LhARA Model Validations

Stage 1 Optics and Beam Uniformity

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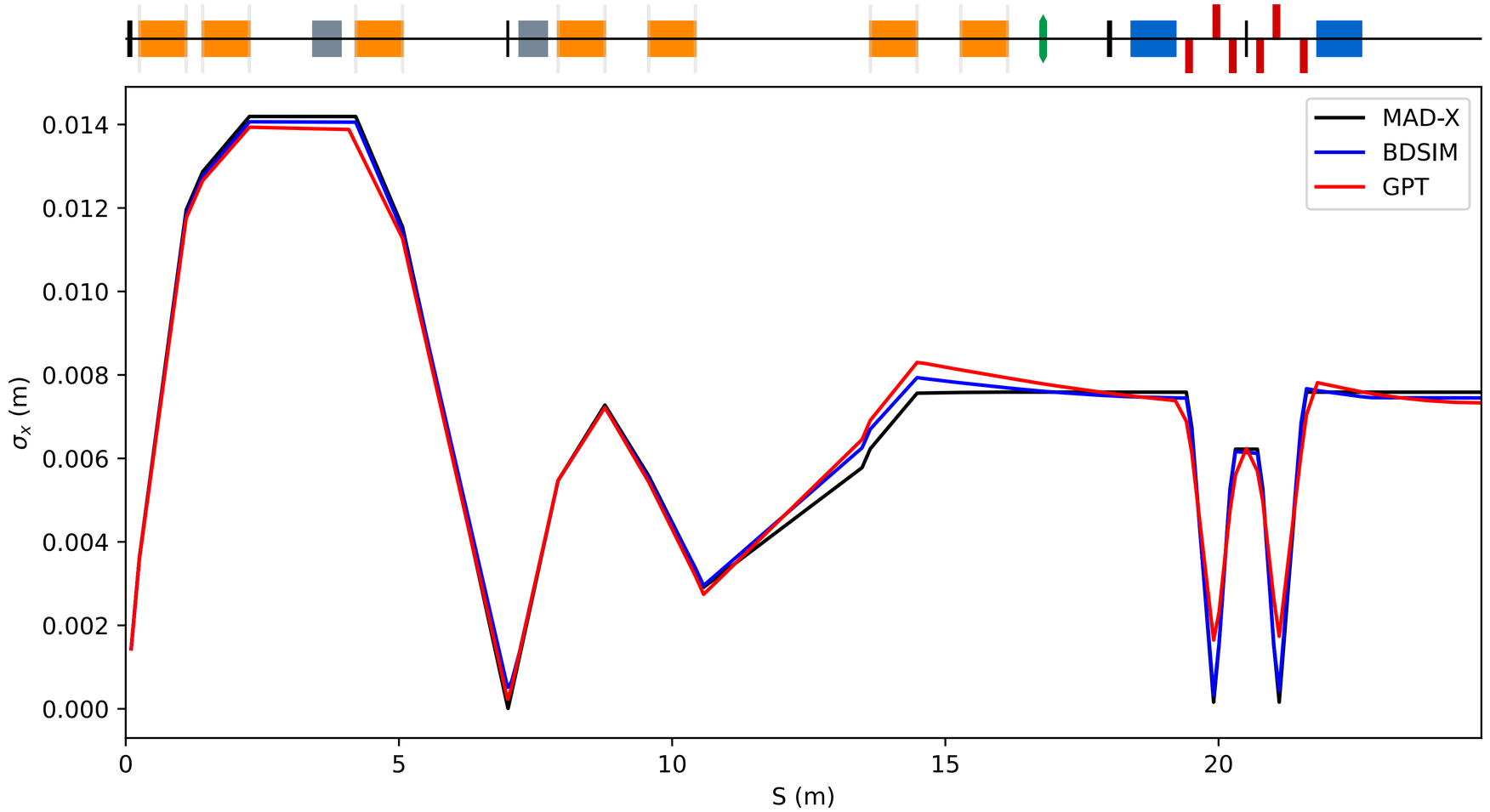
Optics Validation

3.0 cm Beam - Sigma X



Gabor Lens	1	2	3	4	5	6	7
Strength	2.49	1.02	1.45	2.33	0.95	1.40	0.12

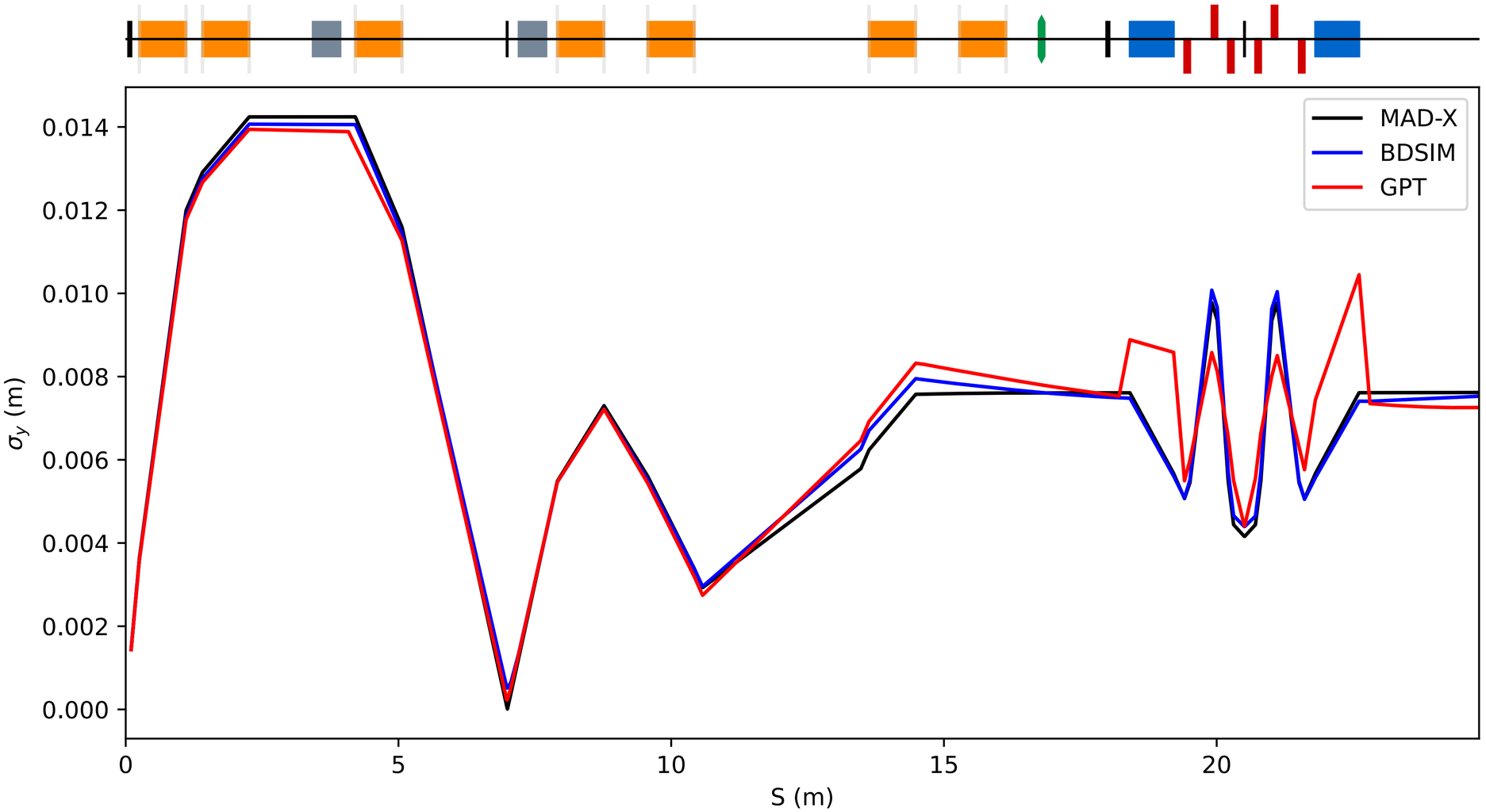
Optics Validation

3.0cm Beam - Sigma Y

GPT Dipole Peaks
Differences around dipoles are due to GPT time snapshots where only half the particles are in the dipole

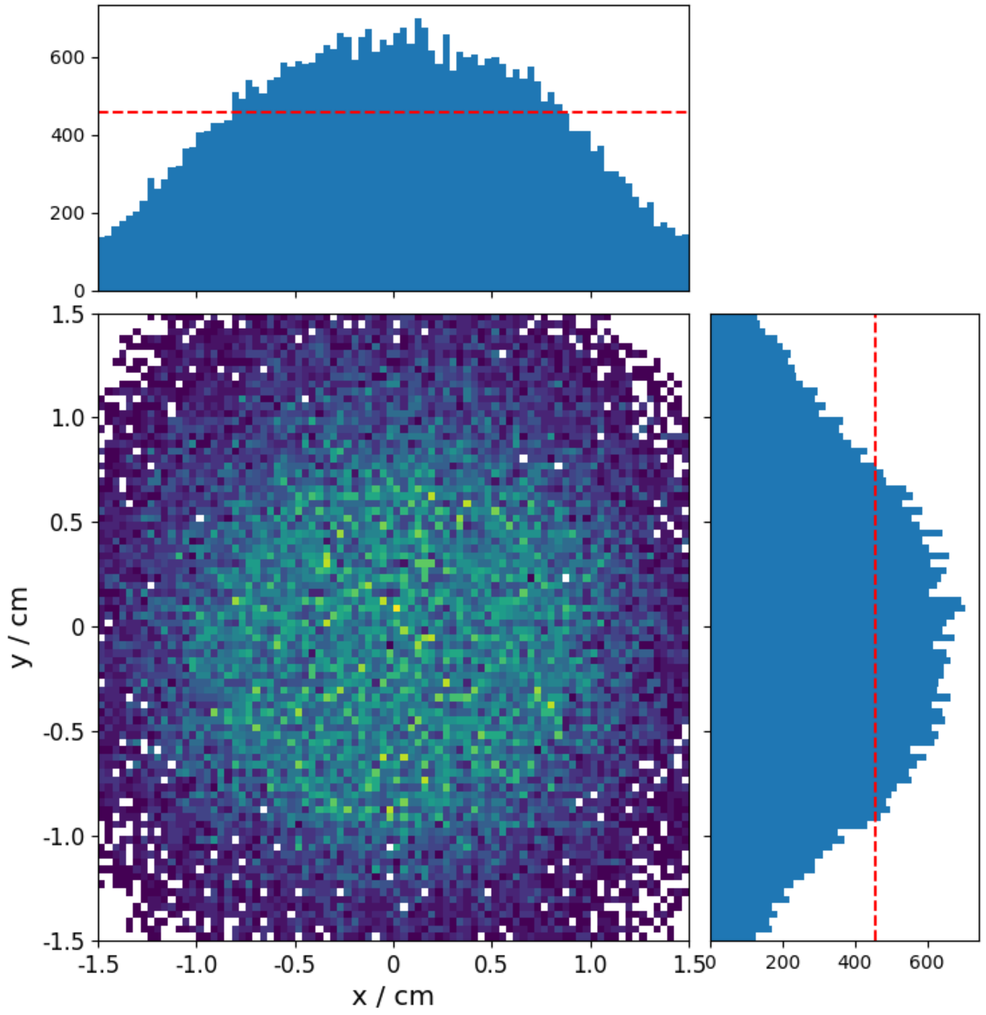
MAD-X Energy Spread
A SigmaE value of 0.006 was required for the SigmaY optics to match
(BDSIM SigmaE = 0.000196).

Likely caused by the way MAD-X handles energy spread but hard to confirm due to a lack of documentation

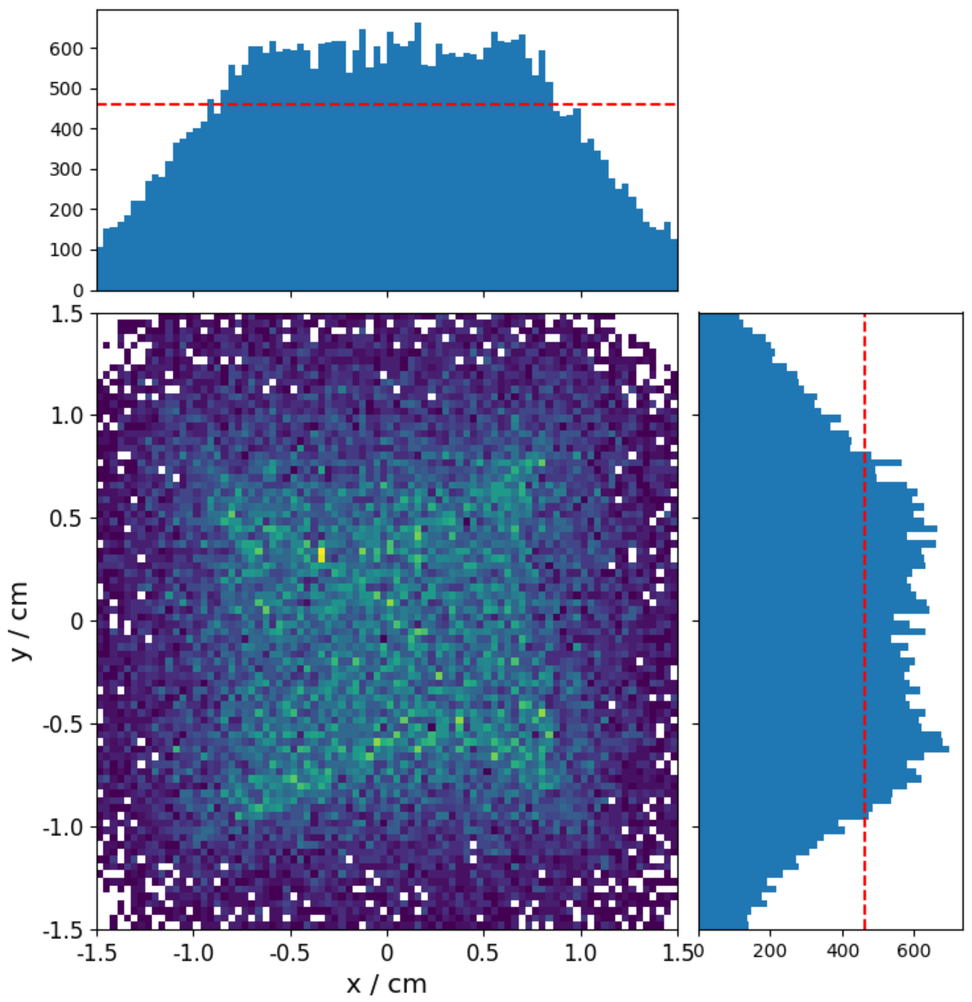


Beam Uniformity

3.0 cm beam - 41,000 particles - Data taken before Stage 1 end station (Drift 30)



Octupole Off



Octupole On
k3 = 6000 m^-4

Further Work

Optics Validation

- Investigate the origin of the required SigmaE value of 0.006

Beam Uniformity

- Investigating the use of higher order magnets or introducing higher order components (combined function Octupole-Dodecapole)
- Octuples are most effective where the beam is larger in one transverse dimension
    - No space for an octupole within the arc quadrupoles
    - Potential of introducing the octupole to the quadrupole scheme being designed by Rehanah for mini-beam focusing after the arc.