Stage 1 Full Spectrum Tracking

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Initial Objectives

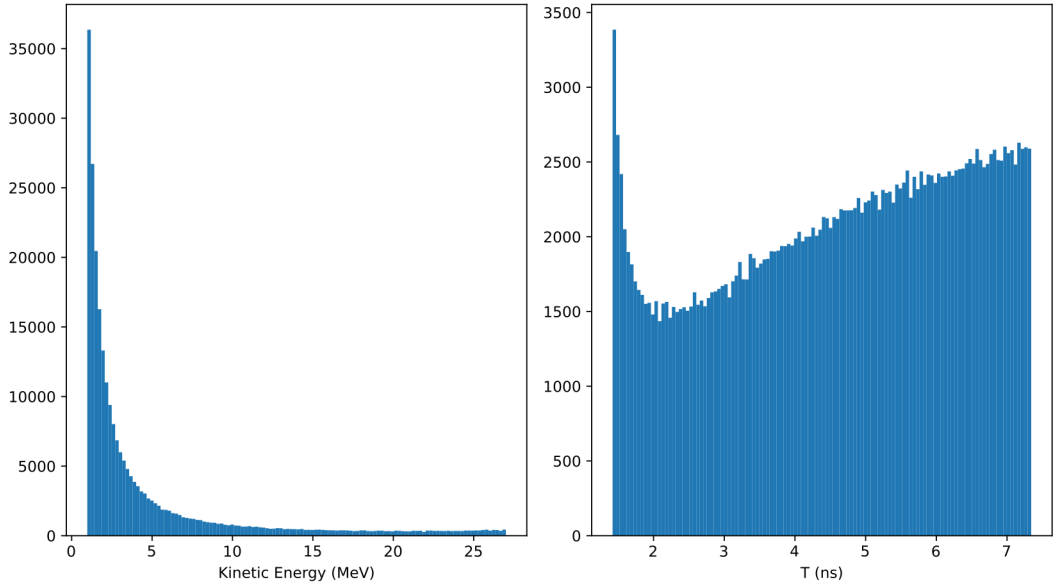
- Run the parametrised source workflow for the full KE spectrum (1-25 MeV)
- Inspect the beam at nozzle exit to assess survival of the nominal energy band
- Inspect the phase space at the first collimator as the initial conditions for a collimation study
- Optimise collimator for energy cleaning and nominal energy band survival
- RF cavity modelling, aiming to increase the population of of the nominal band

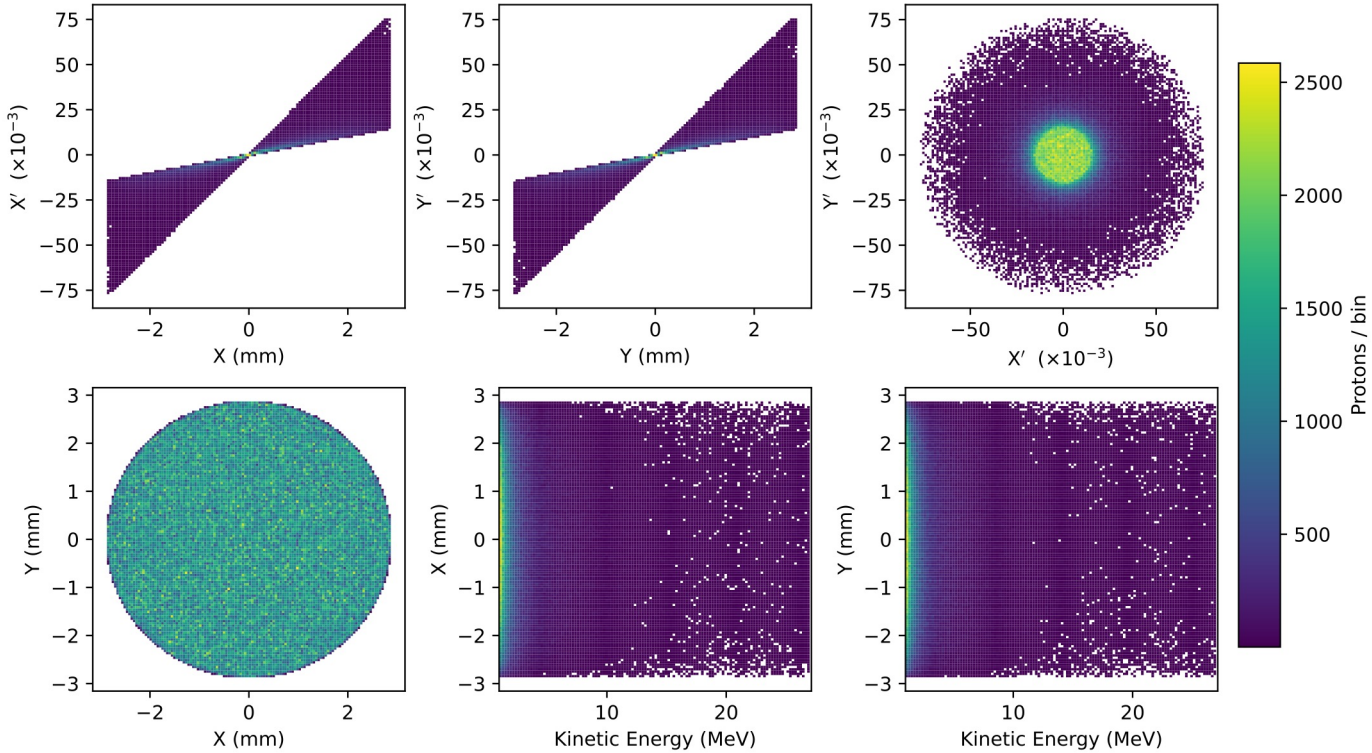
Full Spectrum Beam Generation

Source parameters taken from LhARA CDR

GPT tracking through the nozzle apertures

Particle coordinates at the nozzle exit as input to BDSIM tracking of the Stage 1 lattice
(Shown on this slide)





3M protons at source generation -

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250k protons survive the nozzle

~1000 protons in 15±2% MeV band

Phase Space at Energy Selection Collimator

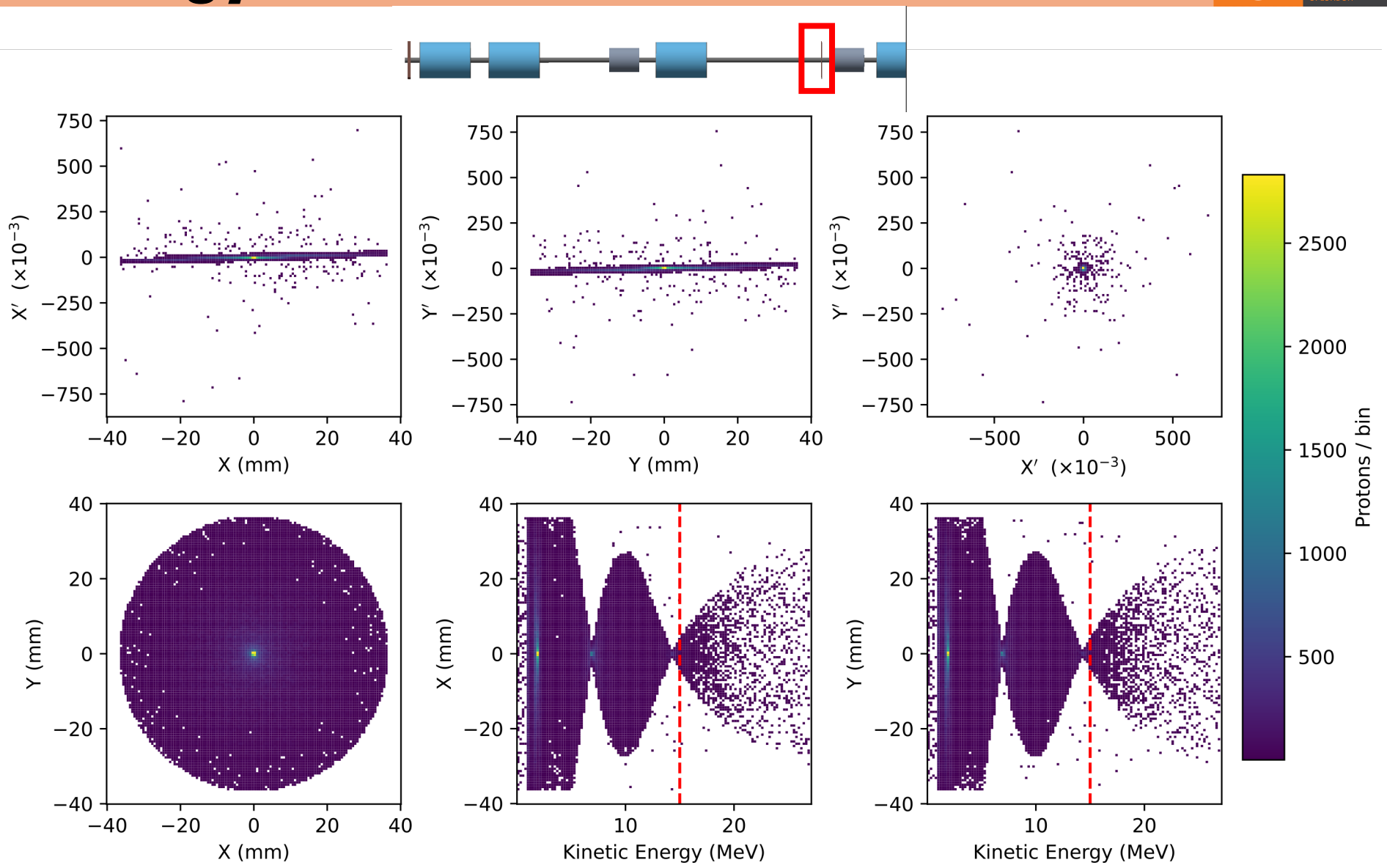
BDSIM Tracking

- Gabor Lenses
- 3.65cm beampipe aperture
- Secondaries off

Multiple points of high intensity within the Transverse–KE phase spaces

~89k protons

380 protons in 15±2% MeV band



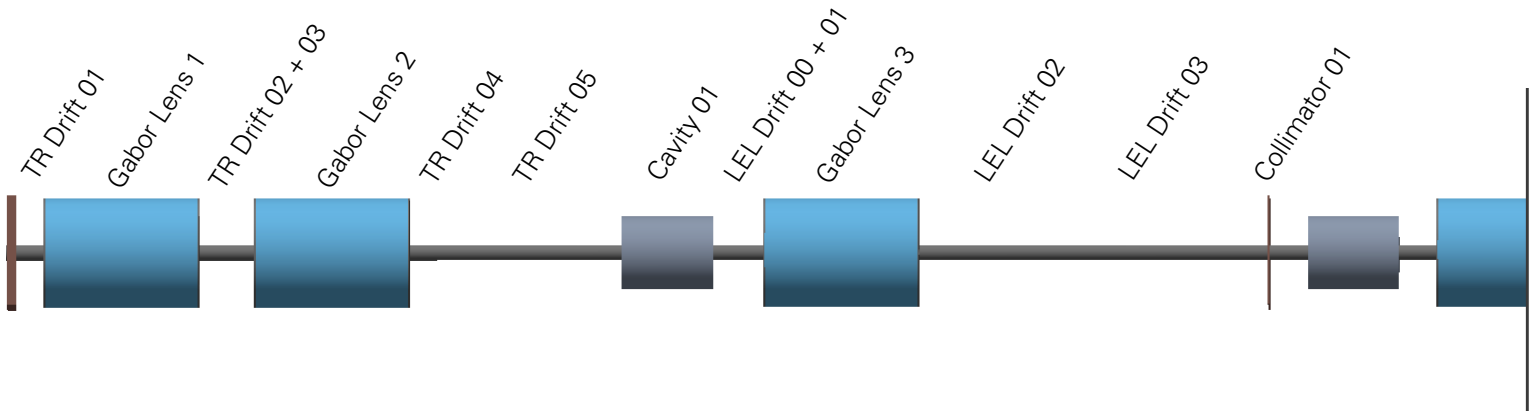
Red dashed line @ 15 MeV

Development of Transverse-KE Phase Spaces

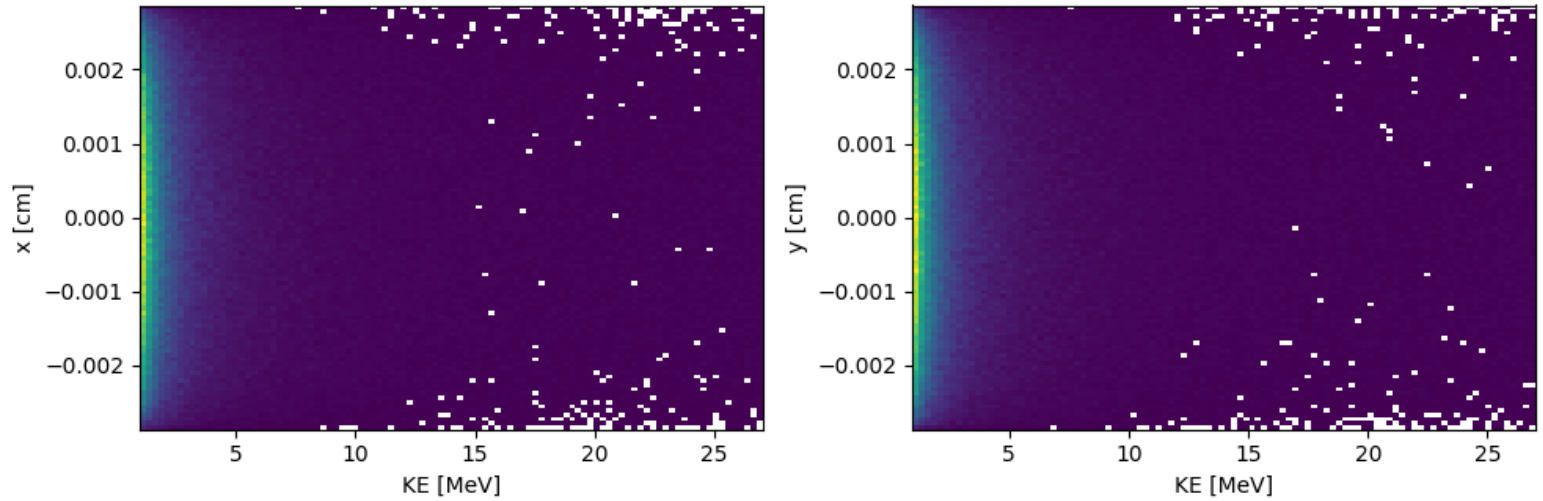
New region of high intensity introduced at each Gabor Lens

Particles of ascending KE being focused to a point and then diverging again

Three Gabor lenses – three foci



Nozzle Exit



Into Arc

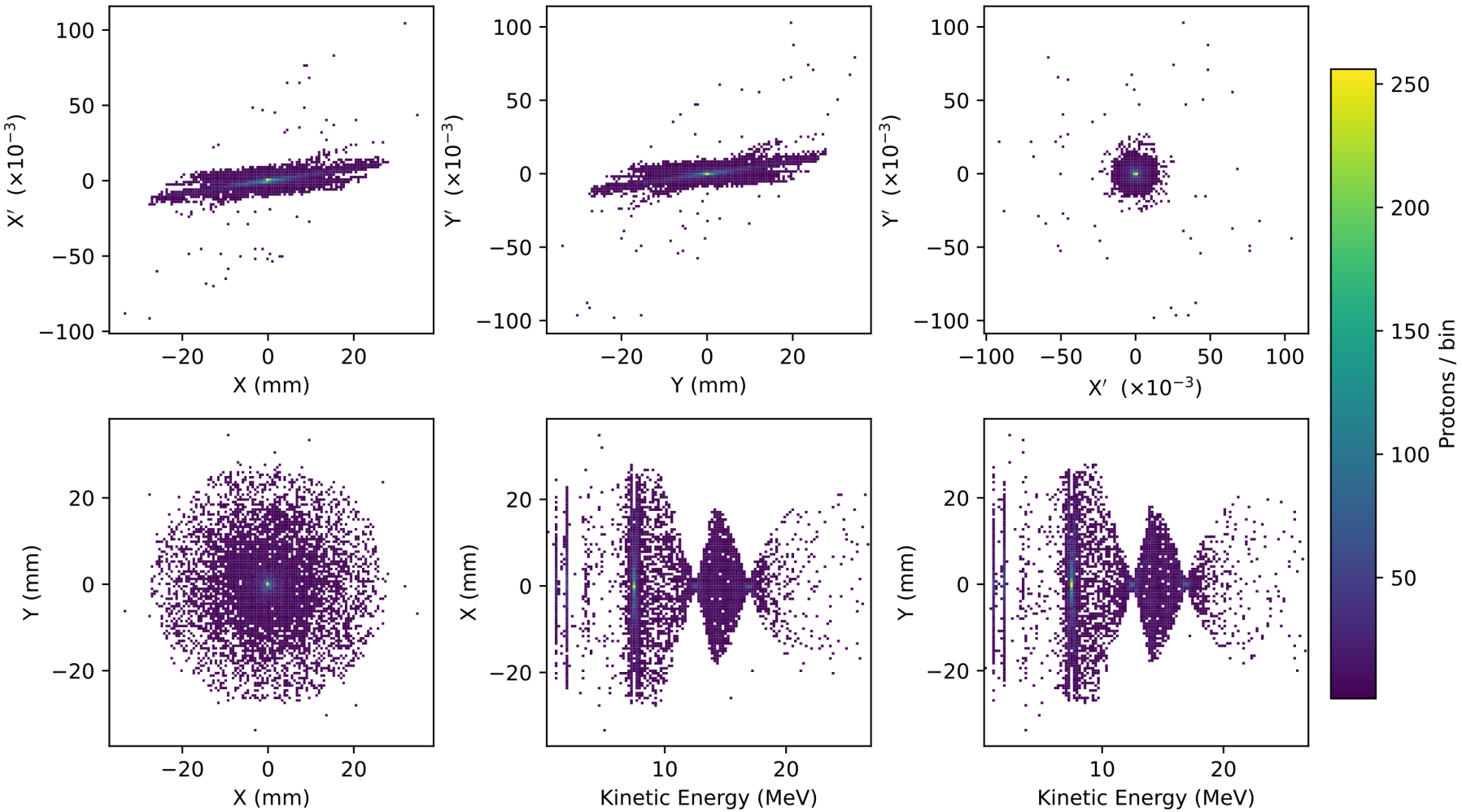
BDSIM Tracking

- Gabor Lenses
- 3.65cm beampipe aperture
- Secondaries off

Sampled at end of drift entering the arc entrance dipole

~8k protons

~370 in 15±2% MeV band

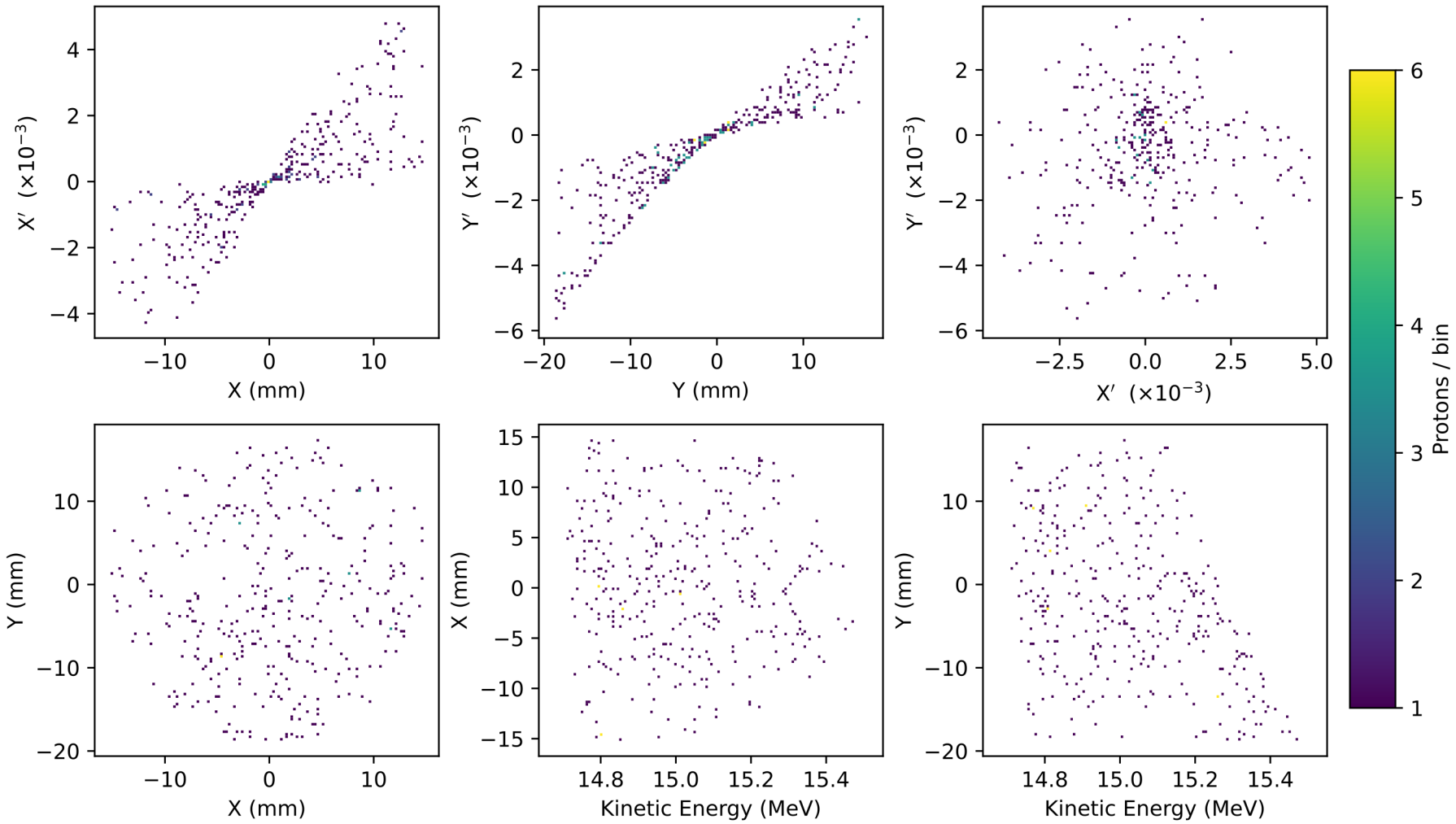


Arc Exit

BDSIM Tracking

- Gabor Lenses
- 3.65cm beampipe aperture
- Secondaries off

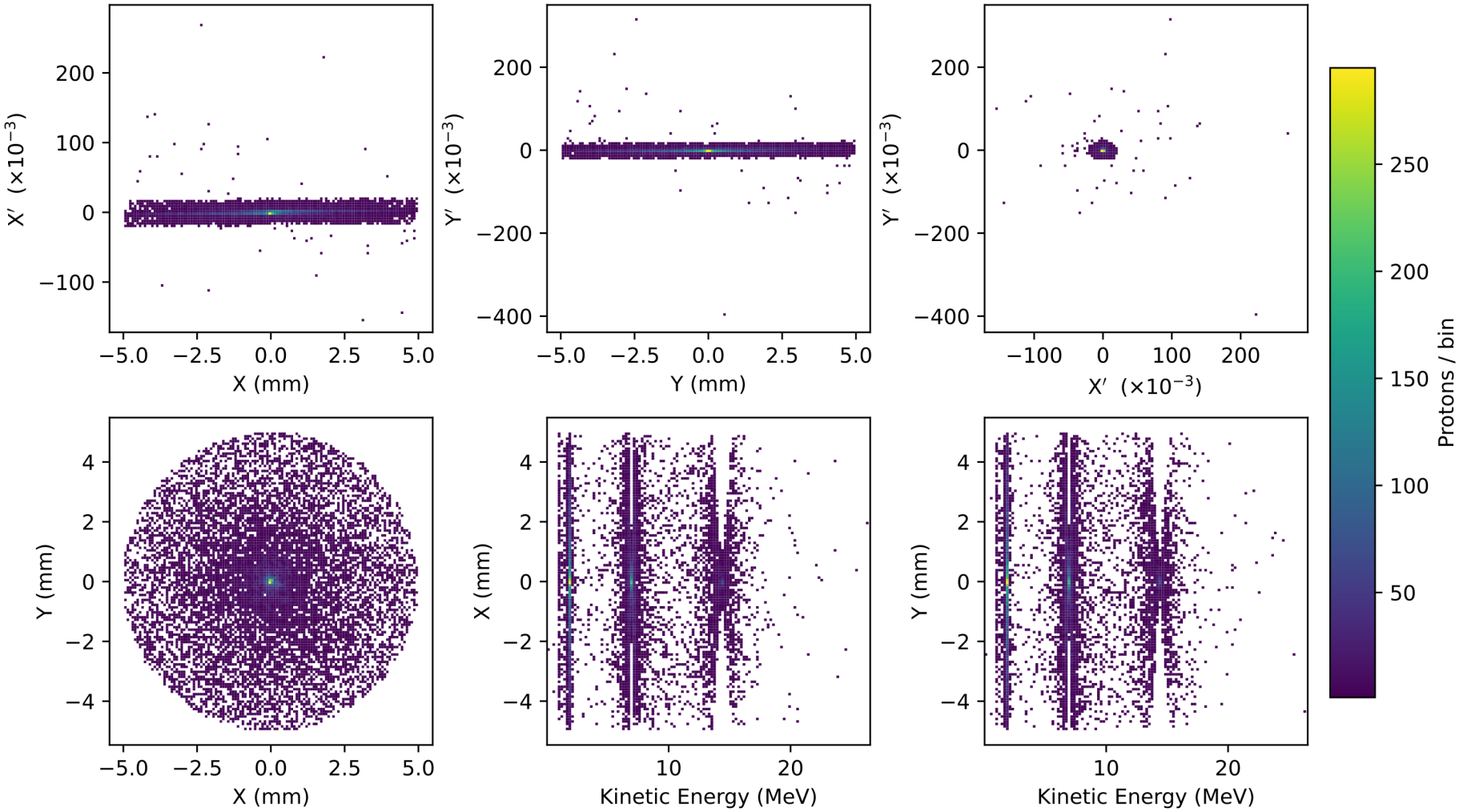
Sampled at end of the drift after the arc exit dipole



Energy Selection Collimator – r=5mm

BDSIM Tracking

- Gabor Lenses
- 3.65cm beampipe aperture
- Secondaries off
- 5 mm radial collimator aperture (material – Iron – 1cm length)



Thank You

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