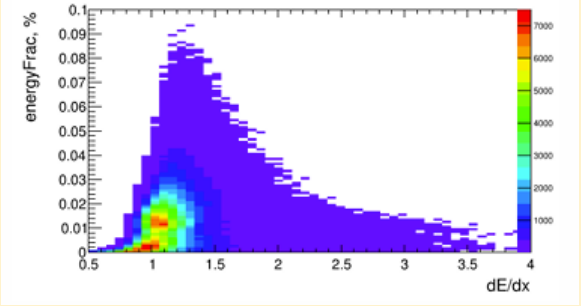
Where the bias come from?











- Back to the equation

$$E_{dep} = E_{em} + E^h_{dep} \Rightarrow E = E_{em} + (1-a)E^h_{dep}$$

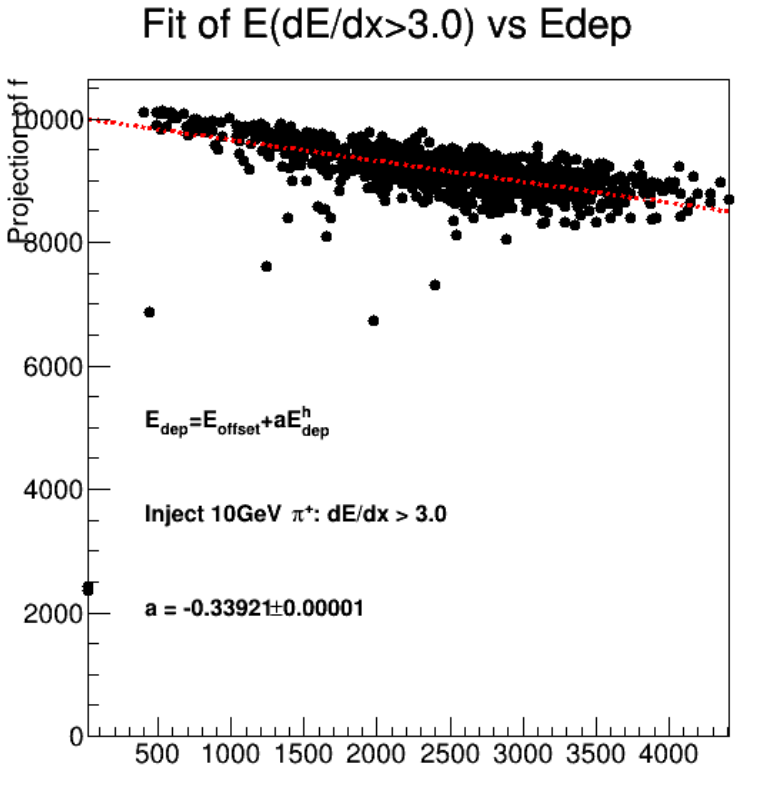
  - $E^h_{dep} = E^h_{dEdx>5} + E^h_{dEdx<5}$
  - When cutting at 5, part of the energy from pion and proton is missing in the equation.

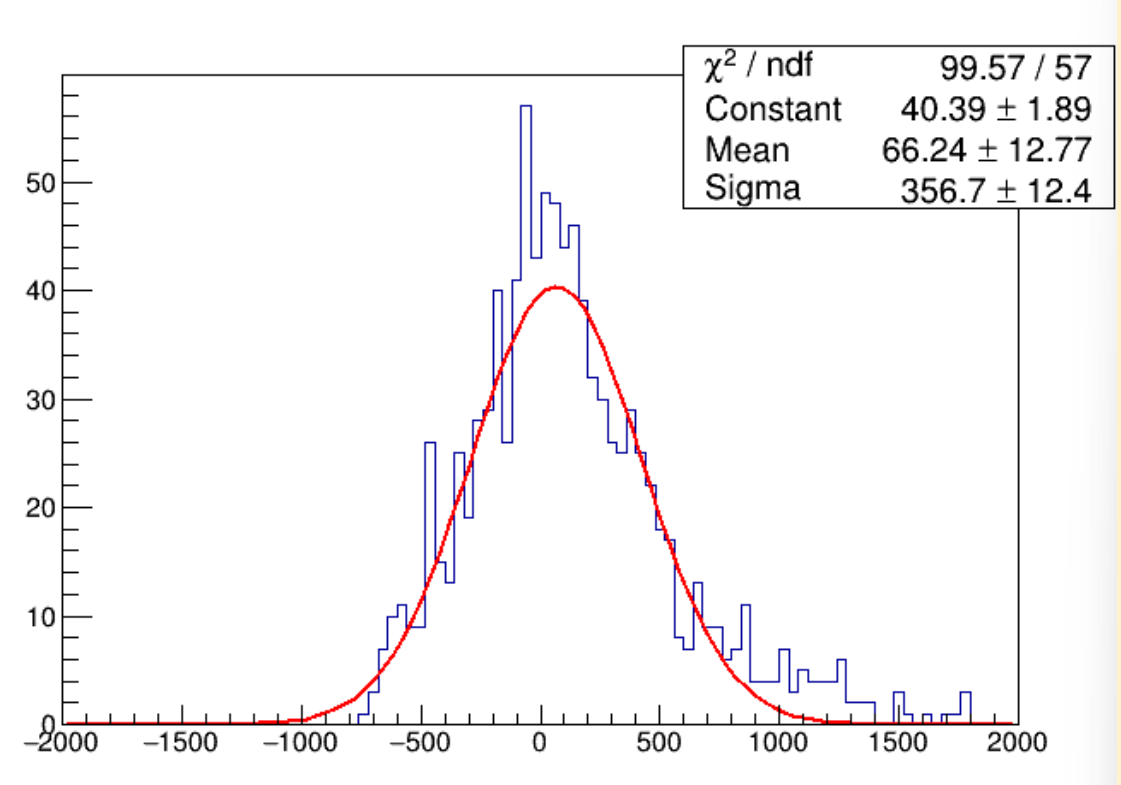
Particle	e^-	e^+	γ	π^-	π^+	p
Mean, %	38.7	13.0	2.0	4.9	11.2	22.9
RMS, %	8.1	5.5	0.5	3.7	11.6	10.3

Particle	n	D	T	α	nuclei	Total
Mean, %	0.8	1.8	0.3	0.8	2.5	98.9
RMS, %	0.4	1.7	0.5	0.5	1.4	

Where the bias come from?

- Change the cut to dE/dx>3 to include most of the proton.
- Add the pion energy loss to the equation.





With the same simulation condition

- Material: ZnWO4 + CH2I2; Energy: 25 GeV