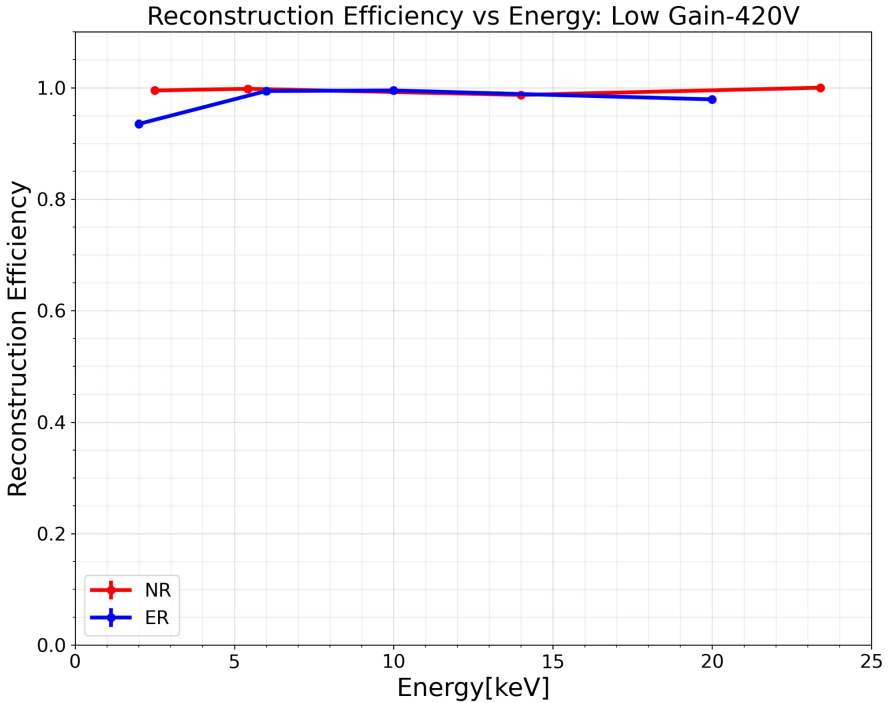
Analysis of 420 V simulation

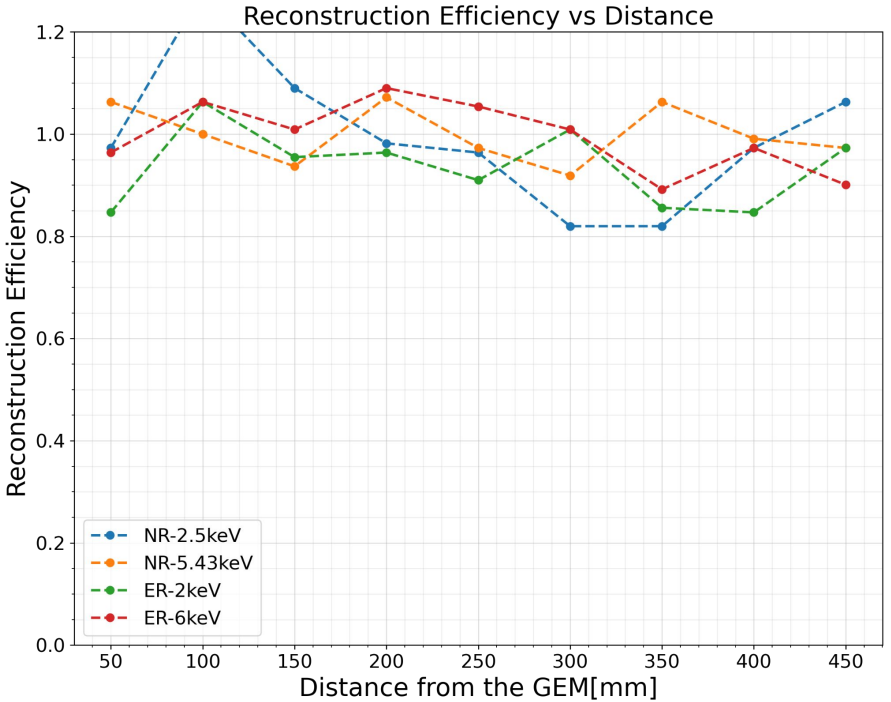
Atul Prajapati Simulation Meeting 18/03/2024

Simulation of 420 V events

- Low Gain Simulations
  - GEM V: 420 V
  - Drift Field : 400 V/cm
  - Diffusion parameters:
    - σ_0^T = 350 μm
    - σ^T = 160 μm/√cm
    - σ_0^L = 260 μm
    - σ^L = 145 μm/√cm
- Energy
  - ER: 2,6,10,20,30,40,50
  - NR: 6,10,20,30,40,50,60
  - NR-QF: 2.5,5.4,14,23.4,33,42.8,49
- Cuts:
  - Noise: rms >3 & tgausssigma x 0.152 > 0.5
  - Geometrical: sc_xmin & sc_ymin >350, sc_xmax & sc_ymax<1950

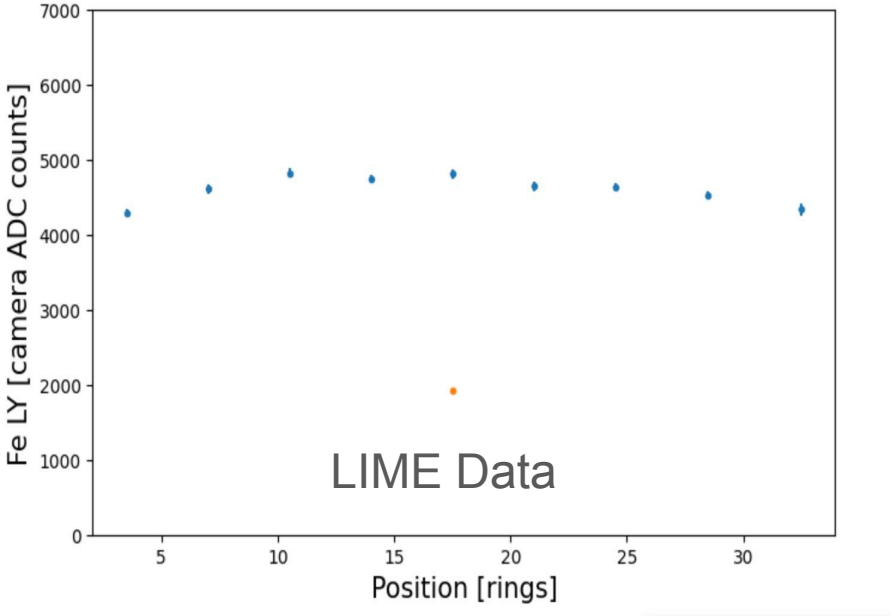
Reconstruction efficiency

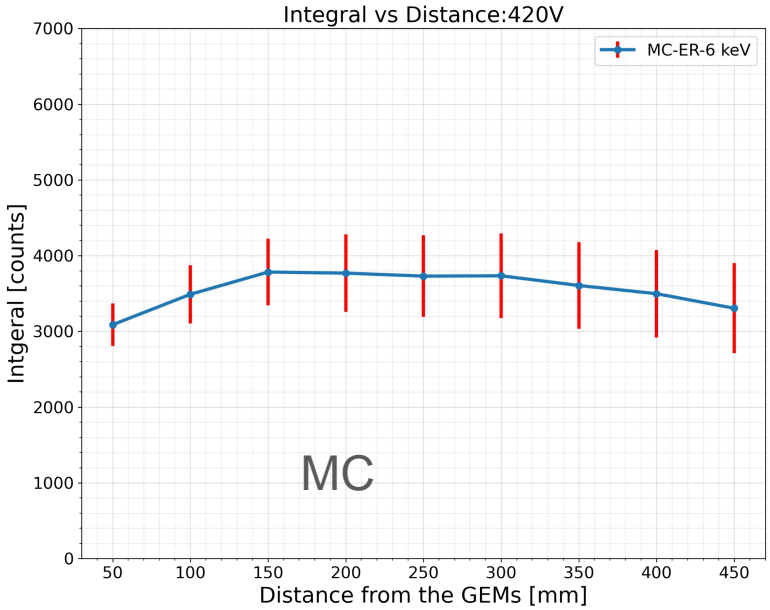




Reconstruction efficiency is better compared to 400 V data and also 440 V data at the same energy. This is due the the “RMS” cut applied. For 440 V, I have used the cut “sc_rms > 6”, whereas for the 400V data I have used “sc_rms >3“. And I have used the same cut “sc_rms >3” for 420 V data as well, therefore at lower energies it is removing less events than 440 V data.

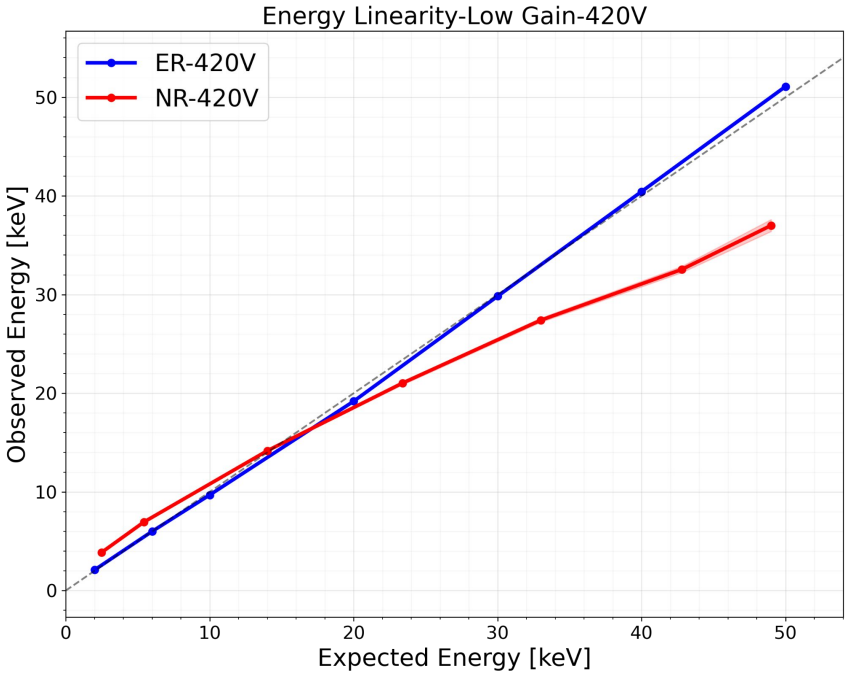
MC ER- 6 keV and Fe data @ 420 V

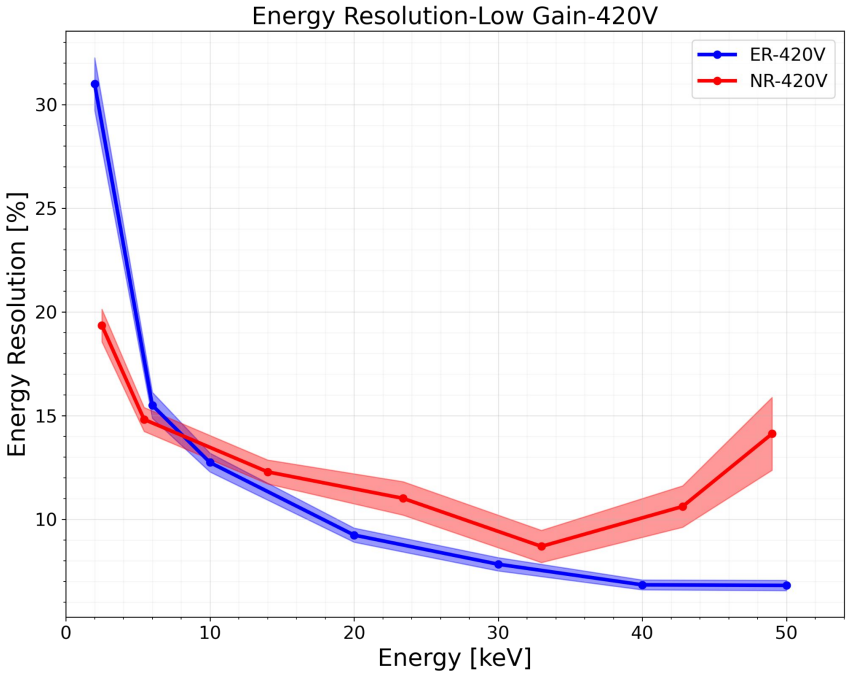




LY in the simulation is lower but the behaviour is same as observed in the data.

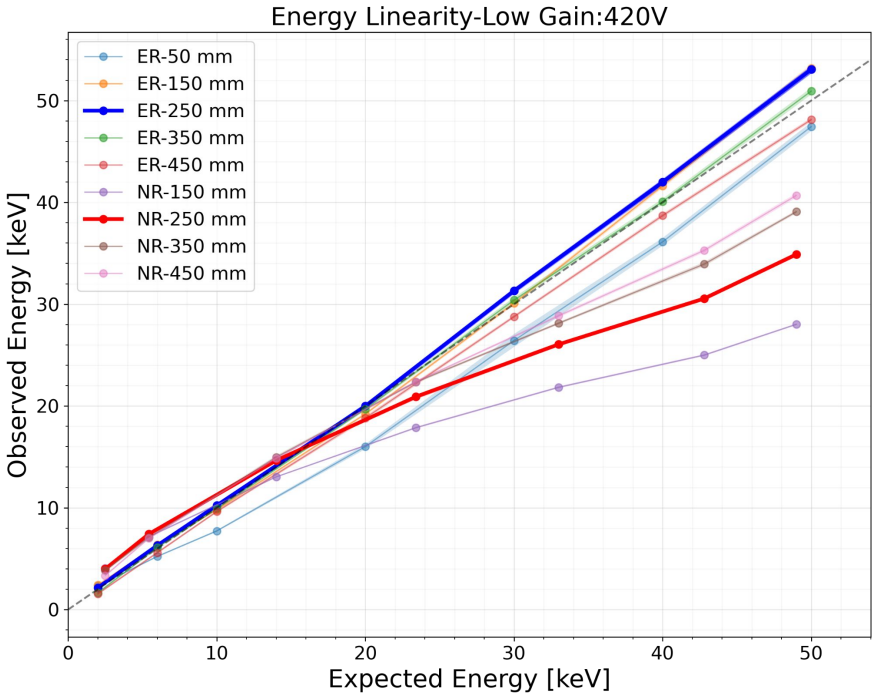
Energy Linearity and Resolution

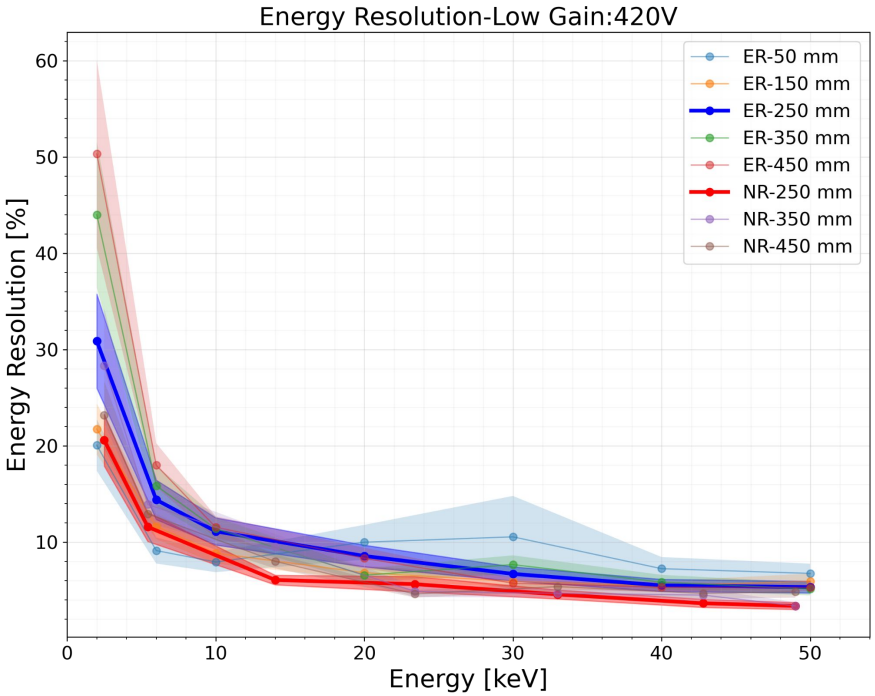




Linearity is better than 440 V simulation (for NR) but slightly worse than 400V simulation.

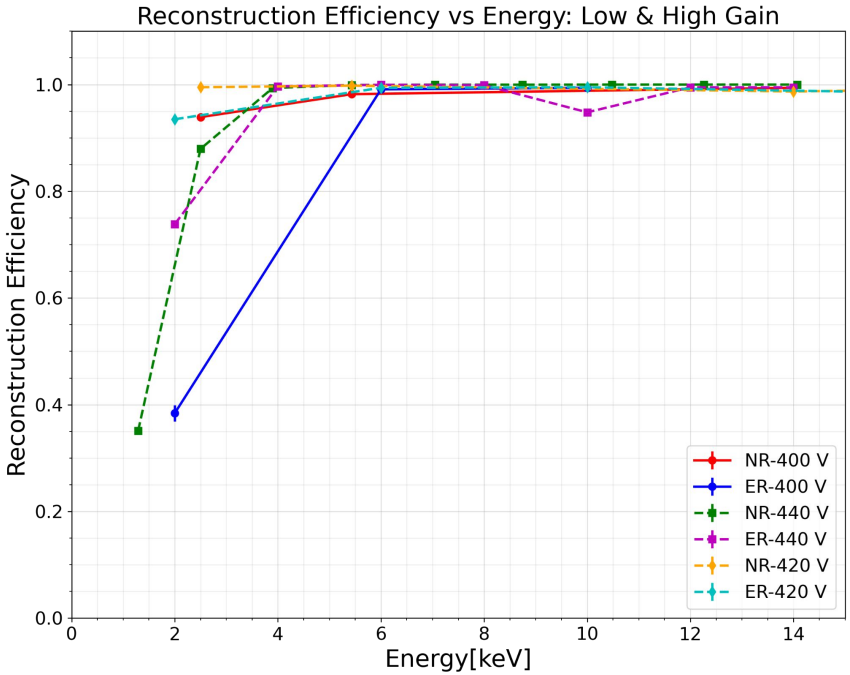
Energy linearity and resolution at different distances



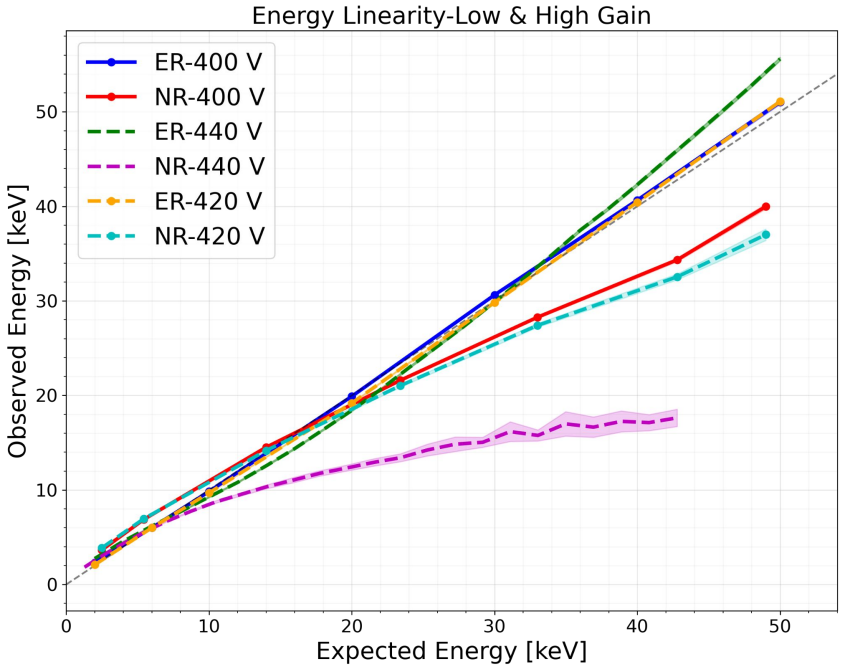


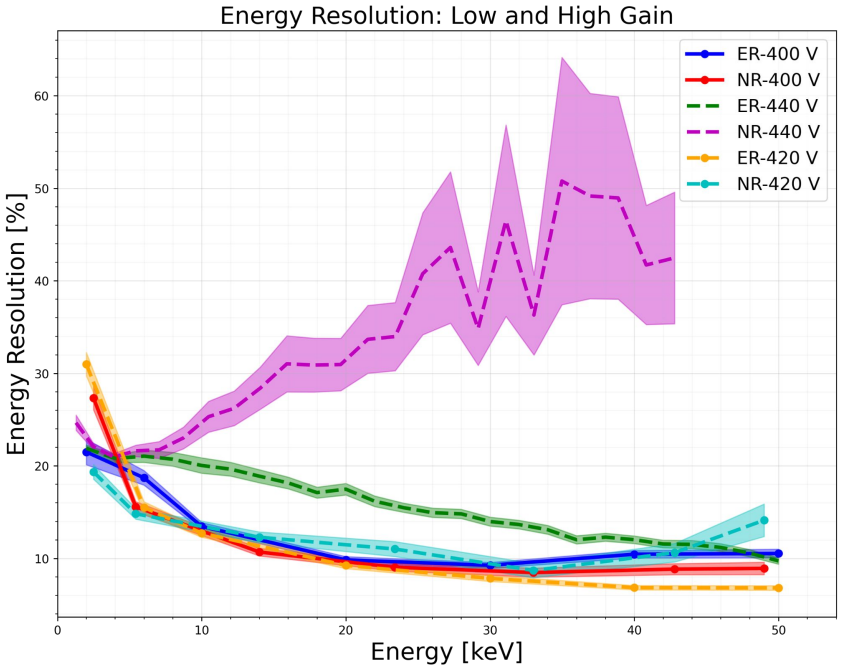
Comparison between 440 V, 420 V & 400 V simulation

Reconstruction efficiency

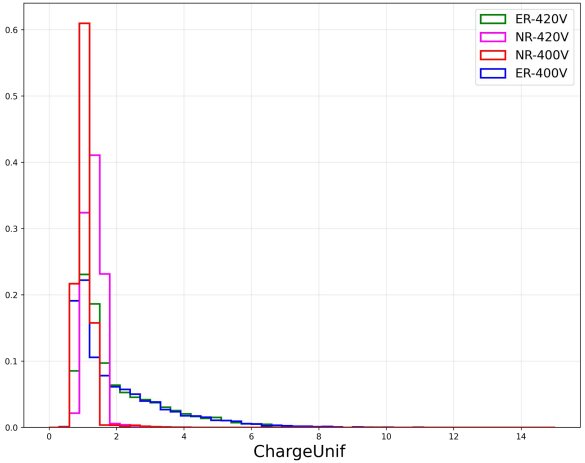


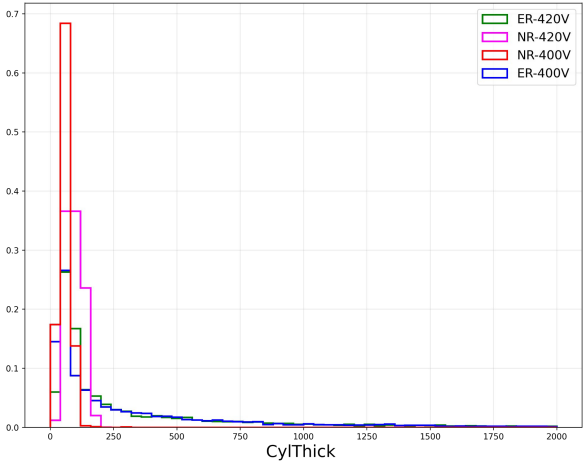
Energy Linearity and resolution

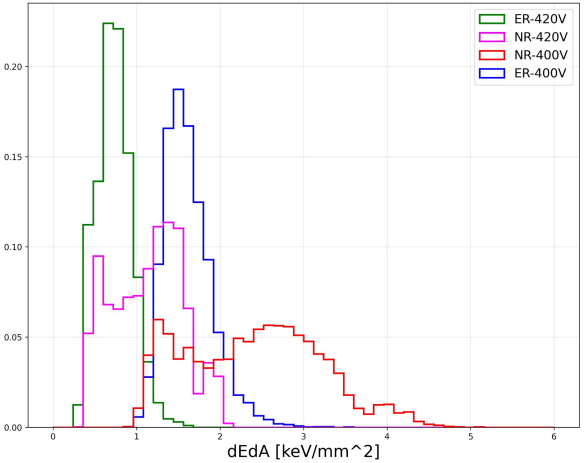


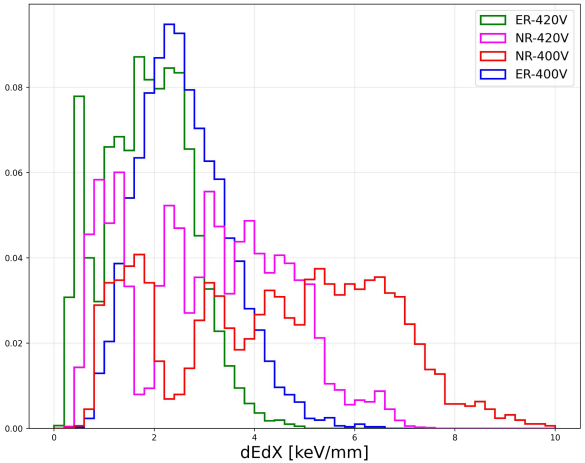


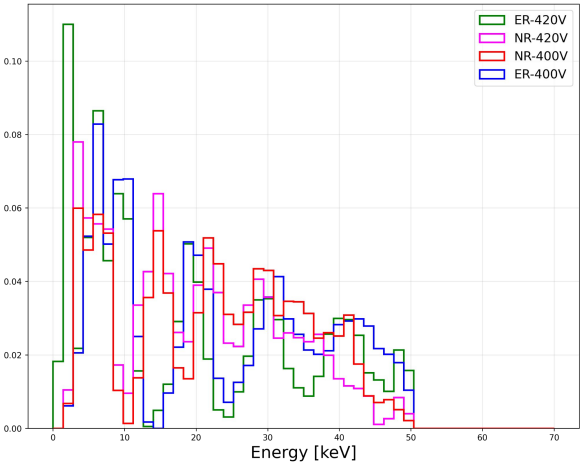
Shape Variables Comparison 420 V and 400V

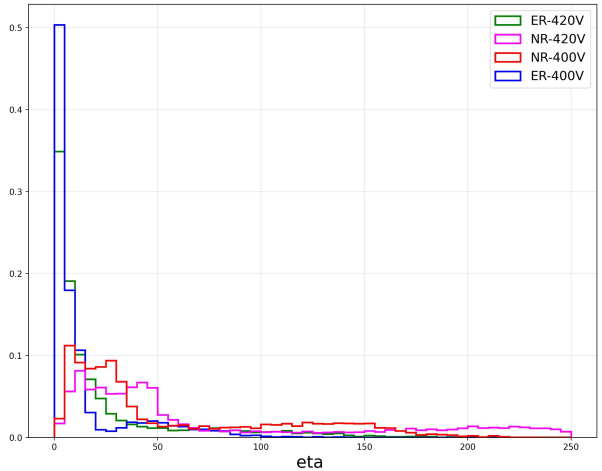

ER-420V
NR-420V
NR-400V
ER-400V
ChargeUnif

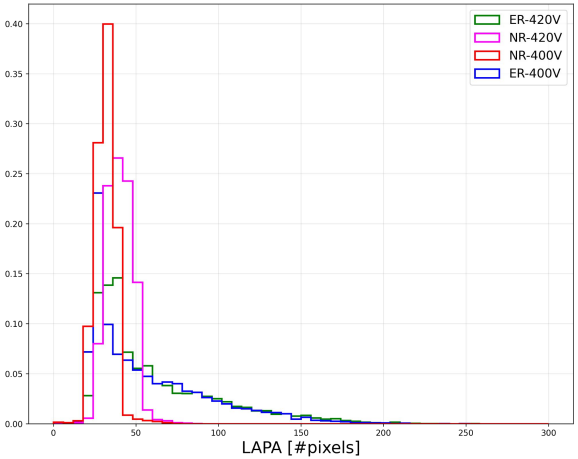

ER-420V
NR-420V
NR-400V
ER-400V
CylThick

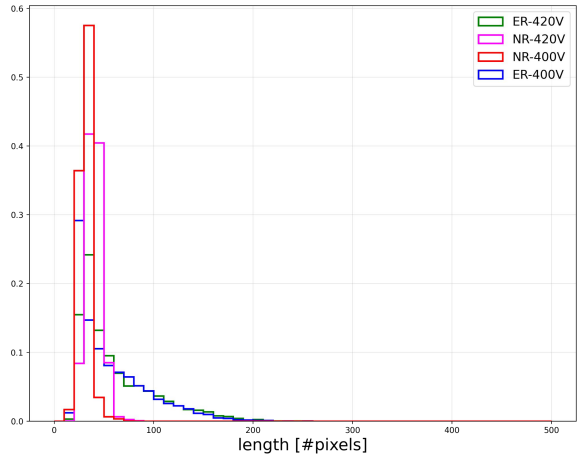

ER-420V
NR-420V
NR-400V
ER-400V
dEdA [keV/mm^2]

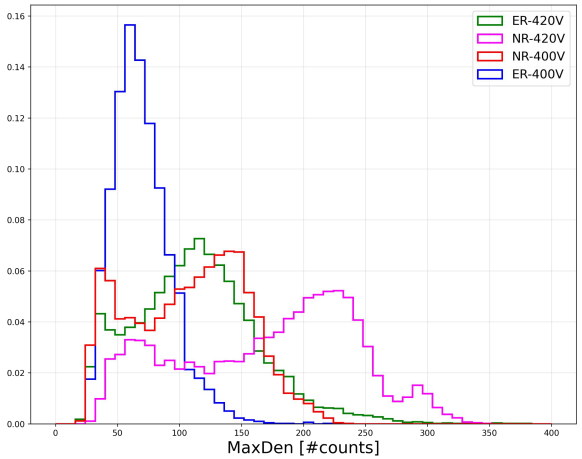

ER-420V
NR-420V
NR-400V
ER-400V
dEdX [keV/mm]

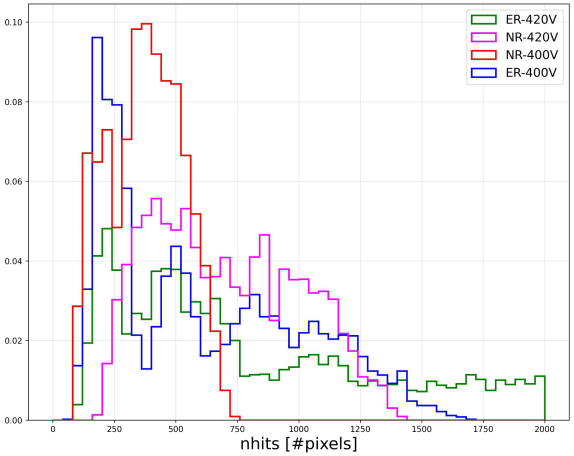

ER-420V
NR-420V
NR-400V
ER-400V
Energy [keV]

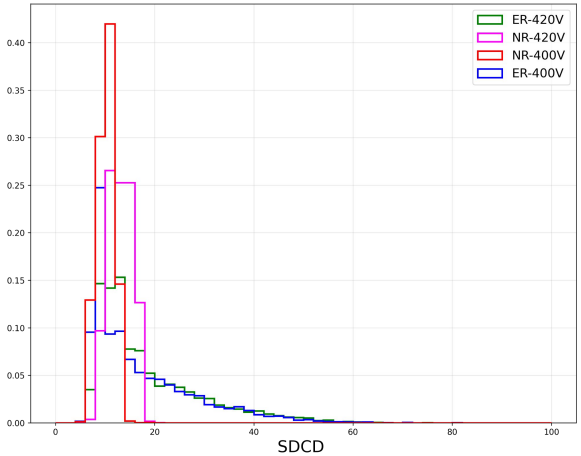

ER-420V
NR-420V
NR-400V
ER-400V
eta

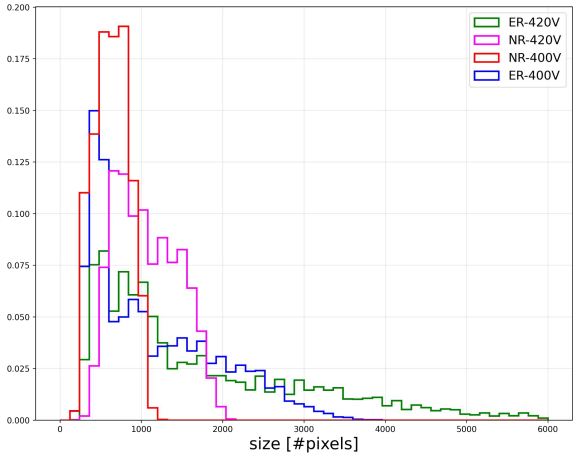

ER-420V
NR-420V
NR-400V
ER-400V
LAPA [#pixels]

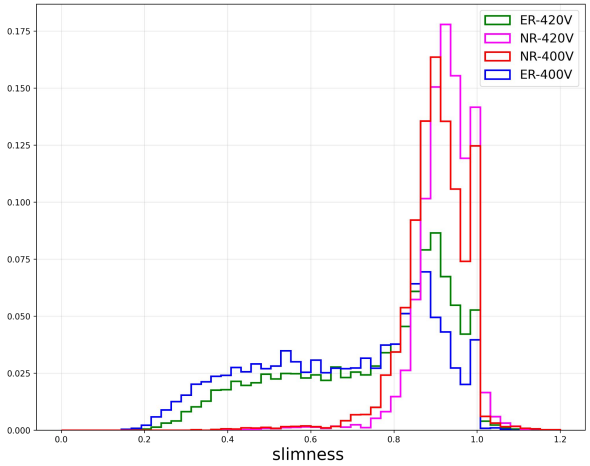

ER-420V
NR-420V
NR-400V
ER-400V
length [#pixels]

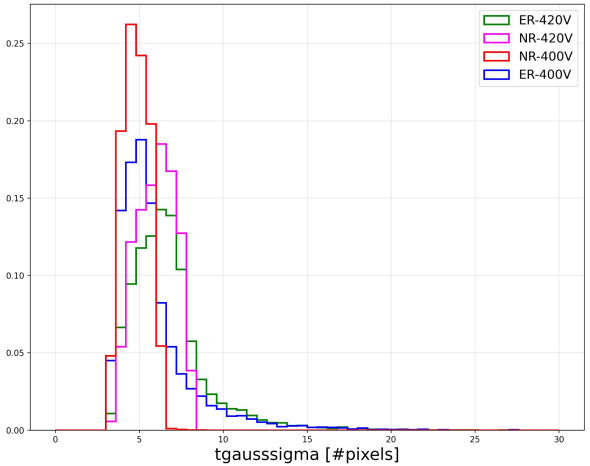

ER-420V
NR-420V
NR-400V
ER-400V
MaxDen [#counts]

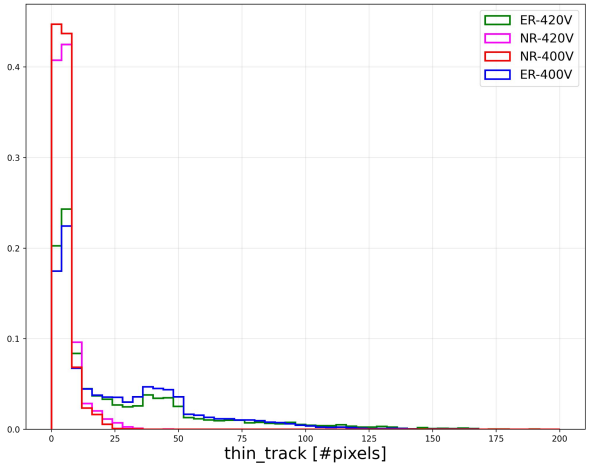

ER-420V
NR-420V
NR-400V
ER-400V
nhits [#pixels]

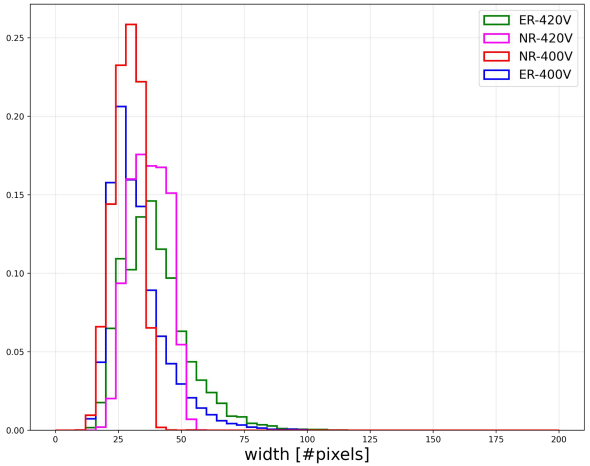

ER-420V
NR-420V
NR-400V
ER-400V
SDCD


ER-420V
NR-420V
NR-400V
ER-400V
size [#pixels]









From shape variables like tgausssigma and width we can see that the 420 V simulation is more diffused as expected due to lower drift field.