Diffusion along the Drift Direction

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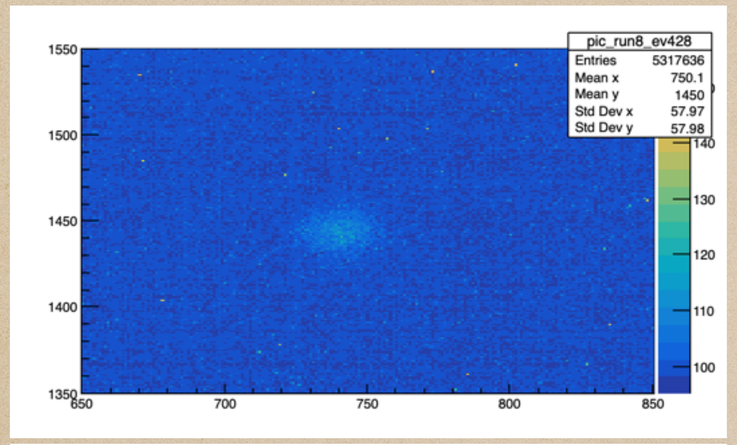
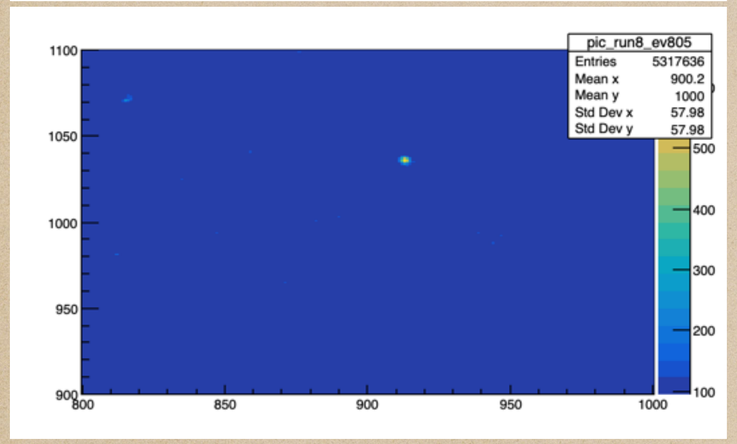
Diffusion along Drift direction in LIME

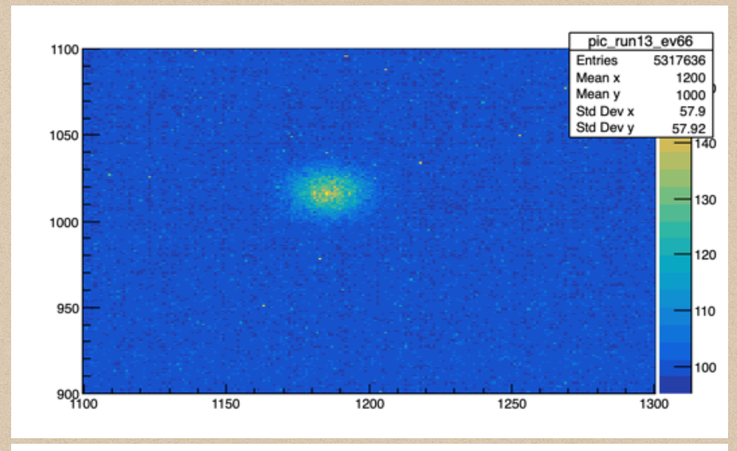
- Both ER and NR tracks are selected between 0-10 mm far and 500-510mm far from the GEM.
- Tracks which are closer to the GEM (between 0-10mm from GEM) diffuse less.
- Tracks which are far from GEM(between 500-510mm from GEM) diffuse a lot.

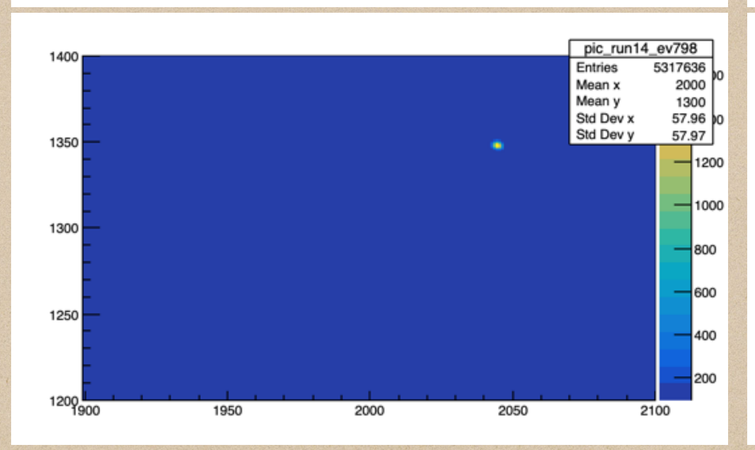
He-NR



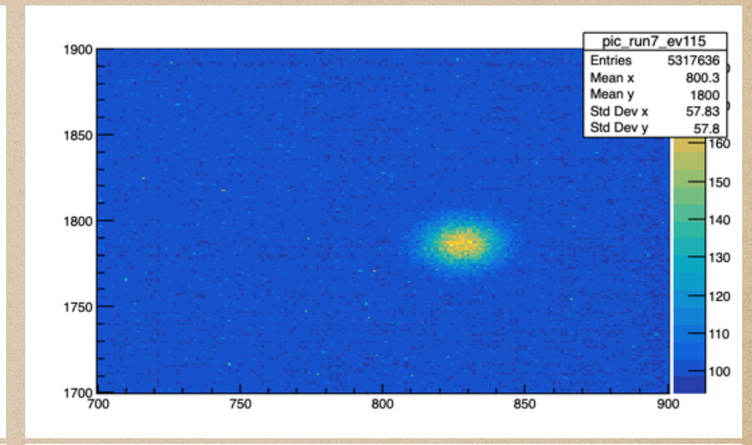


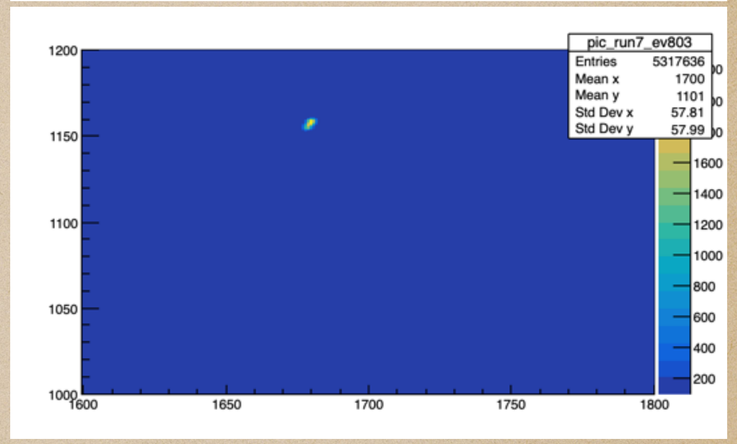
10 keV NR





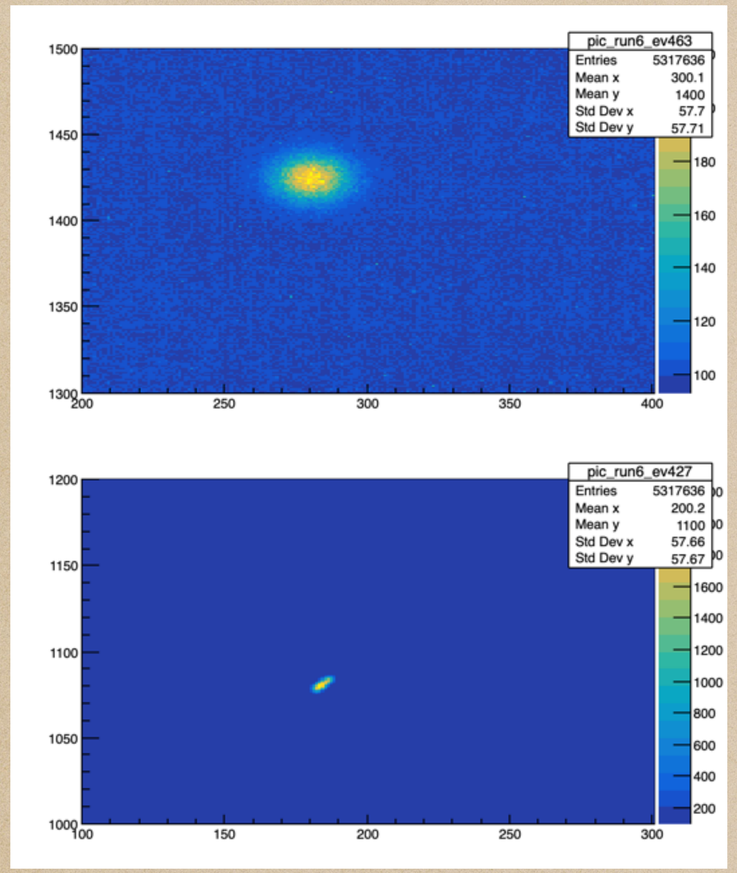
30 keV NR



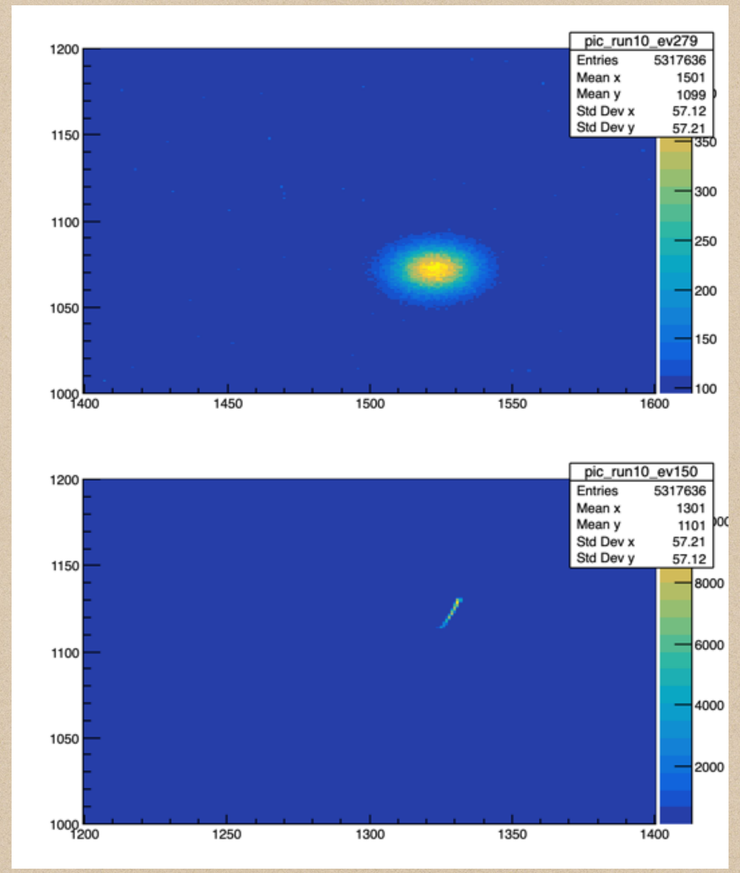


60 keV NR

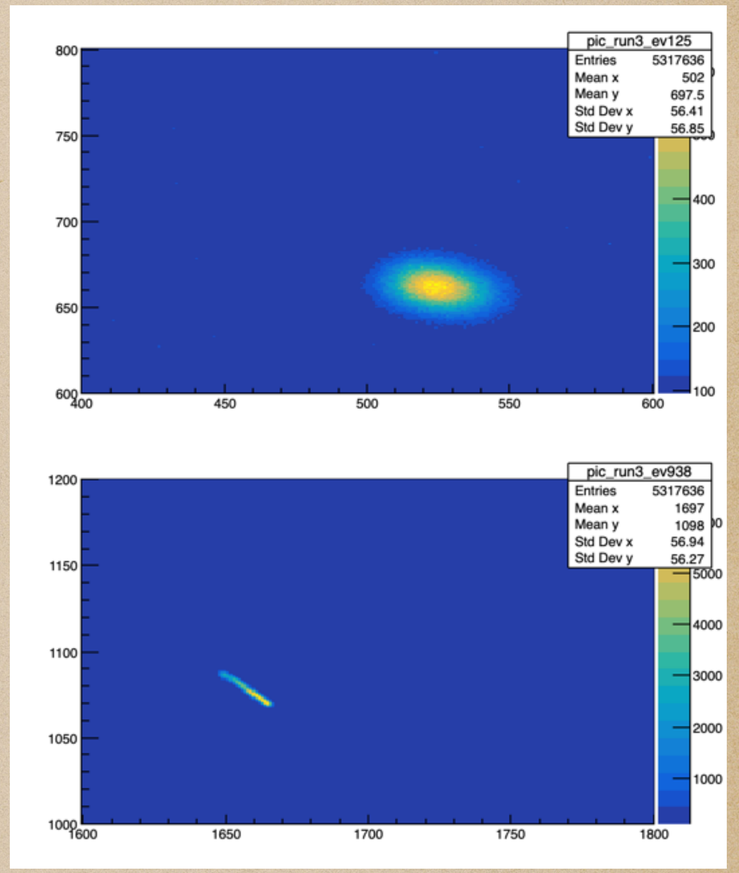
He-NR



100 keV NR

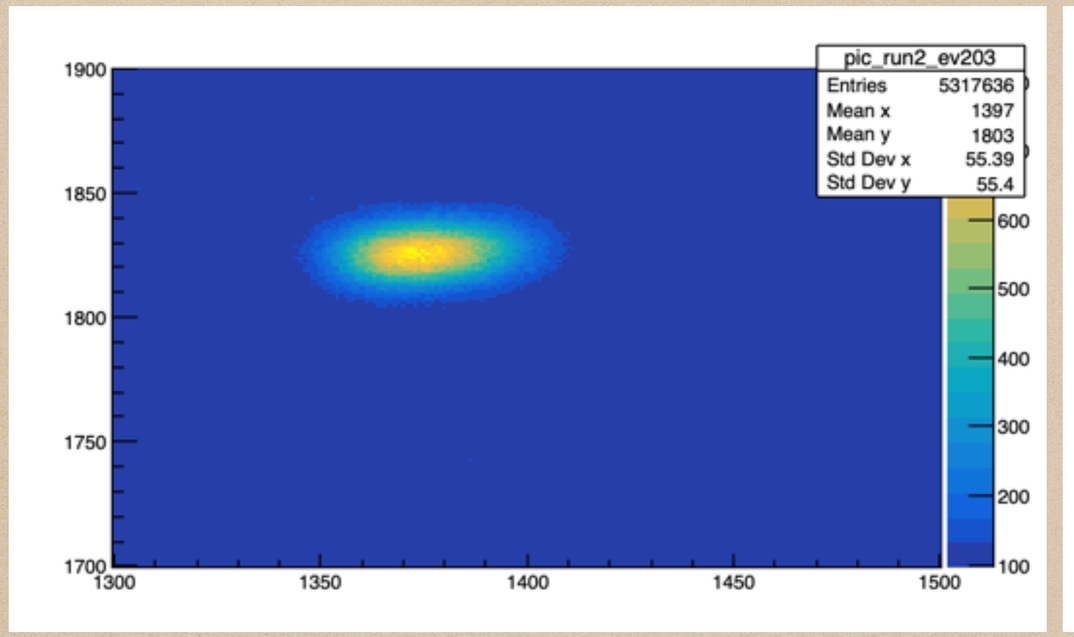


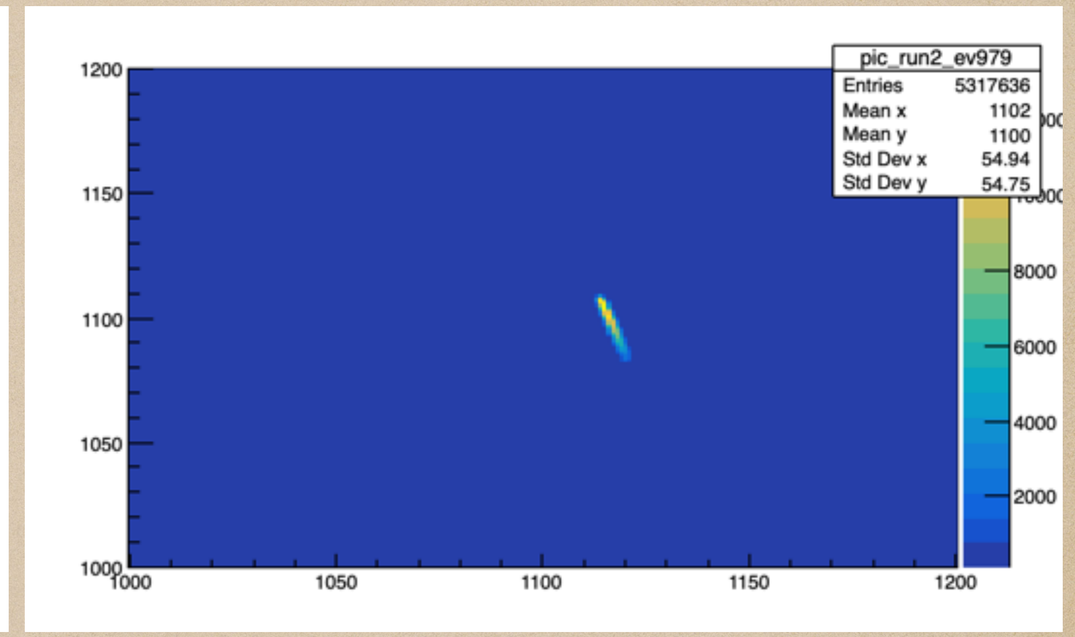
300 keV NR



600 keV NR

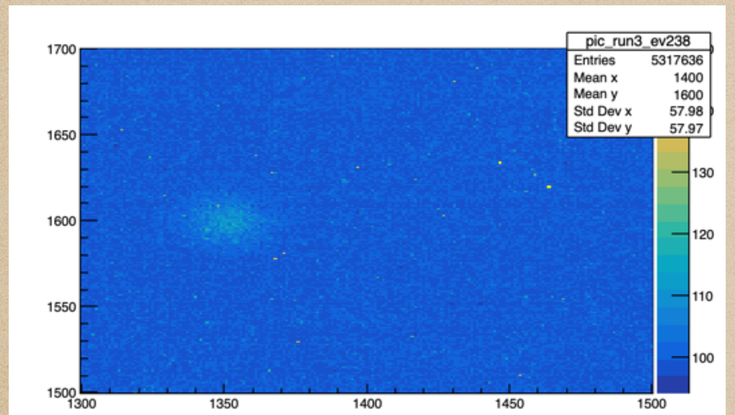
He-NR

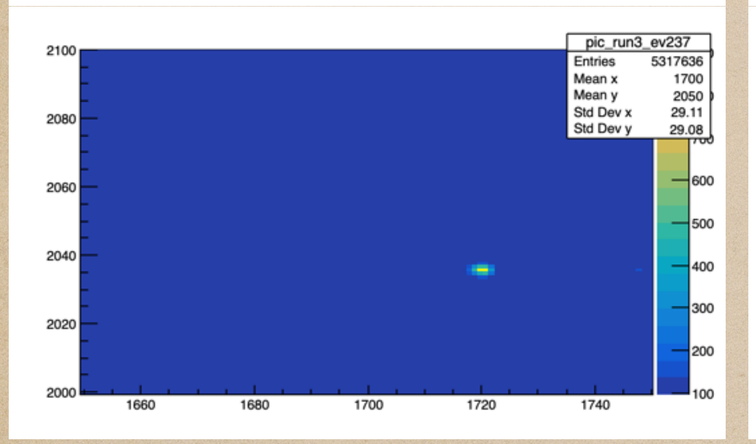




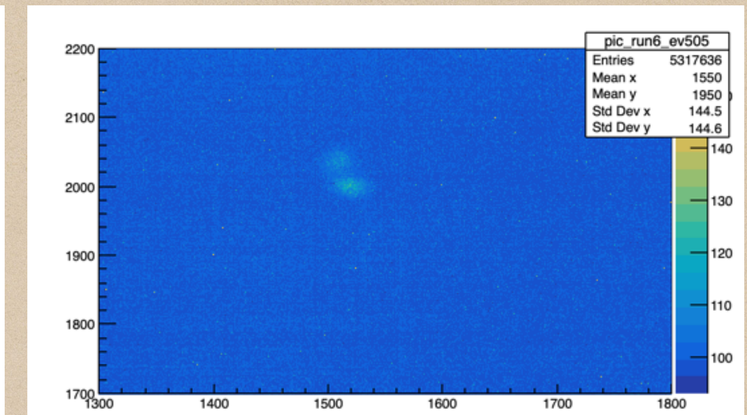
1000 keV NR

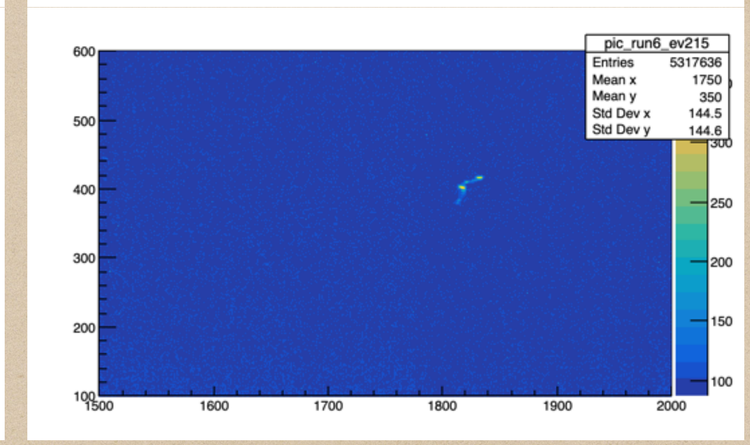
ER



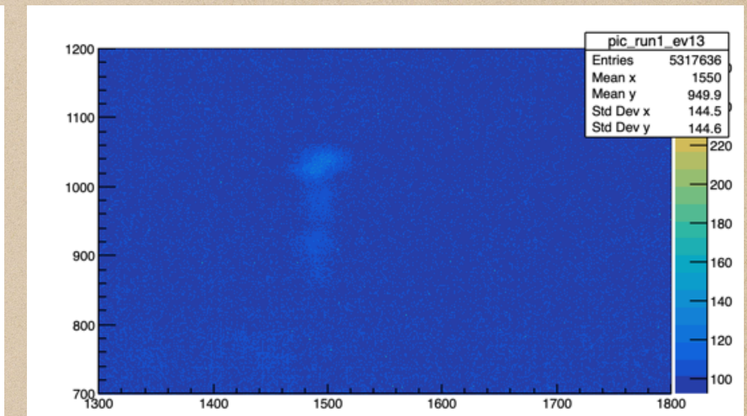


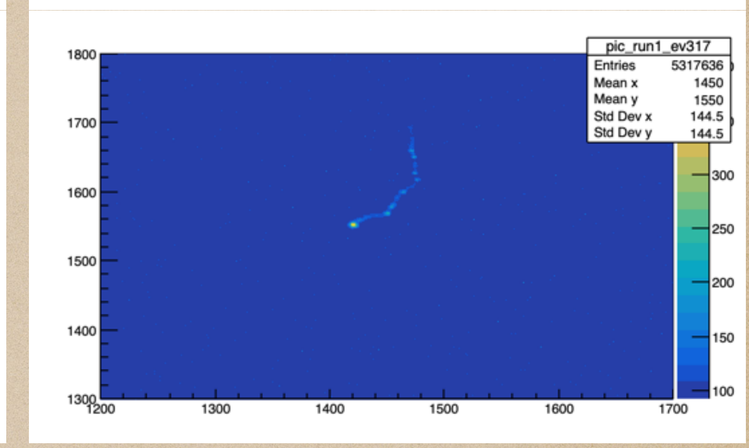
10 keV ER





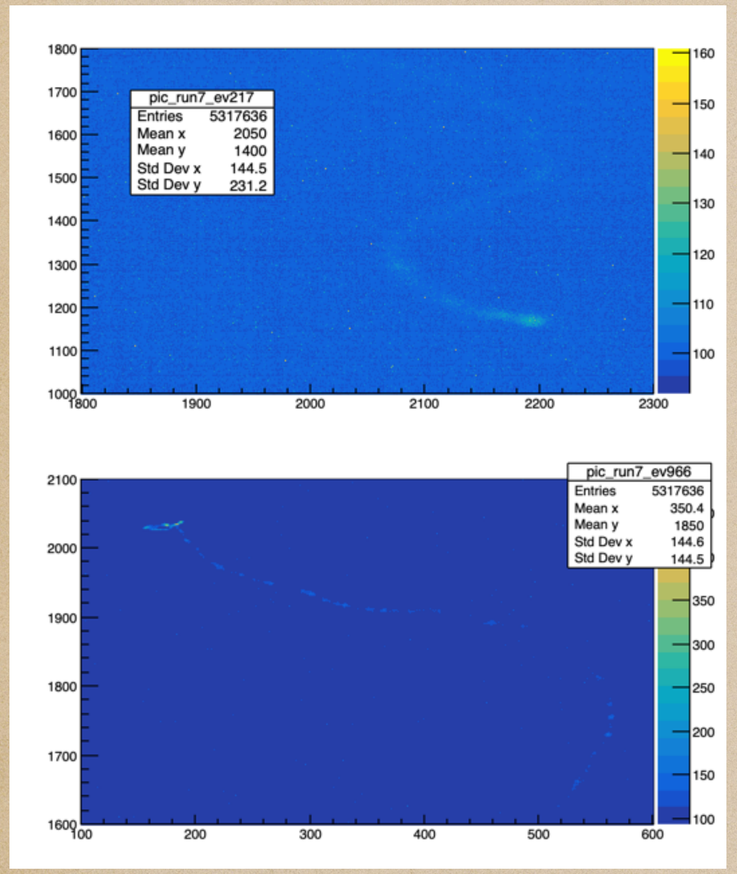
30 keV ER



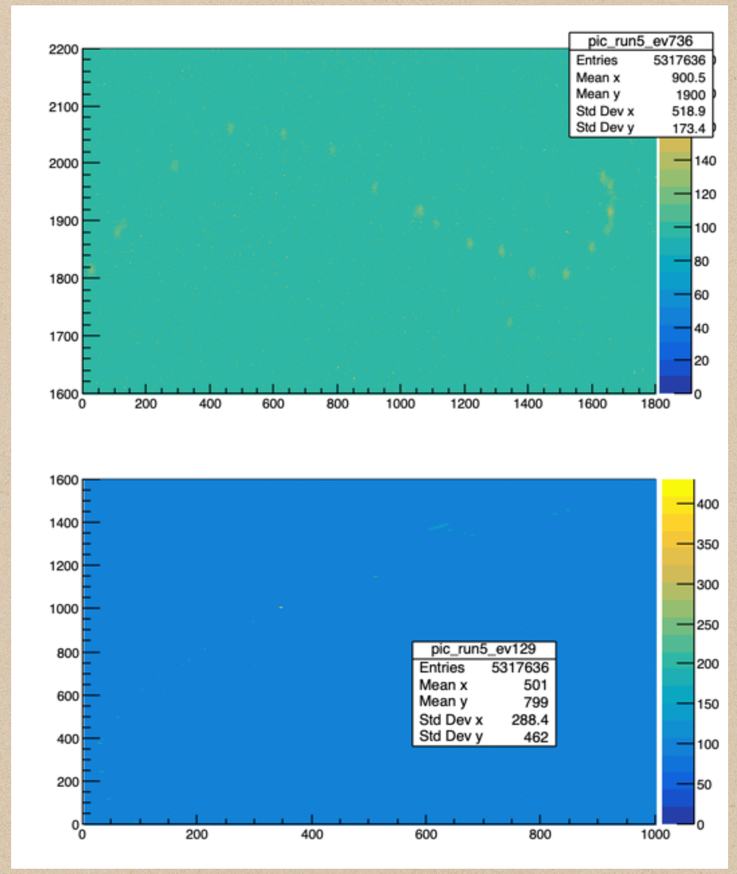


60 keV ER

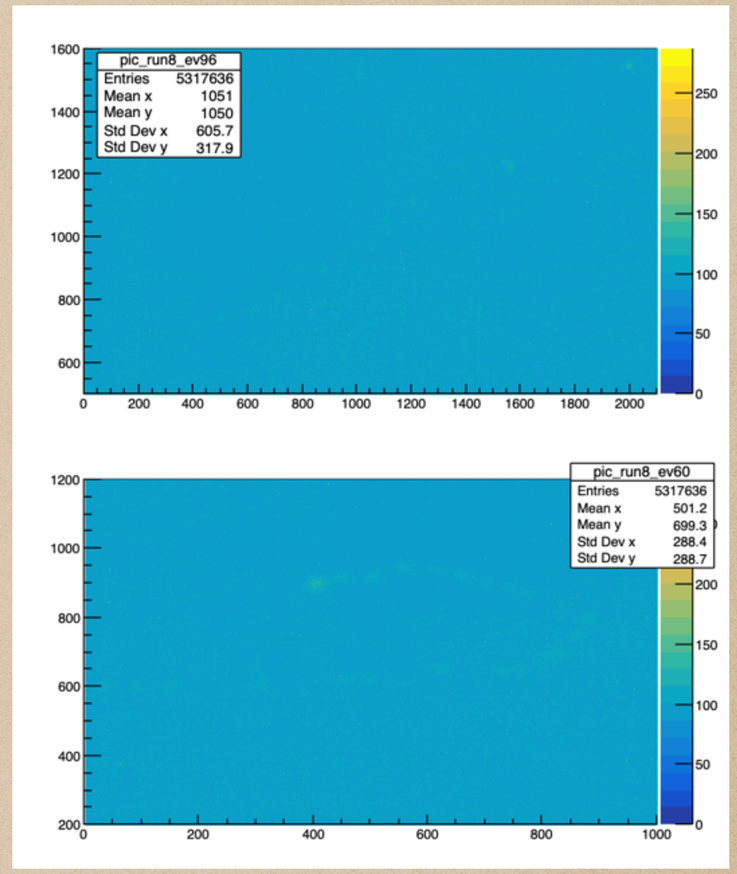
ER



100 keV ER

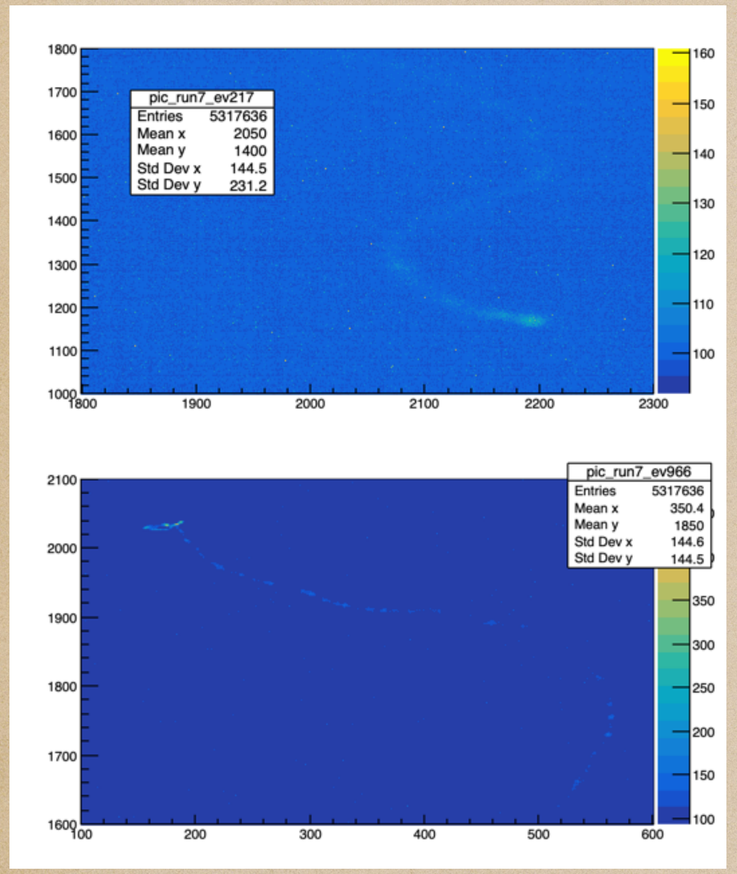


300 keV ER

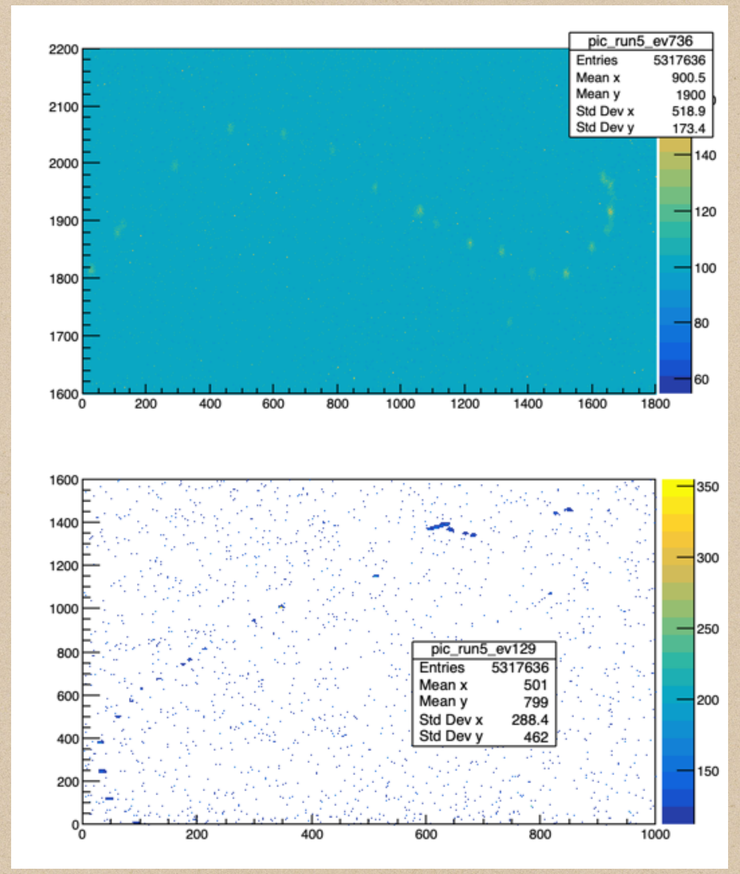


600 keV ER

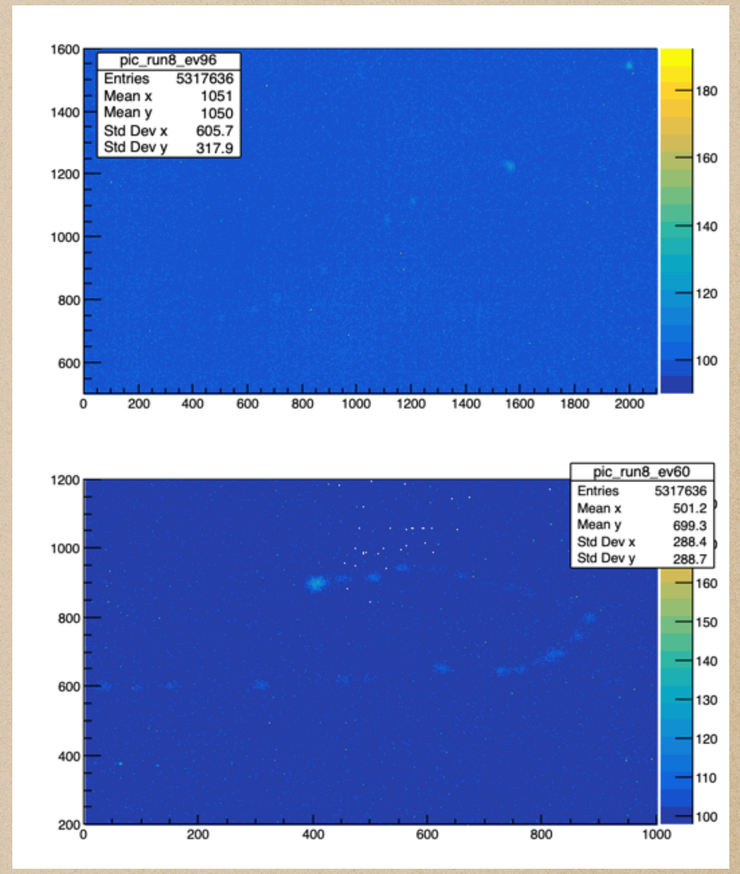
ER



100 keV ER

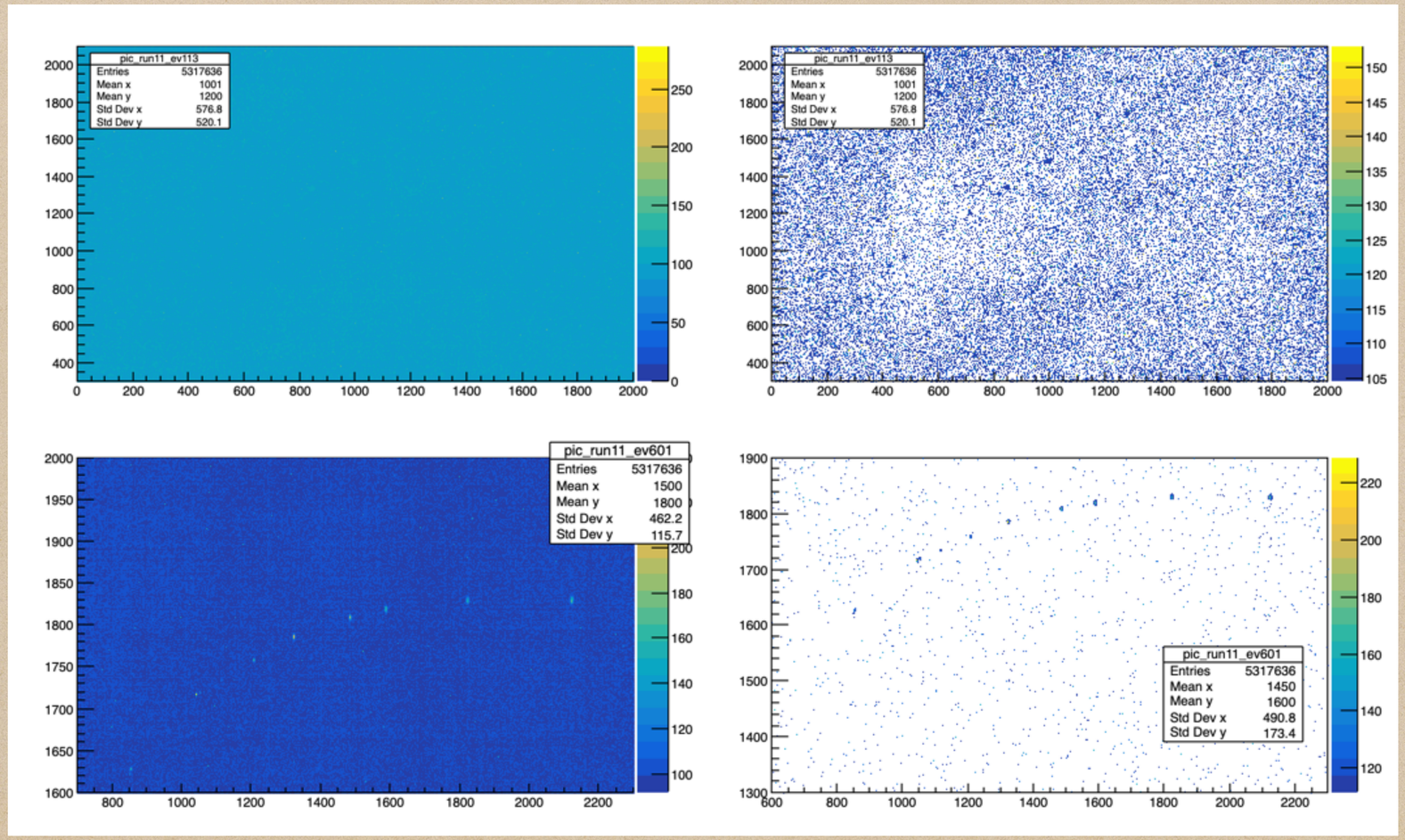


300 keV ER (Different colour scale)



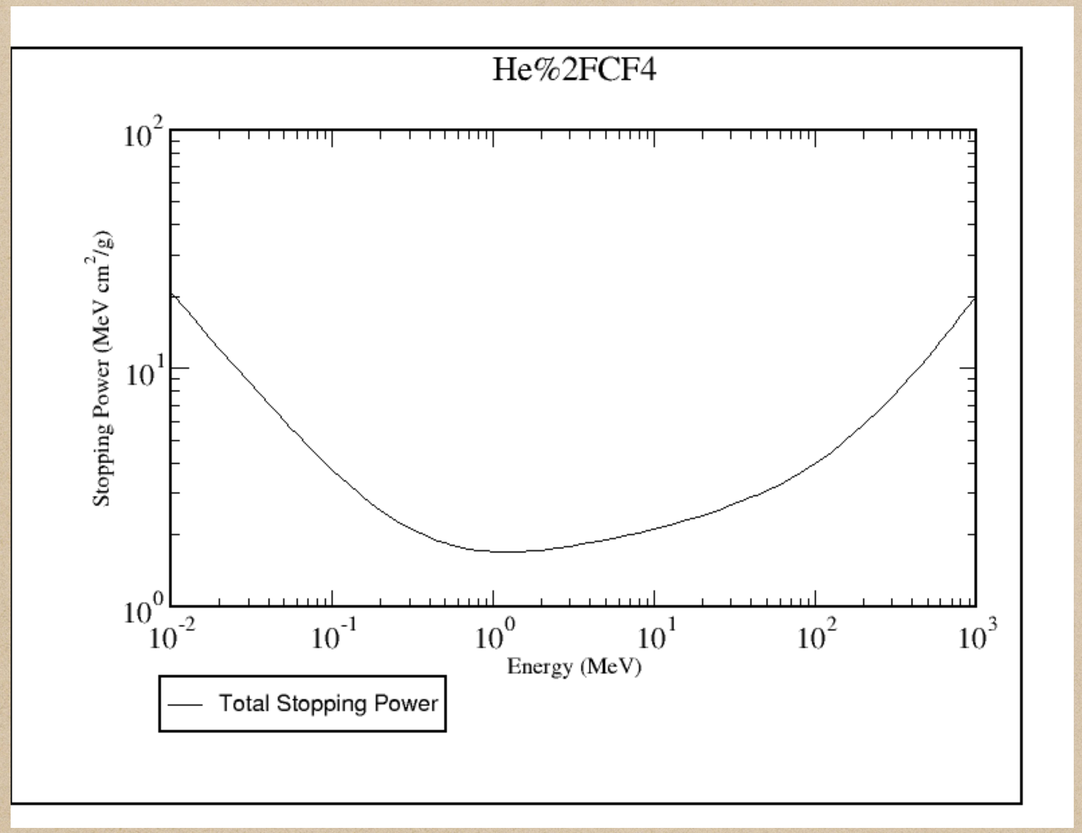
600 keV ER (Different colour scale)

ER



1000 keV ER

Stopping Power for electron in He:CF4 Gas



$$\rho_{Tot} = 0.00159 \frac{g}{cm^3}$$

$$StoppingPower = 3.18 \frac{keV}{cm}$$

Near 1 MeV region

Source: https://physics.nist.gov/PhysRefData/Star/Text/ESTAR.html

Conclusion

- Tracks which are far from GEM (between 500-510mm) diffuses a lot and because of this sometimes intensity of these tracks is similar the noise level of the camera. This is very evident in case of high energy ERs.
- 1 MeV electron is very difficult to fully contain inside the LIME, and it also deposits very low energy in the gas mixture. Therefore it is very difficult to find the tracks for high energy ER (1 MeV range).