

IC Local Meeting

TITUS DASCALU

MAY 15, 2020

Overview

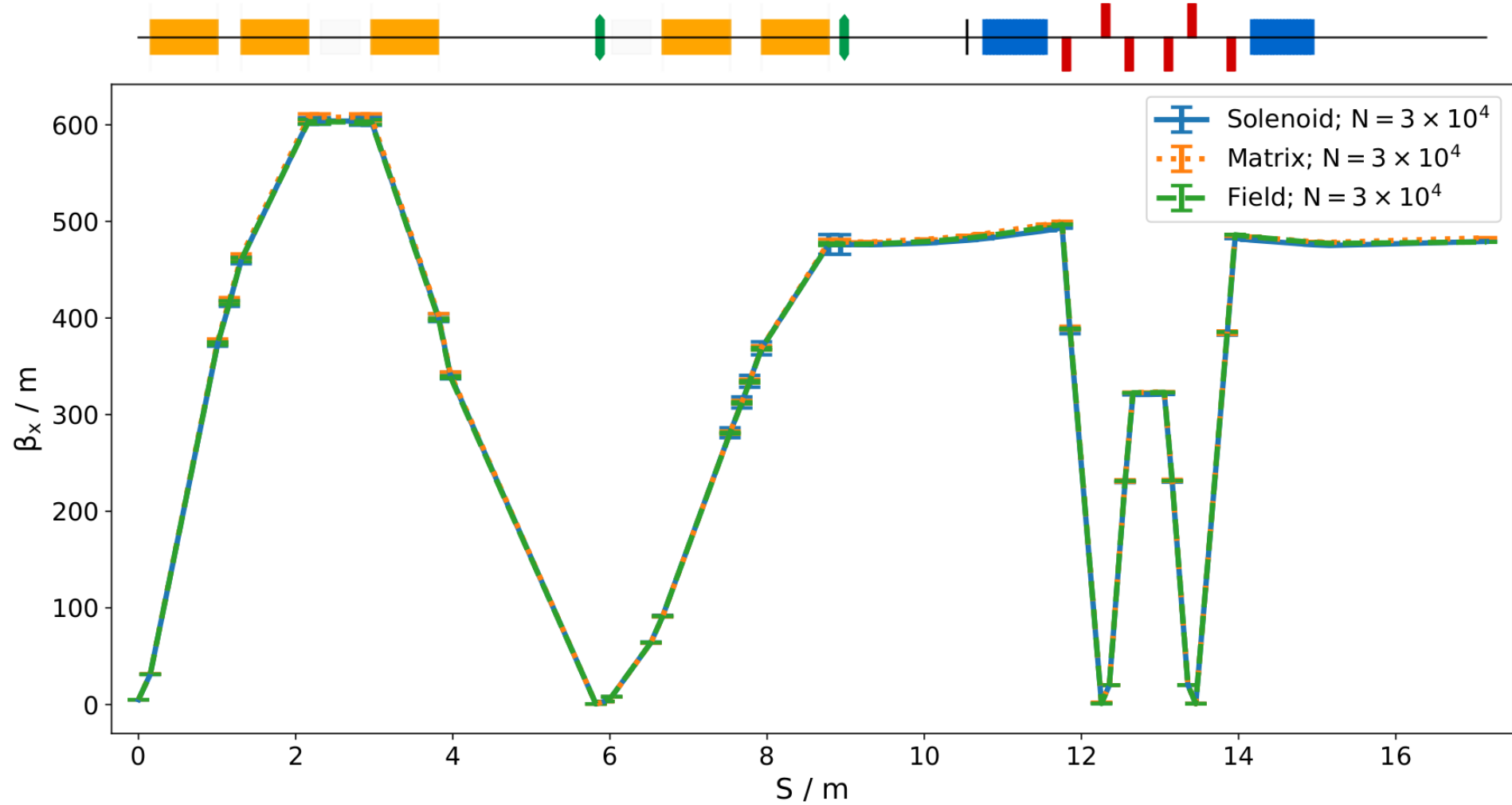
- Replace solenoids with Gabor lenses (maintaining the same focusing strength)
- Generate ideal E field map – loaded into BDSIM
- Choose interpolator and integrator which gives optics consistent with both solenoids and lens transfer matrices
- Ideal E field from:

$$E_r = -\frac{en_e}{2\epsilon_0} r$$

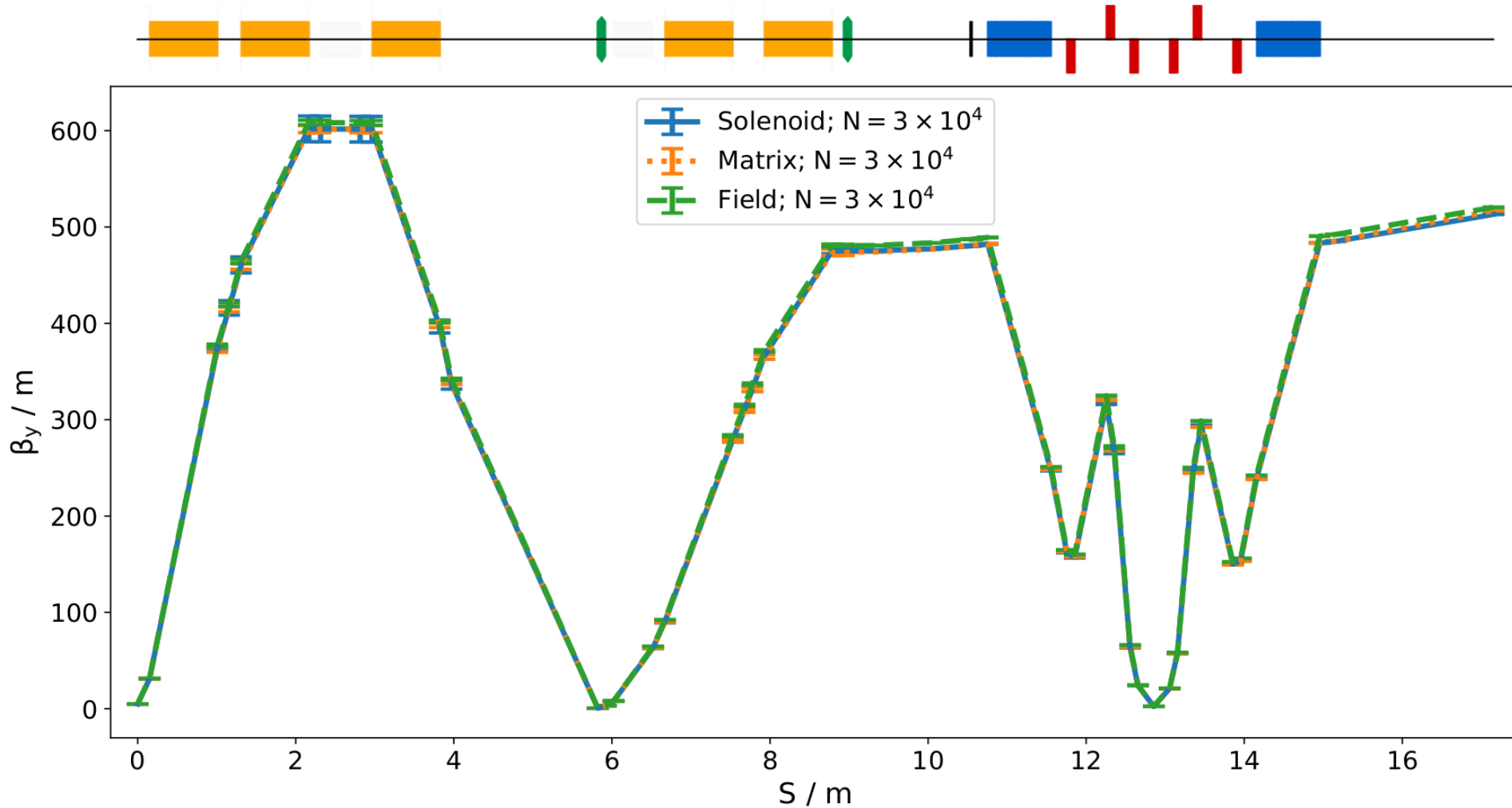
$$n_{e,max} = \frac{\epsilon_0}{2m_e} B_{GL}^2$$

$$B_{GL} = B_{sol} \sqrt{Z \frac{m_e}{m_{ion}} \frac{1}{\gamma_0}}$$

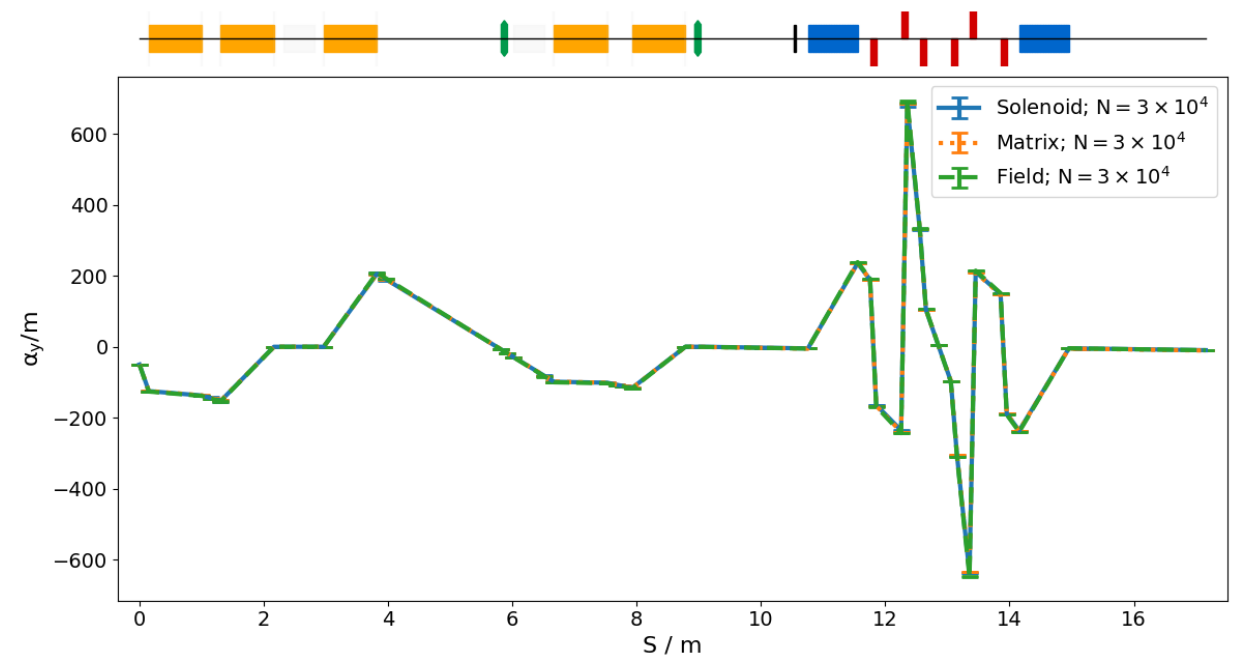
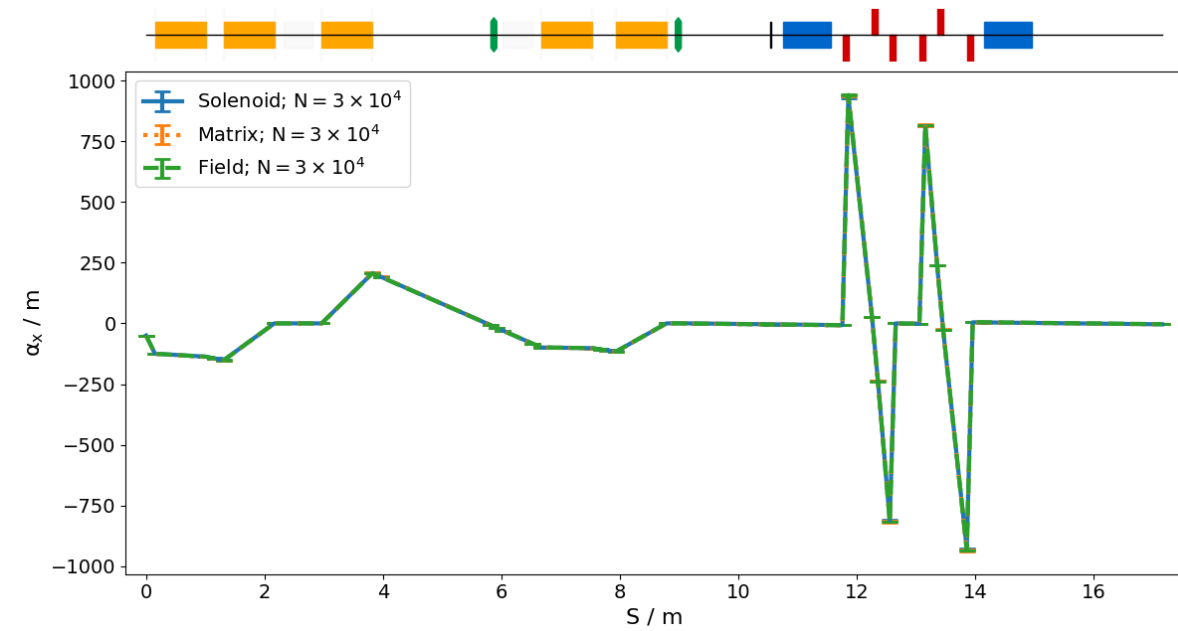
Optical comparison – β_x



Optical comparison – β_y

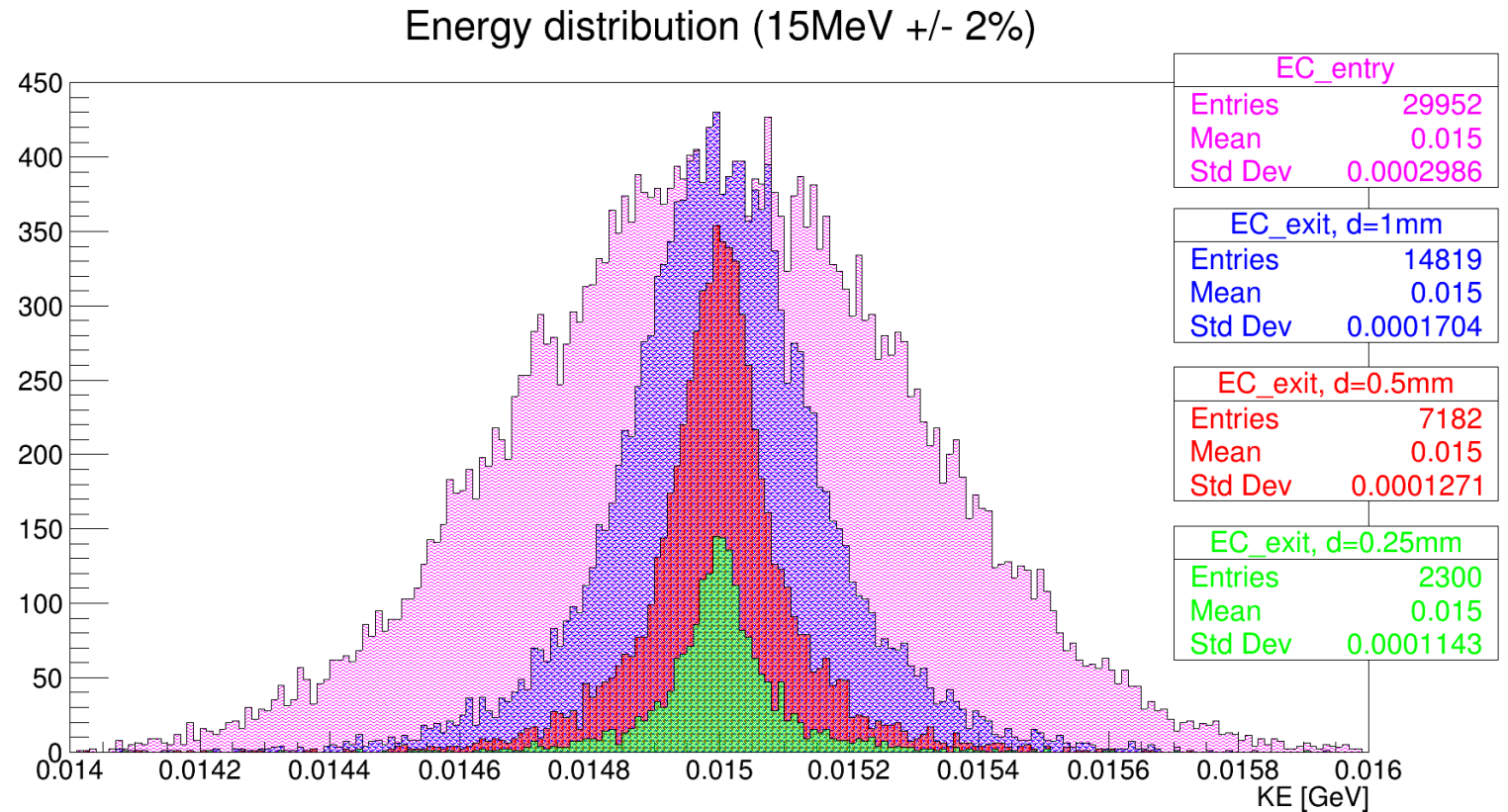


Optical comparison – α_x, α_y



Beam 1 – 15 MeV \pm 2% (Gauss from Twiss)

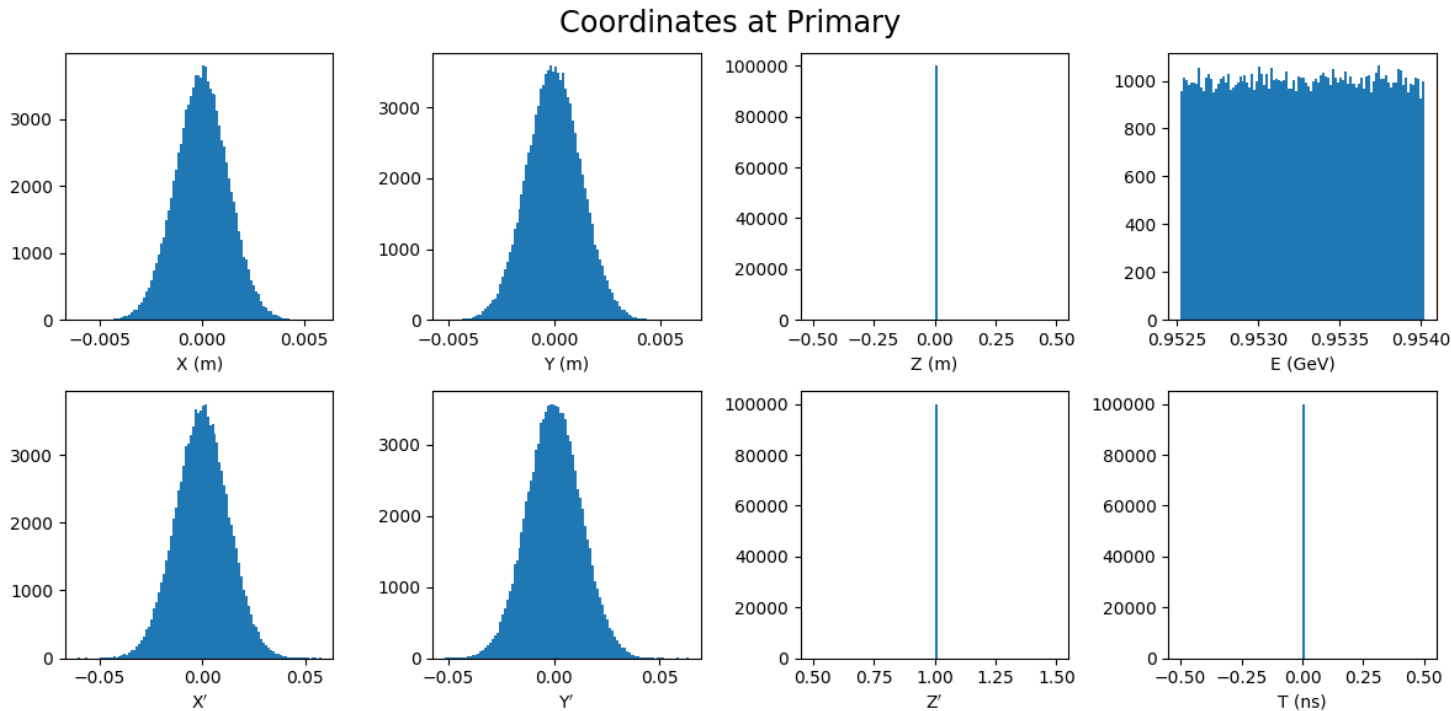
- Use Gaussian beam to adjust the position of the energy collimator such that the downstream beam is centred at 15.00 MeV
- If the collimator is placed at focal length of 3rd lens: $E_{\text{central}} = 15.03$ MeV
- An offset of about 1.5cm towards the 3rd lens ensures $E_{\text{central}} = 15.00$ MeV
- Collimator length = 1cm
- Collimator diameters:
d = 1mm, 0.5mm, 0.25mm



Beam 2 – 15 MeV \pm 5% (flat energy profile)

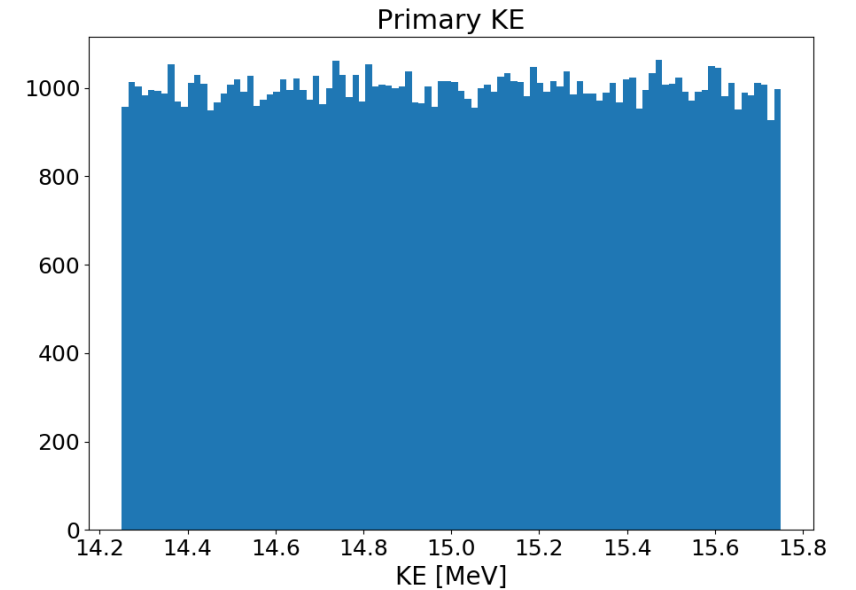
- Primary beam started at 10 cm from source

$N = 10^5$ particles



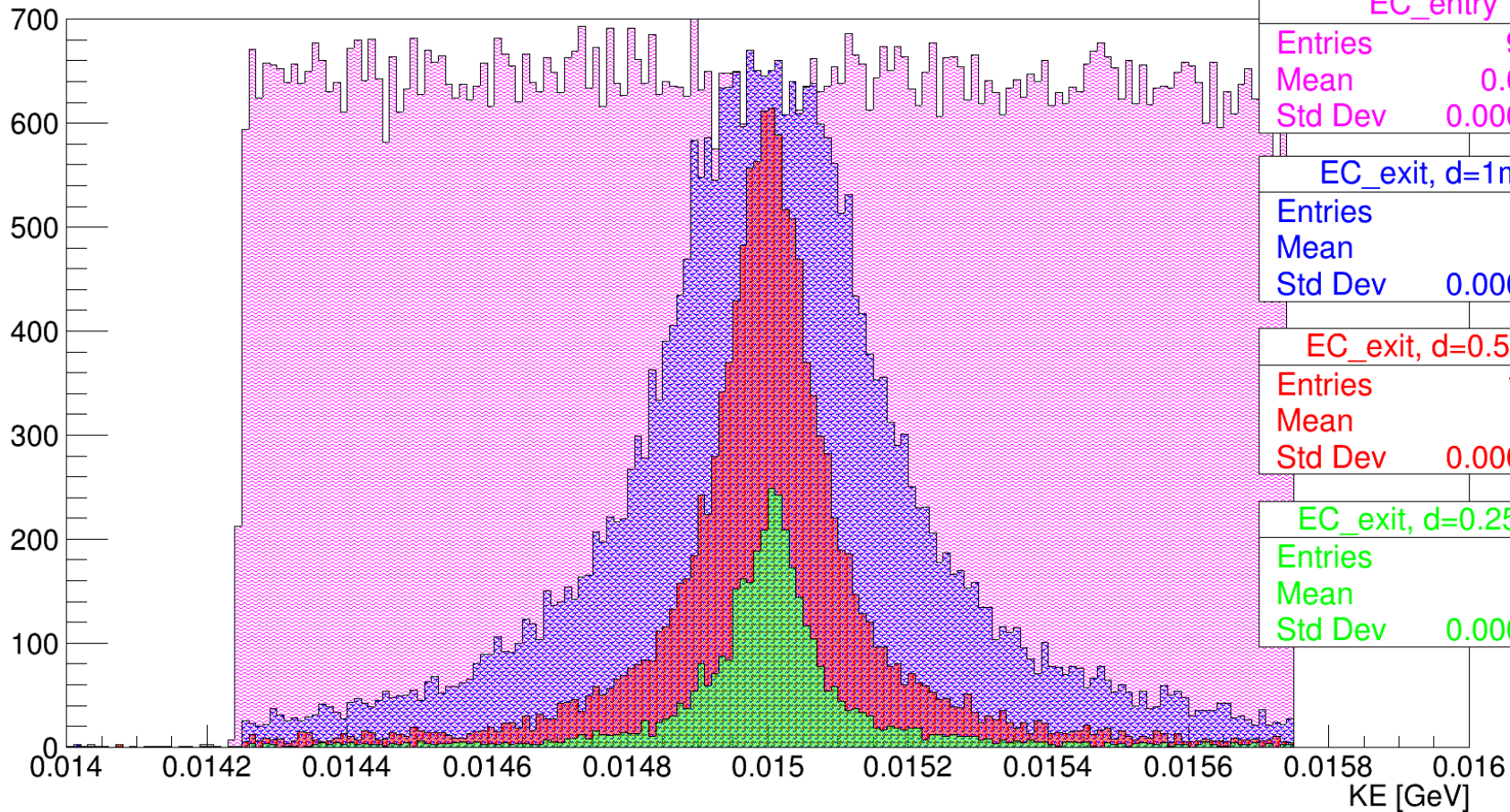
x,y: Gauss from Twiss

E,T: square



Beam 2 – 15 MeV \pm 5% (flat energy profile)

Energy distribution (15MeV +/- 5%)



EC_entry	
Entries	96693
Mean	0.01499
Std Dev	0.0004319

EC_exit, d=1mm	
Entries	30291
Mean	0.015
Std Dev	0.0002387

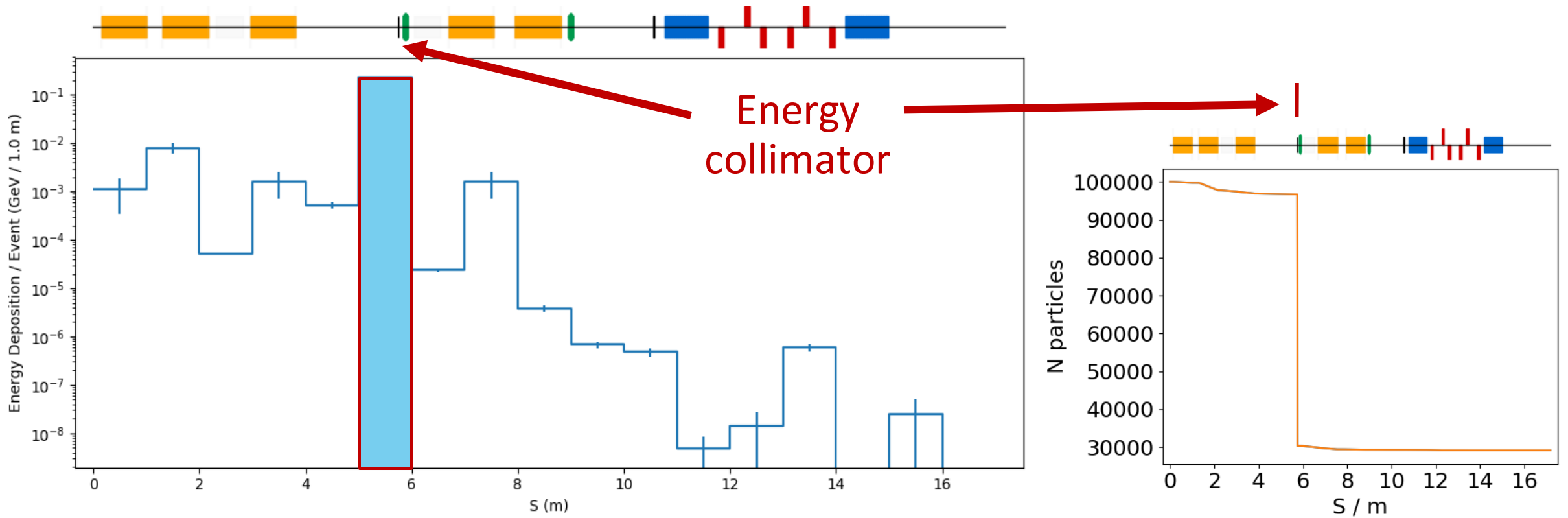
EC_exit, d=0.5mm	
Entries	13744
Mean	0.015
Std Dev	0.0001797

EC_exit, d=0.25mm	
Entries	4213
Mean	0.015
Std Dev	0.0001617

% Particles Downstream of collimator	Std Dev as % out of 15MeV
31%	1.591%
14%	1.198%
4%	1.078%

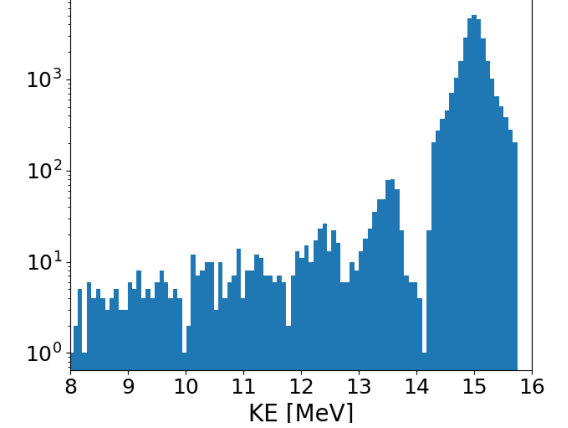
Beam 2 – 15 MeV \pm 5% (flat energy profile)

- Verify energy deposition and particle number (d=1mm)

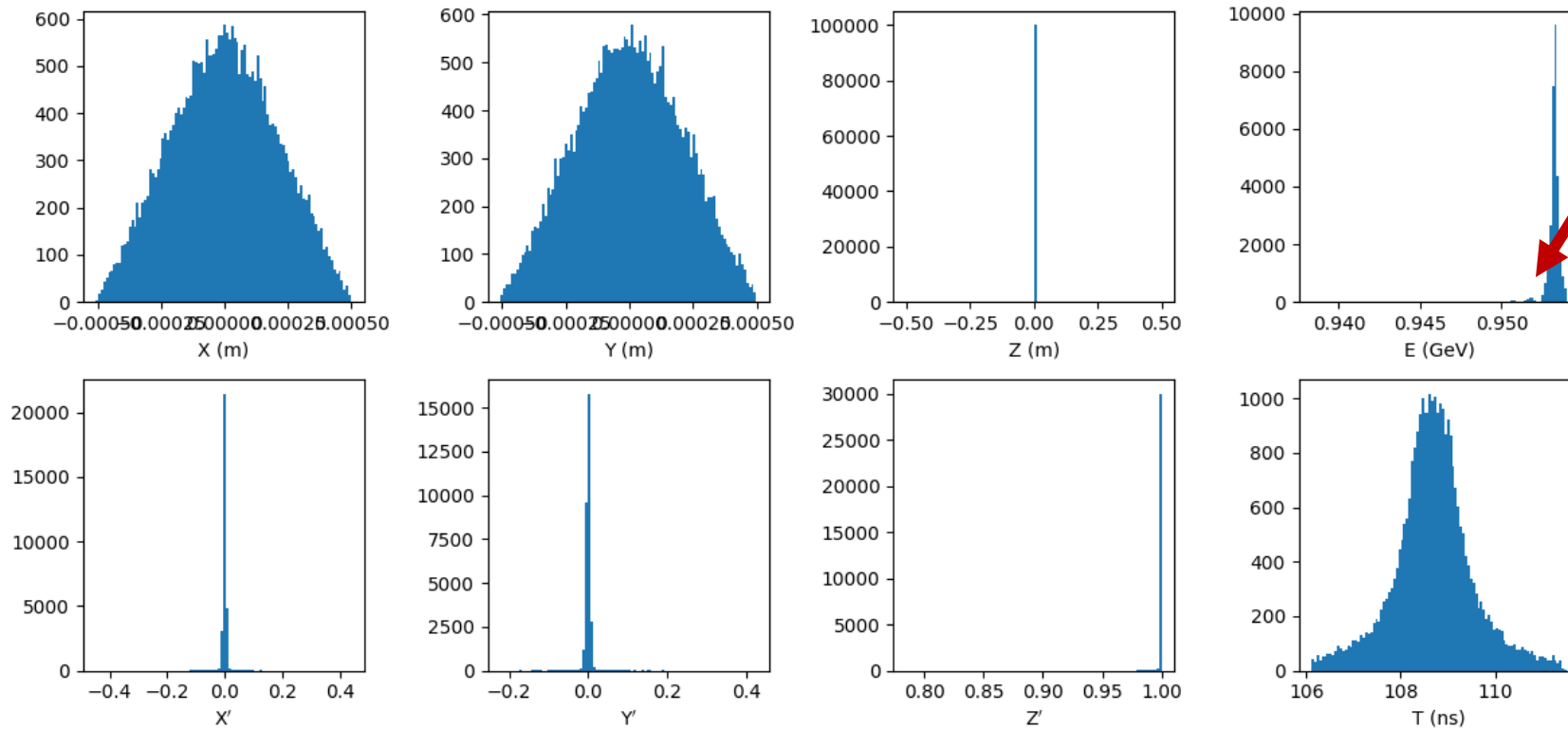


Beam 2 – 15 MeV \pm 5% (flat energy profile)

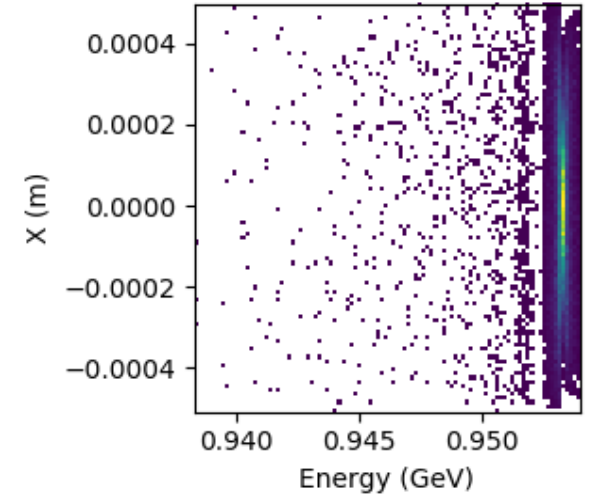
- Verify phase space downstream of collimator (d=1mm)



Coordinates at energy_col.

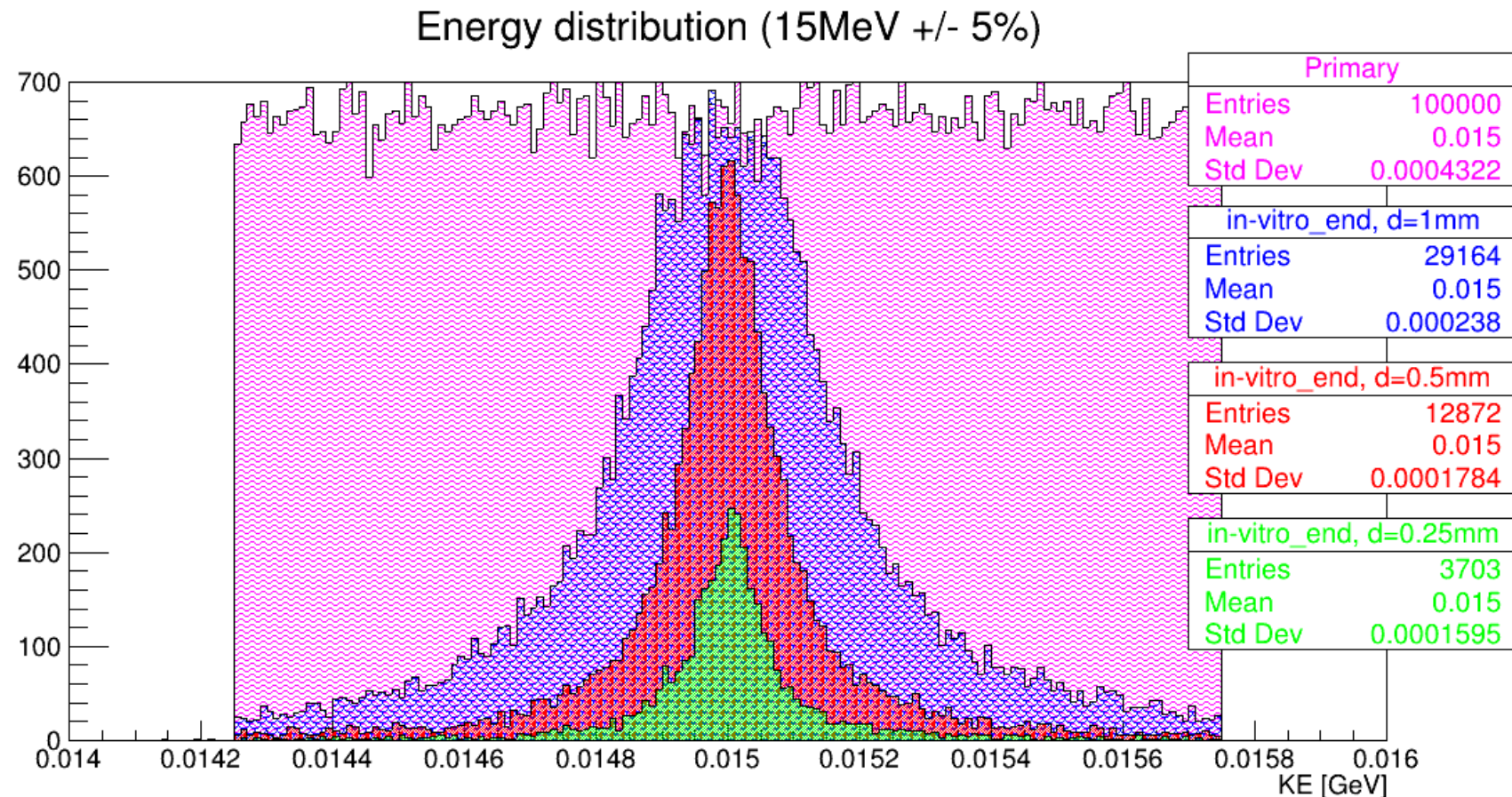


Secondary peaks



Beam 2 – 15 MeV \pm 5% (flat energy profile)

- Verify KE distribution at the end of in-vitro line (end of last drift)



Std Dev as %
out of 15MeV

1.587%

1.189%

1.063%

Virtually same Std.Dev.
as downstream of
energy collimator