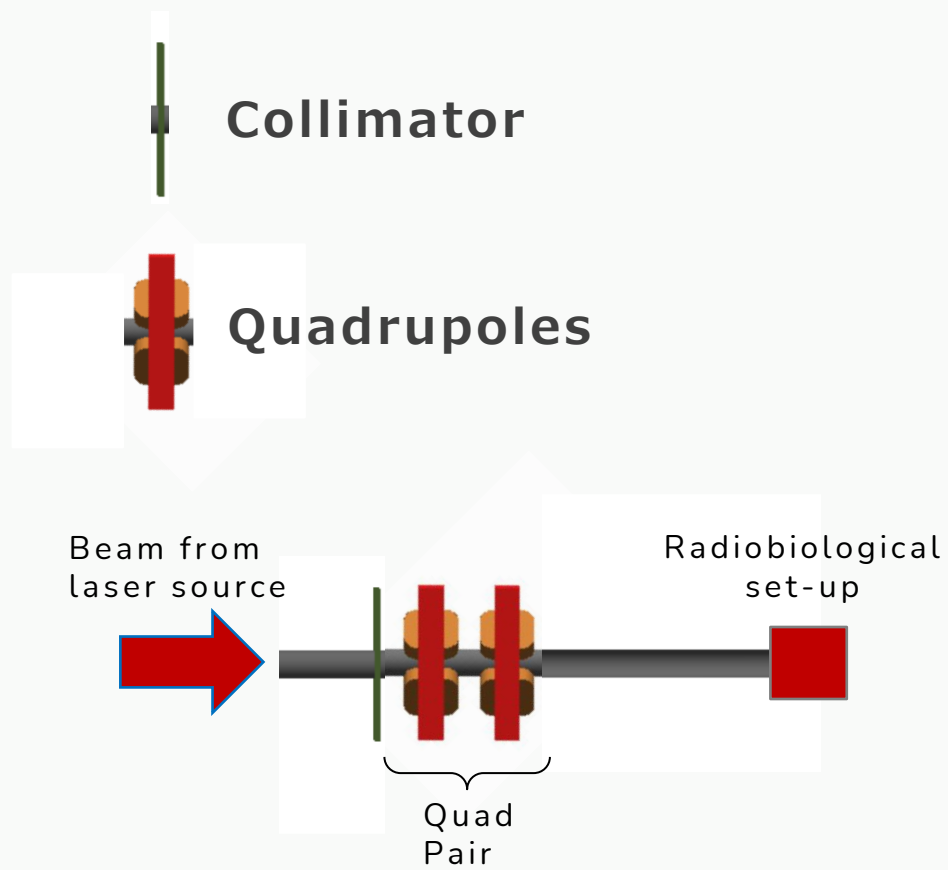


BEAMLINE OPTIMISATION UPDATES

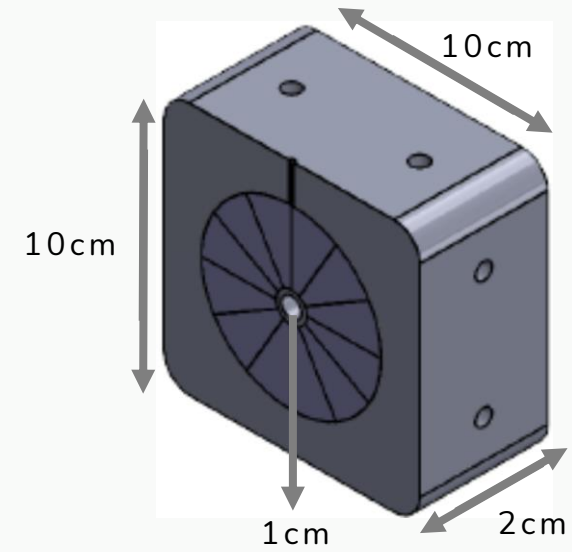
PoPLaR workshop

22/11/2024





Halbach Quadrupoles

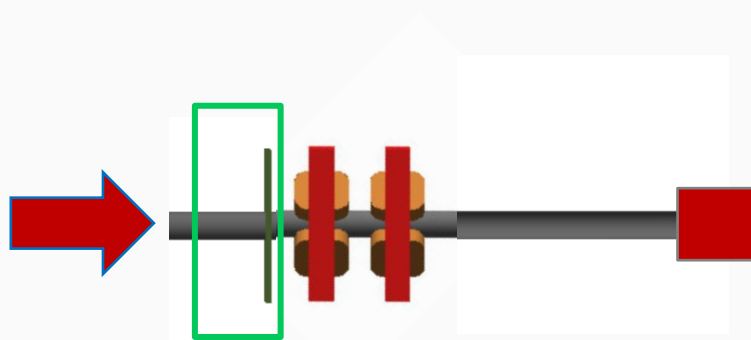


PoPLaR Components

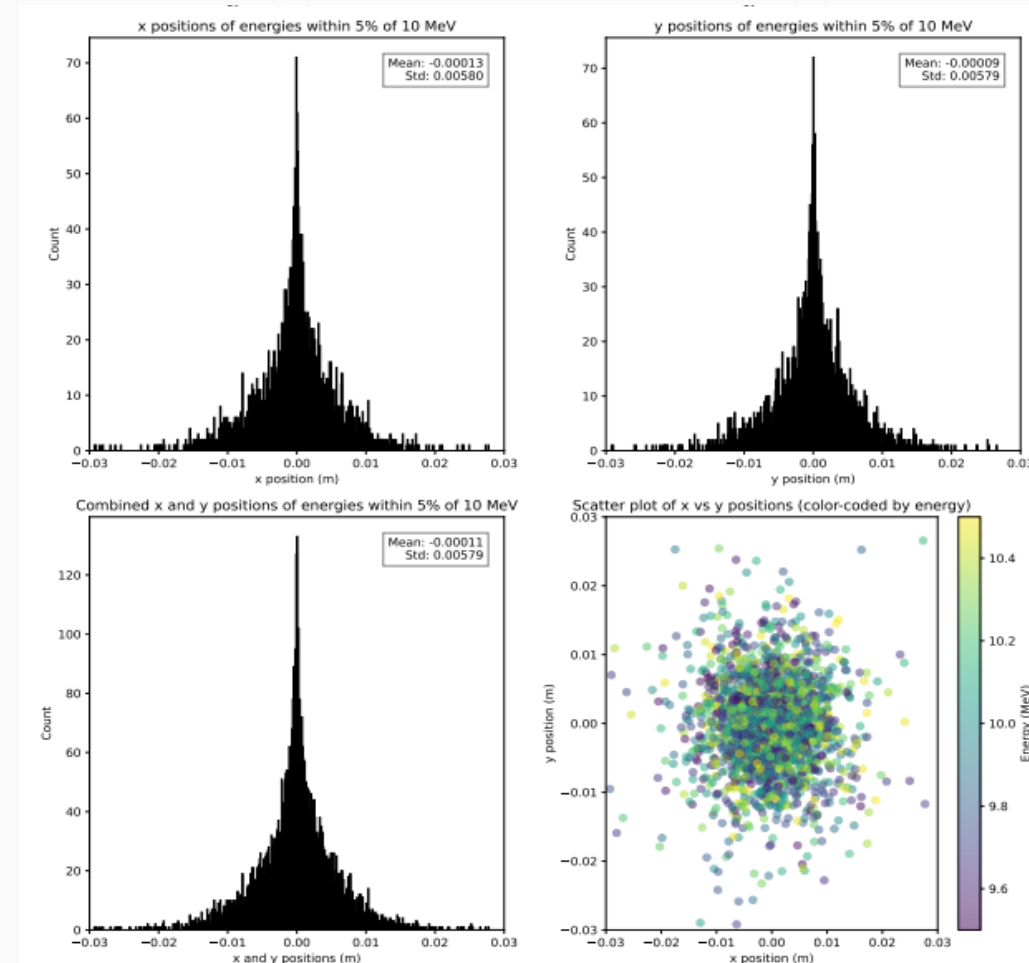
Optimisation Step 1- Collimator 1

Mapping the positions of the particles with 10MeV ($\pm 5\%$) at 3cm:

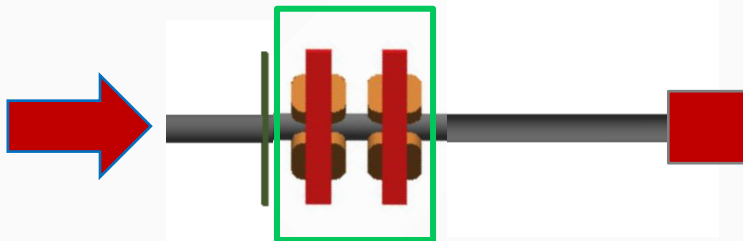
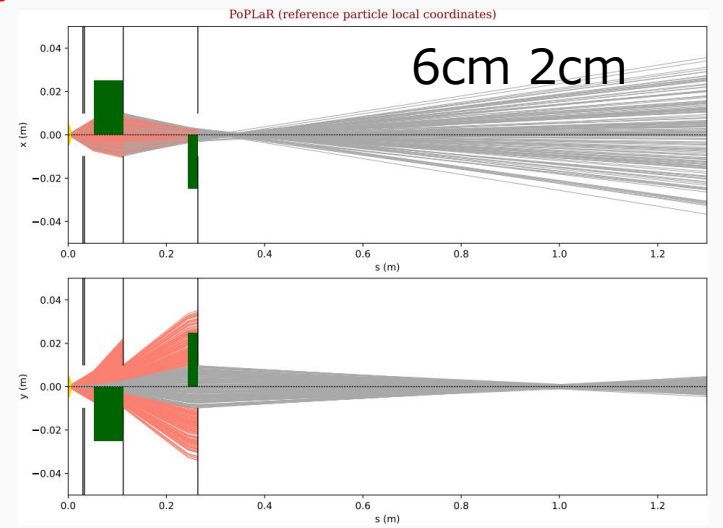
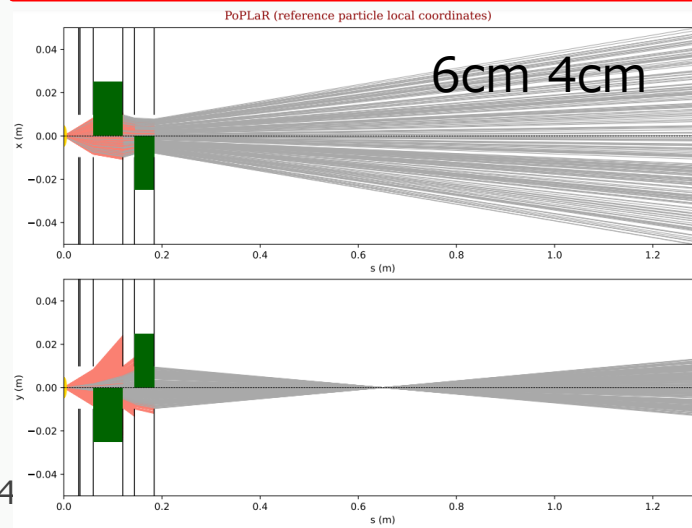
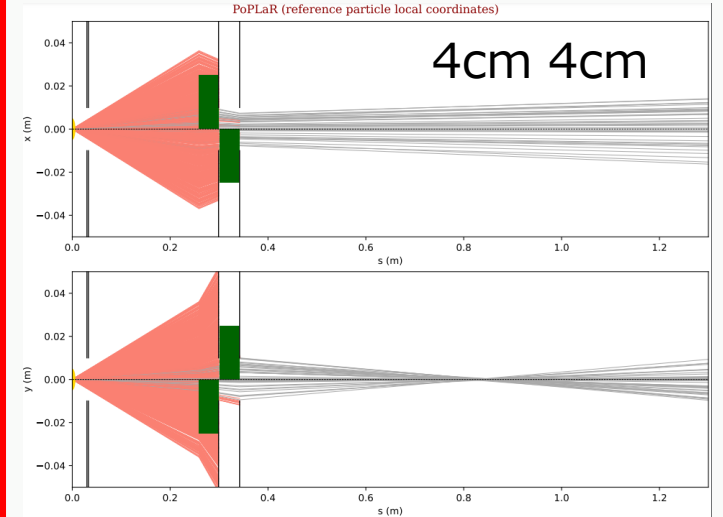
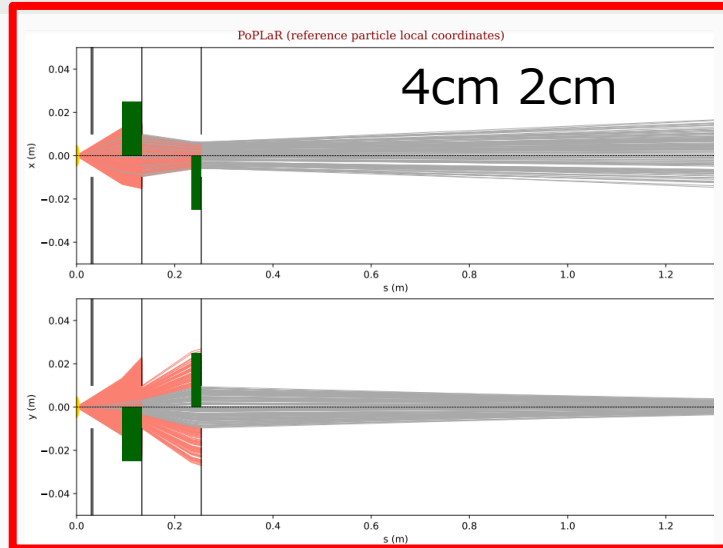
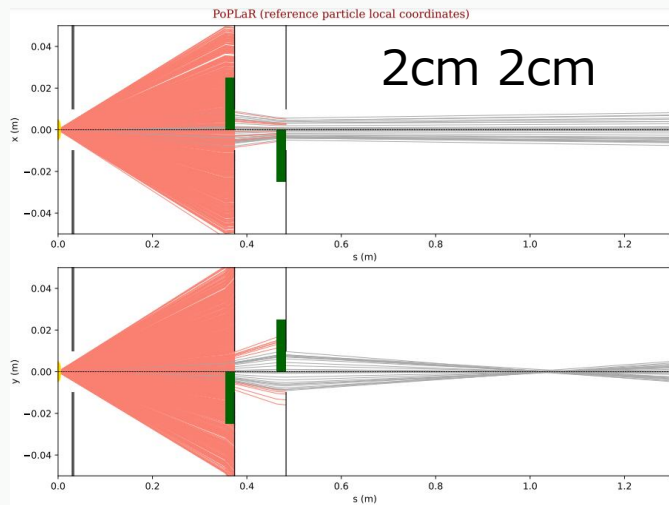
- Mean & std similar in x and y- use circular collimator
- 1cm radius circular aperture decided on



PoPLaR: Source



Optimisation Step 2- Quad doublet

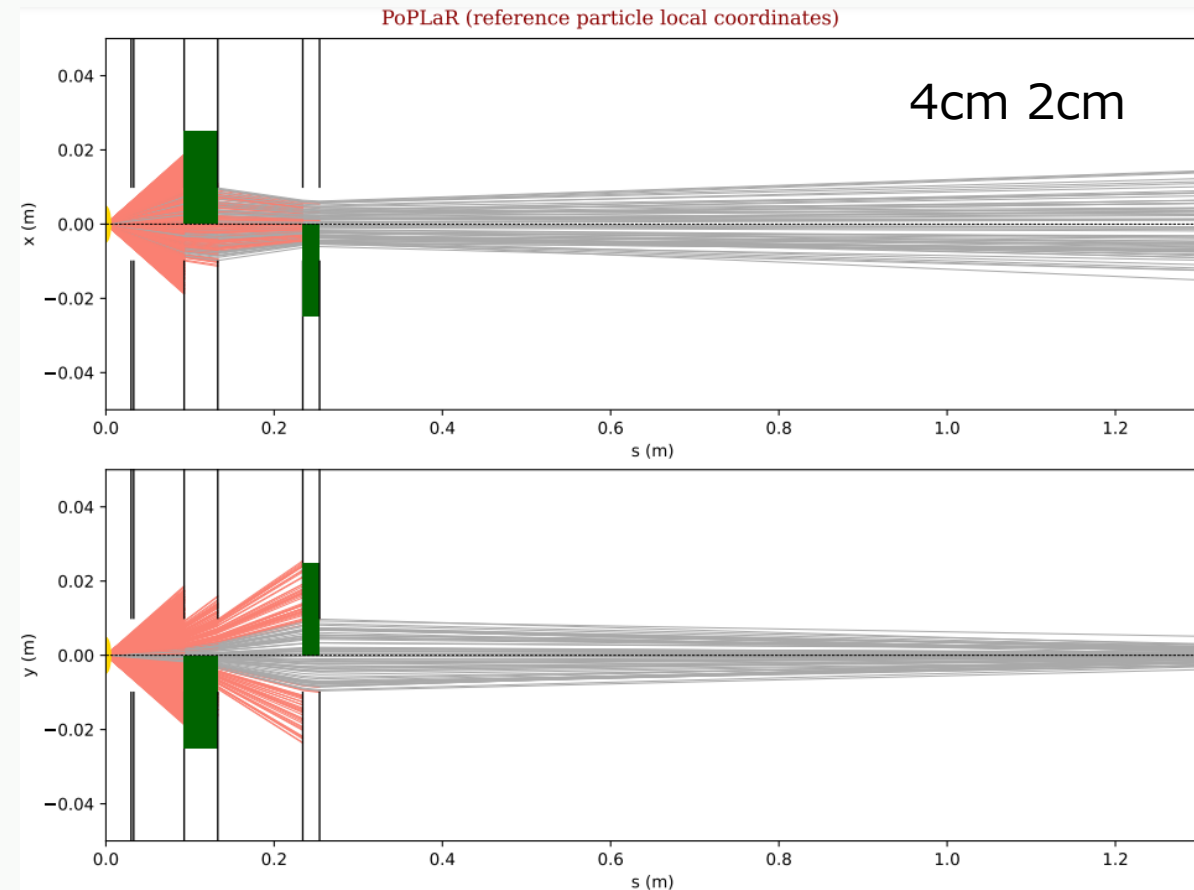
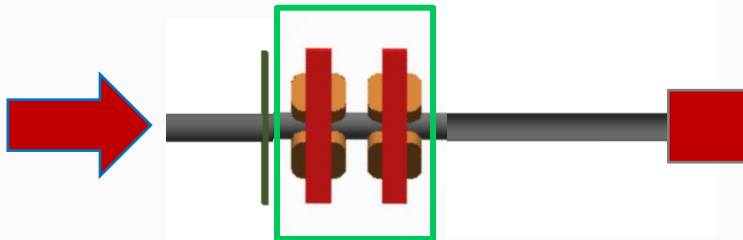


Optimisation Step 2- Quad doublet

Cost function for Bayesian to create circular aperture to create spot size between 1 and 3cm.

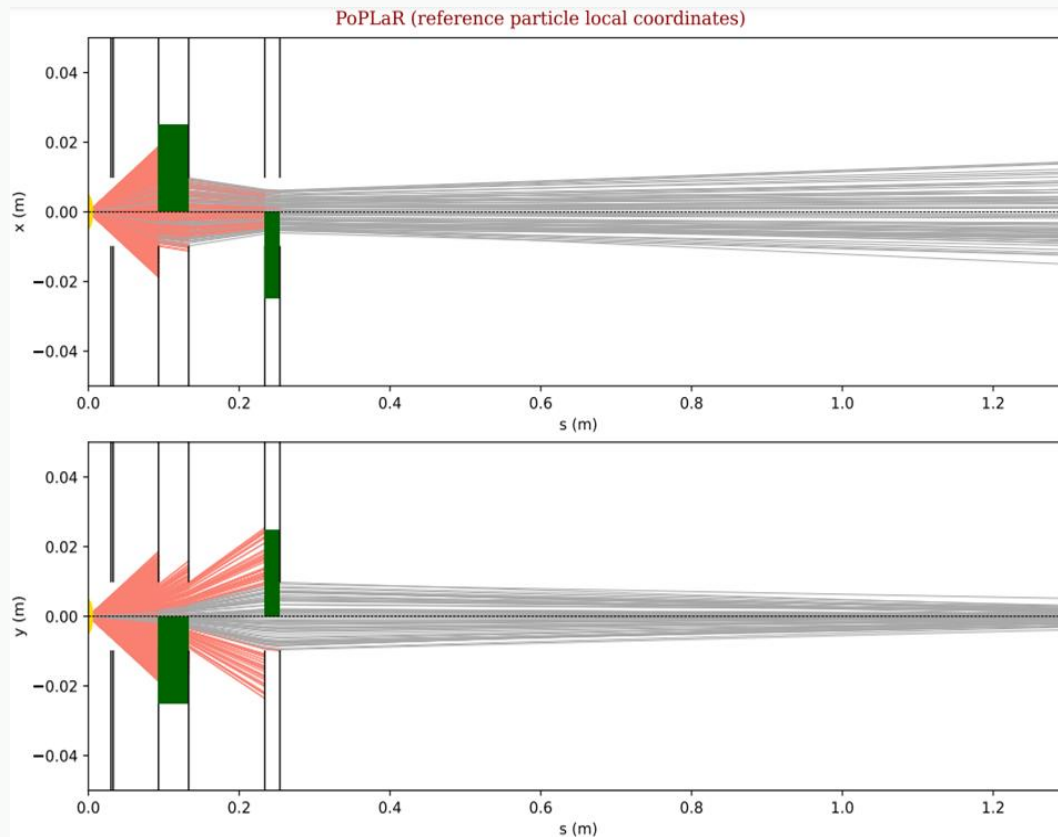
Bayesian Optimisation showed optimal positions of:

- Focus quad: 9.3cm from laser source
- Defocus quad: 23.4cm from laser source

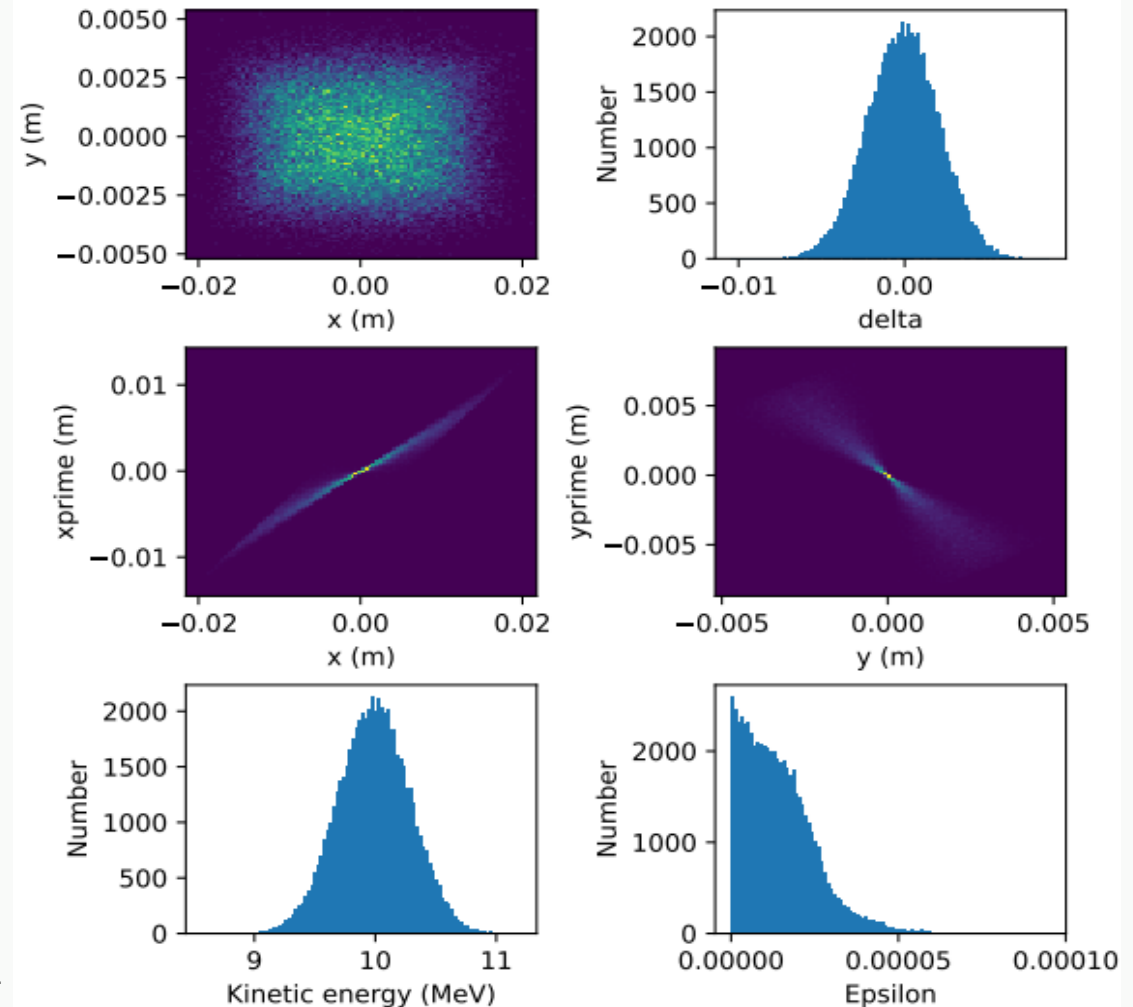


Sensitivity testing step 1- xy shifting

Reference: 4cm 2cm quad combination

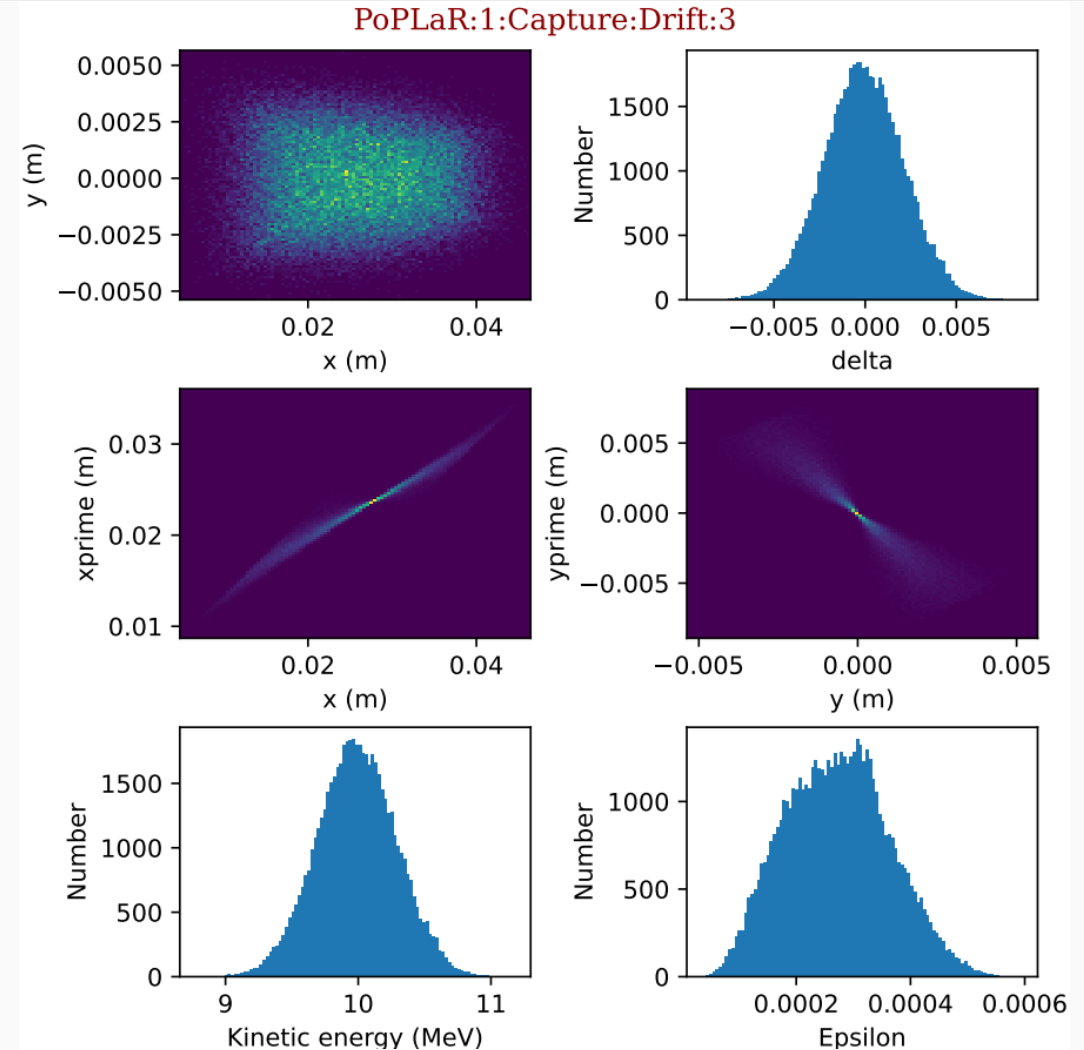
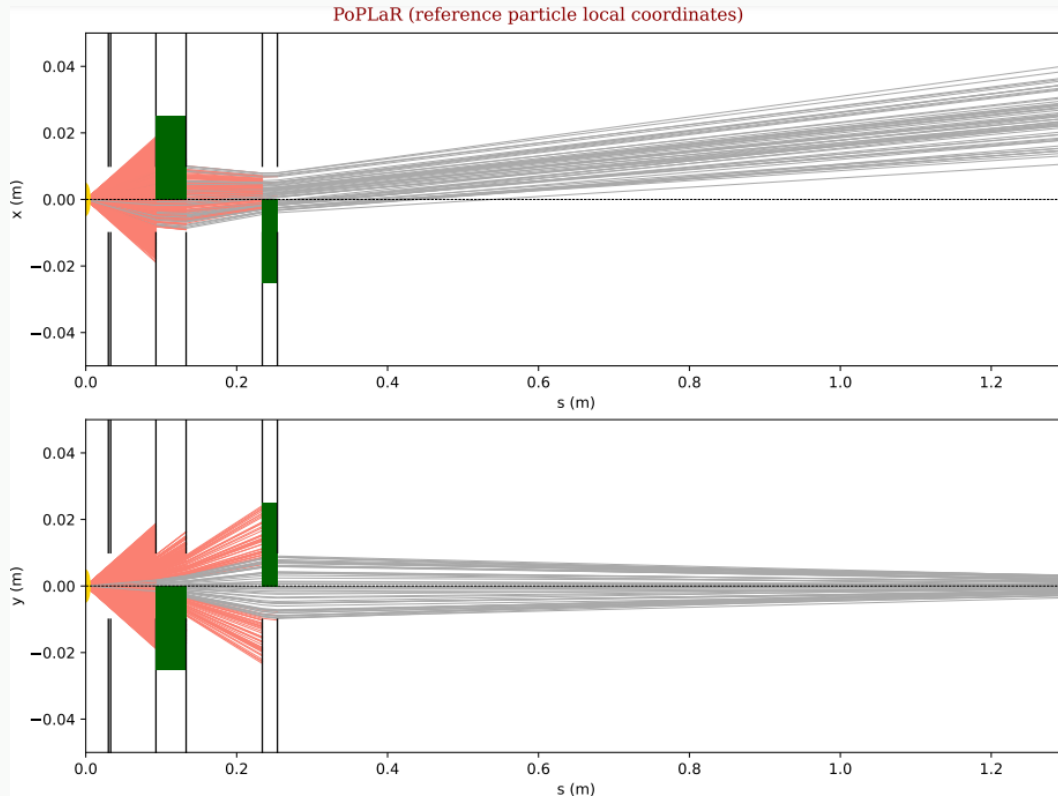


PoPLaR:1:Capture:Drift:3



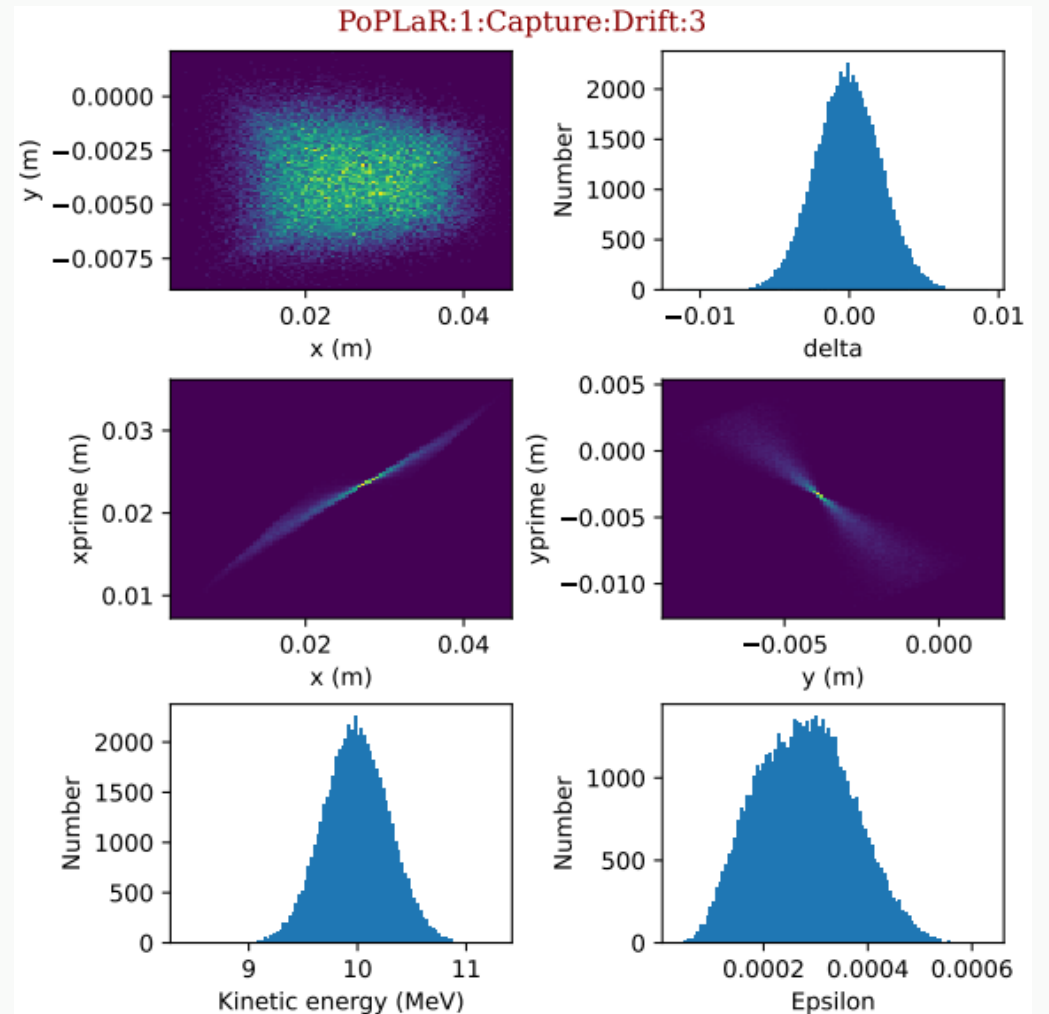
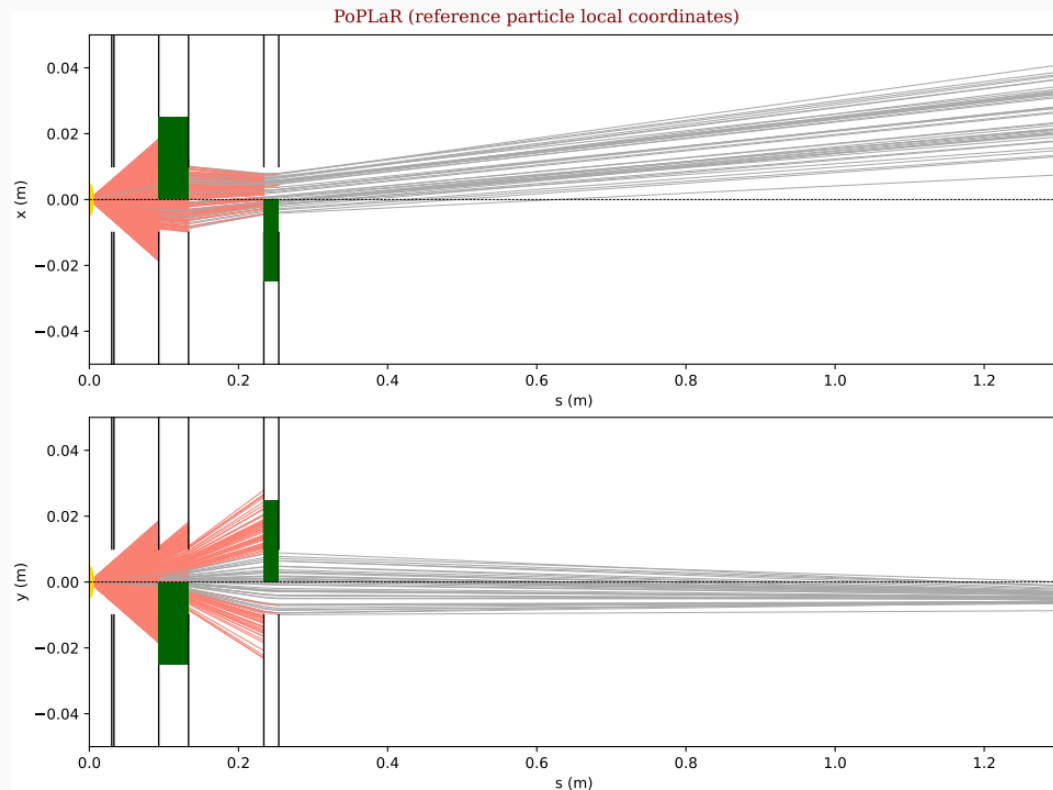
Sensitivity testing step 1- xy shifting

Quadrupole 1 shifted in x axis 1mm



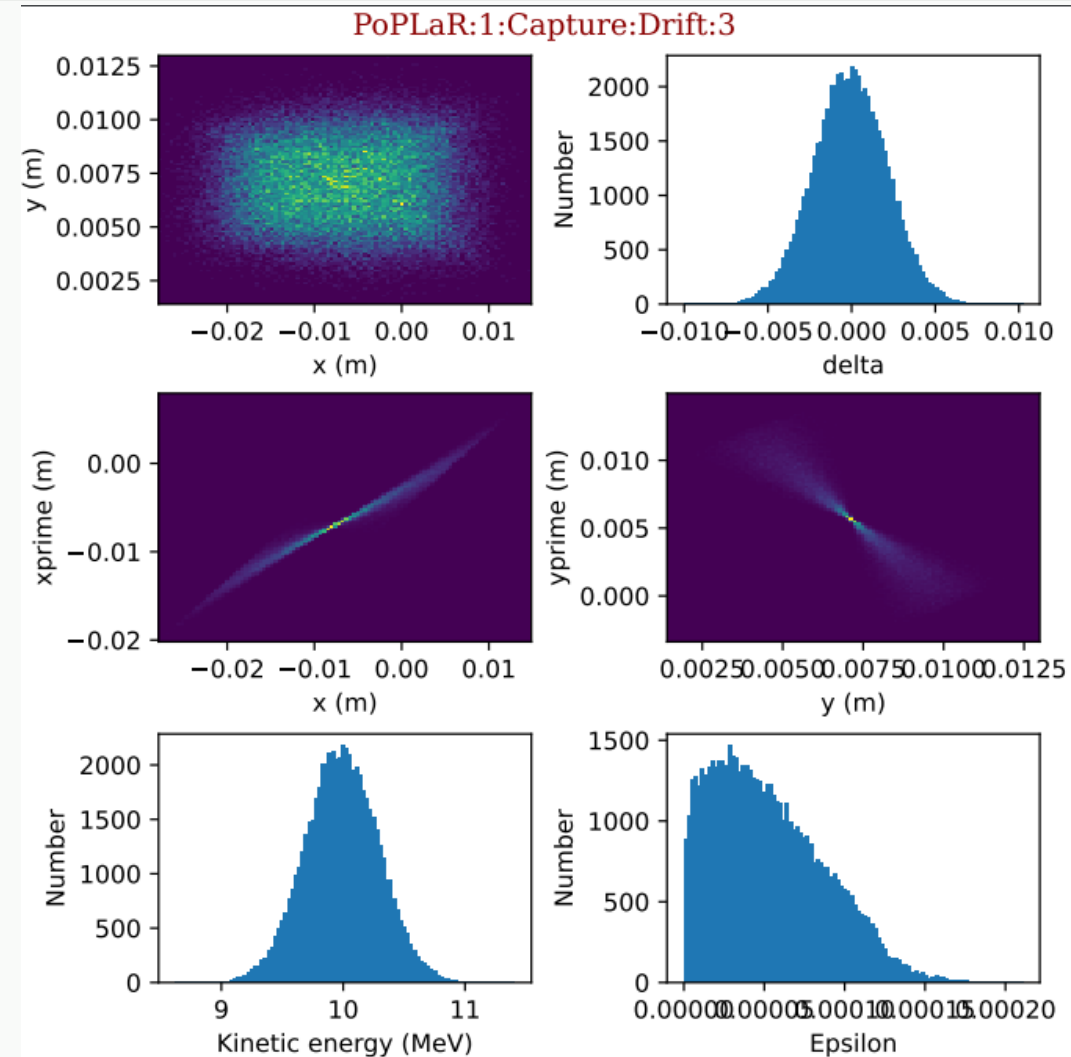
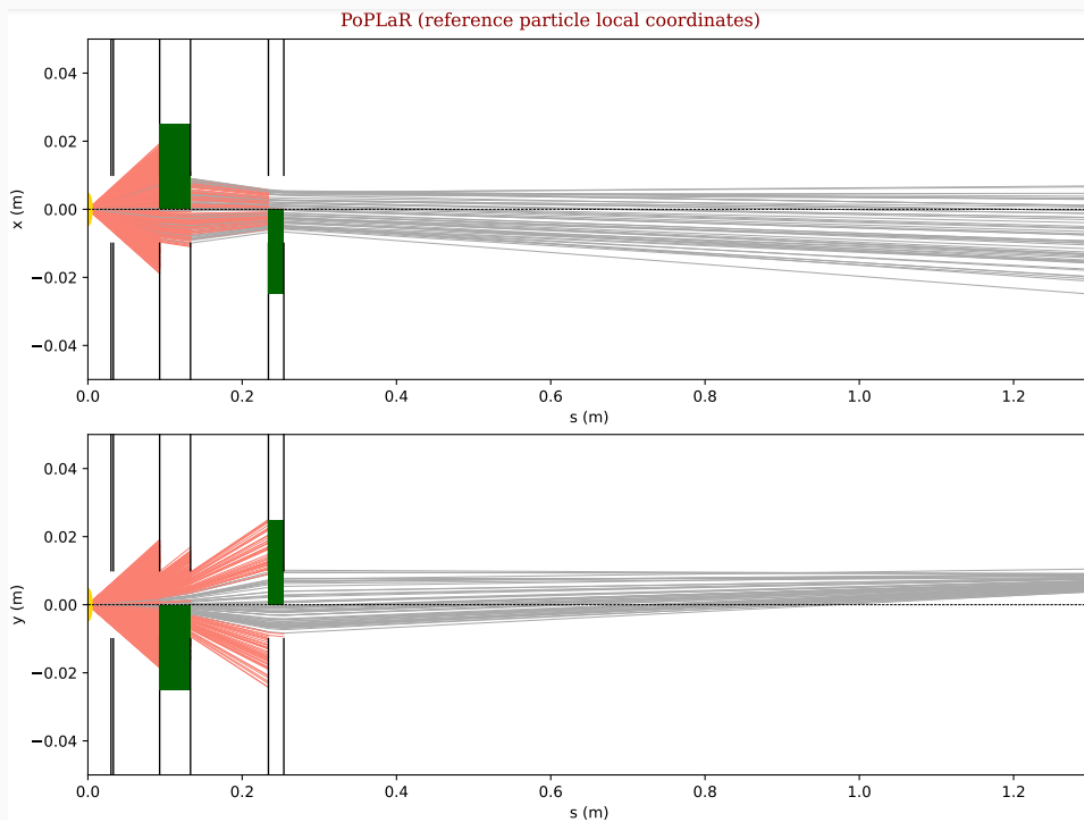
Sensitivity testing step 1- xy shifting

Quadrupole 1 shifted in x and y axis 1mm



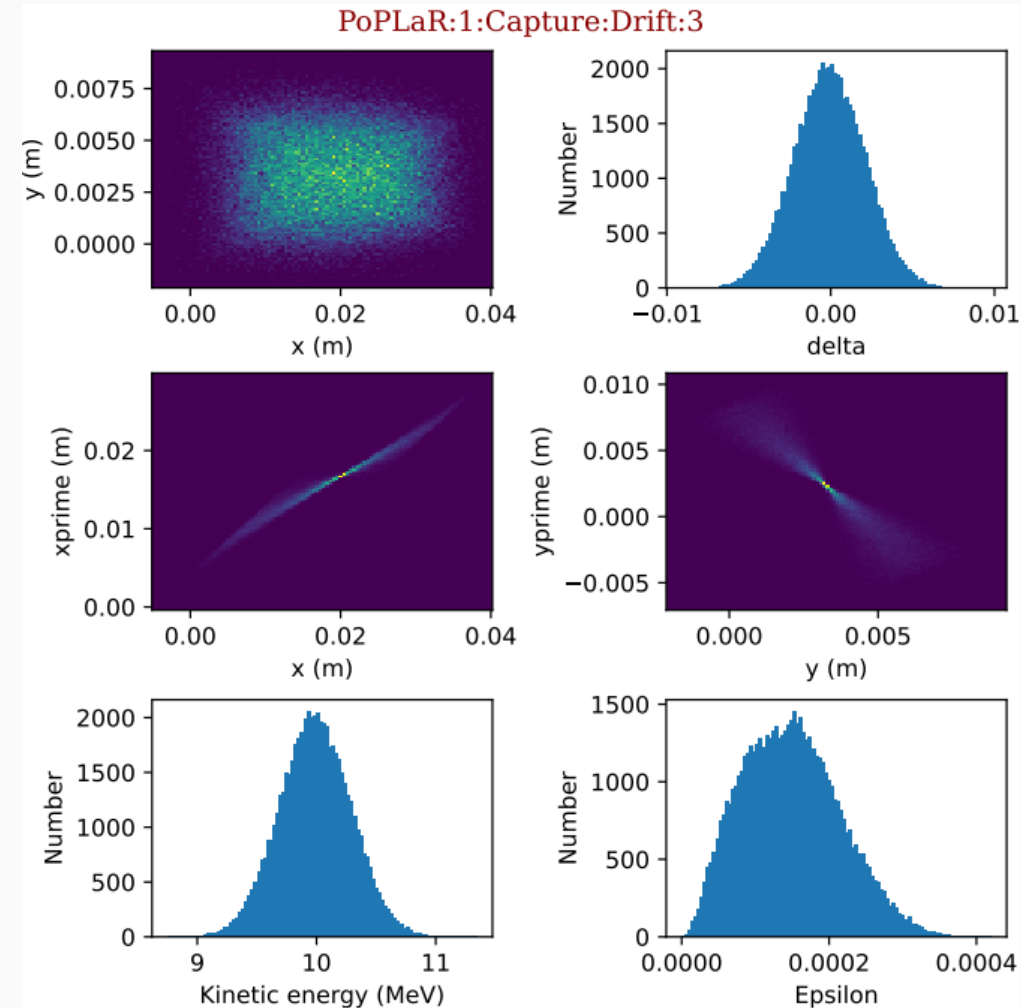
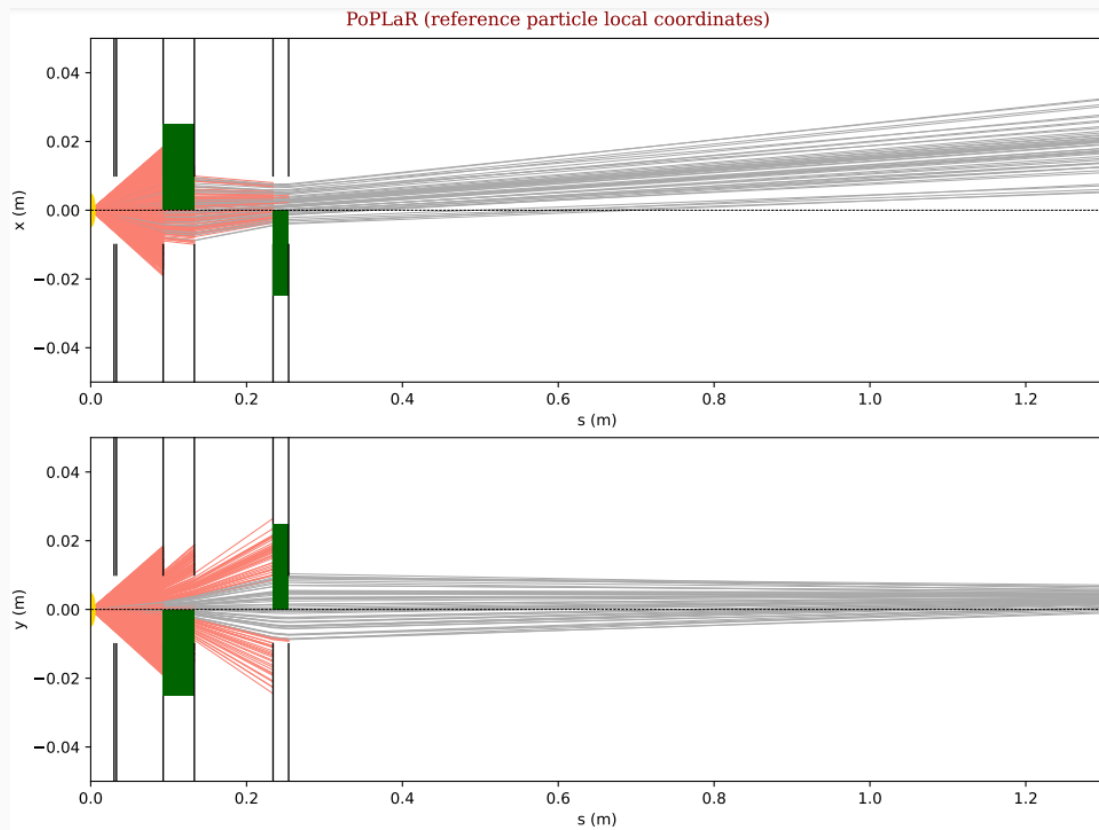
Sensitivity testing step 1- xy shifting

Quadrupole 2 shifted in x and y axis 1mm



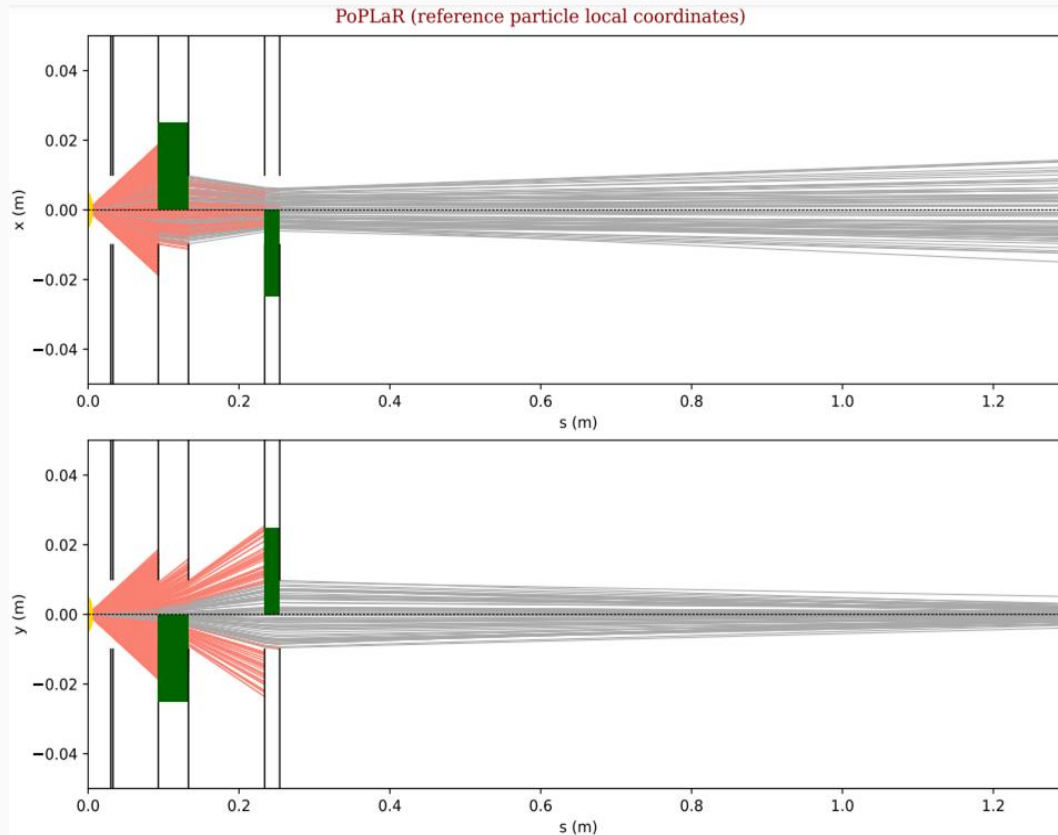
Sensitivity testing step 1- xy shifting

Quadrupole pair shifted in x and y axis 1mm

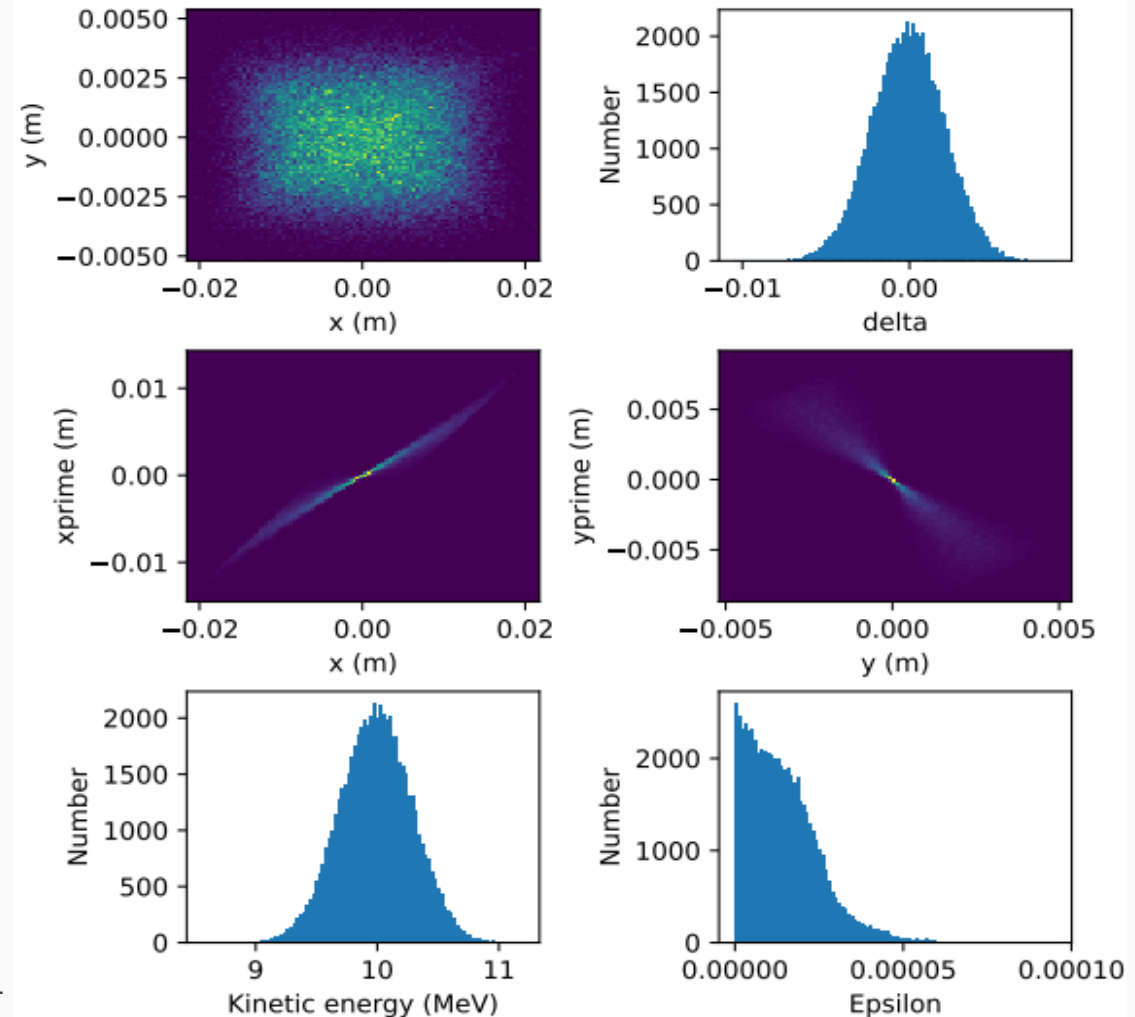


Sensitivity testing step 2- quad tilt

Reference: 4cm 2cm quad combination

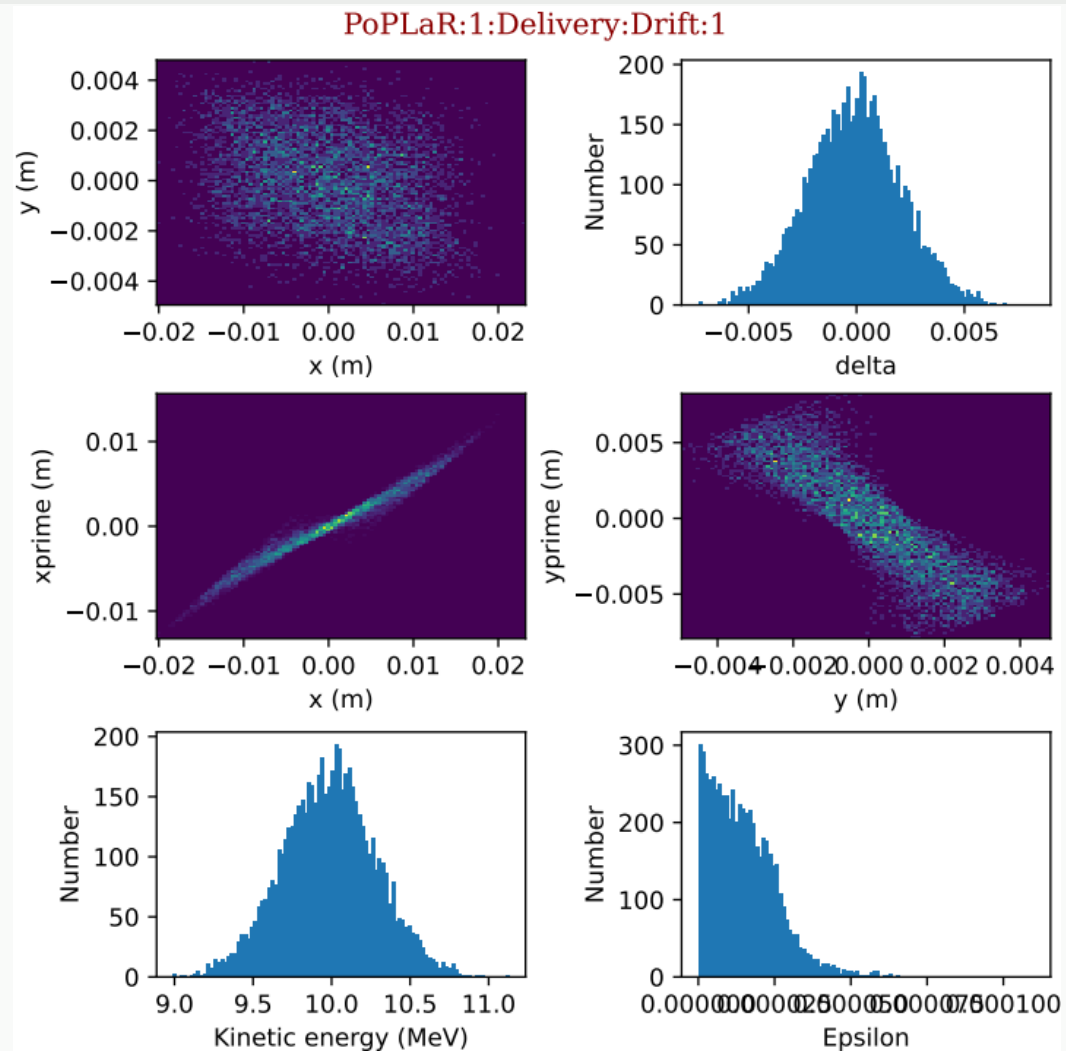
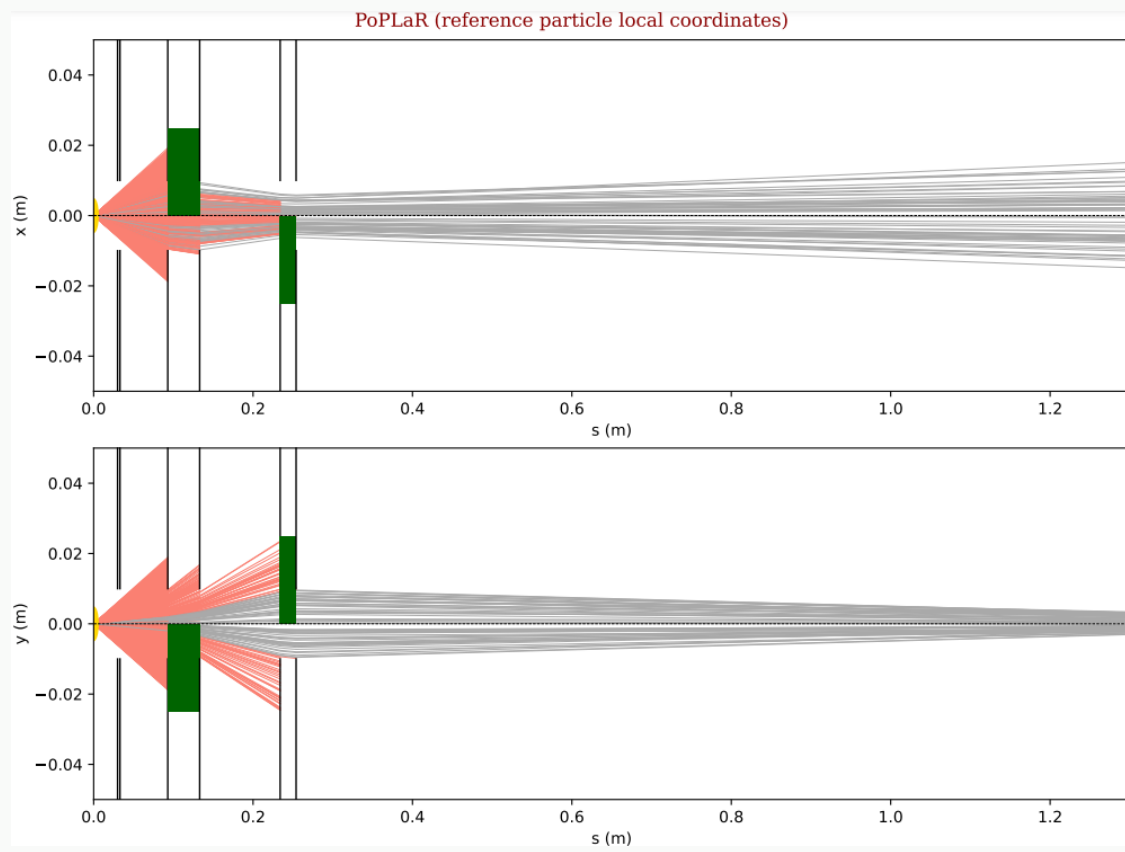


PoPLaR:1:Capture:Drift:3



Sensitivity testing step 2- quad tilt

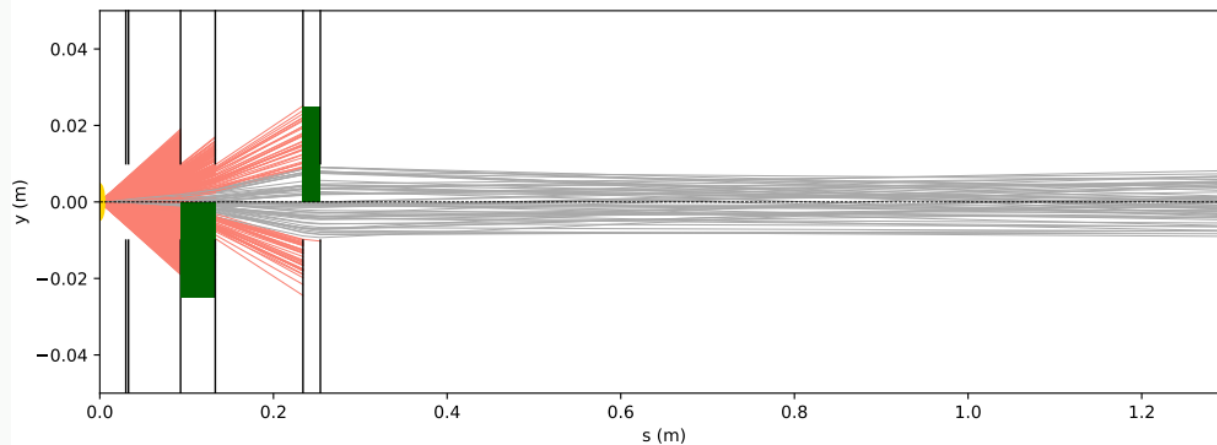
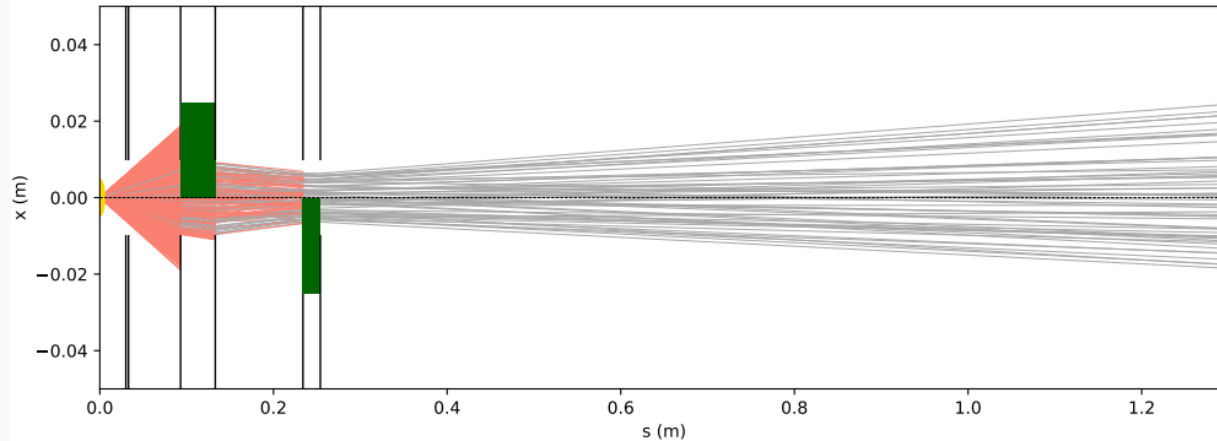
Quadrupole 1 tilted- αE rotation 0.01rad



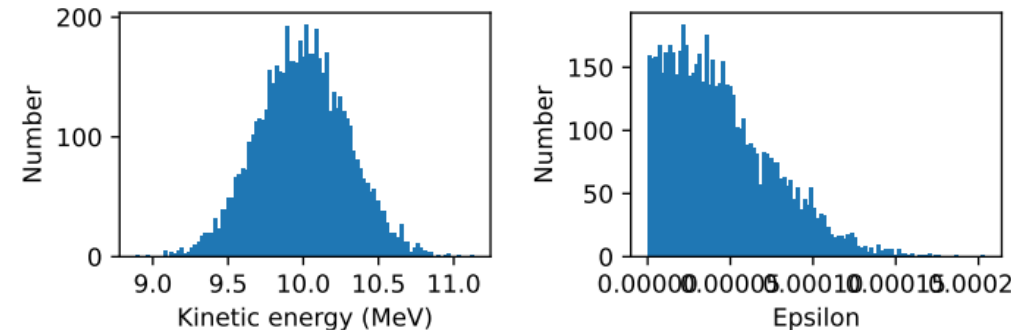
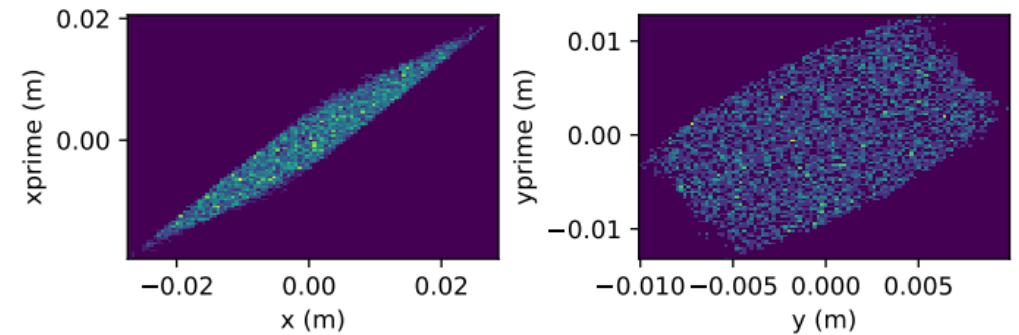
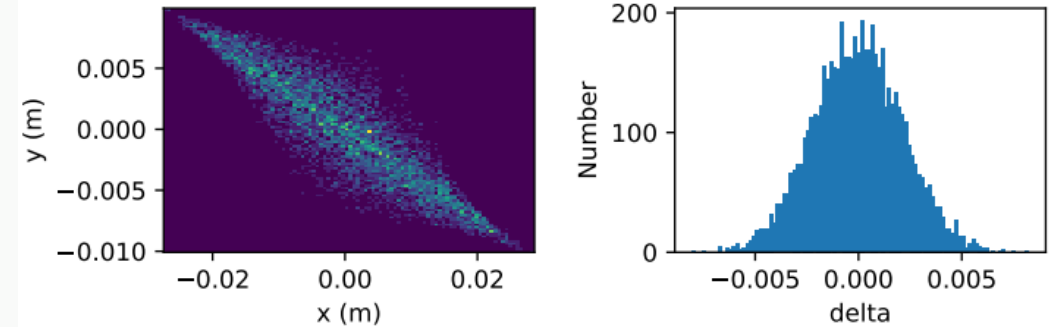
Sensitivity testing step 2- quad tilt

Quadrupole 1 tilted- α_E rotation 0.1rad

PoPLaR (reference particle local coordinates)

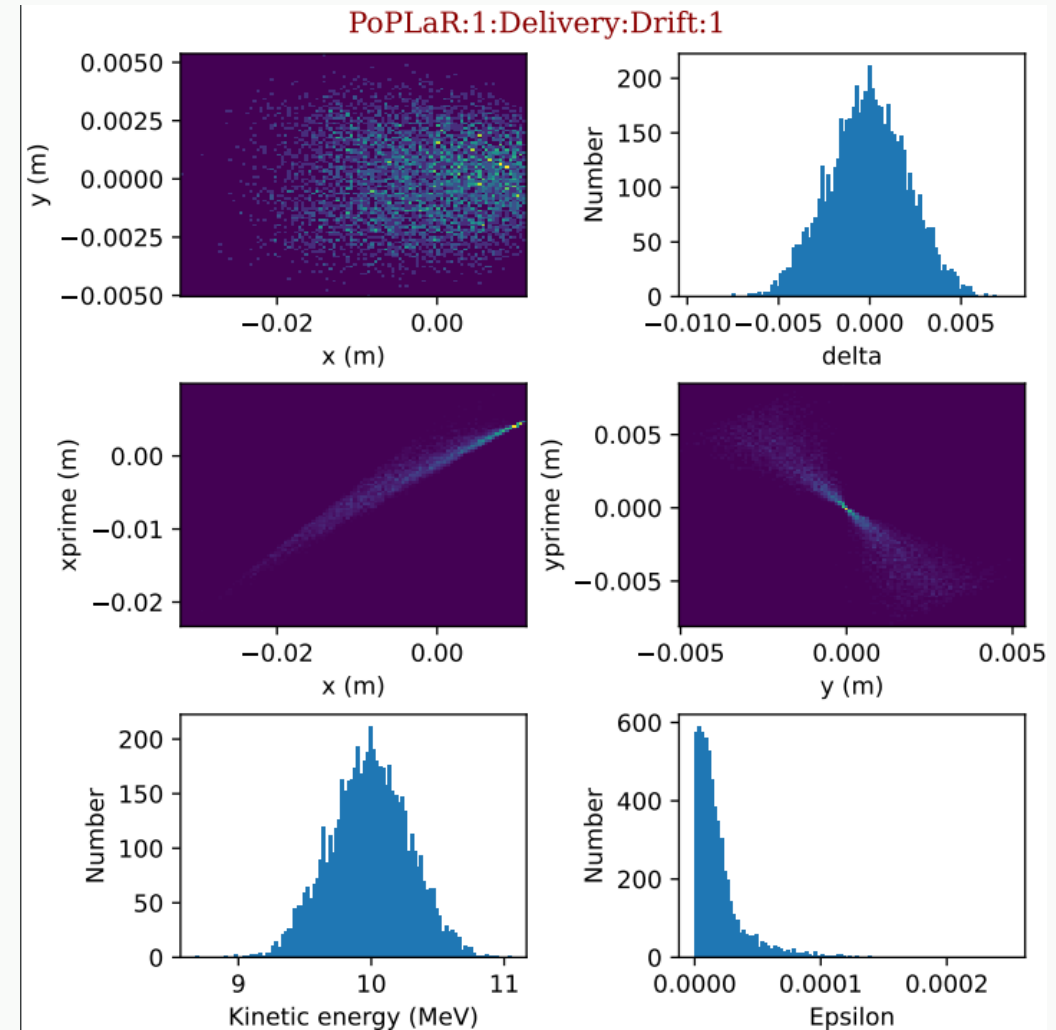
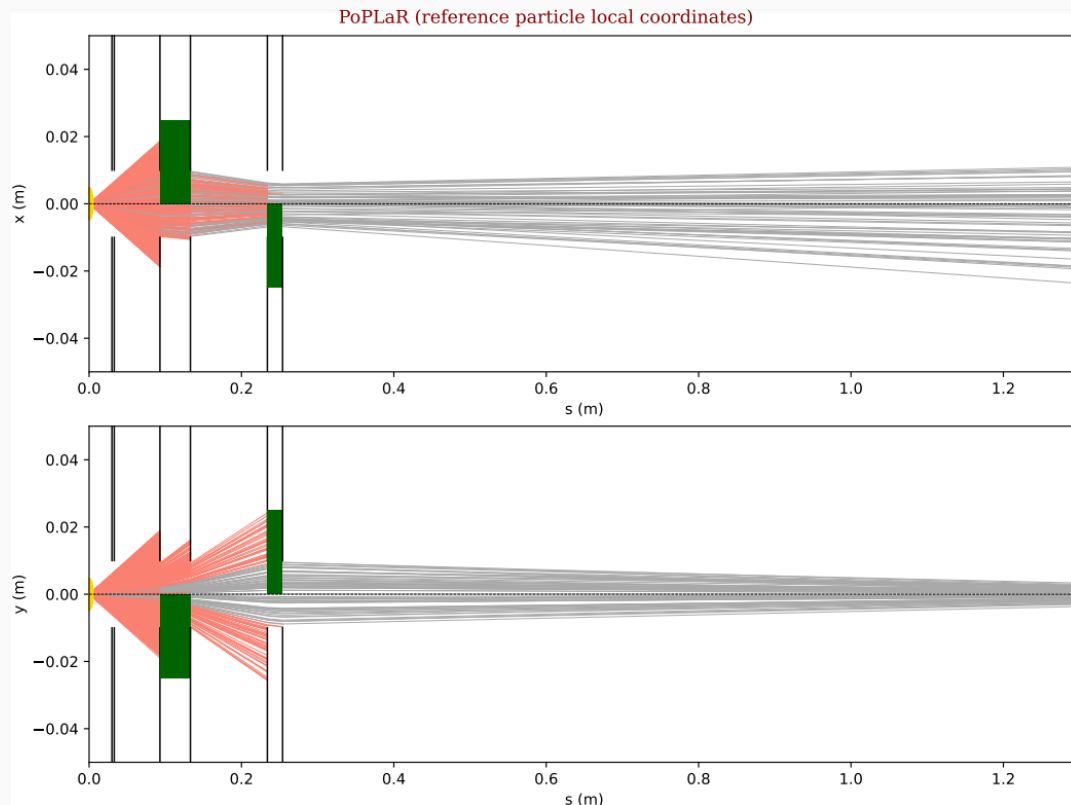


PoPLaR:1:Delivery:Drift:1



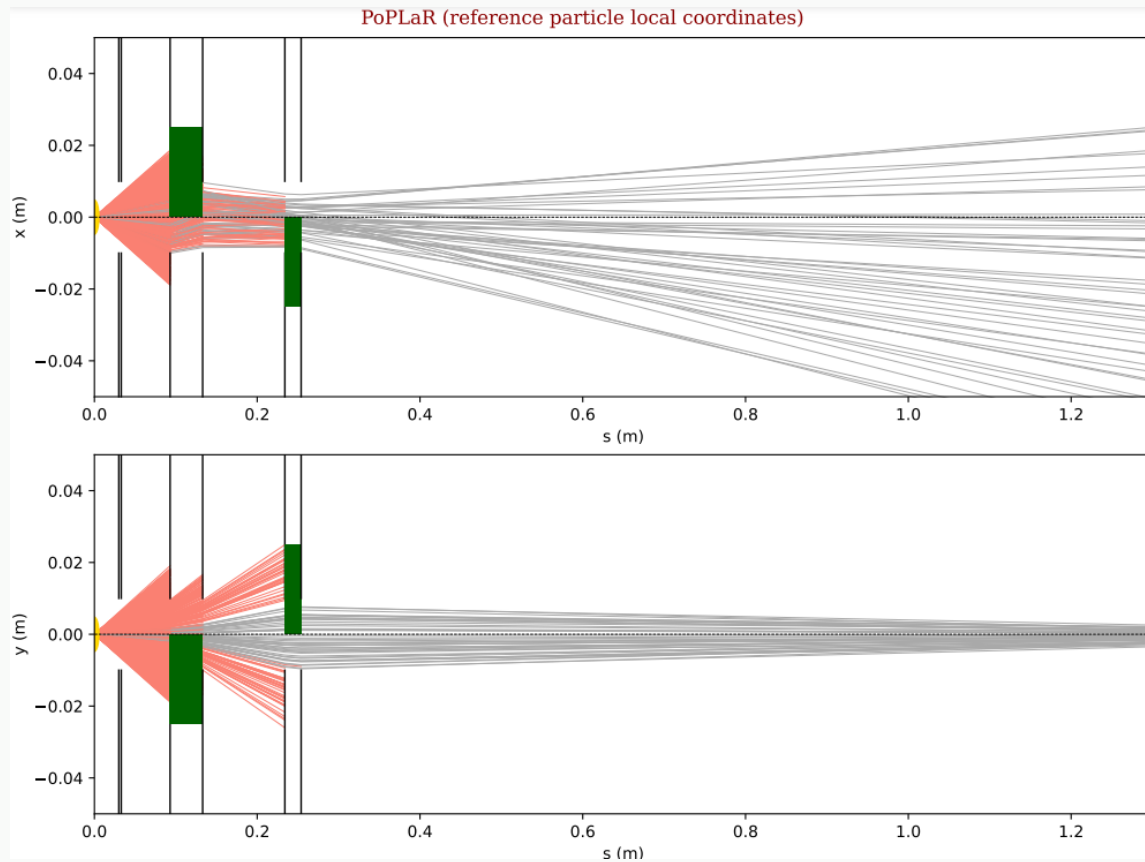
Sensitivity testing step 2- quad tilt

Quadrupole 1 tilted- betaE rotation 0.01rad

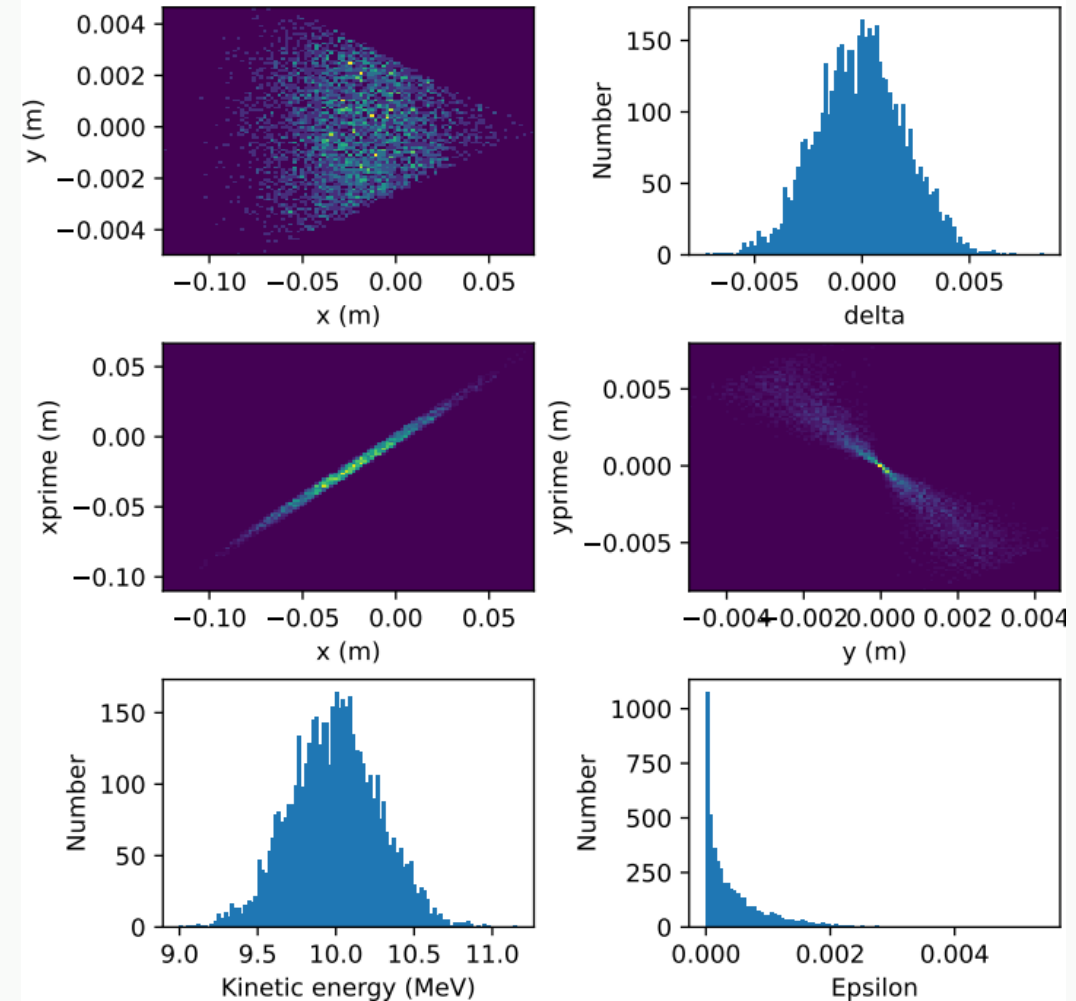


Sensitivity testing step 2- quad tilt

Quadrupole 1 tilted- betaE rotation 0.1rad



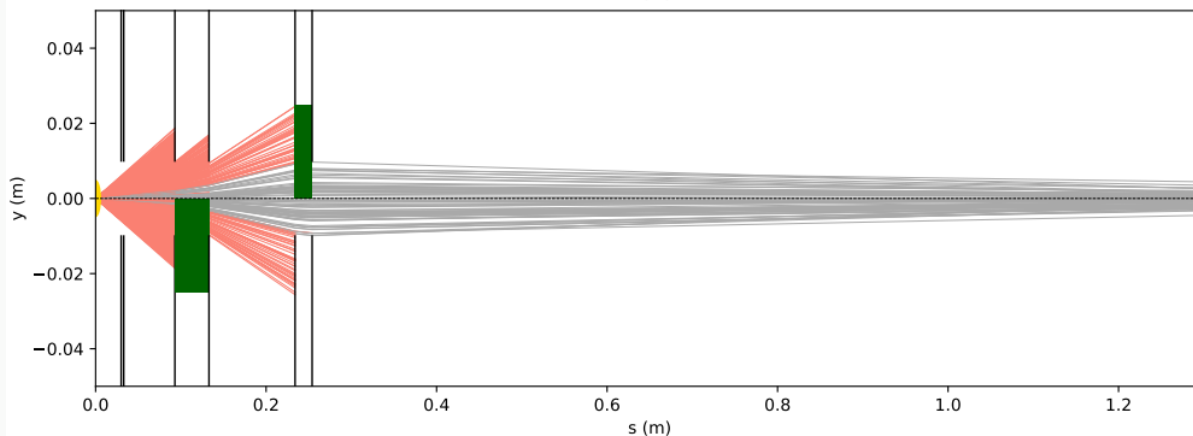
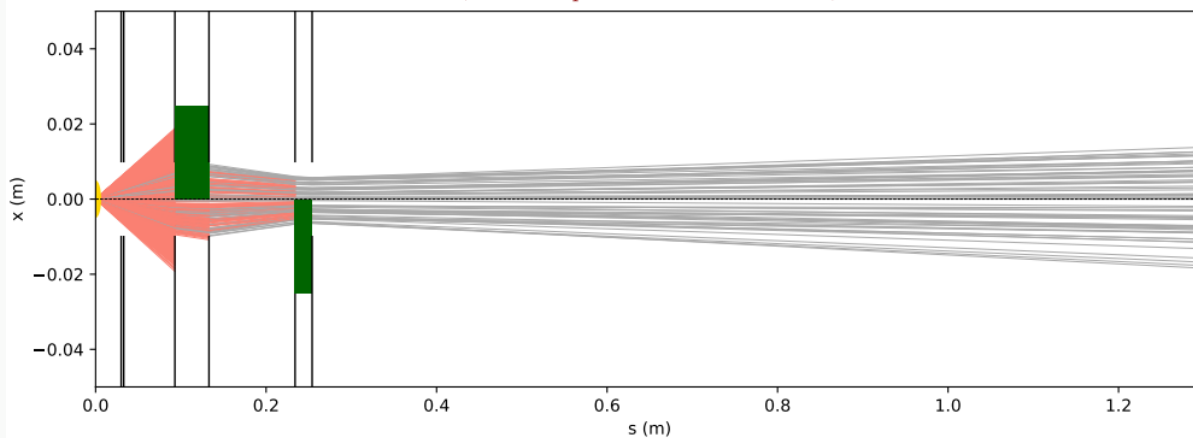
PoPLaR:1:Delivery:Drift:1



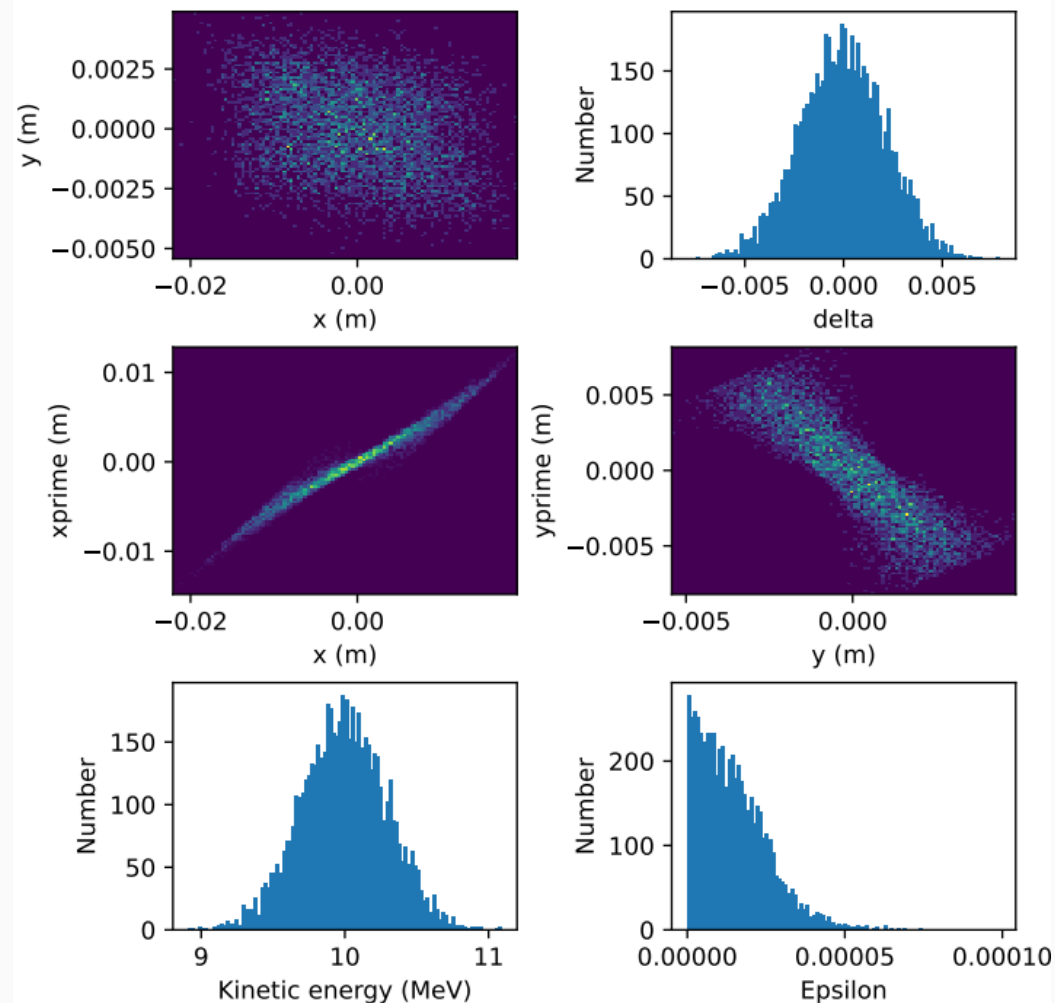
Sensitivity testing step 2- quad tilt

Quadrupole 1 tilted- gammaE rotation 0.01rad

PoPLaR (reference particle local coordinates)



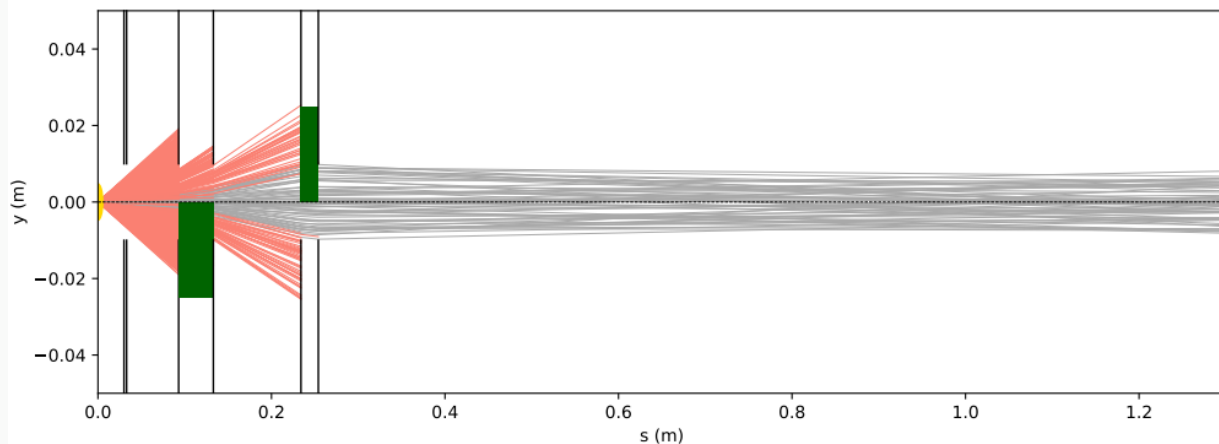
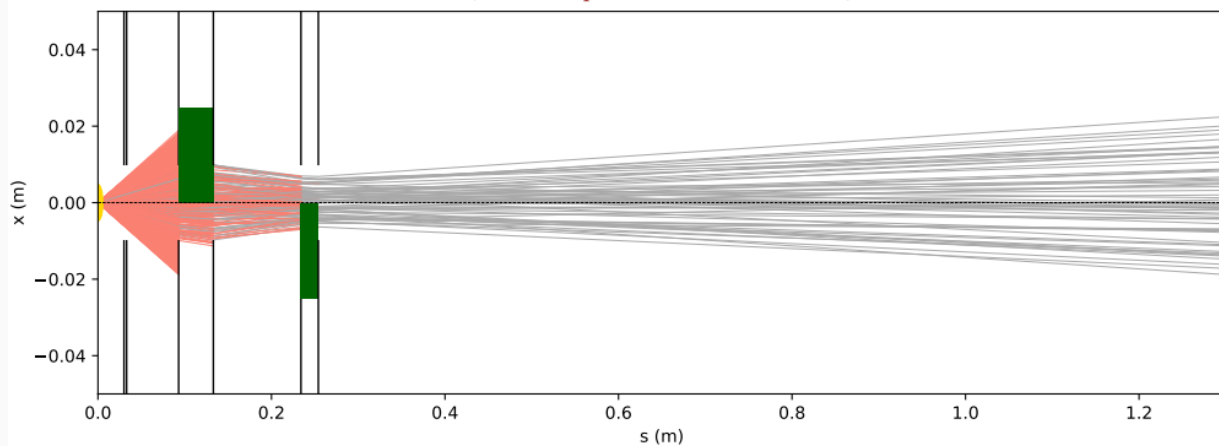
PoPLaR:1:Delivery:Drift:1



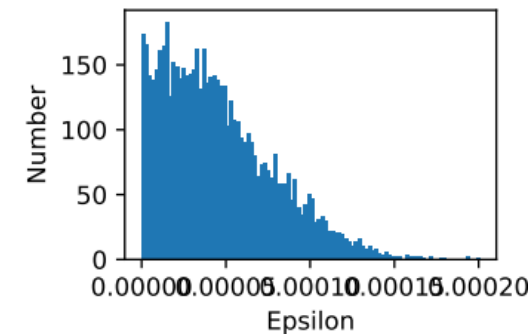
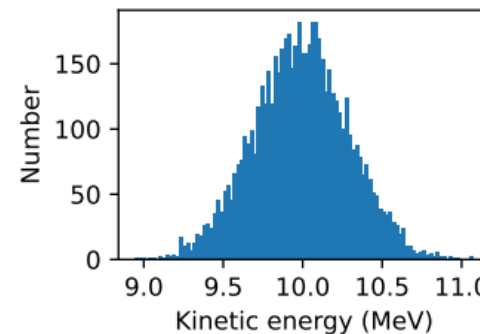
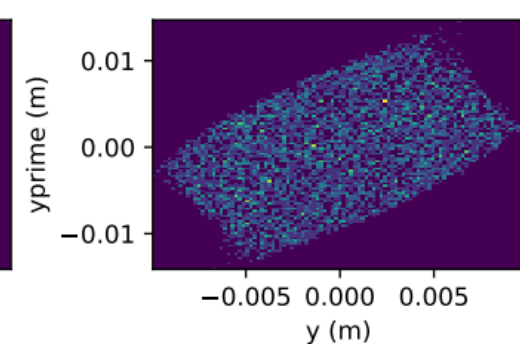
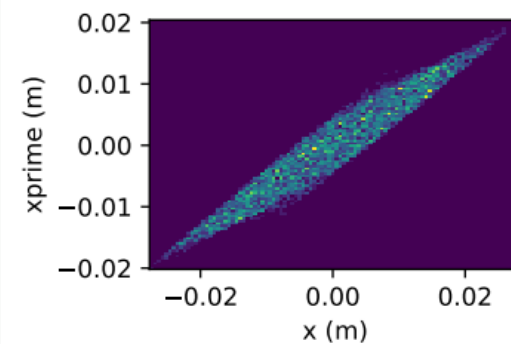
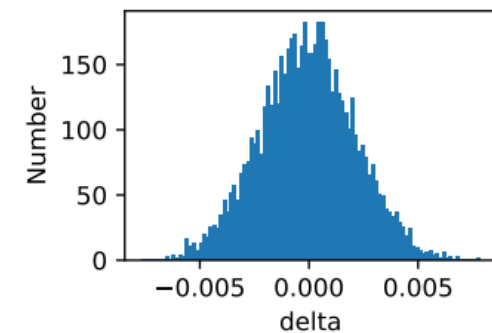
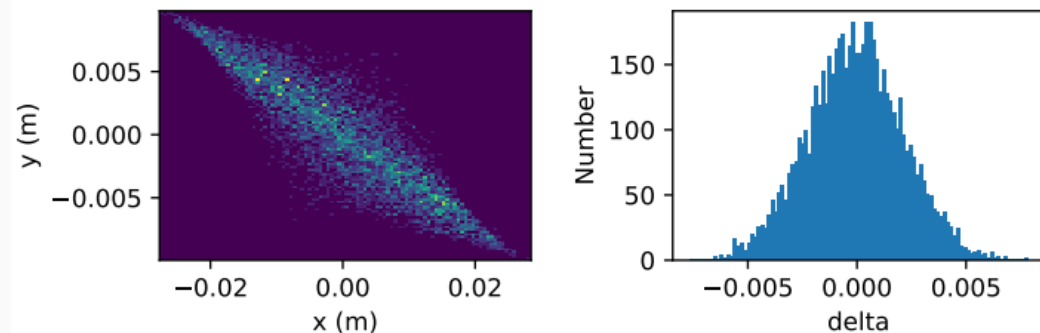
Sensitivity testing step 2- quad tilt

Quadrupole 1 tilted- gammaE rotation 0.1rad

PoPLaR (reference particle local coordinates)

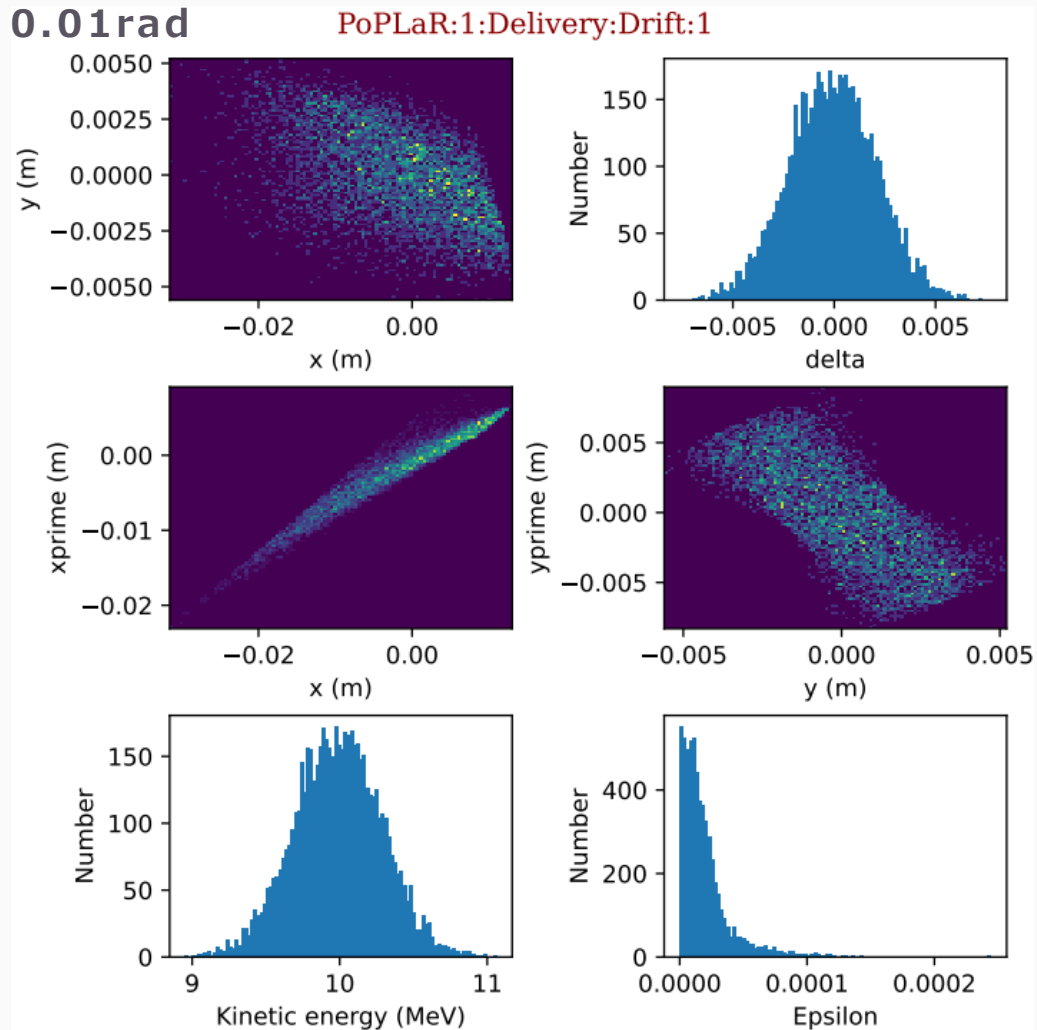
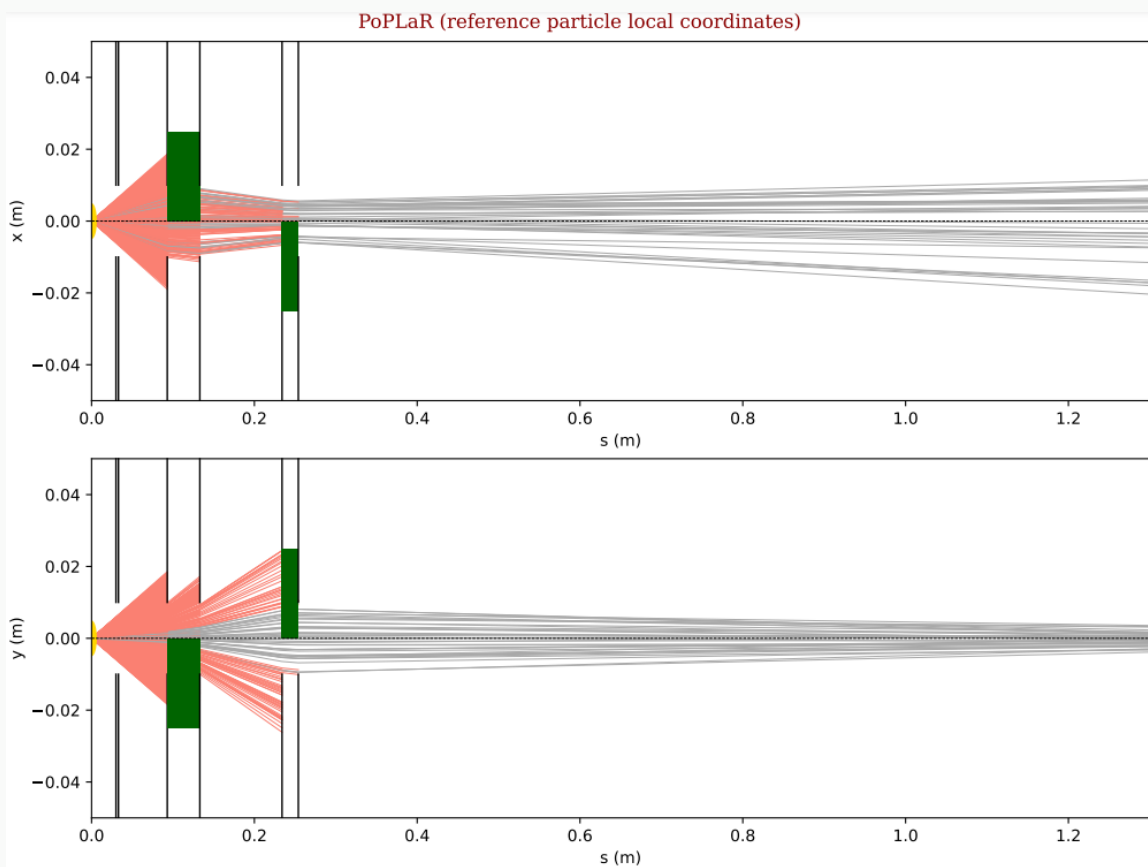


PoPLaR:1:Delivery:Drift:1



Sensitivity testing step 2- quad tilt

Quadrupole 1 tilted- α_E , β_E , γ_E rotation 0.01rad

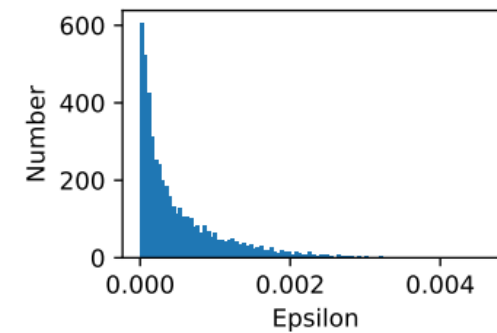
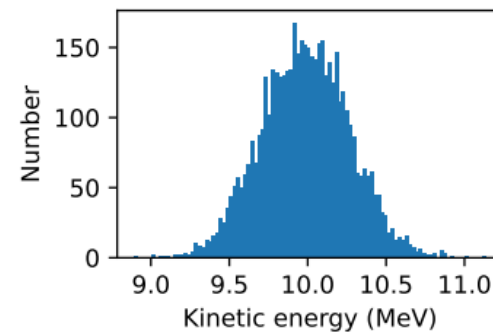
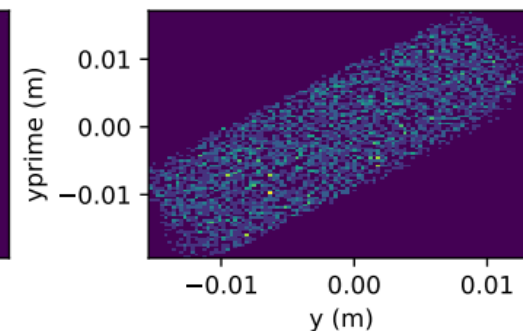
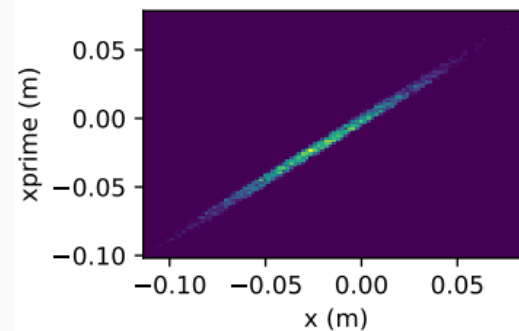
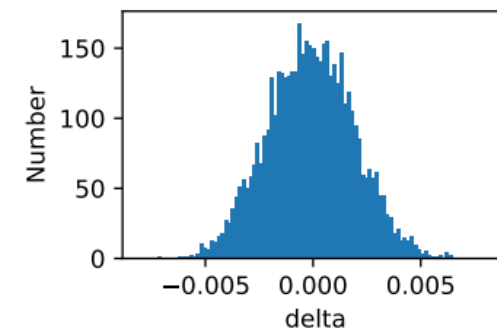
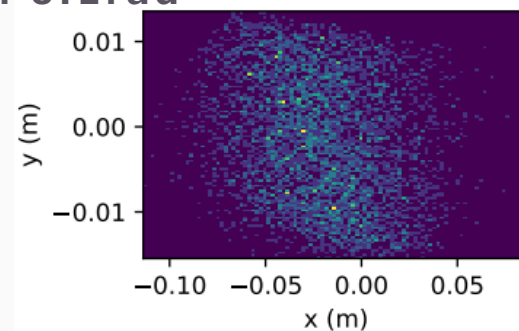
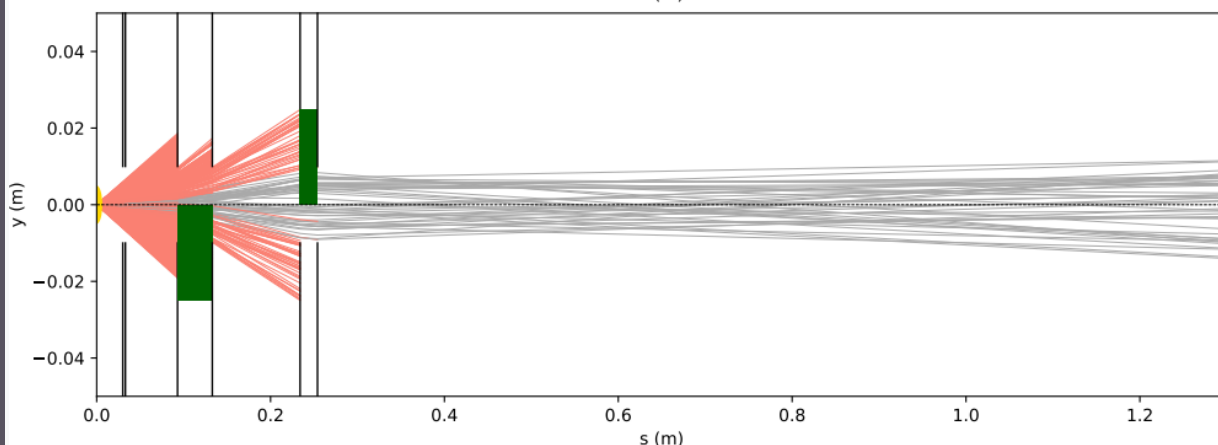
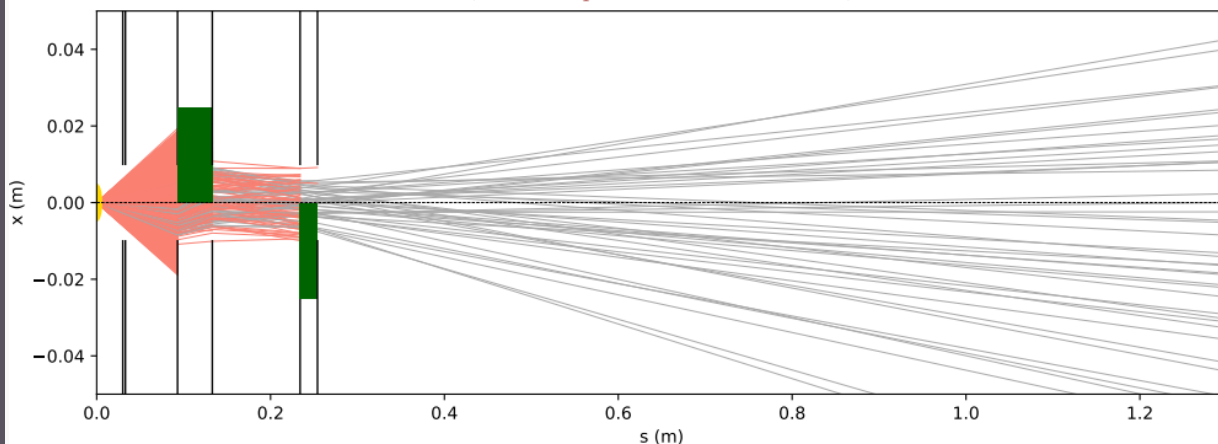


Sensitivity testing step 2- quad tilt

Quadrupole 1 tilted- αE , βE , γE rotation 0.1rad

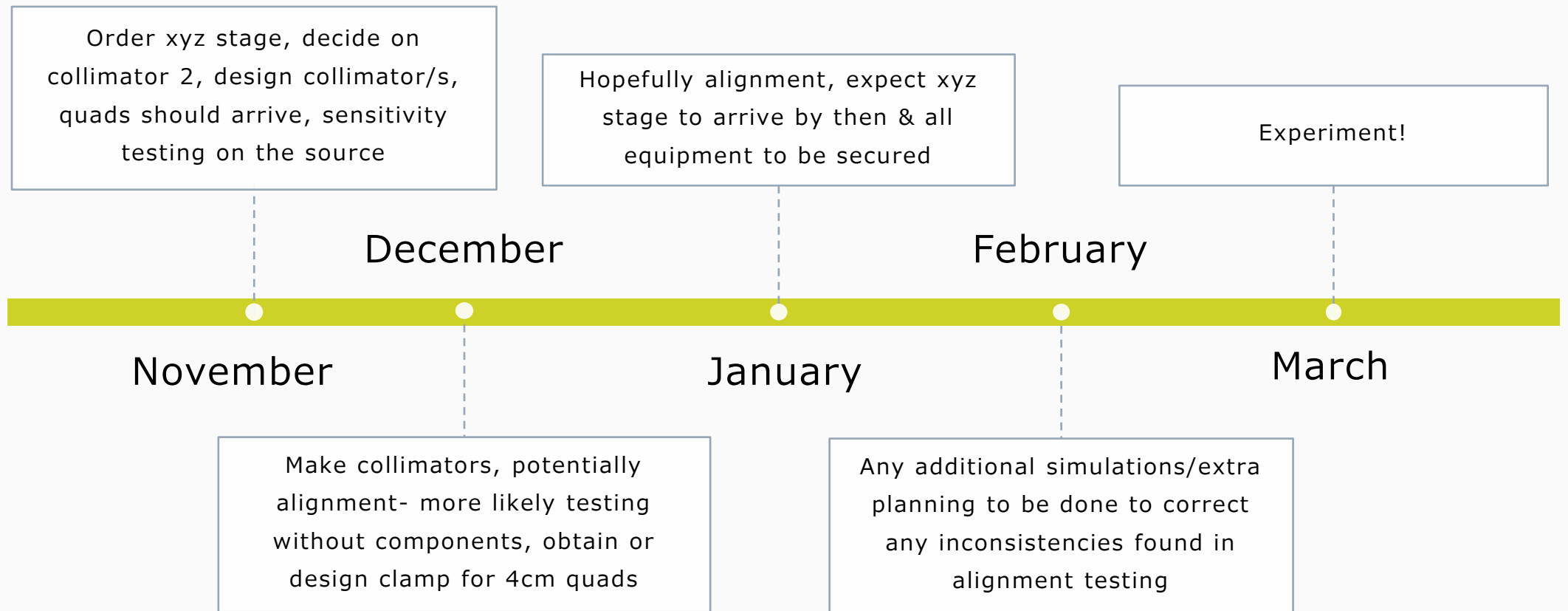
PoPLaR:1:Delivery:Drift:1

PoPLaR (reference particle local coordinates)



Next steps

- Sensitivity testing on the source
- Decide on if 2nd collimator
- Design & make collimator/s
- Obtain or design clamp for 4cm quads
- Order xyz motorised stage
- Magnet testing
- Alignment
- Experiment



Timeline