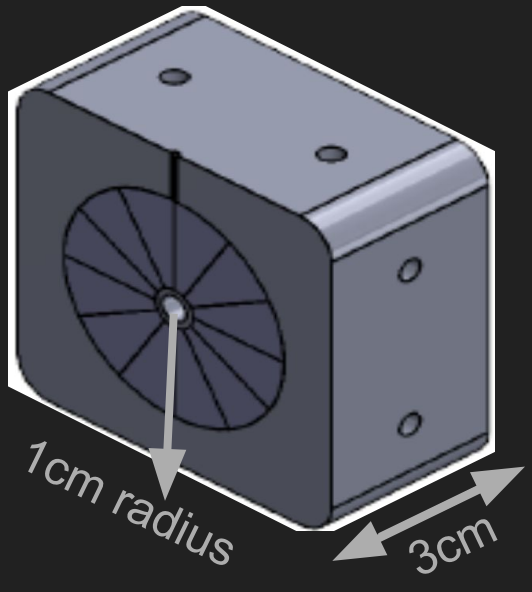
PoPLaR Meeting

25/07/2024

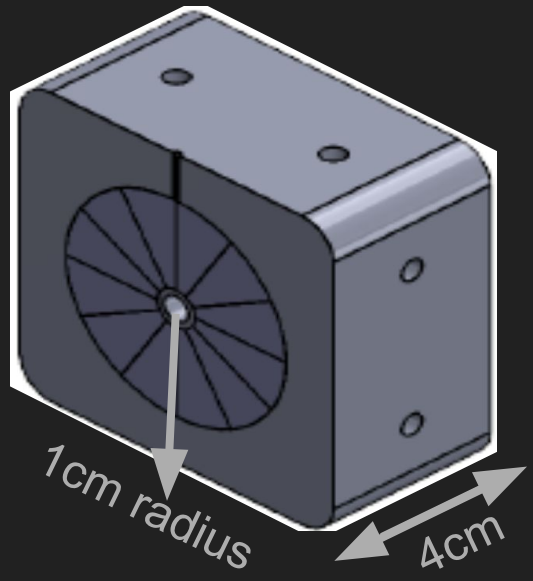
Recap

3 Quad combination

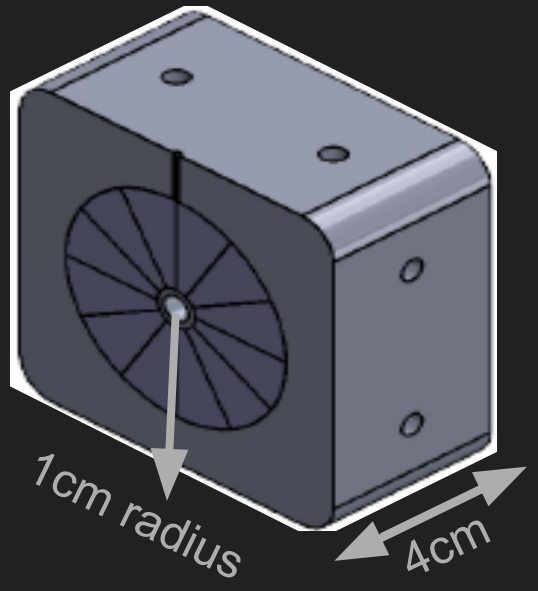
Focusing quad



Defocusing quad



Defocusing quad 2



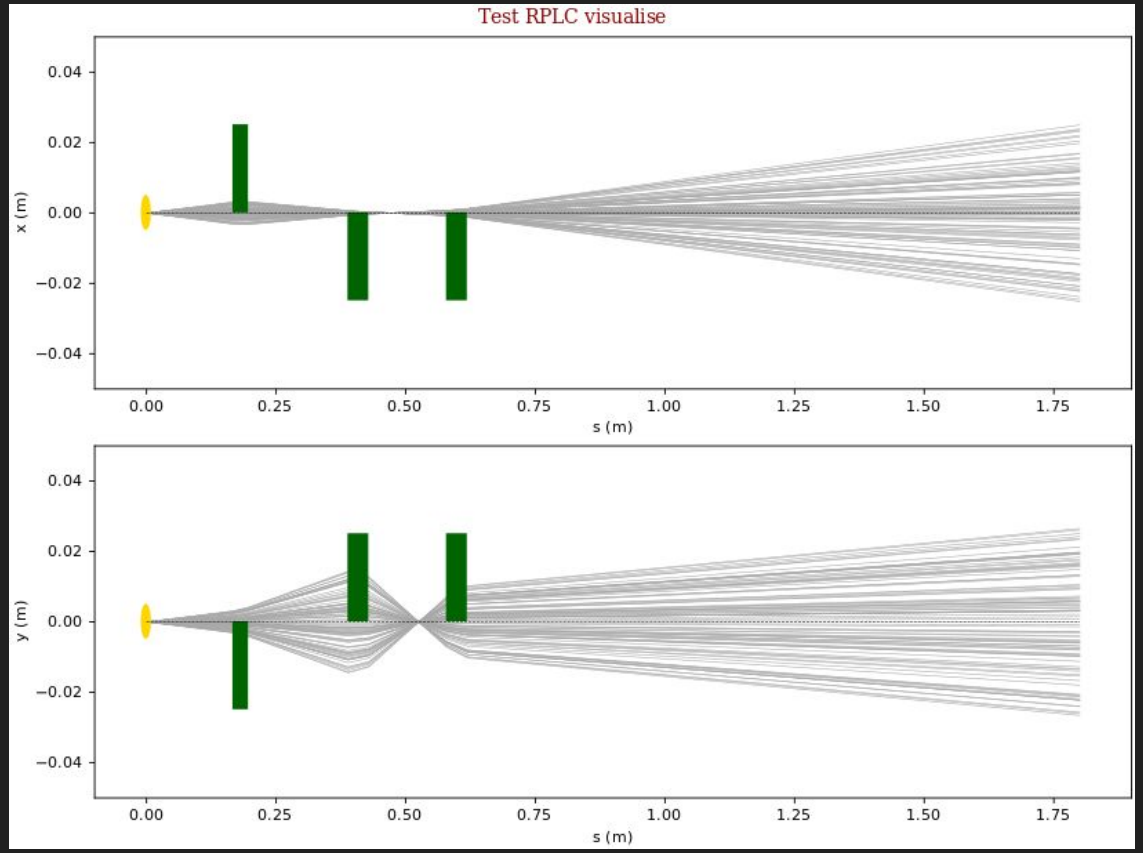
Quads were optimised 3 ways

1. By symmetry- making the x and y dimensions as similar as possible at the final delivery.

2. By gradient- making the beam as horizontal as possible when arriving to the sample.

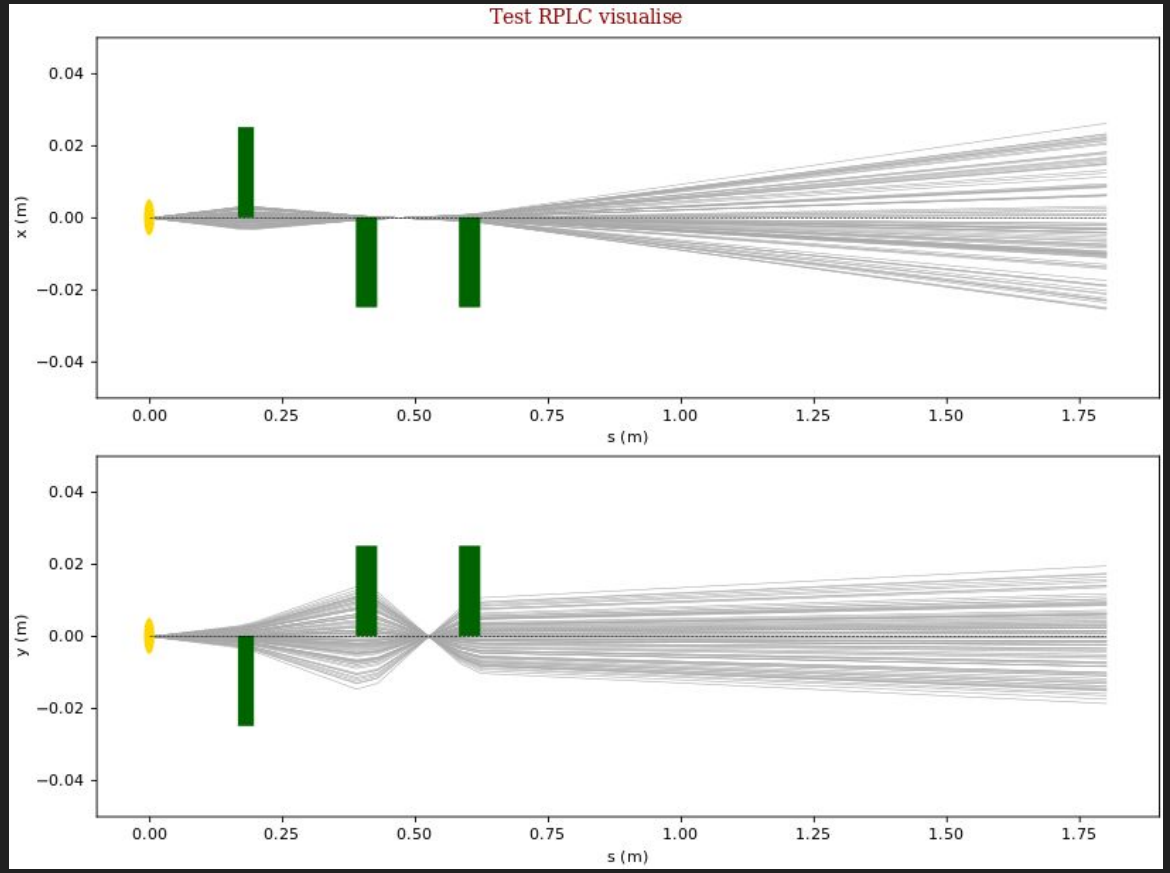
3. A combination of both (perhaps not as sophisticated)

10 MeV beam profile- symmetric optimisation



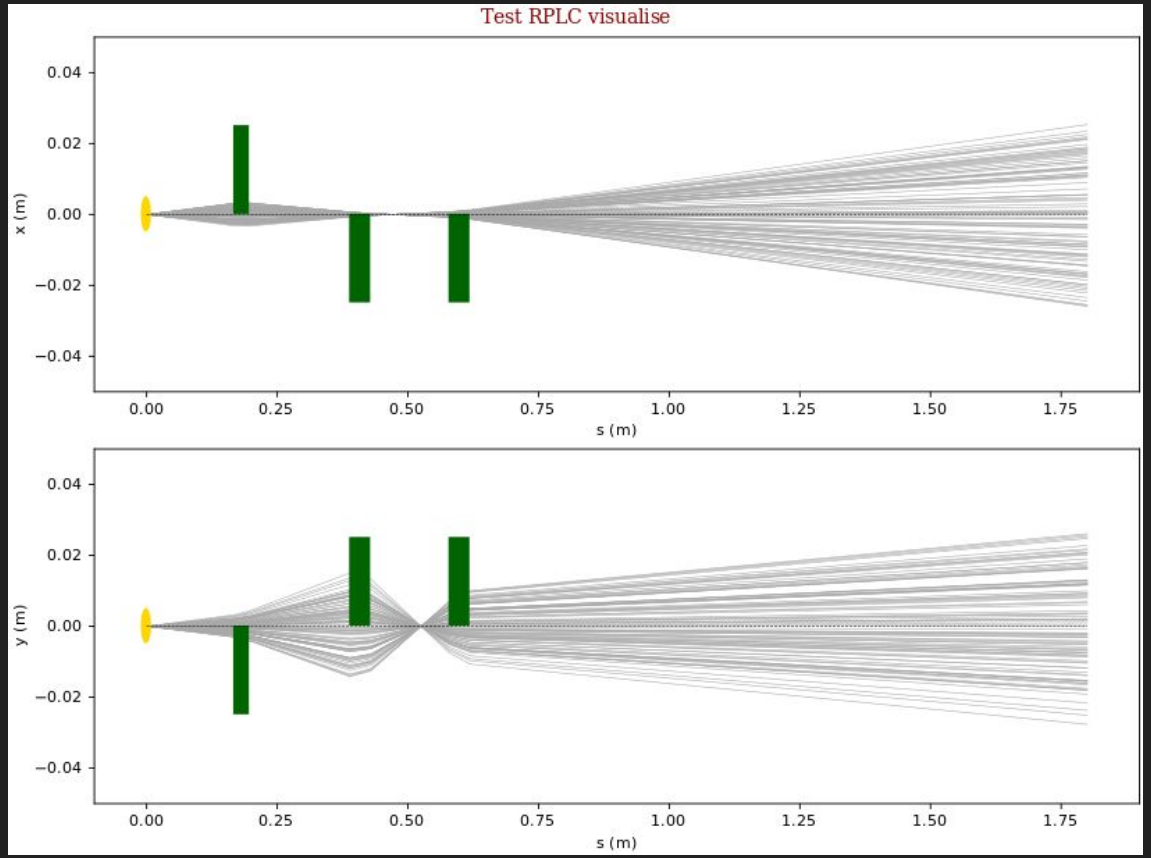
Drift 1- 16.7cm
Drift 2- 19.2cm
Drift 3- 15cm
Drift 4- 1.181m

10 MeV beam profile- gradient optimisation



Drift 1- 16.7cm
Drift 2- 19.2cm
Drift 3- 15.4cm
Drift 4- 1.77m

10 MeV beam profile- combined optimisation

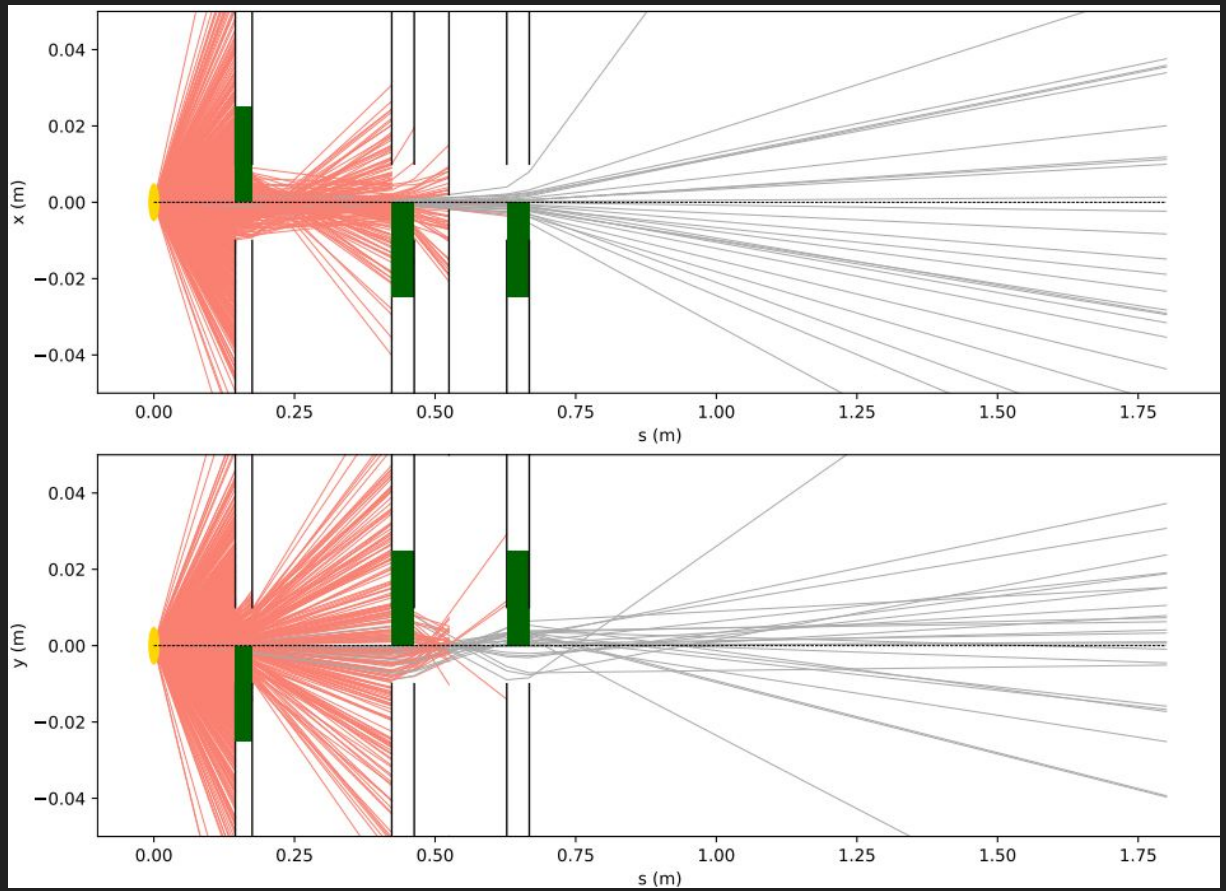


Drift 1- 16.7cm
Drift 2- 19.2cm
Drift 3- 15cm
Drift 4- 1.181m

Next steps

1. Look at the particles that made it to the source by running a particle by particle visual

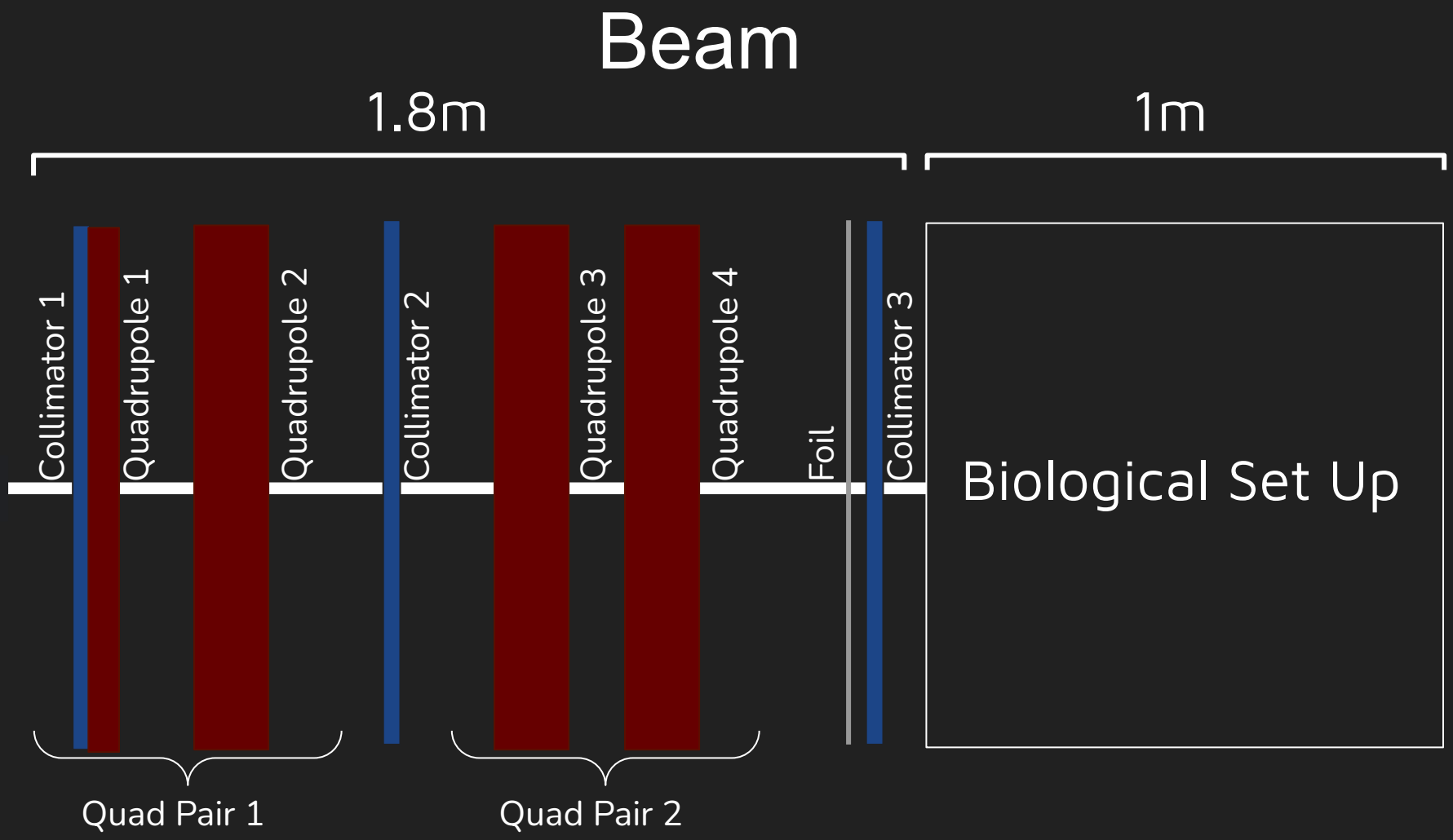
10 MeV pbp visual colour coded for transmission



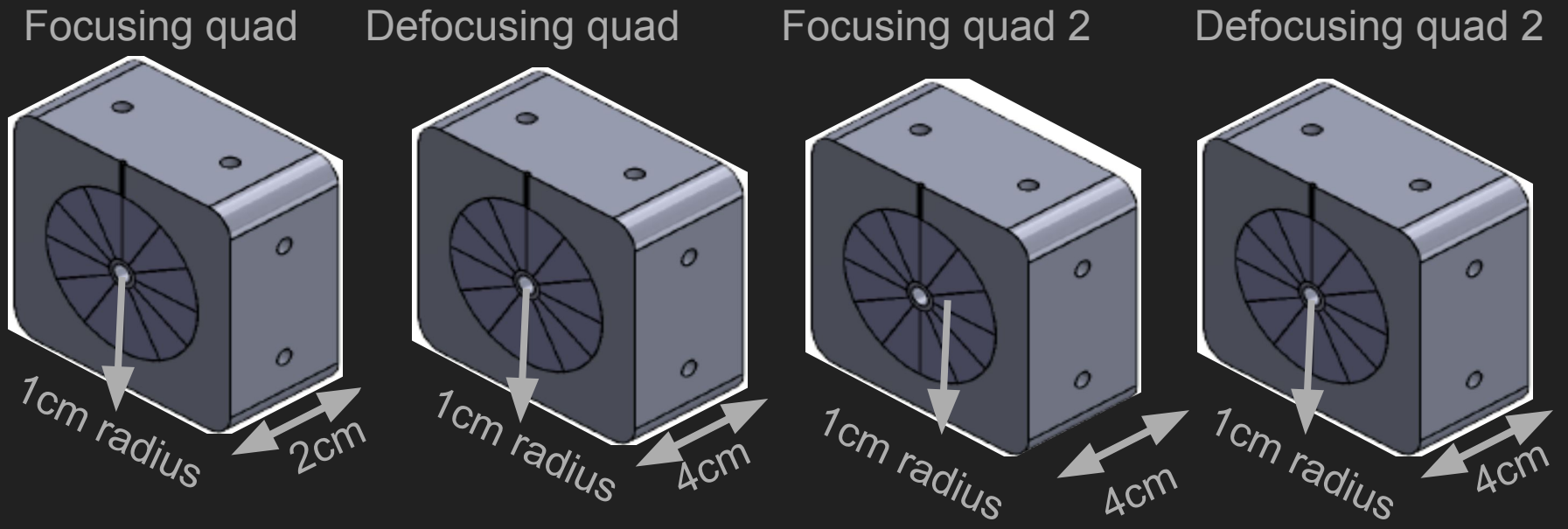
Next steps

1. Add apertures & collimators
2. Move first quad doublet closer to the source by limiting the search space of the gaussian
3. Repeat for other energies
4. Plot the particle progression plots to see the spot size and distribution of the beam/ energy at the source

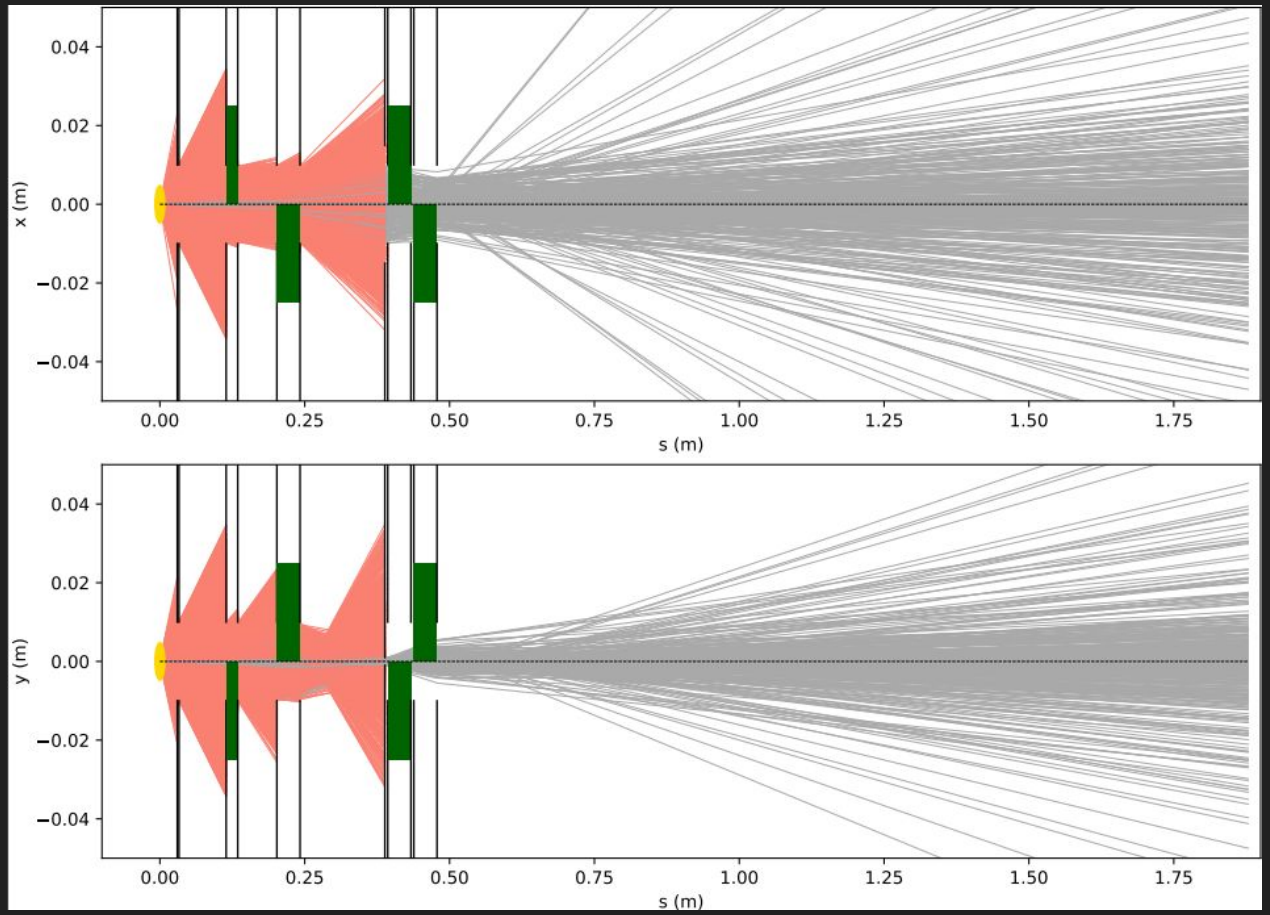
Updates


Beam
1.8m
1m
Collimator 1
Quadrupole 1
Quadrupole 2
Collimator 2
Quadrupole 3
Quadrupole 4
Foil
Collimator 3
Biological Set Up
Quad Pair 1
Quad Pair 2

4 Quad combination



Beam

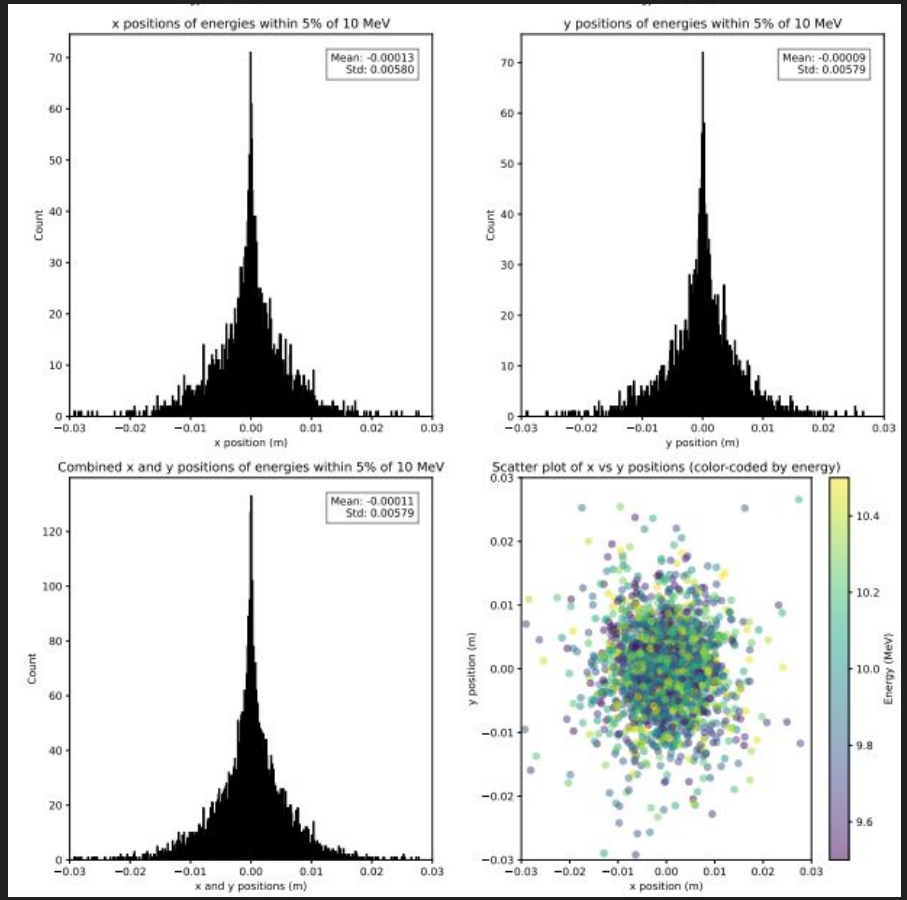


To Improve:

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

Beam Optimisation- Collimator 1

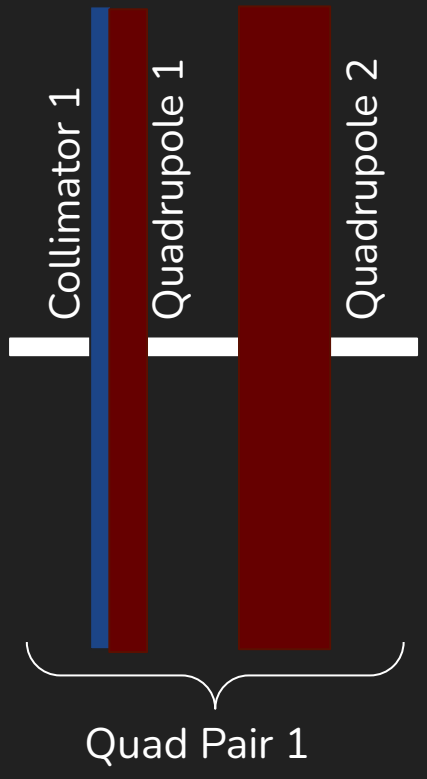
Collimator 1

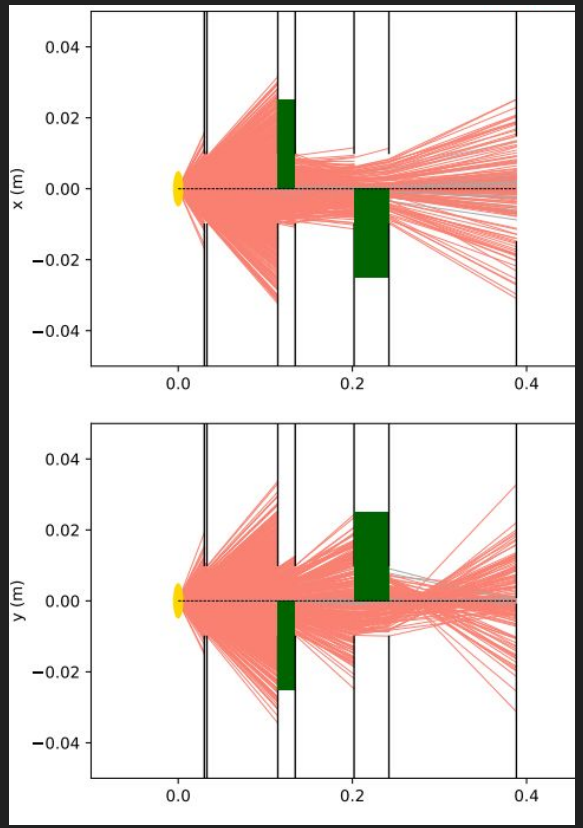


Mapping the positions of the particles with 10MeV (+/- 5%) at 3cm:

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

Beam Optimisation- Quad doublet 1

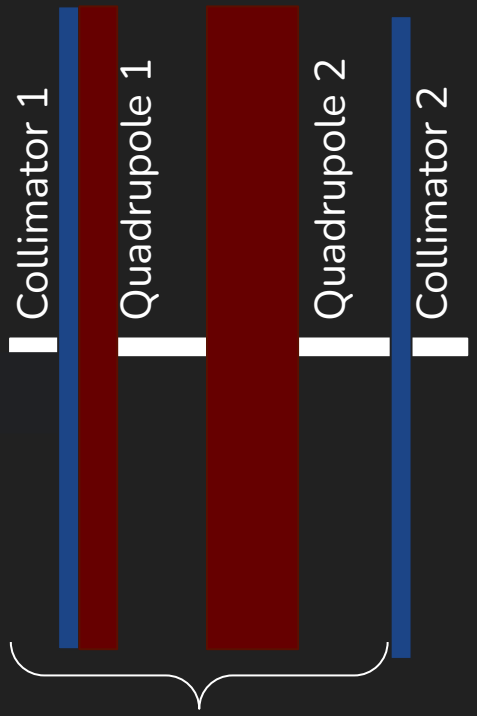


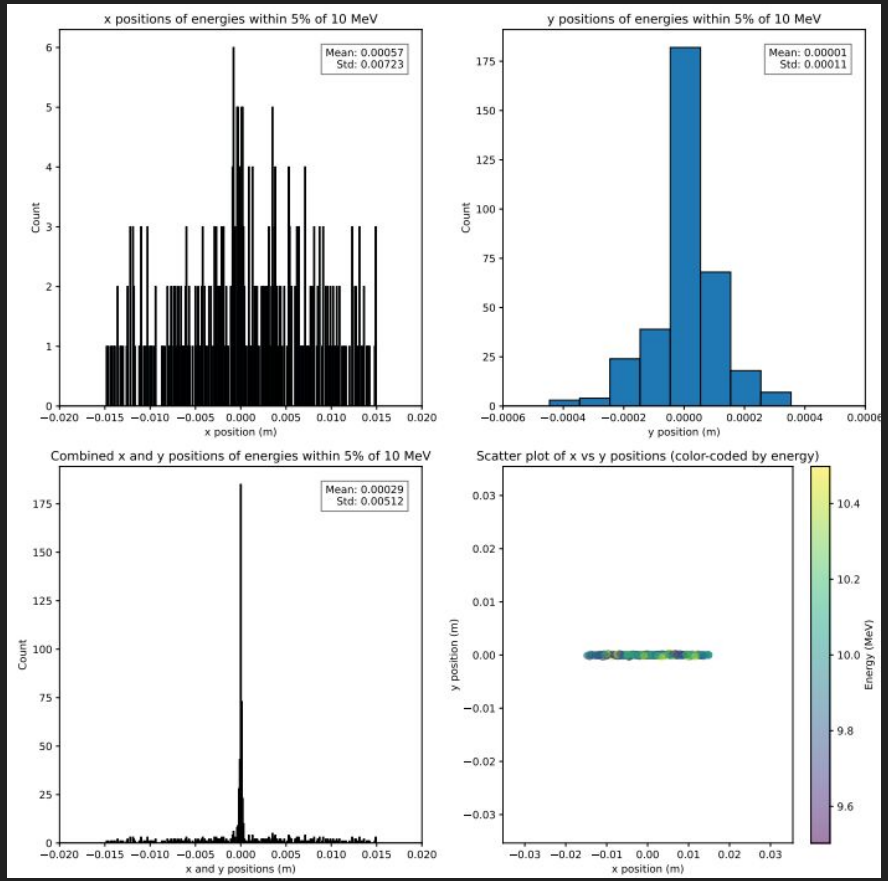


Bayesian Optimisation showed optimal positions of:

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

Beam Optimisation- Collimator 2

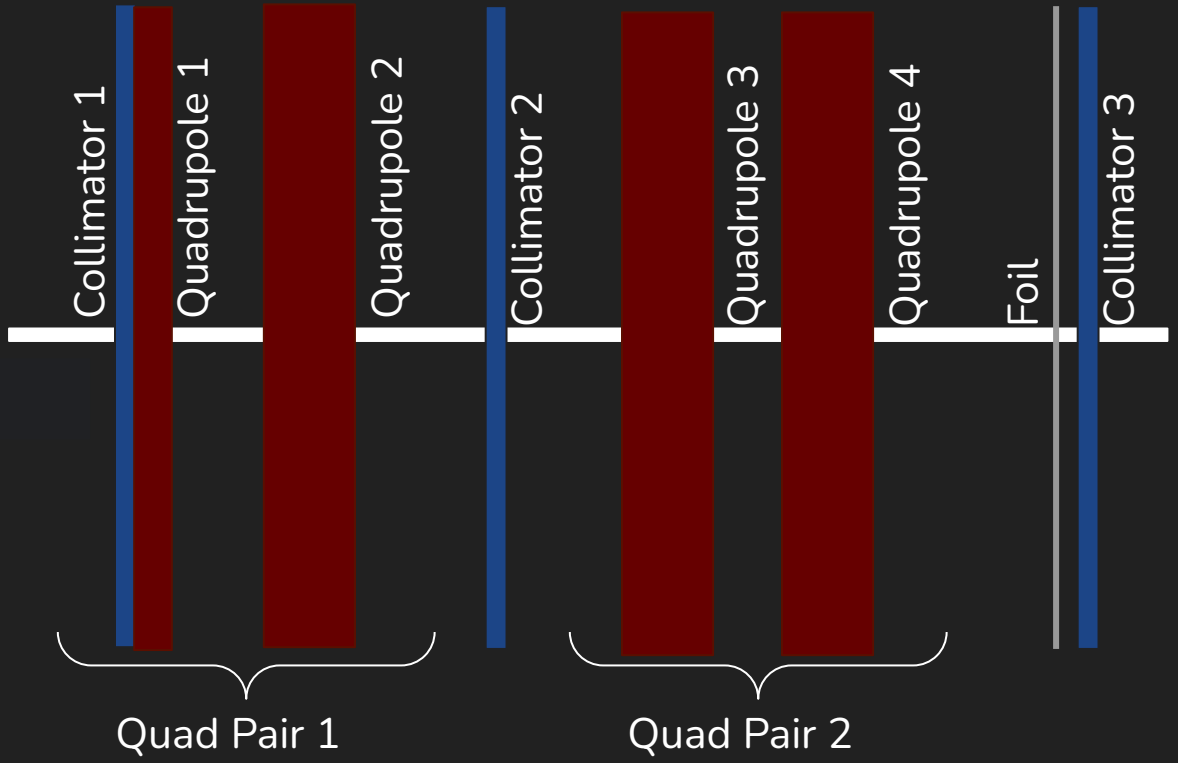




Mapping the positions of the particles with 10MeV (+/- 5%) colimator 2:

- 1mm x rad and 0.5mm y rad elliptical aperture decided on to begin

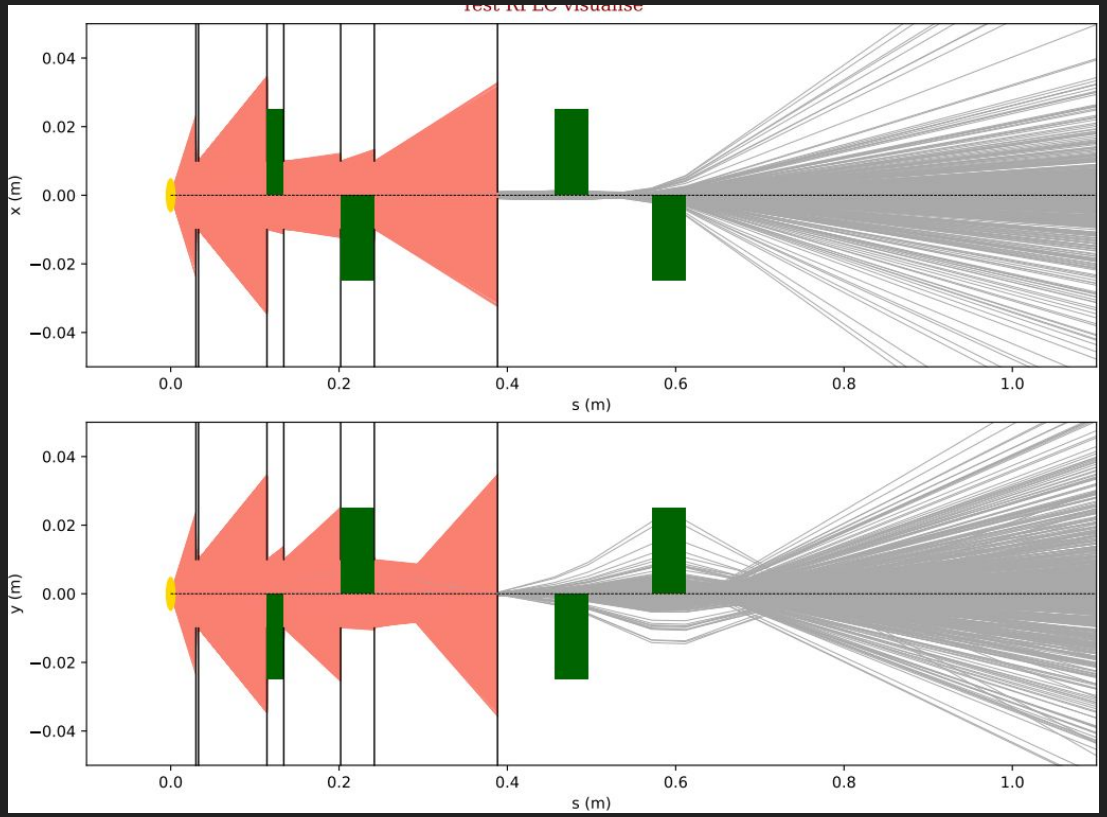
Beam Optimisation- Quad doublet 2 & end



Next steps:

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

First run example



Problems:

- Large spread
- Large gradient

Thoughts:

- Run for pencil/gaussian first then implement with laser driven source