

LhARA: Capture Meeting

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Open Collimator Beam Size Evolution

- Still waiting for higher statistics simulations
- Took the lower statistics distribution (last week) but fixed nozzle geometry to have an exit diameter of 5.74 mm

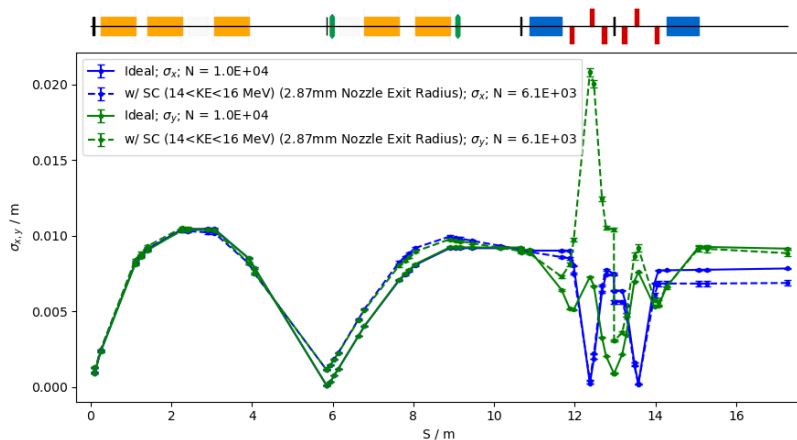
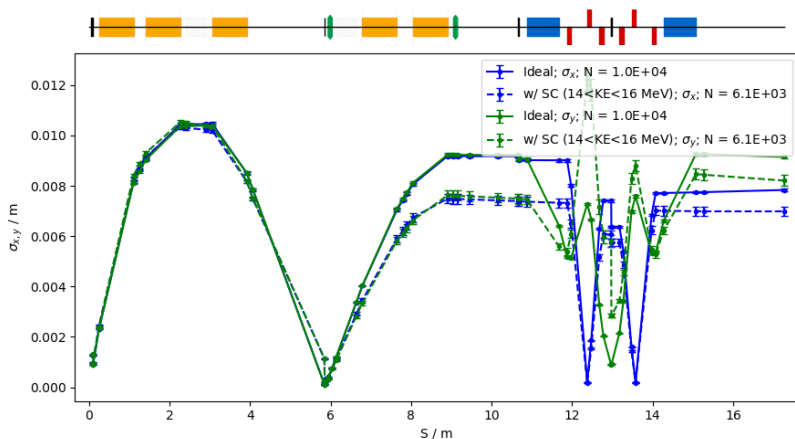


Figure: Open collimator at around 6 m.

Closed Collimator Beam Size Evolution

- With properly defined aperture for collimator at around 6 m:
- Less pronounced peak in arc, though still present



Closed Collimator Beam Size Evolution

Cartesian Geometric Sampled Proton Beam: Second Quad in Arc (w/ SC)

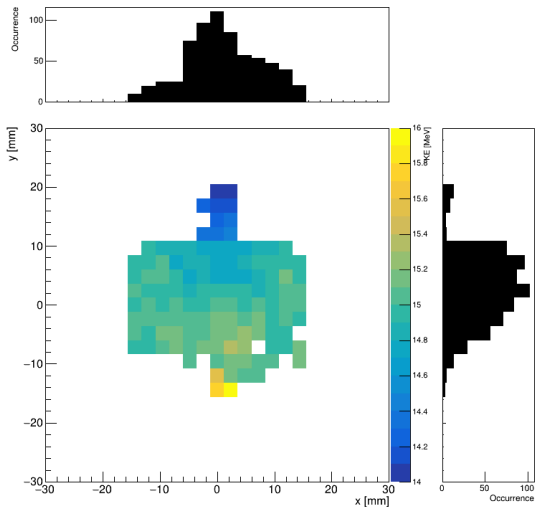
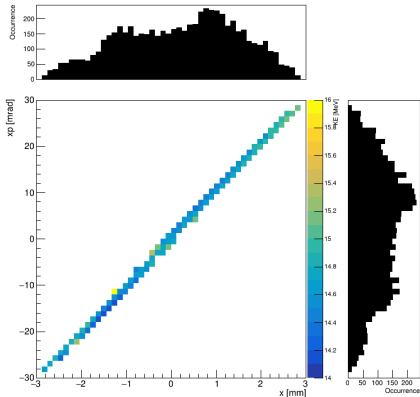


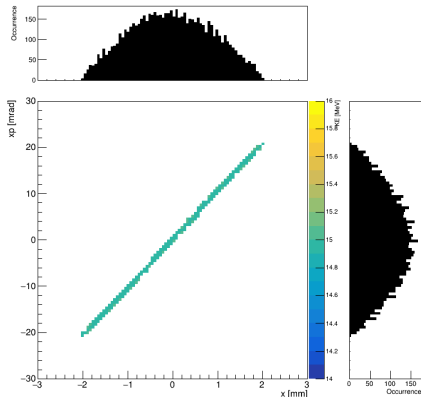
Figure: Beam at the 'peak' i.e. second quadrupole in arc.

Fitted Twiss

Cartesian Geometric Sampled Proton Beam: Nozzle End (w/ SC)



Ideal Beam: Nozzle End (w/ SC)



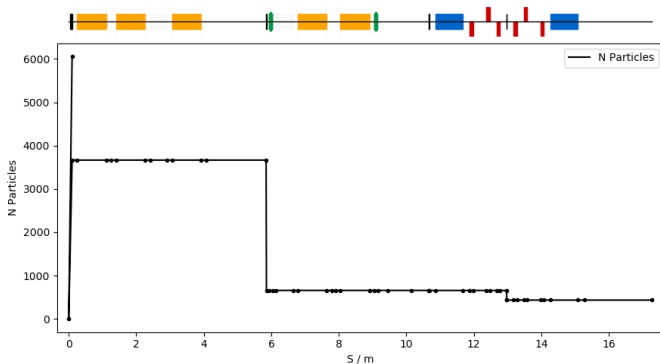
| | | |
|-----------------------------|--|-----------------------|
| β_x [m] | 31.602 | 39.38 |
| α_x | -317.667 | -395.14 |
| ϵ_x [π m rad] | 2.984×10^{-8} | 4.18×10^{-8} |
| β_y [m] | 31.652 | 40.45 |
| α_y | -318.088 | -405.91 |
| ϵ_y [π m rad] | 2.888×10^{-8} | 4.19×10^{-8} |

| | |
|-----------------------------|------------------------|
| β_x [m] | 4.82 |
| α_x | -49.43 |
| ϵ_x [π m rad] | 3.277×10^{-7} |
| β_y [m] | 4.97 |
| α_y | -51 |
| ϵ_y [π m rad] | 3.256×10^{-7} |

Beam Losses

- Beam losses for the $14 < KE < 16$ MeV beam
- Main losses at around 6 m

| Collimator | Aperture Radius |
|-------------|-----------------------------|
| Around 6 m | $r_x = r_y = 0.5$ mm |
| Around 11 m | $r_x = r_y = 20$ mm |
| In arc | $r_x = 12$ mm, $r_y = 6$ mm |



KE Spectrum

Cartesian Geometric Sampled Proton Beam: After Collimator at 6 m (w/ SC)

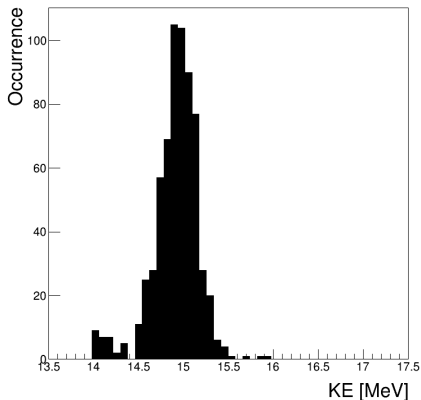


Figure: KE distribution after collimator at 6 m.

Cartesian Geometric Sampled Proton Beam: At Endstation (w/ SC)

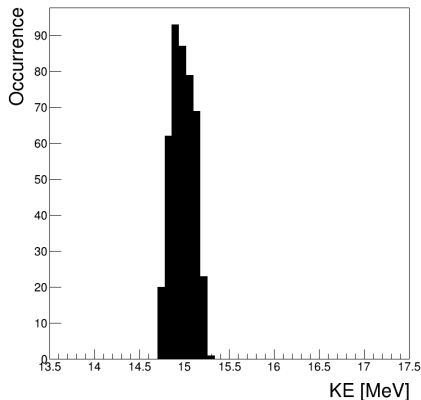


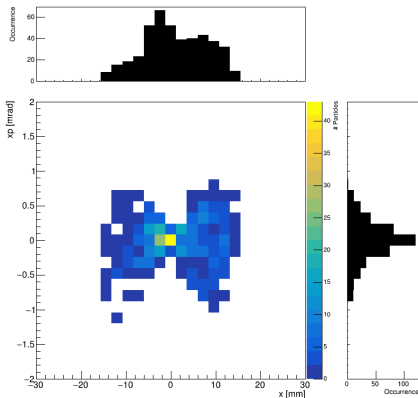
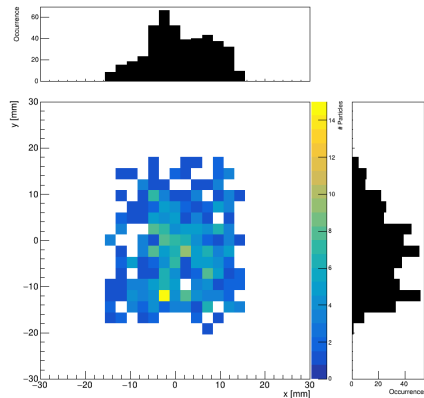
Figure: KE distribution at endstation.

Update

- Needs more statistics
- Colour in plots are population in bins

Cartesian Geometric Sampled Proton Beam: Endstation (w/ SC)

Cartesian Geometric Sampled Proton Beam: Endstation (w/ SC)



- Positional distributions of $14 < KE < 16$ MeV beam coming out of nozzle (15 cm away from the start of GL field)

Cartesian Geometric Sampled Proton Beam: Nozzle End (w/ SC)

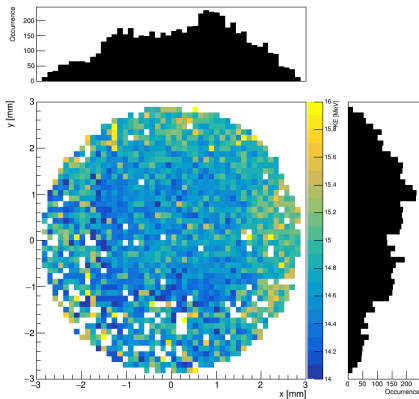


Figure: Colour represents KE of protons.

Cartesian Geometric Sampled Proton Beam: Nozzle End (w/ SC)

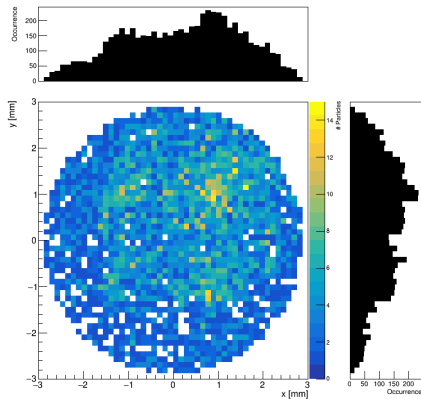


Figure: Colour represents population binning of protons.