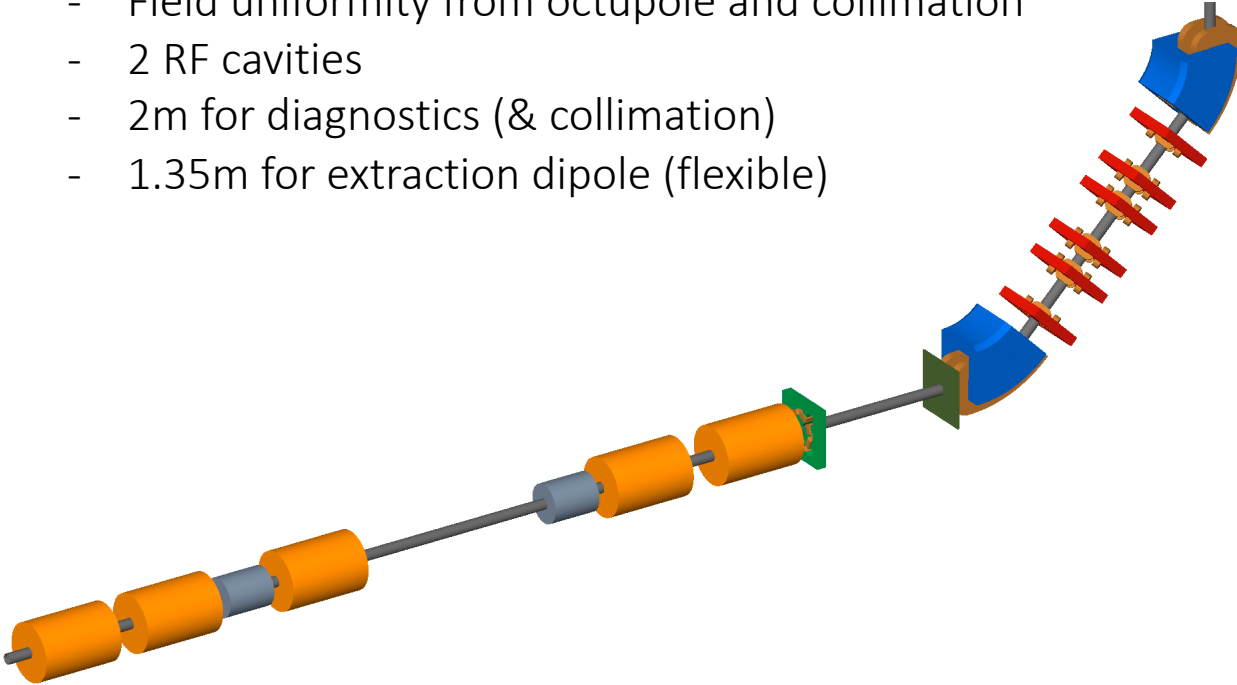


LhARA Stage 1 Lattice(s): Overview

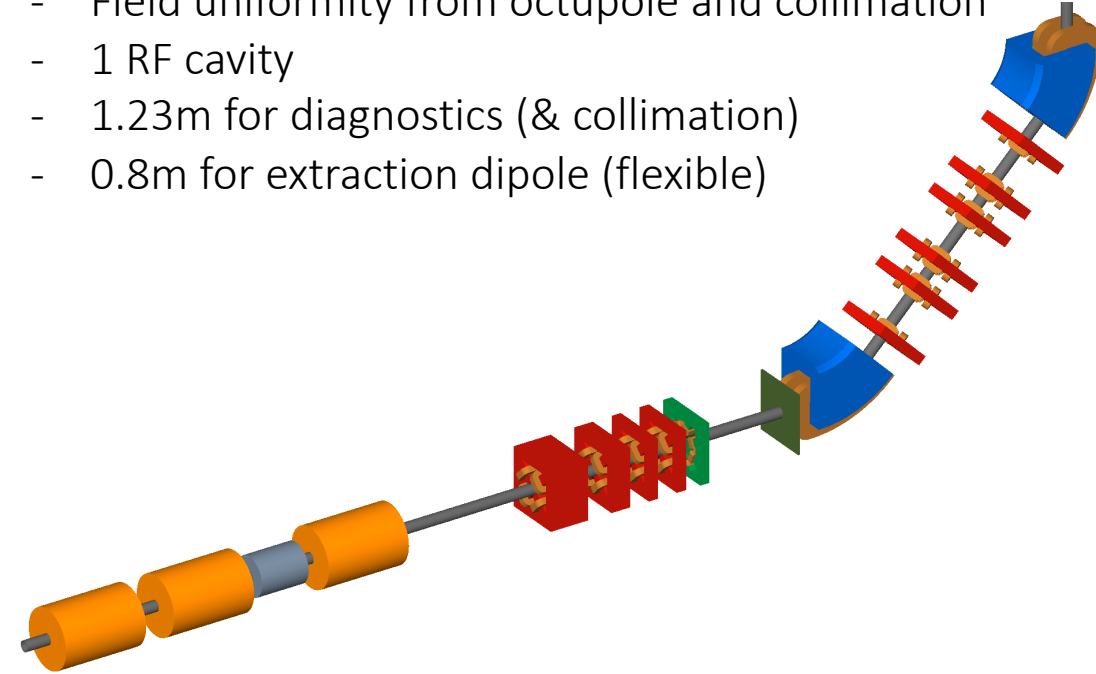
Version 4.3: Gabor Lenses:

- Length: 17.255m (source to Target)
- 5 Gabor lenses, 2 dipoles, 6 quadrupoles
- Vertical arc design 3
- Field uniformity from octupole and collimation
- 2 RF cavities
- 2m for diagnostics (& collimation)
- 1.35m for extraction dipole (flexible)



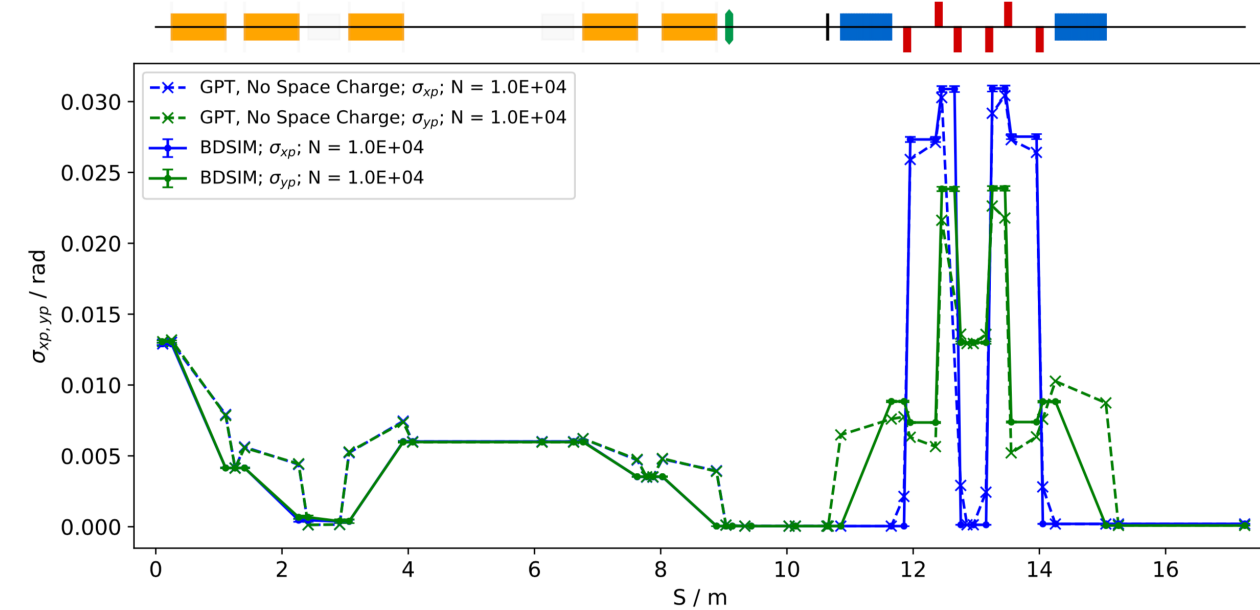
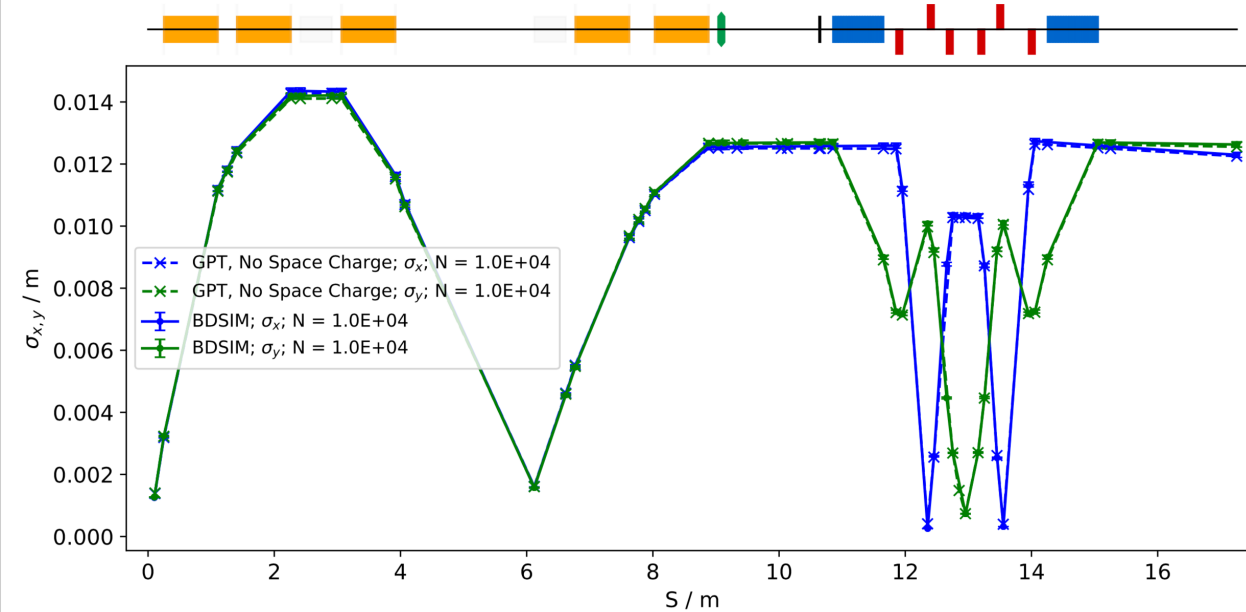
Version 5.2: Quadrupoles:

- Length: 14.710m (source to target)
- 3 Gabor lenses, 2 dipoles, 10 quadrupoles
- Vertical arc design 3
- Field uniformity from octupole and collimation
- 1 RF cavity
- 1.23m for diagnostics (& collimation)
- 0.8m for extraction dipole (flexible)



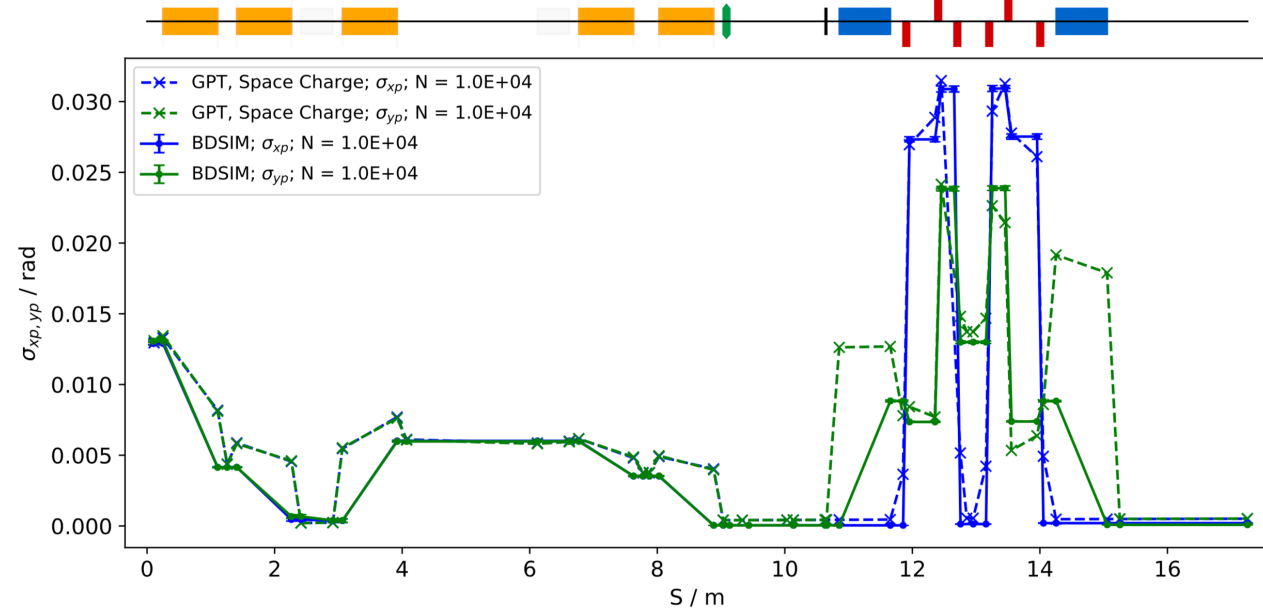
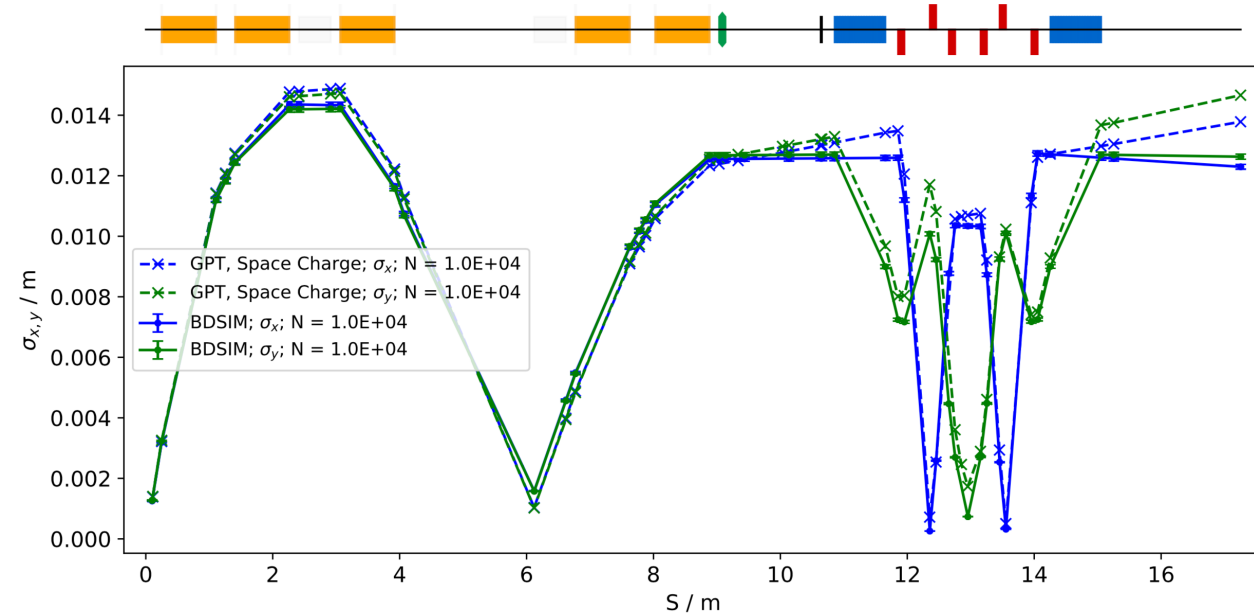
LhARA Stage 1 Lattices: v4.3: Optics Without Space Charge

- Very good agreement between BDSIM & GPT.
- Minor discrepancy in solenoids – GPT under strength by $\sim 3\%$ - updated in both V4.3 and V5.2 models
 - Either conversion or difference in elements themselves - systematic



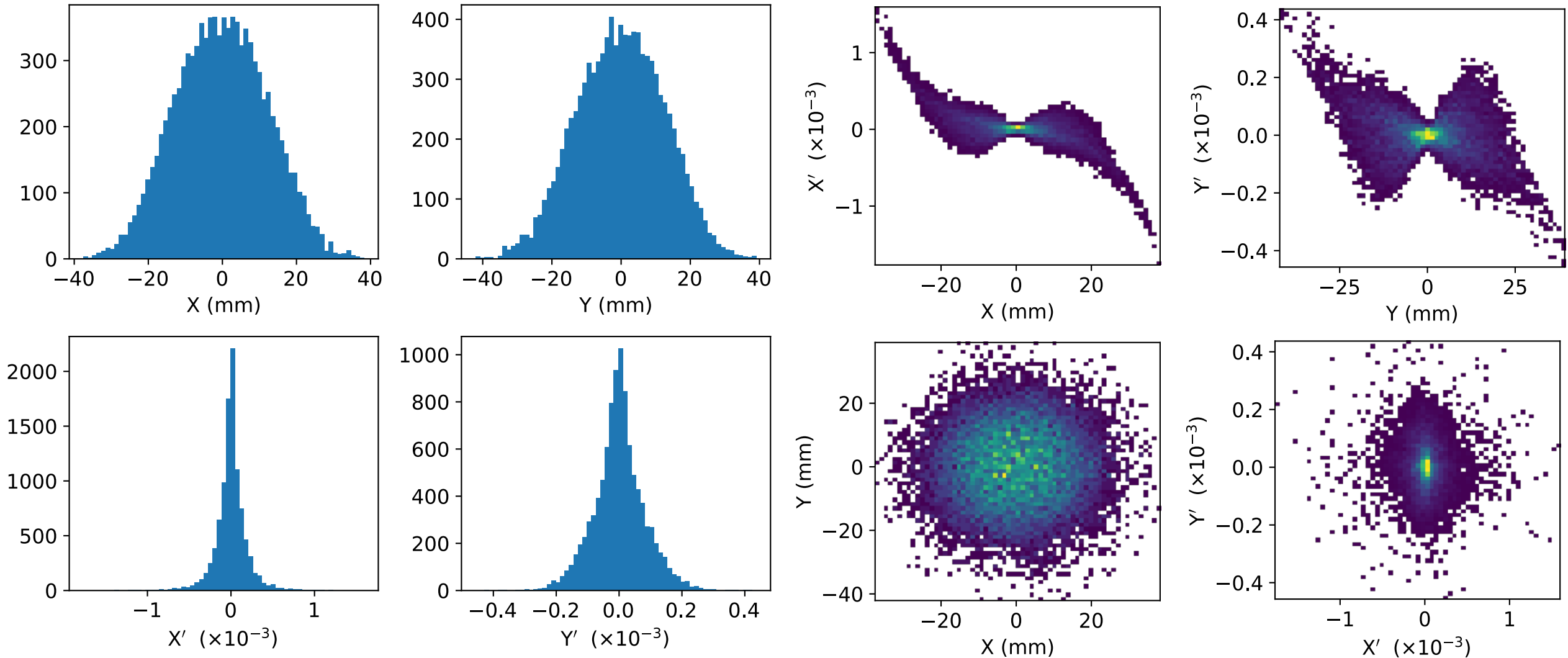
LhARA Stage 1 Lattices: v4.3: Optics With Space Charge

- Further initial emittance growth due to space charge causing disagreement
- Non-zero alpha after lenses leads to diverging beam at the target station.
- Solenoids (lenses) can be tweaked – slow process.



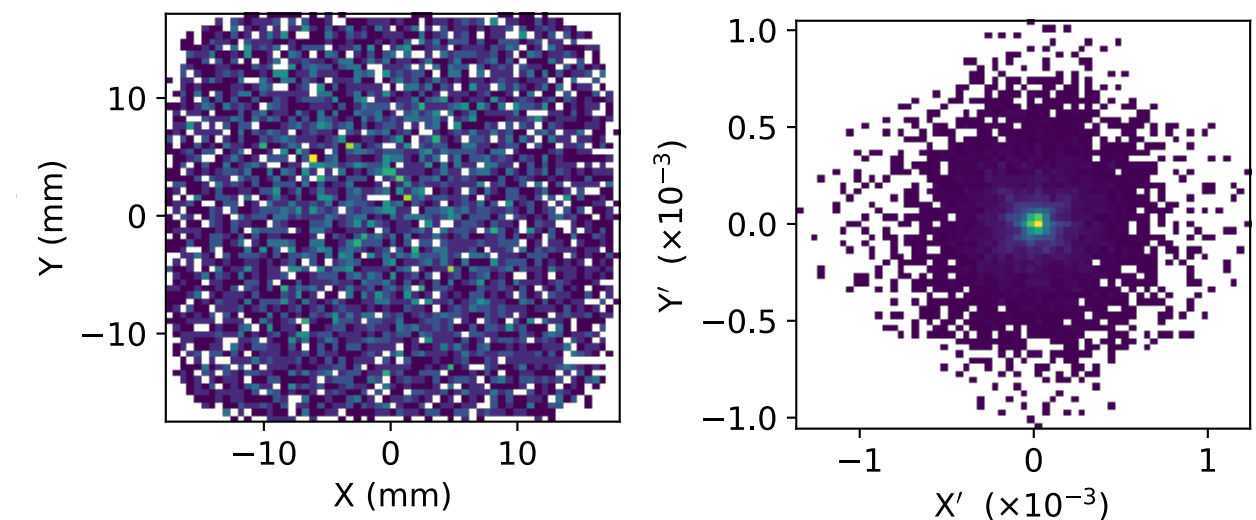
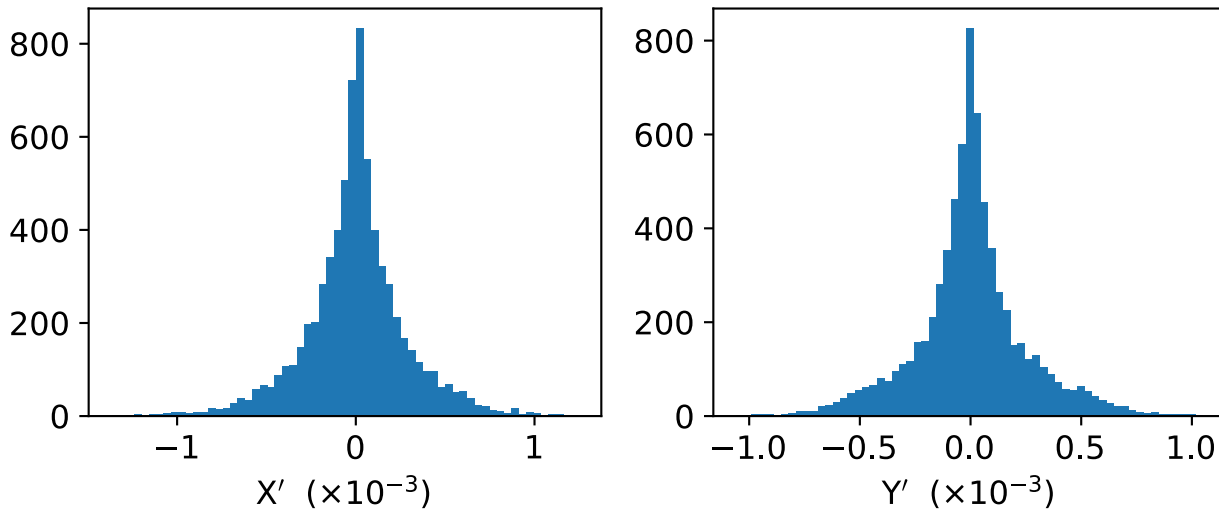
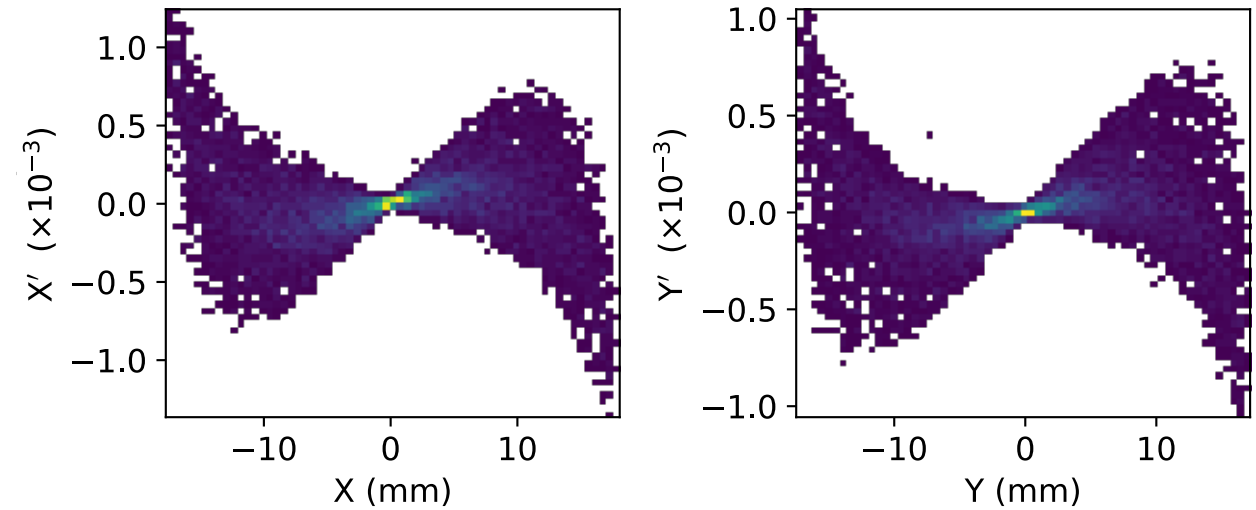
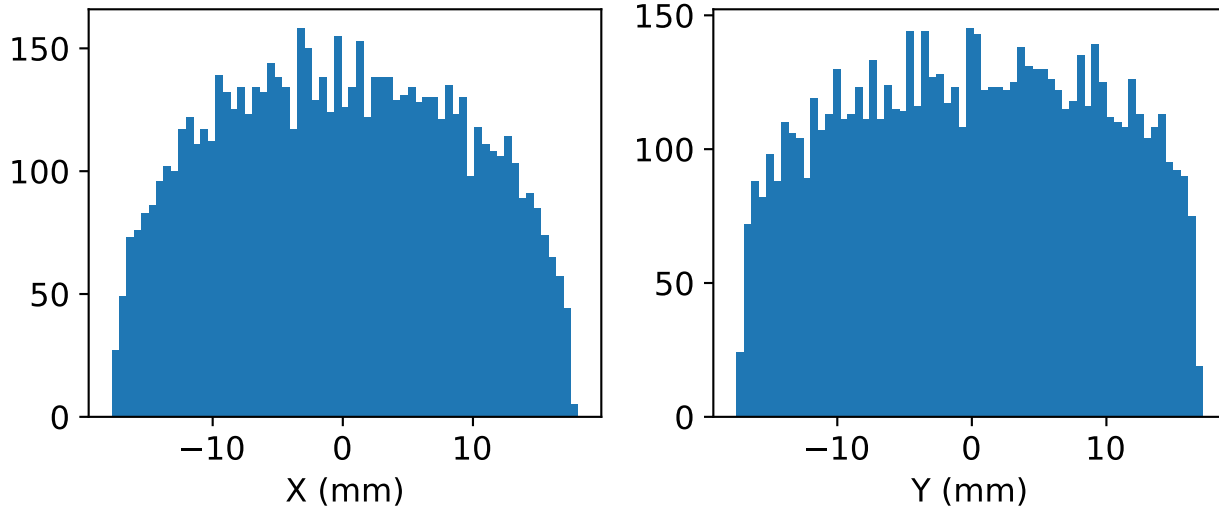
LhARA Stage 1 Lattices: v4.3: BDSIM Phase Space at the Target Station

- Without the octupole and collimation



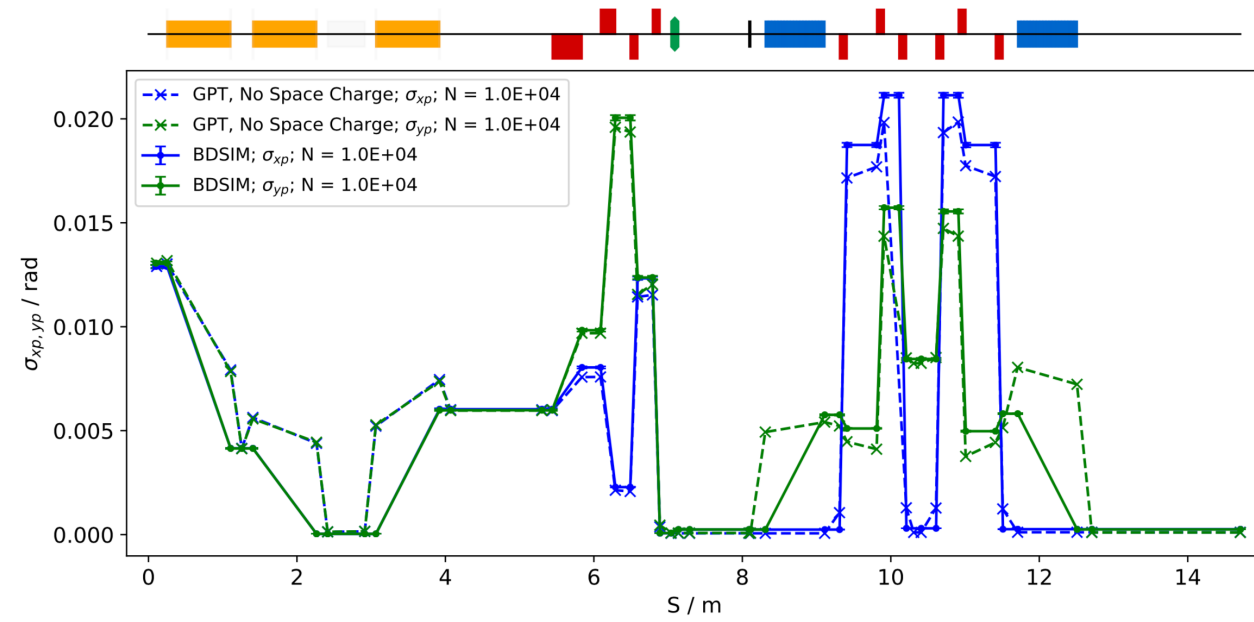
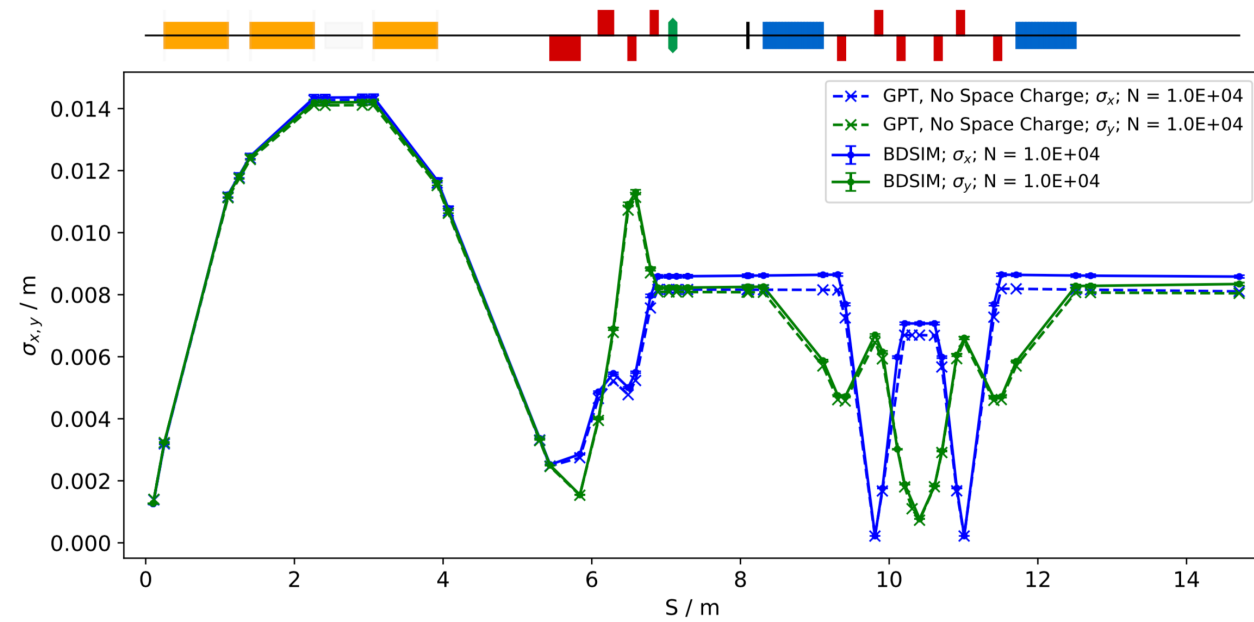
LhARA Stage 1 Lattices: v4.3: BDSIM Phase Space at the Target Station

- With the octupole and collimation
- Small number of secondaries



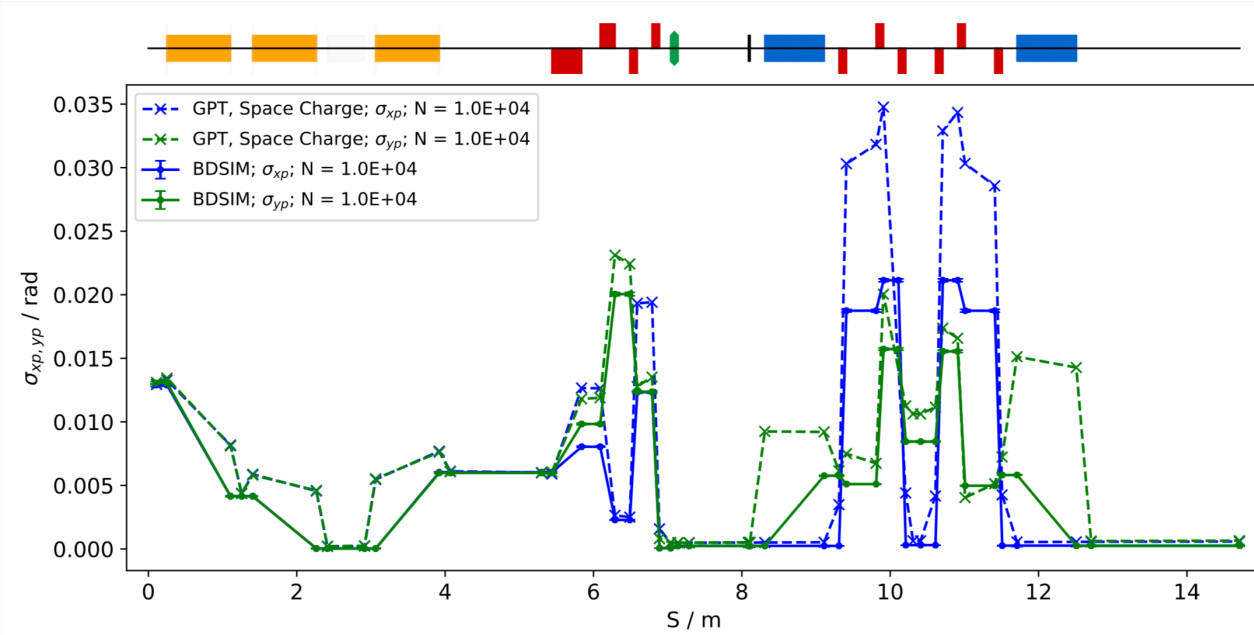
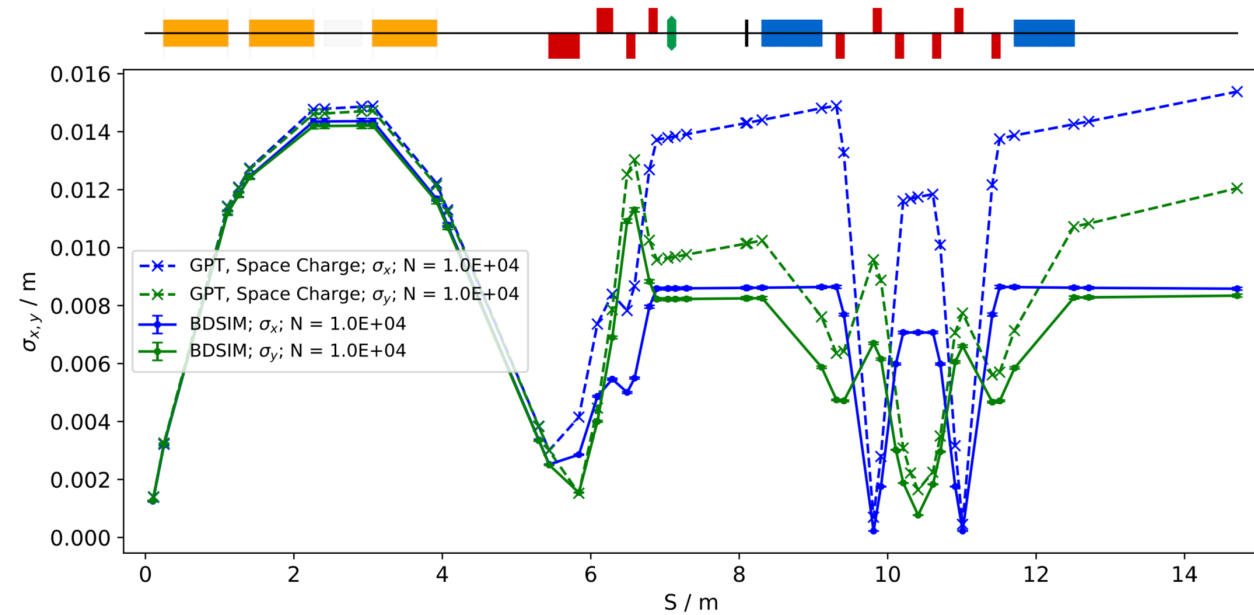
LhARA Stage 1 Lattices: v5.2: Optics Without Space Charge

- Reasonable agreement between BDSIM & GPT
- Minor discrepancy arising in quadrupoles – unknown cause
 - Again suspected systematic effect



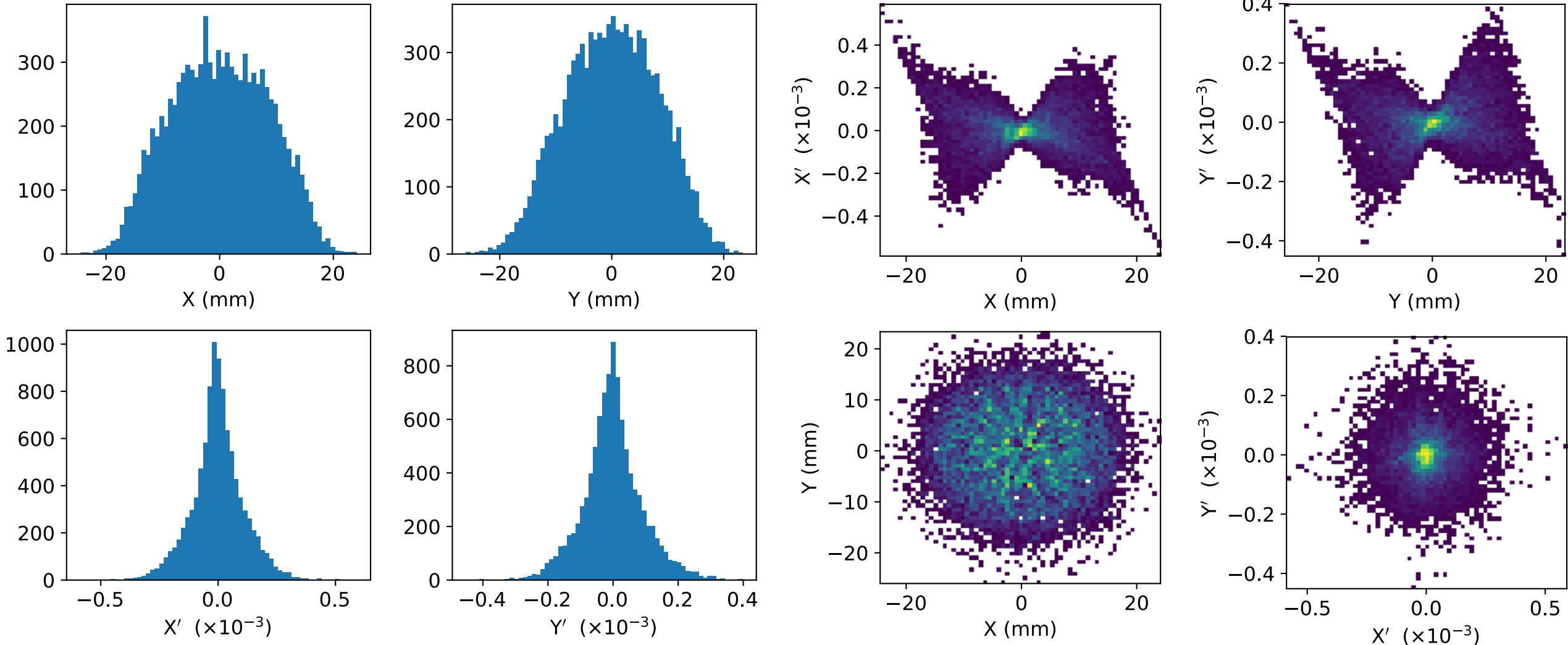
LhARA Stage 1 Lattices: v5.2: Optics With Space Charge

- Again, disagreement between BDSIM & GPT with space charge
- Exacerbated at 1st quadrupole
- Solenoids (lenses) can be tweaked – slow process.



LhARA Stage 1 Lattices: v5.2: BDSIM Phase Space at the Target Station

- Without the octupole and collimation



LhARA Stage 1 Lattices: v5.2: BDSIM Phase Space at the Target Station

- With the octupole and collimation
- Small number of secondaries

