Design and simulation of a post-merging Guggenheim for a Muon Collider

Diktys Stratakis

Brookhaven National Laboratory

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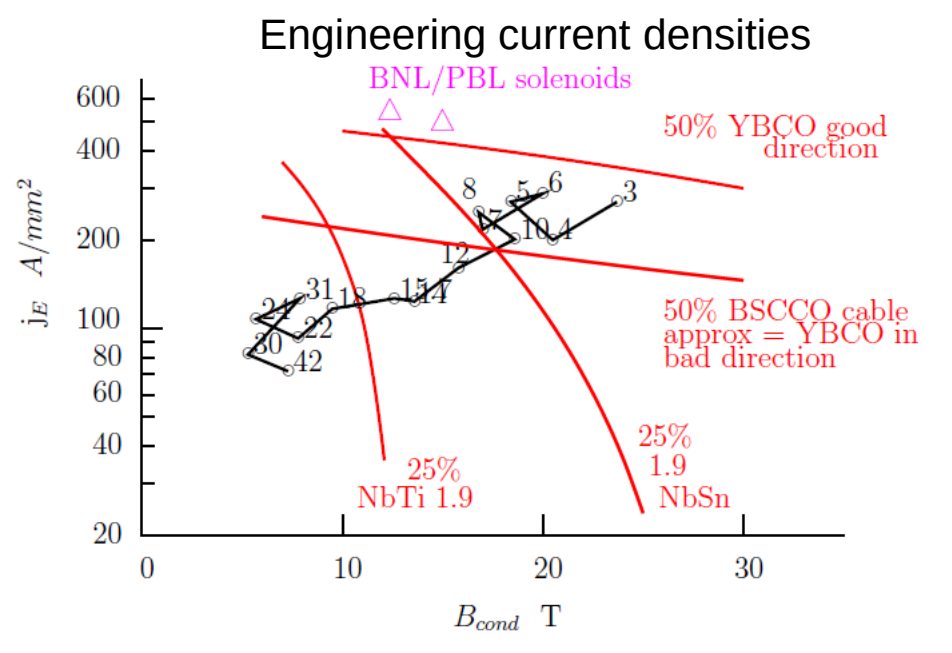
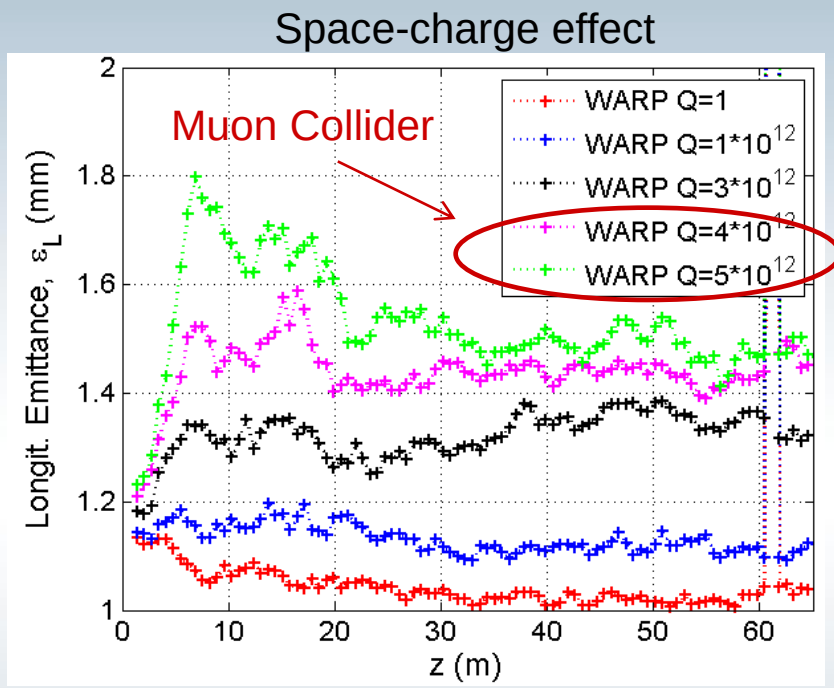
History (1)





- Bob has simulated this channel (in 17 stages) but:
  - It was a 2D simulation
  - It used not “realistic” current densities at the last stages
  - My simulation showed space-charge effects at last stages

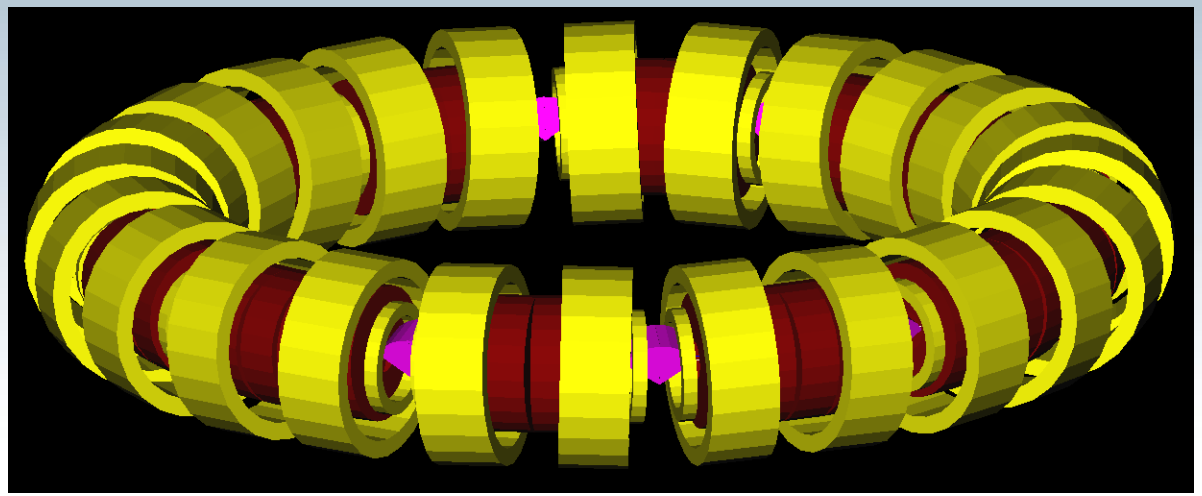
History (2)

- A full 3D simulation is need that will include the constraints discussed earlier.
- Rick has simulated the first 11 stages
- However, there were some issues:
  - Transmission
  - Lenght
  - Low statistics
  - Most important not complete because transverse emittance was 3 times higher to the baseline value (~0.250 mm)

Outline

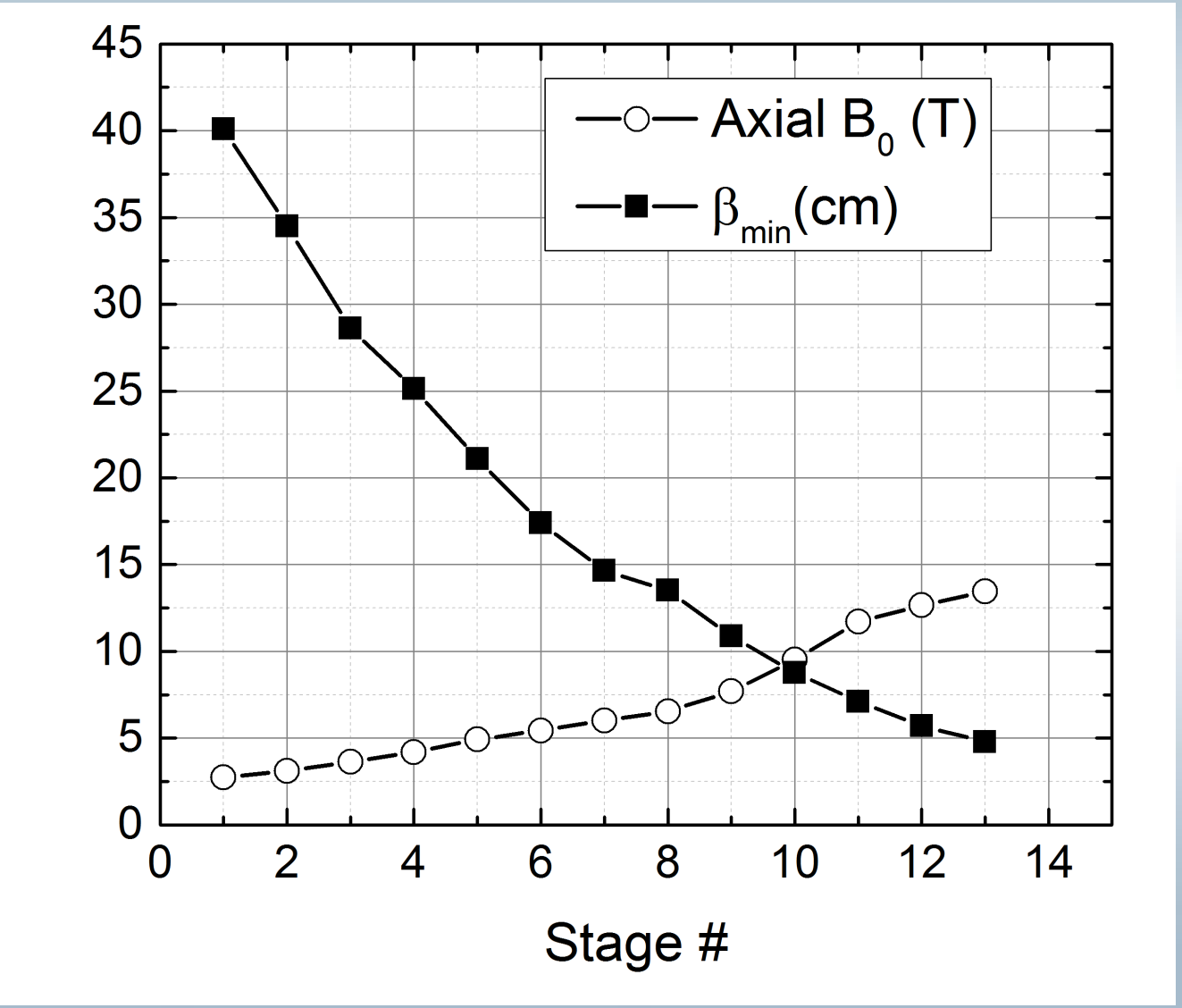
- I will show a full 3D simulation of the post-merging Guggenheim
  - I started from scratch (independent from Rick's numbers)
  - Simulated the first 13 stages
  - I use high statistics ~100,000 particles
  - I achieve reasonable transmission and the channel length is reasonable
  - Current densities of coils below critical values
- Work is far from complete. Study is in progress…

Lattice Details

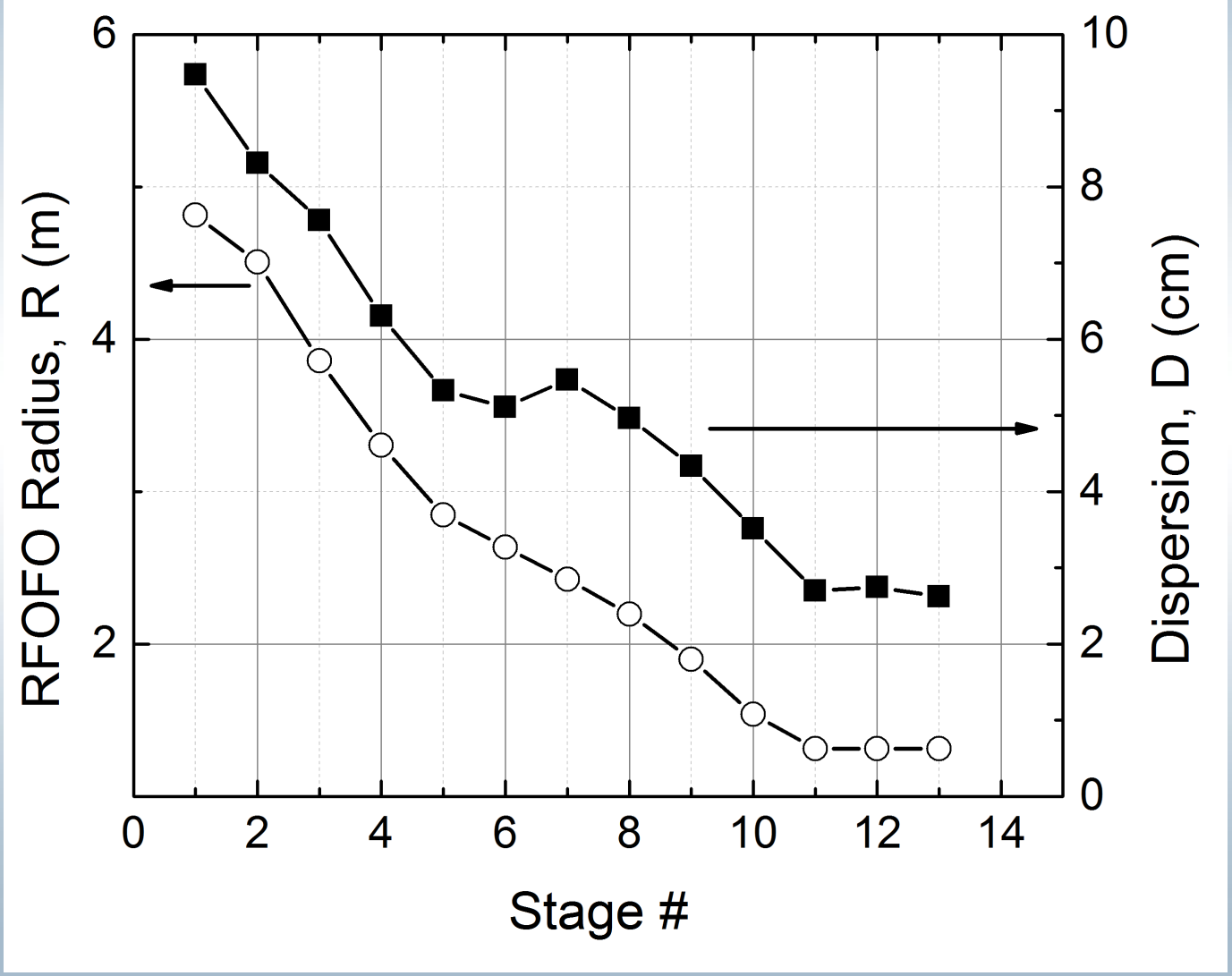


- Each stage is a ring with 12 cells
- Radius falls because cell length decreases
- Coils are tilted to generate dispersion
- LH wedges for cooling
- Opening angle 98 – 121 degrees.

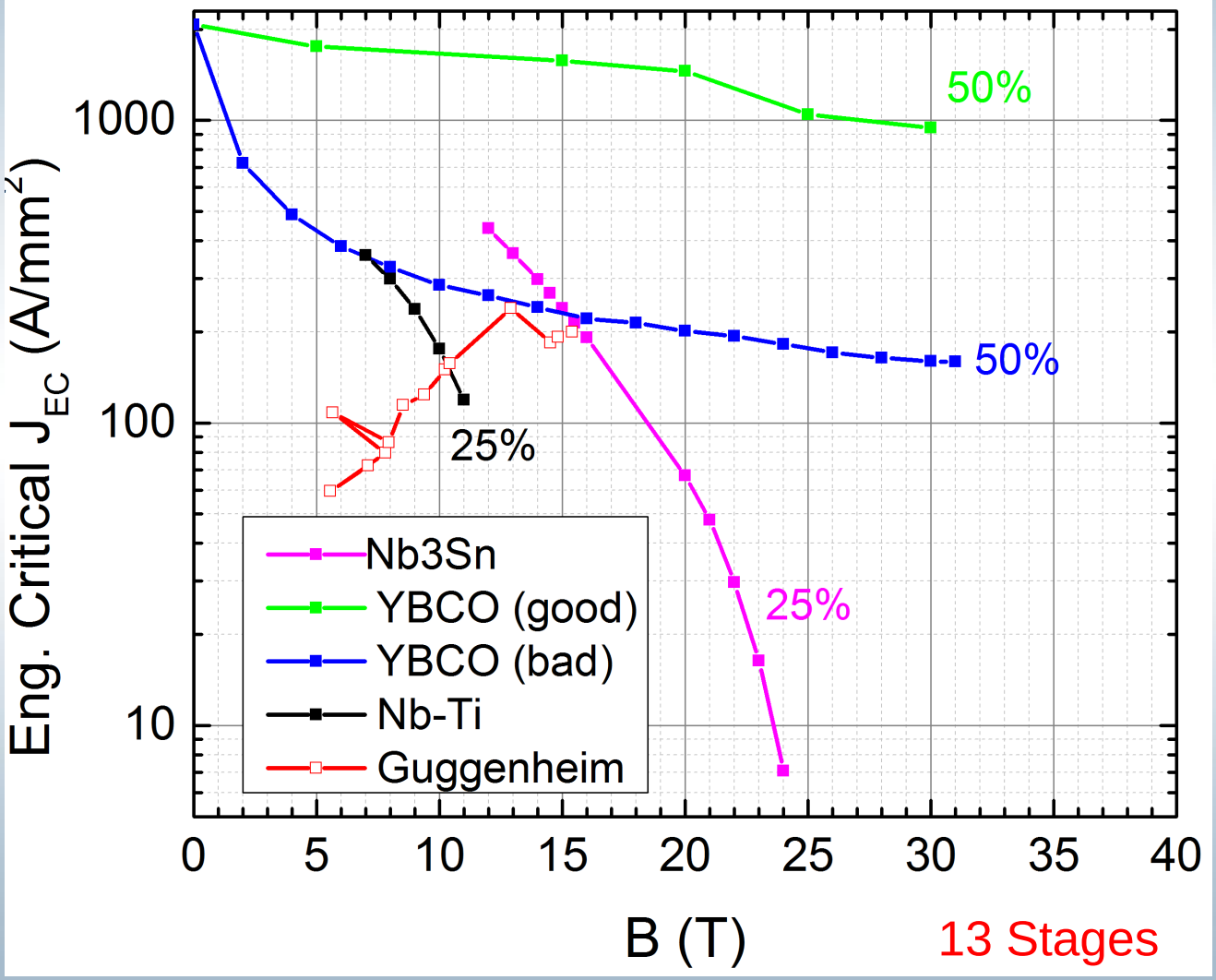
Lattice Design (1)



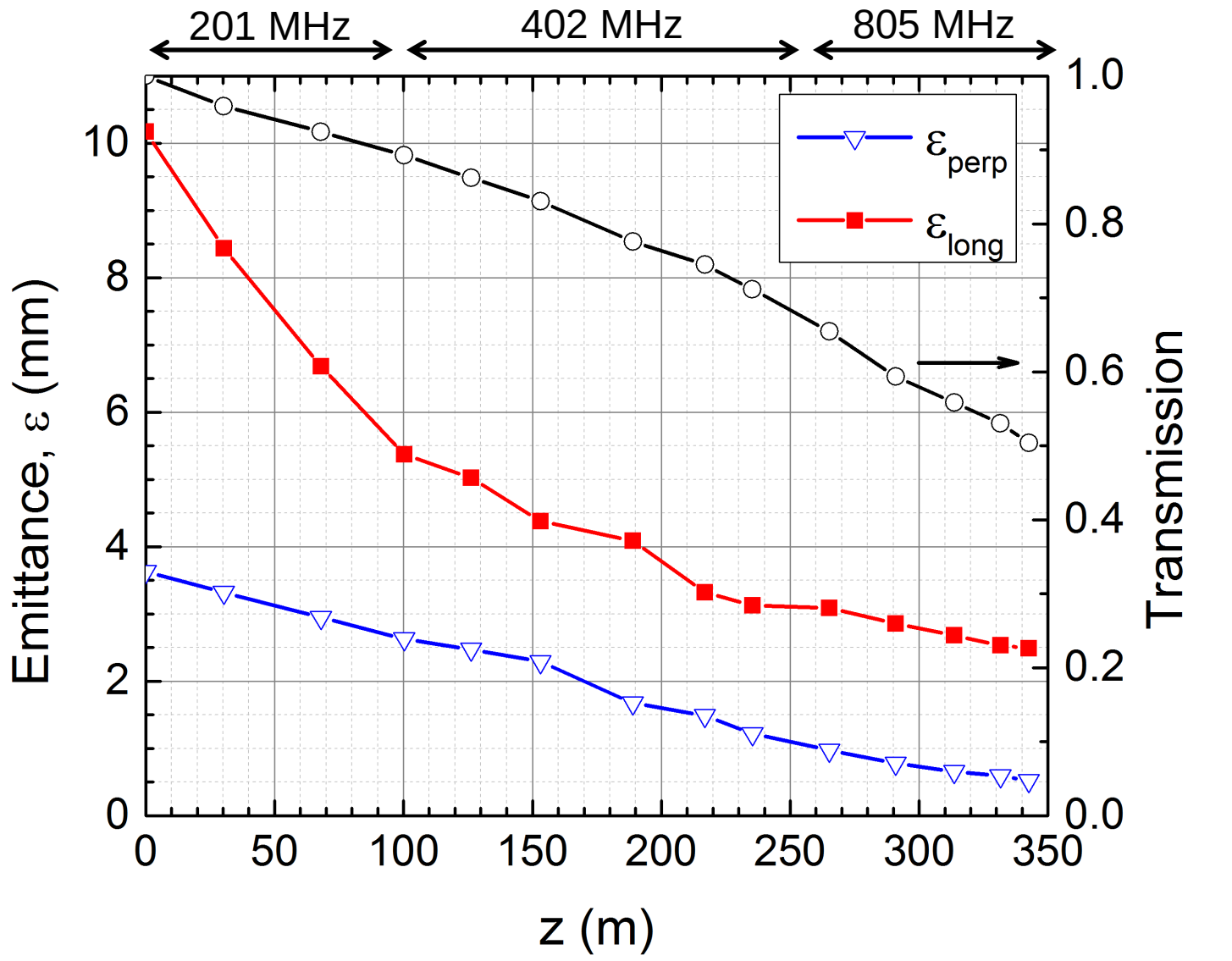
Lattice Design (2)



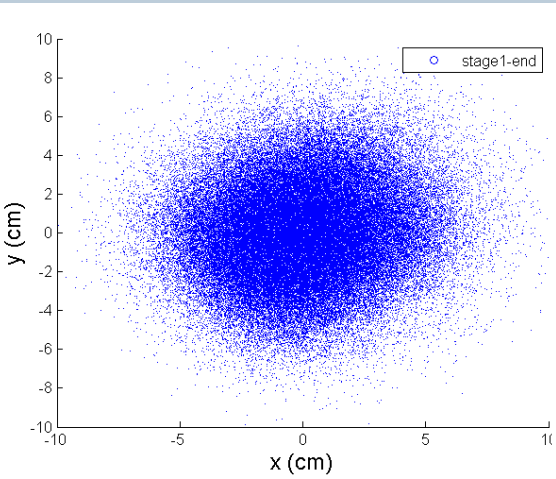
Critical Engineering Current Density

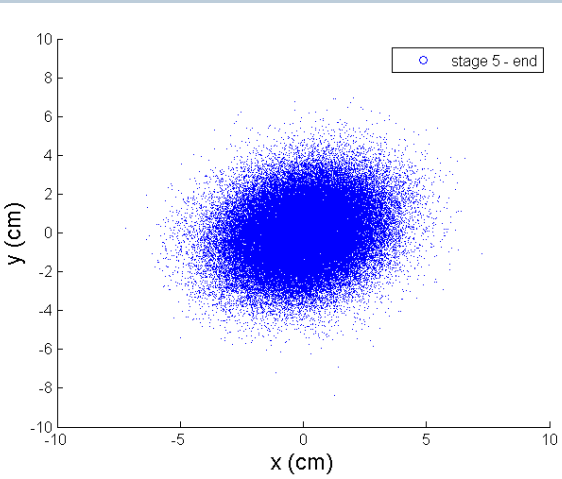


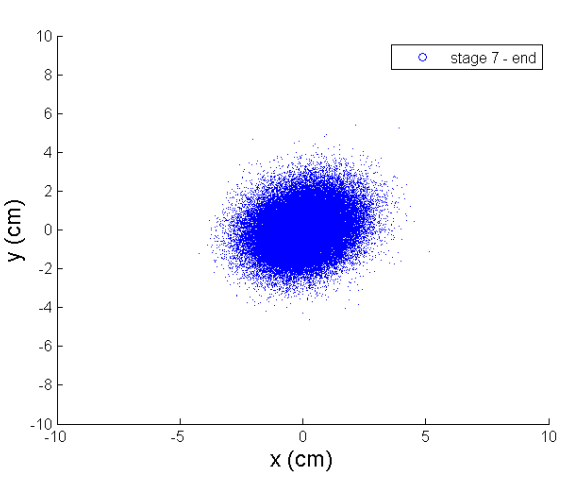
Particle Tracking (13 Stages)

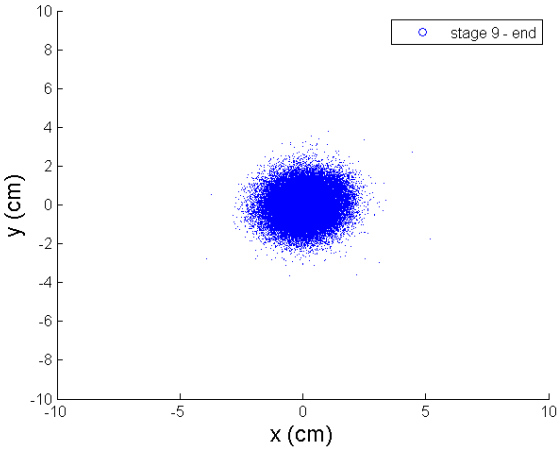


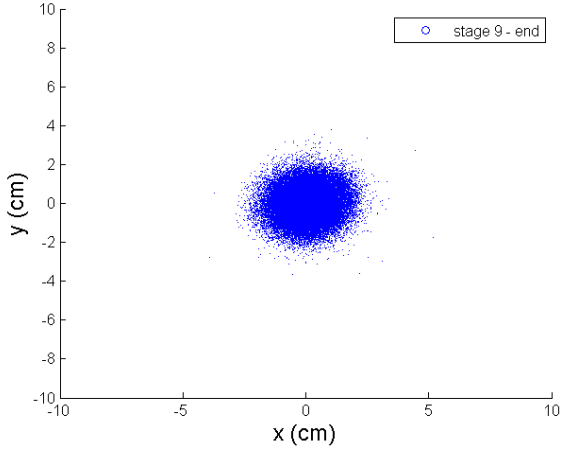
Transverse Cooling

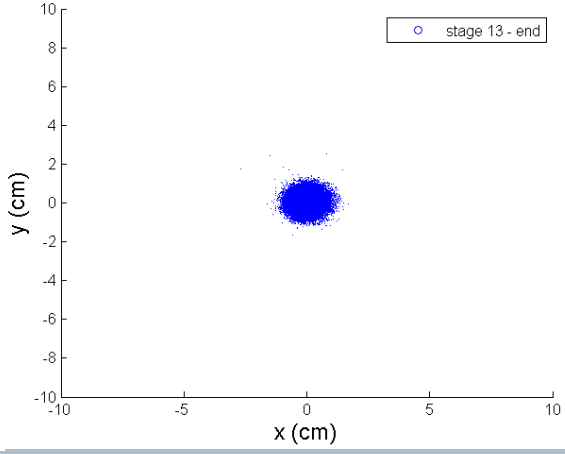








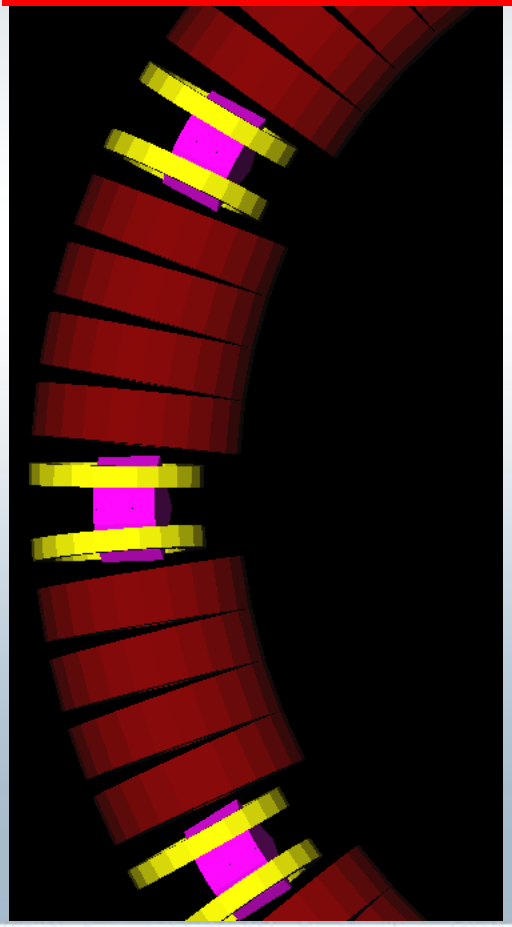




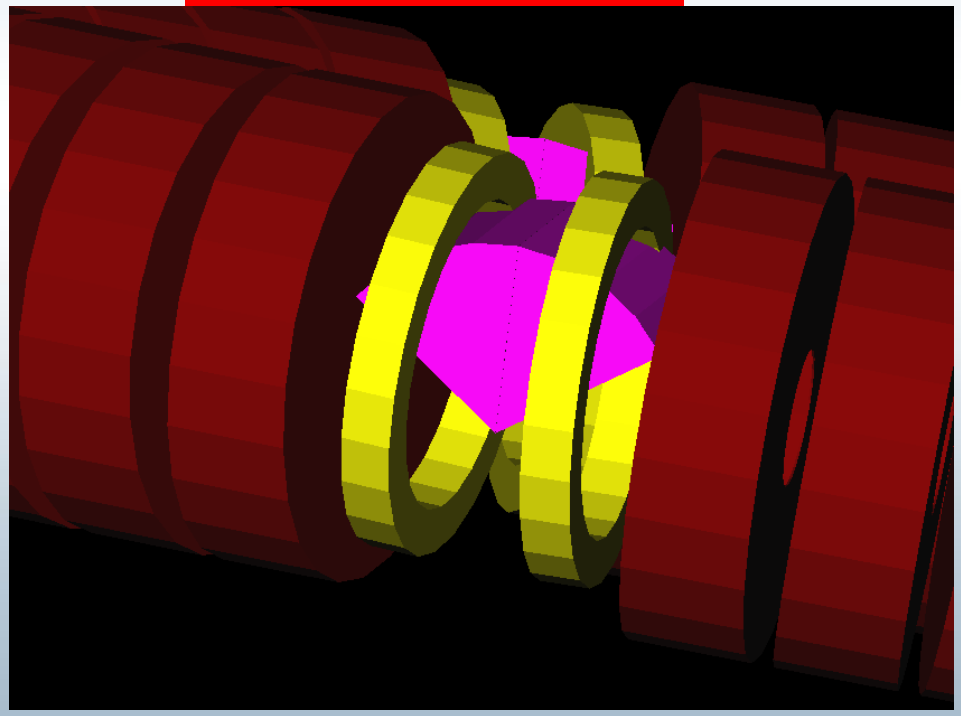
Cautions on lattice design (not done so far)

- Most stages need to be checked for element overlap

Rf intersect each other



Wedge intersects coil



Conclusions and Outlook

- The desired values from Bob are ε_{long} =2 and ε_{perp} =0.25 mm.
- Most likely 4-5 additional stages are needed to reach the desired values.
- There are some matching issues. Especially for stages where the frequency changes.
- Element overlap check (hard to see in ICOOL). It is possible that cavities, tilted coils and absorbers intersect.
- The plan is to cross-check with G4BL (some stages)
- So work is in progress…

Space-Charge effects for ε_l=1 mm (Stg. 7)