Laser Diagnostic Simulation

FETS Meeting

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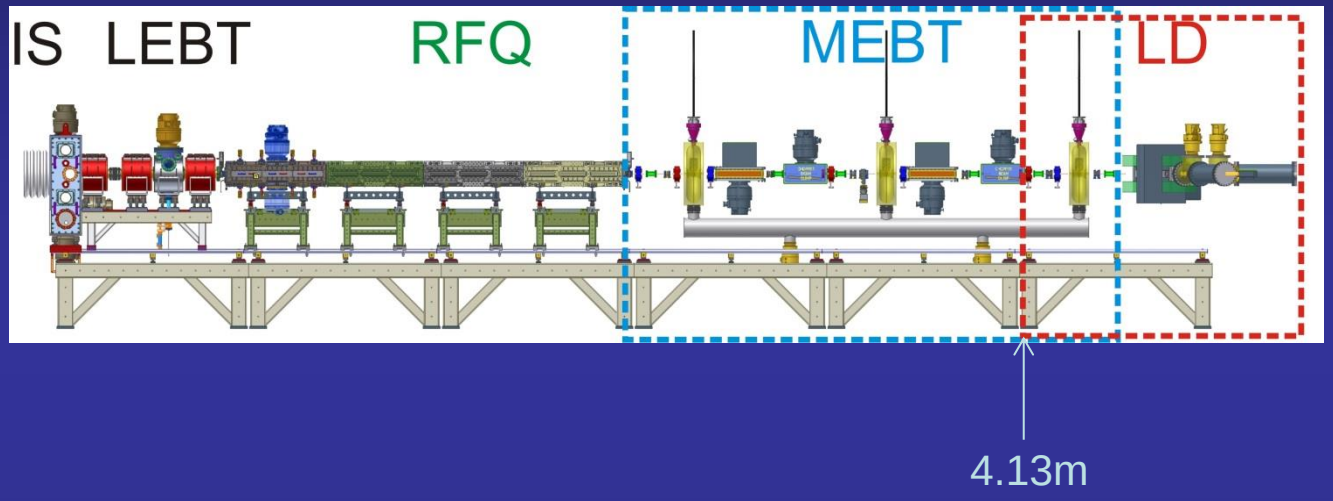
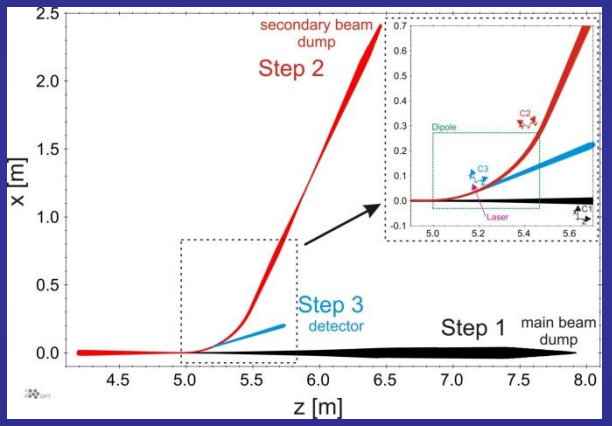
Outline

- Started simulating the laser diagnostic lattice.
- Previous lattice simulations from Juergen.
  - Results presented at IBIC 2013
  - Lattice updated.
- Update to the final MEBT lattice.
- Summary and plans.

Previous Simulations

- Work presented at IBIC 2013
  - Lattice 2 for the MEBT and lattice 3 for the diagnostics.





  - Particle distribution from the MEBT simulation at z=4.13m is used as input to the laser diagnostics lattice simulation.

Lattice Elements

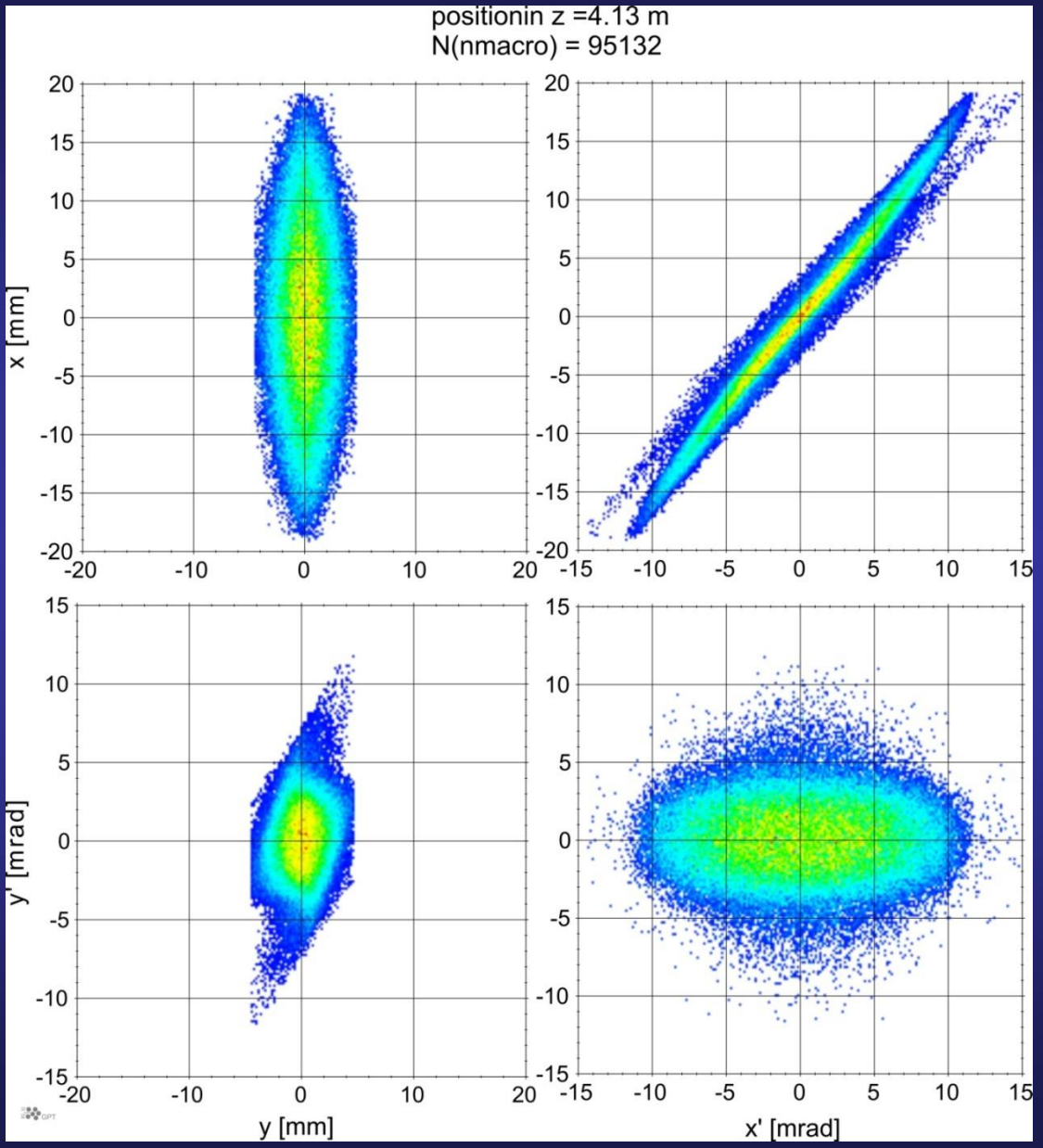
Lattice 2 – MEBT

Element	Position [m]
Q1	0.31
Q2	0.56
Q3	0.9
Q4	2.15
Q5	2.56
Q6	2.90
Cav1	0.745
Cav2	2.745
screen	4.13

Lattice 3 – Laser diag.

Element	Position [m]
Q7	4.5
Q8	4.9
Dipole	5.0
Q9	6.0
Q10	6.5
Q11	0.54 (after dipole)
Q12	1.04 (after dipole)

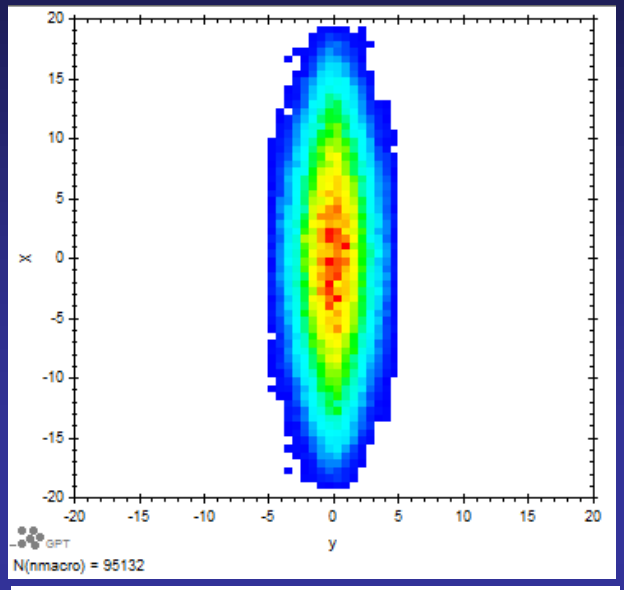
IBIC 2013 Results

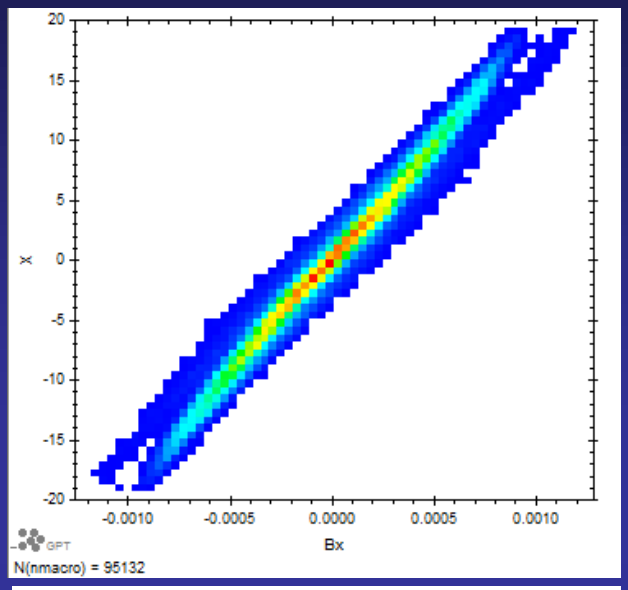


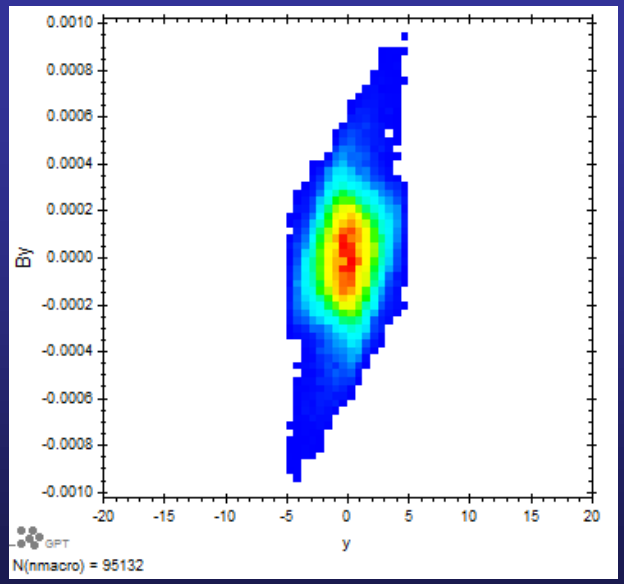
Lattice 4

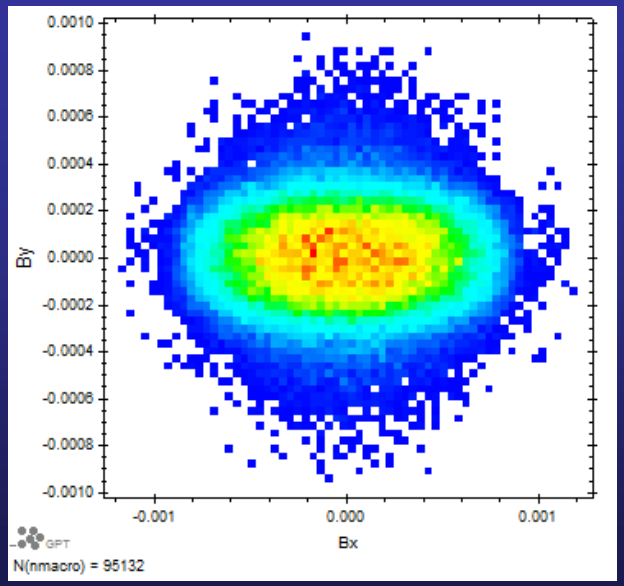
- MEBT part is the same as Lattice 2.
- Diagnostics part is a bit different.
  - Uses field map for dipole instead of sectormagnet element.
  - Large bore quad field map instead of quadrupole element.
- Comparison of MEBT part should be identical but laser diagnostic part will be different.

Results from Lattice 4 – MEBT



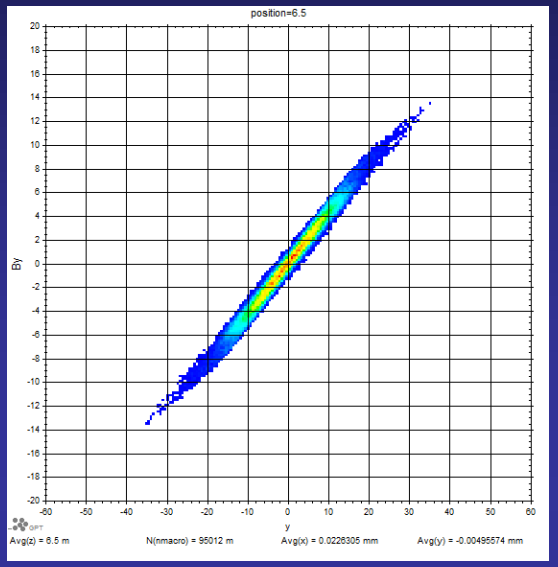


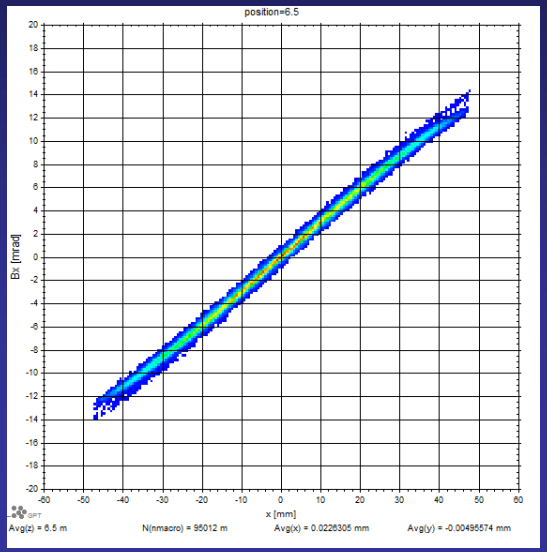


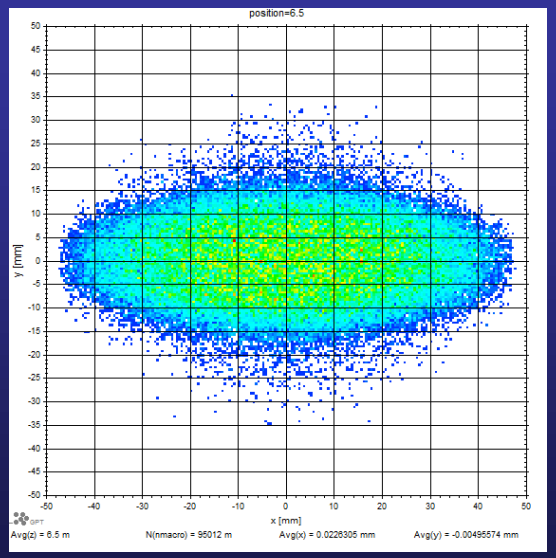


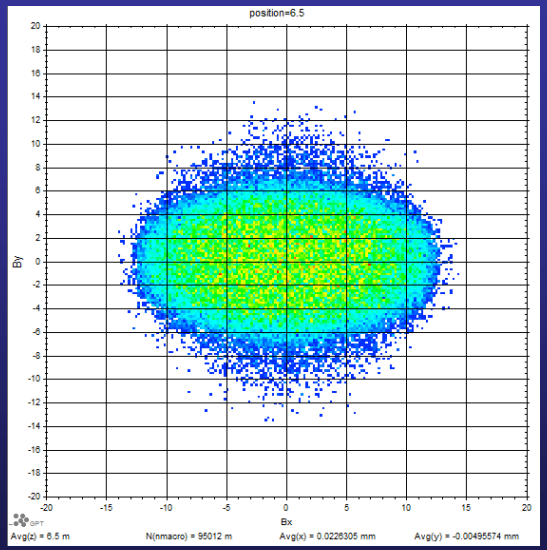
Results from Lattice 4 – Laser Diag

- With dipole off but quads on. Screen at 6.5m



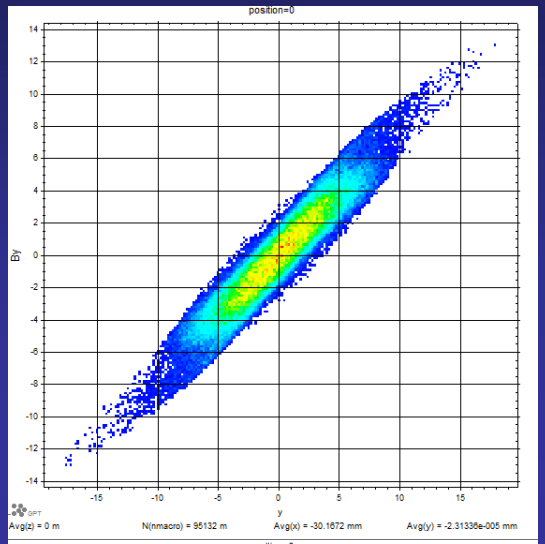


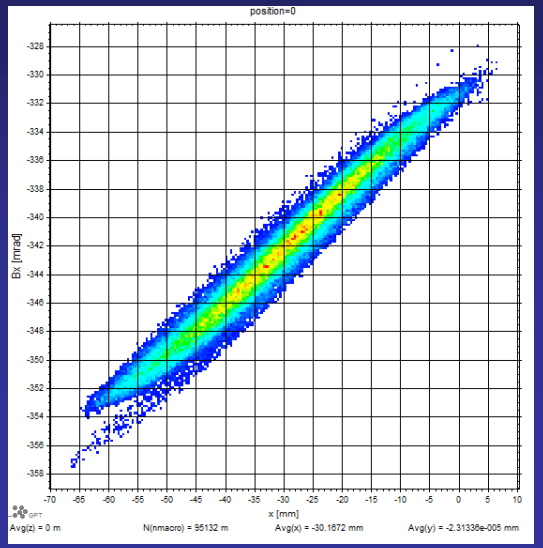


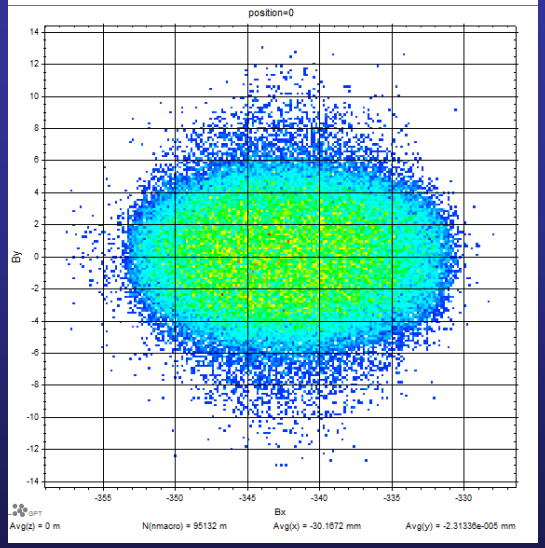


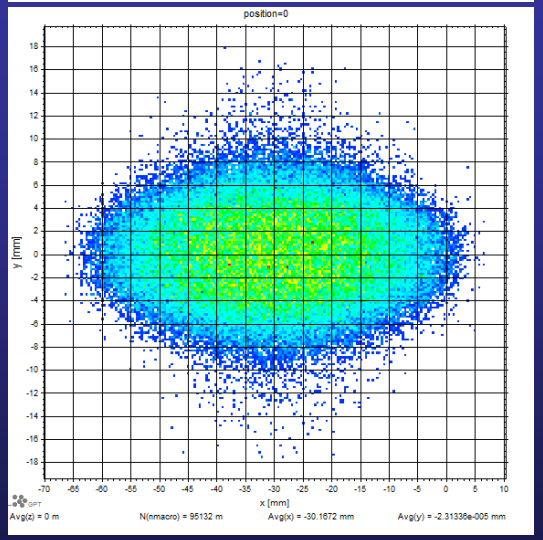
Results from Lattice 4 – Laser Diag

- Dipole on and screen at laser position.

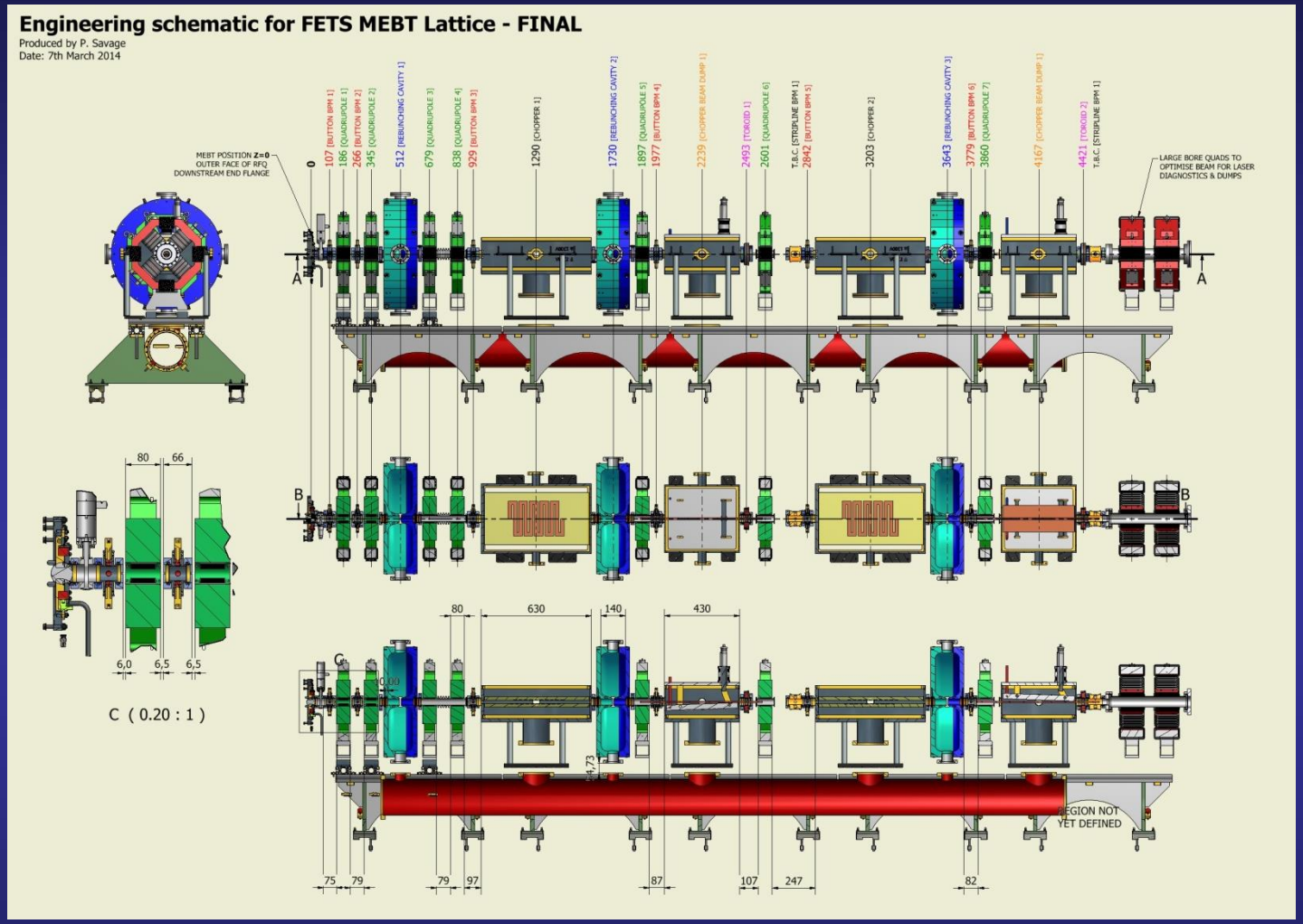








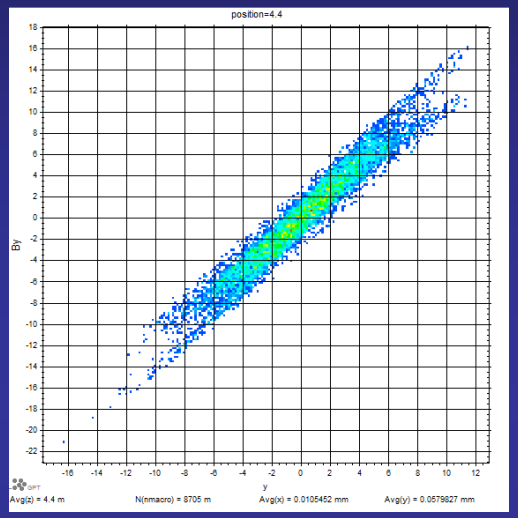
MEBT Final Lattice

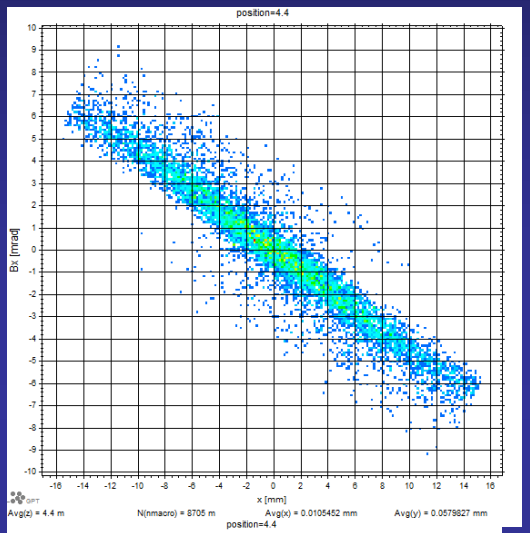


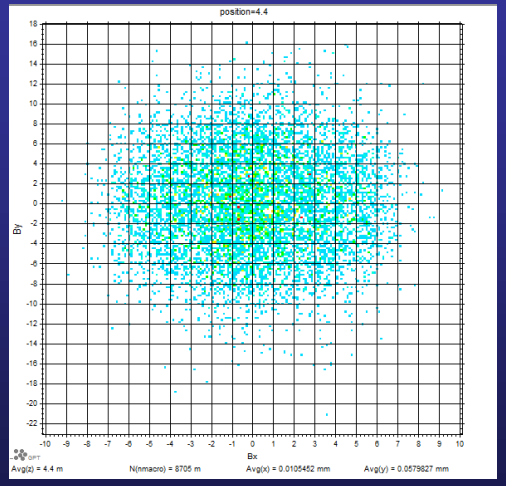
- Screen position is now 4.4m.
- Elliptical cavities.

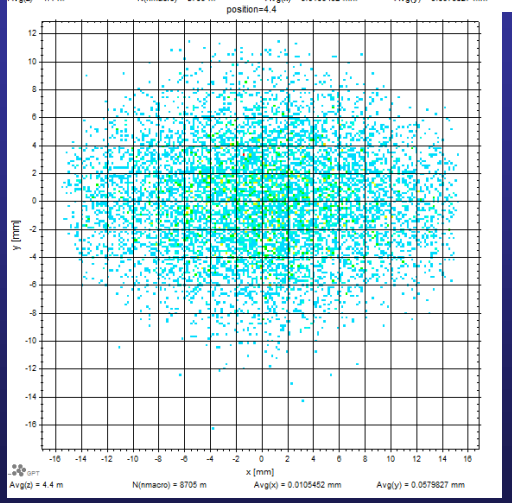
MEBT Final Lattice Results

- Ran with map25D_TM instead of map3D_EB.
  - Need to work out how to use map3D_EB.









MEBT Final Lattice and Laser Diag Lattice 4

- First two quads in laser diagnostic lattice are at z=4.25m and z=4.90m but last two quads in MEBT are at z=4.474m and z=4.633m.
- Screen position in MEBT run is at 4.4m, i.e. before last two quads of the MEBT.
- Need to discuss with Juergen, Morteza, et al. about what to do.

Summary

- Morteza, Juergen, Stephen, Konstantin and myself have started having regular meetings to progress this.
  - Nominally 2 days before FETS meeting.

- Started recreating Juergen's simulations
  - Sanity check.

- Questions.
  - Problems with:
    - Screens placed relative to the dipole coord system.
    - Elliptical cavities: map3D_EB
  - Should the laser diagnostic lattice be shifted down to accommodate final MEBT lattice.
  - How much space is available and what are the limitations?

Plans

- Fix issues with using the final MEBT lattice and generate particle distribution at the laser interaction point and give to Konstantin.
- Look at effect of dipole fringe fields?
  - Affects deflection of the beam, hence vessel design.
  - Is it possible to vary dipole field strength or shift laser position to compensate?
- Look at altering quad settings to change beam parameters at the detector.
- Laser.
  - Realistic simulation of the stripping – Konstantin.
  - Investigate detector options and how to do the reconstruction.
  - Dump for laser, can we have a power meter in the dipole field?
  - Scan the beam in x? Needs a 45° mirror in the vessel.
- Beam dump studies.