

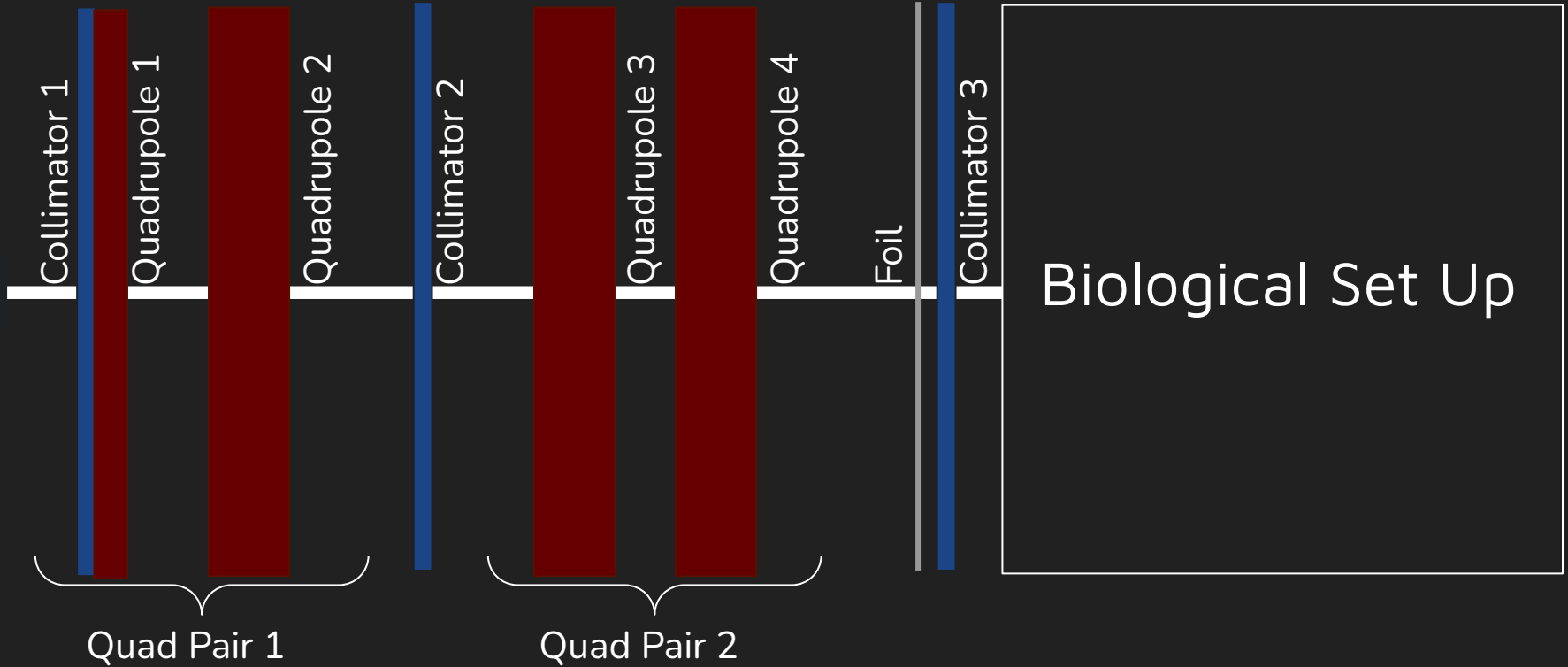
PoPLaR Meeting

08/08/2024

Beam

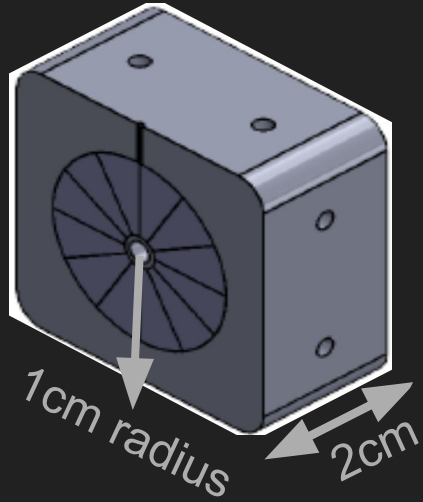
1.8m

1m

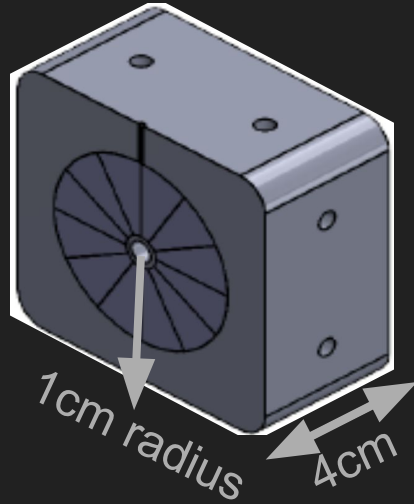


4 Quad combination

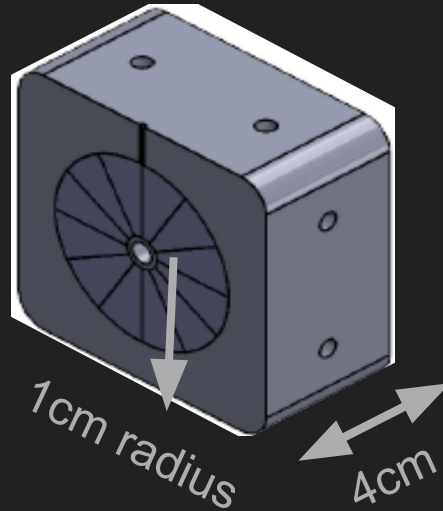
Focusing quad



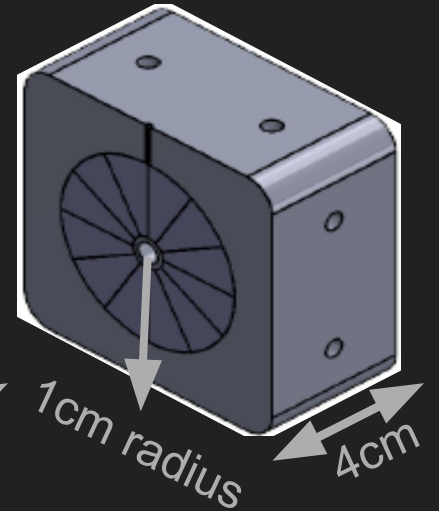
Defocusing quad



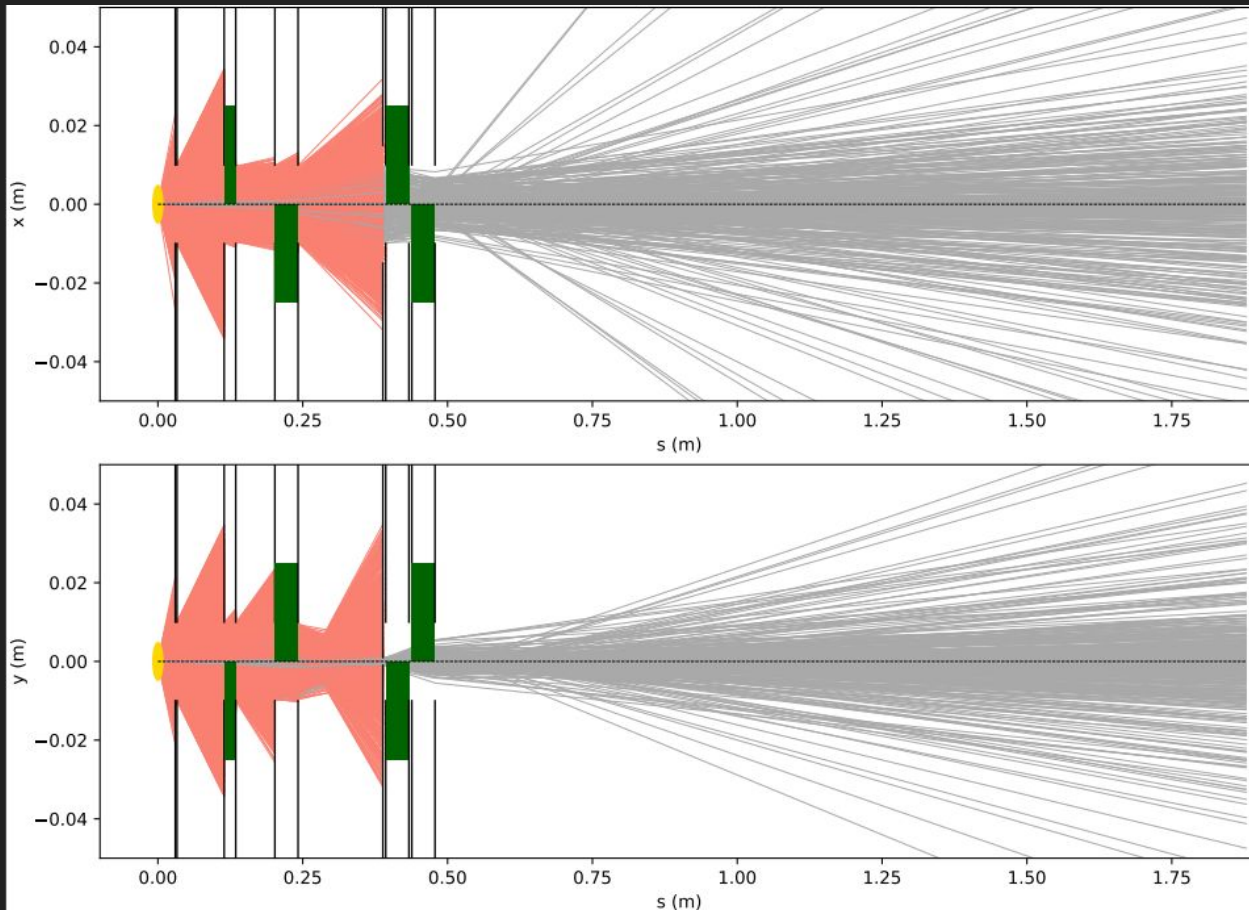
Focusing quad 2



Defocusing quad 2



Beam

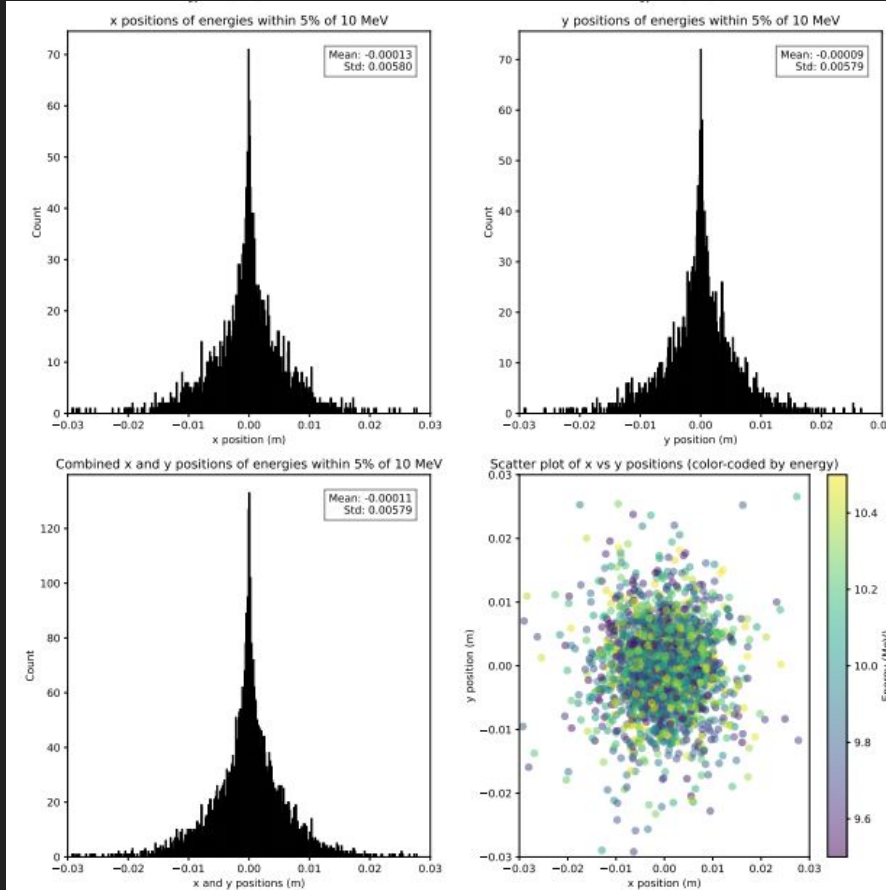


To Improve:

- Find optimal collimator sizes
- Find optimal position of the second quad doublet

Beam Optimisation- Collimator 1

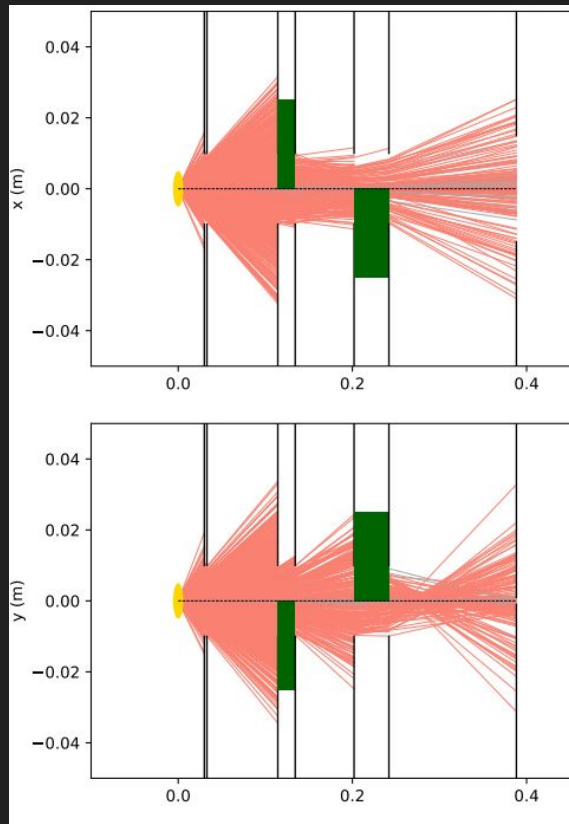
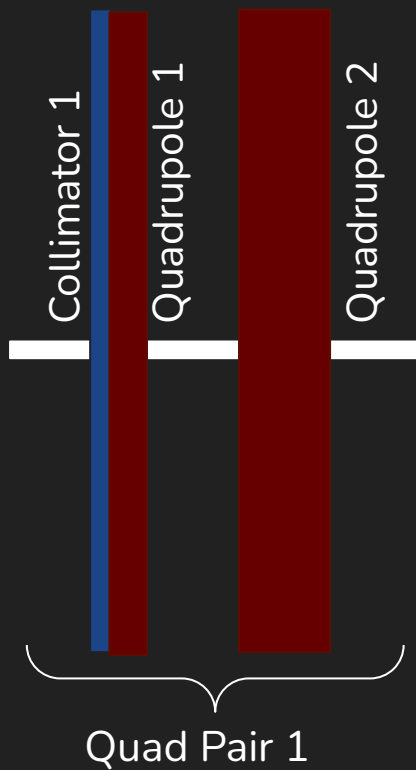
Collimator 1



Mapping the positions of the particles with 10MeV (+/- 5%) at 3cm:

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

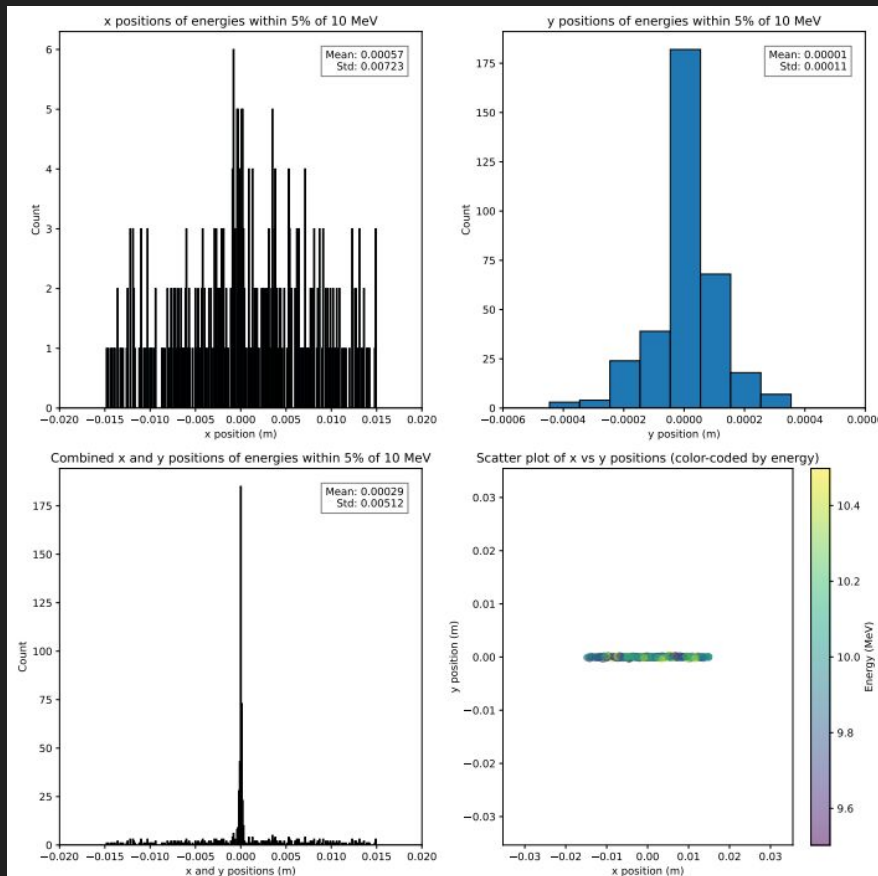
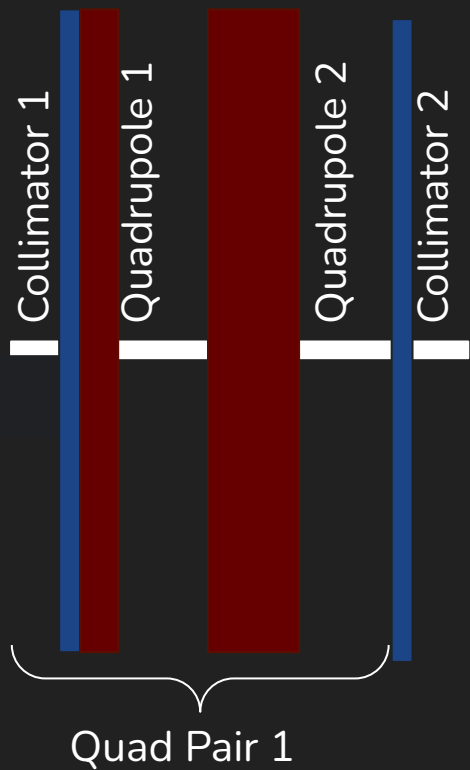
Beam Optimisation- Quad doublet 1



Bayesian Optimisation showed optimal positions of:

- Focus quad: 8.1cm from colimator
- Defocus quad: 6.8cm from fquad
- Colimator 2: 14.6cm from dquad

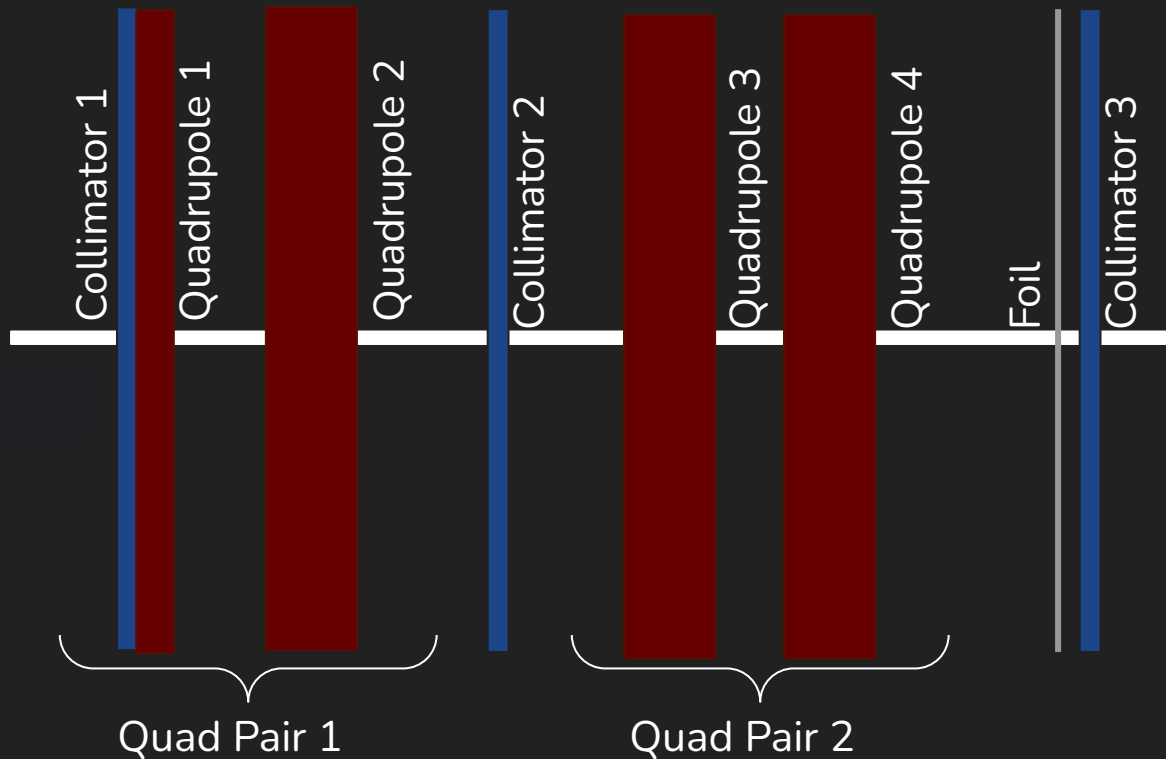
Beam Optimisation- Collimator 2



Mapping the positions of the particles with 10MeV (+/- 5%) collimator 2:

- 15mm x rad and 0.1mm y rad elliptical aperture decided on to begin

Beam Optimisation- Quad doublet 2 & end

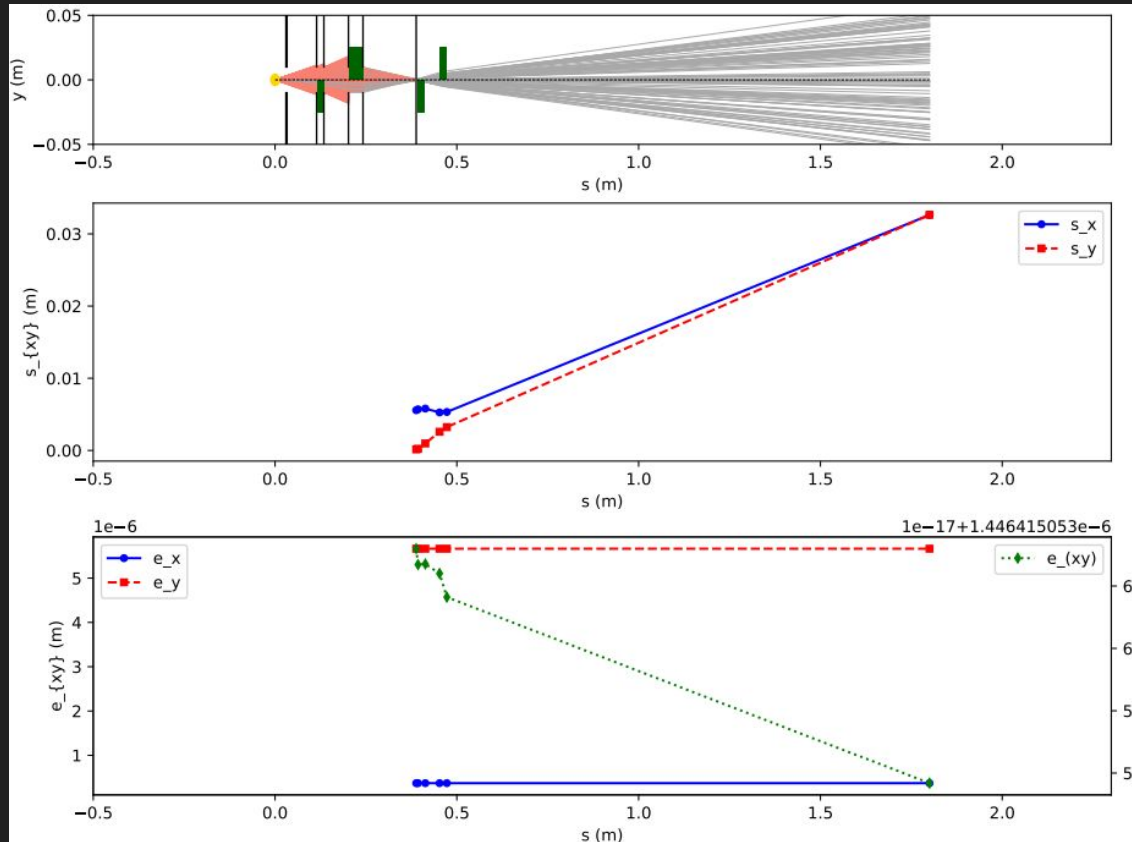


Next steps:

- Bayesian optimisation for positioning of second quad doublet
- Repeat colimator selection process for final colimator

Updates

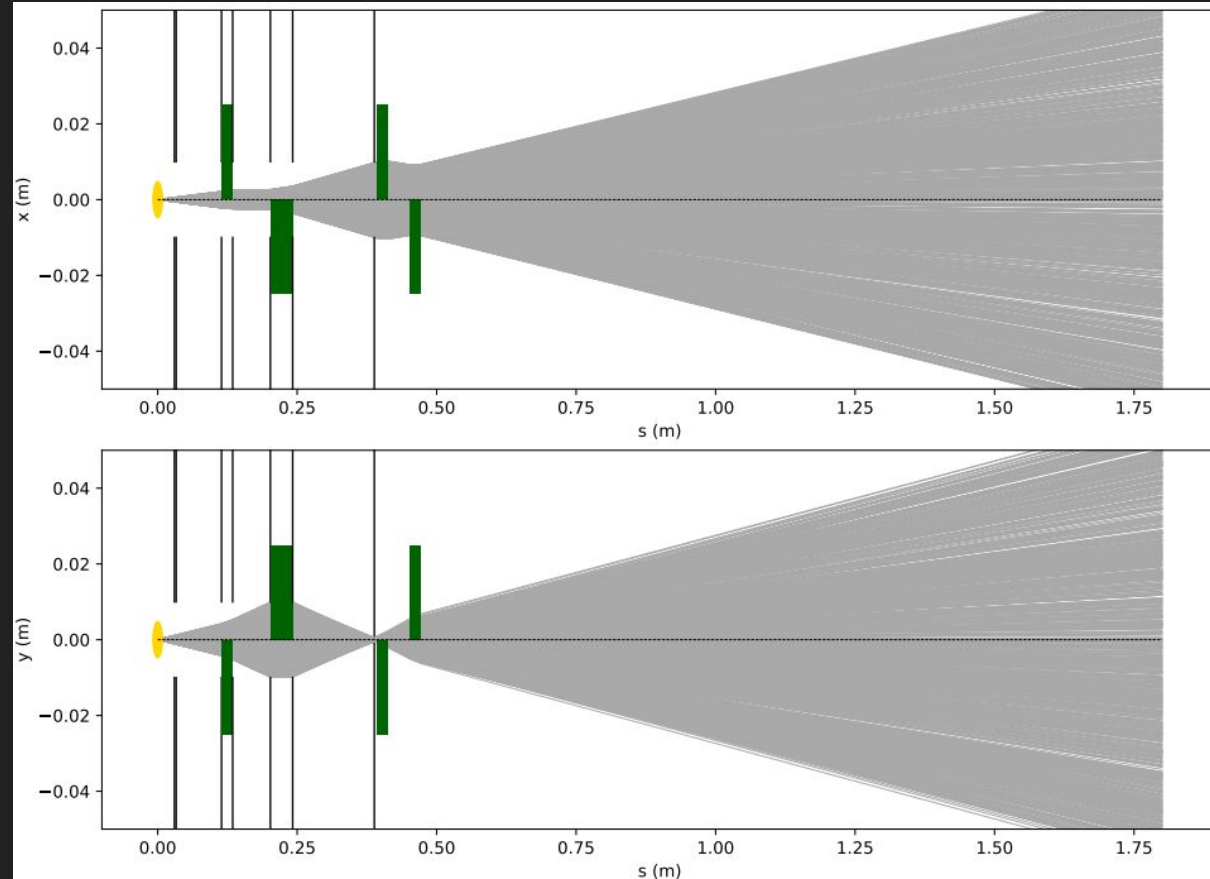
Full beam line visualisation- Pencil



Bayesian Optimisation showed optimal positions of:

- Focus quad: 8.1cm from collimator
- Defocus quad: 6.8cm from fquad
- Collimator 2: 14.6cm from dquad
- Focus quad 2: 5mm from collimator 2
- Defocus quad 2: 3.9cm from focus quad 2
- Final drift = 1.33m

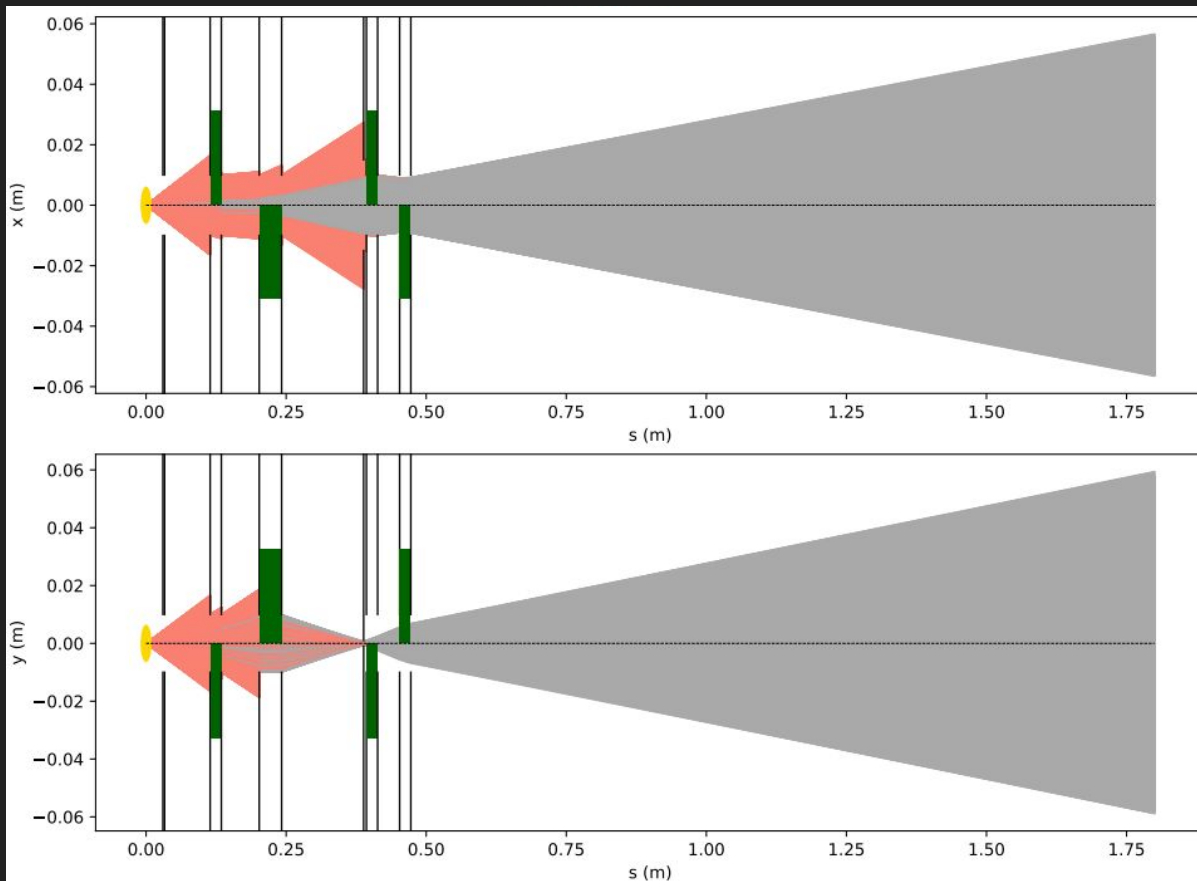
Full beam line visualisation- Pencil



Bayesian Optimisation showed optimal positions of:

- Focus quad: 8.1cm from collimator
- Defocus quad: 6.8cm from fquad
- Collimator 2: 14.6cm from dquad
- Focus quad 2: 5mm from collimator 2
- Defocus quad 2: 3.9cm from focus quad 2
- Final drift = 1.33m

Full beam line visualisation- Gaussian



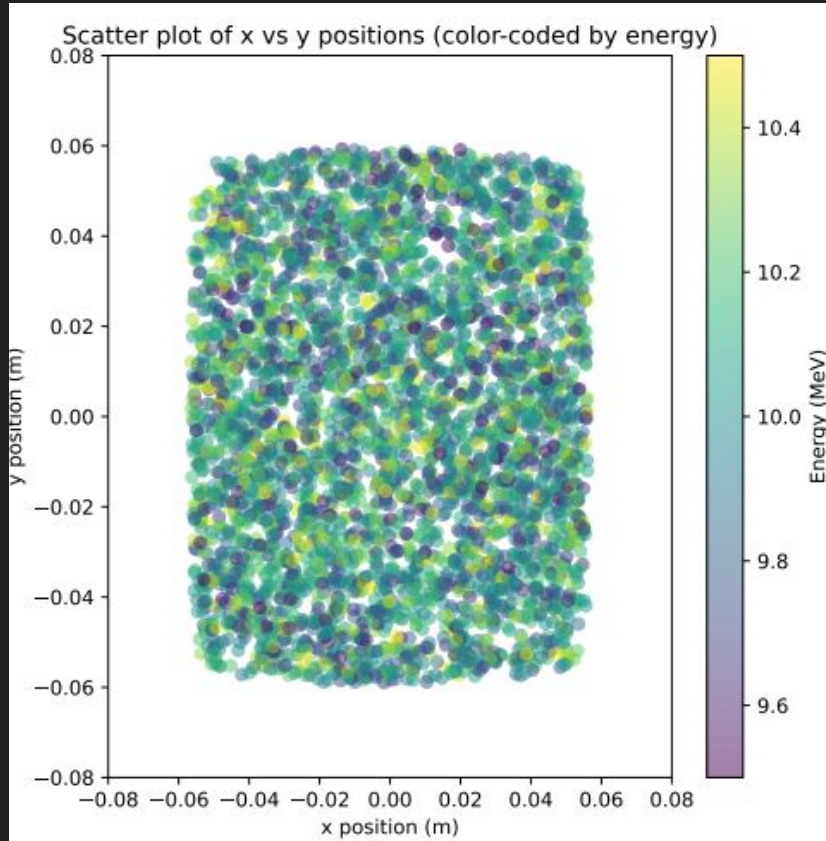
Bayesian Optimisation showed optimal positions of:

- Focus quad: 8.1cm from collimator
- Defocus quad: 6.8cm from fquad
- Collimator 2: 14.6cm from dquad
- Focus quad 2: 5mm from collimator 2
- Defocus quad 2: 3.9cm from focus quad 2
- Final drift = 1.33m

Full beam line visualisation

Stage	Section	Element	Type	Parameter	Value	Unit	Comment
0	Facility	Global	Name	Name	PoPLaR		
0	Facility	Global	Reference particle	Kinetic energy	10	MeV	
0	Facility	Global	Vacuum chamber	Mother volume radi	0.5	m	
1	Source	Source	Gaussian	SourceMode	1		Gaussian kinetic energy
1	Source	Source	Gaussian	SigmaX	0.000004	m	Gaussian width, x
1	Source	Source	Gaussian	SigmaY	0.000004	m	Gaussian width, y
1	Source	Source	Gaussian	MeanEnergy	10	MeV	Mean of gaussian kinetic energy
1	Source	Source	Gaussian	SigmaEnergy	0.3	MeV	Sigma of gaussian kinetic energy
1	Source	Source	Gaussian	MinCTheta	0.99		Minimum theta for flat cos theta
1	Nozzle	Drift		Length	0.03	m	
1	Nozzle	Aperture	Circular	Radius	0.01	m	
1	Nozzle	Drift		Length	0.003	m	
1	Nozzle	Aperture	Circular	Radius	0.01	m	
1	Capture	Drift		Length	0.0813669	m	Gap between colimator and first quad
1	Capture	Aperture	Circular	Radius	0.01	m	Aperture of quad
1	Capture	Fquad		Length	0.02	m	Length of focusing quad
1	Capture	Fquad		Strength	150	T/m	Strength of focusing quad
1	Capture	Aperture	Circular	Radius	0.01	m	Aperture of quad
1	Capture	Drift		Length	0.0675723	m	Gap between colimator first (F)quad and second (D)quad
1	Capture	Aperture	Circular	Radius	0.01	m	Aperture of quad
1	Capture	Dquad		Length	0.04	m	Length of defocusing quad
1	Capture	Dquad		Strength	150	T/m	Strength of defocusing quad
1	Capture	Aperture	Circular	Radius	0.01	m	Aperture of quad
1	Capture	Drift		Length	0.1463635	m	Final drift
1	Capture	Aperture	Elliptical	RadiusX	0.015	m	Half aperture in x of elliptical colimator
1	Capture	Aperture	Elliptical	RadiusY	0.001	m	Half aperture in y of ellipse of elliptical colimator
1	Delivery	Drift		Length	0.005	m	
1	Delivery	Aperture	Circular	Radius	0.01	m	Aperture of quad
1	Delivery	Fquad		Length	0.02	m	Length of focusing quad
1	Delivery	Fquad		Strength	150	m	Strength of focusing quad
1	Delivery	Aperture	Circular	Radius	0.01	m	Aperture of quad
1	Delivery	Drift		Length	0.0392506	m	Gap between colimator first (F)quad and second (D)quad
1	Delivery	Aperture	Circular	Radius	0.01	m	Aperture of quad
1	Delivery	Dquad		Length	0.02	m	Length of defocusing quad
1	Delivery	Dquad		Strength	150	T/m	Strength of defocusing quad
1	Delivery	Aperture	Circular	Radius	0.01	m	Aperture of quad
1	Delivery	Drift		Length	1.3274467	m	

End distribution visualisation



Total number of
particles at the end of
the line: 3856

% of particles at the
end of the line:
3.856%

End distribution visualisation

