



Muon plume beam studies and simulations

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AD, External Beamlines

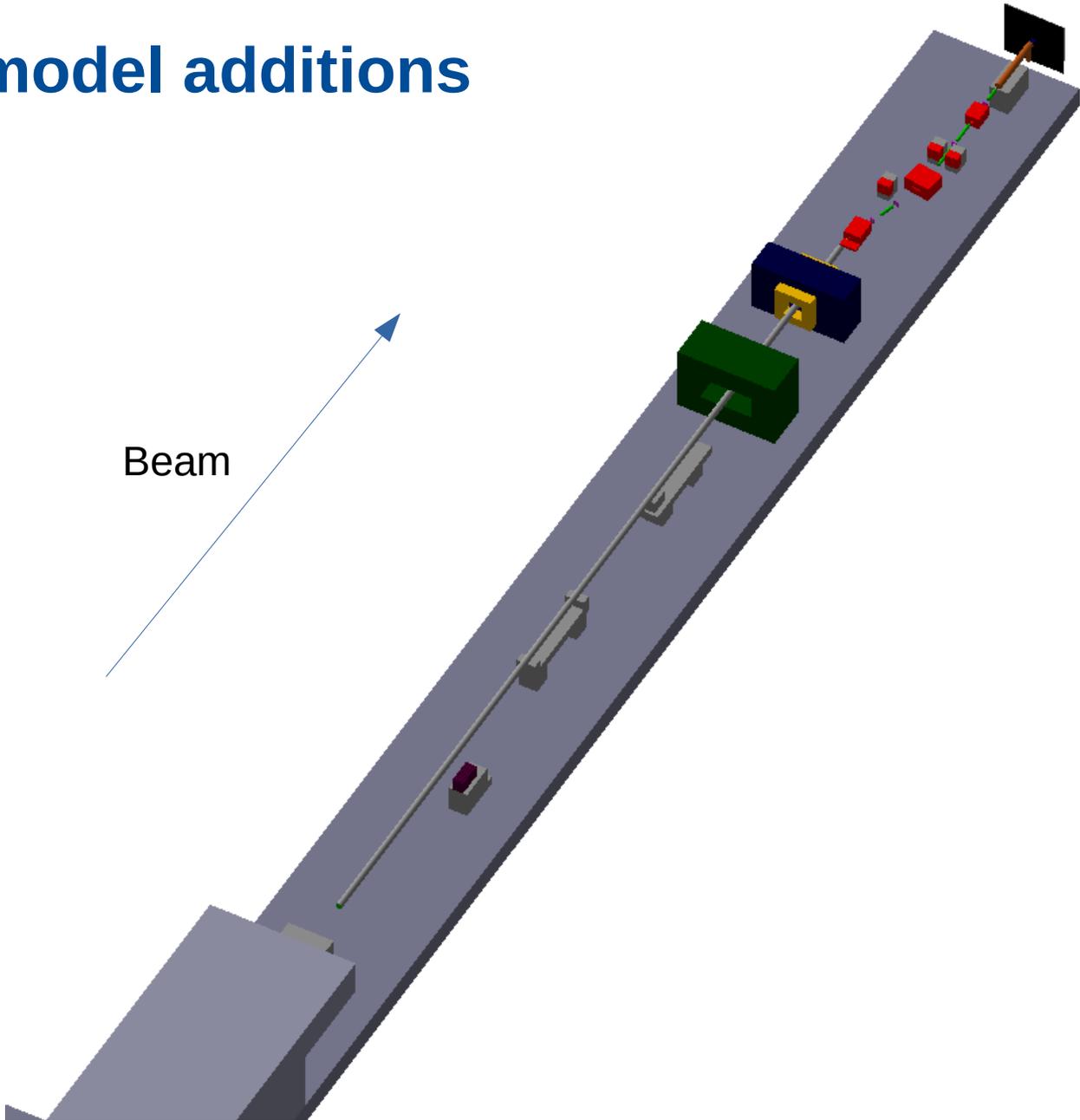
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G4BL model additions

Currently working on adding the following to the G4BL model:

- Shielding blocks, LArIAT muon range stack, etc. **Complete.**
- Magnetic fields in the magnet yoke iron. **Making progress.**
- No progress yet on fixing jobsub for high-stats batch jobs. Did figure out how to run parallel instances on my 6-core home computer (results on following slides)

G4BL model additions



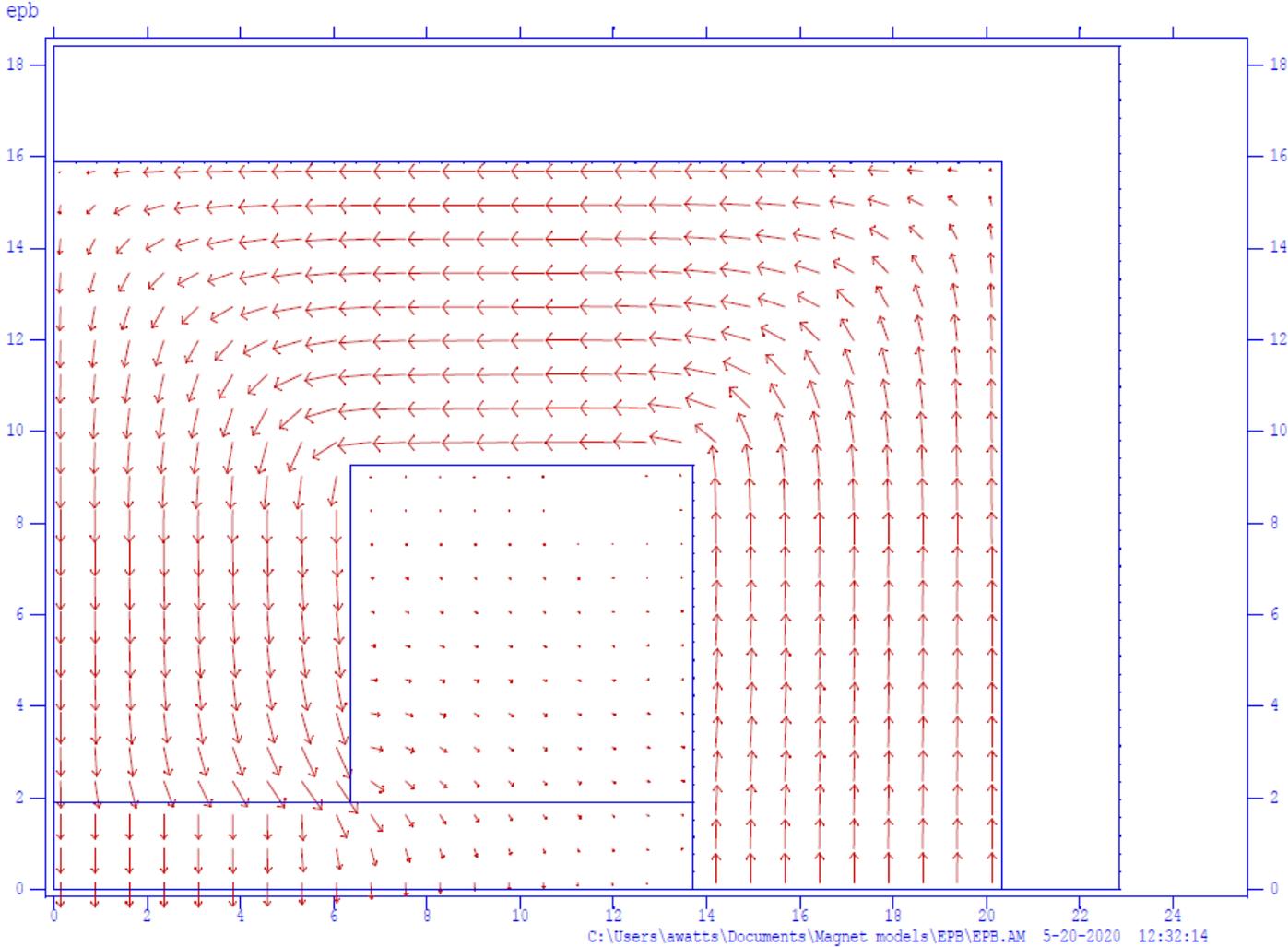
Beam

Defer to Mike's slides for G4BL data at 2E9 on target. Thanks Mike!

Magnet yoke field modeling

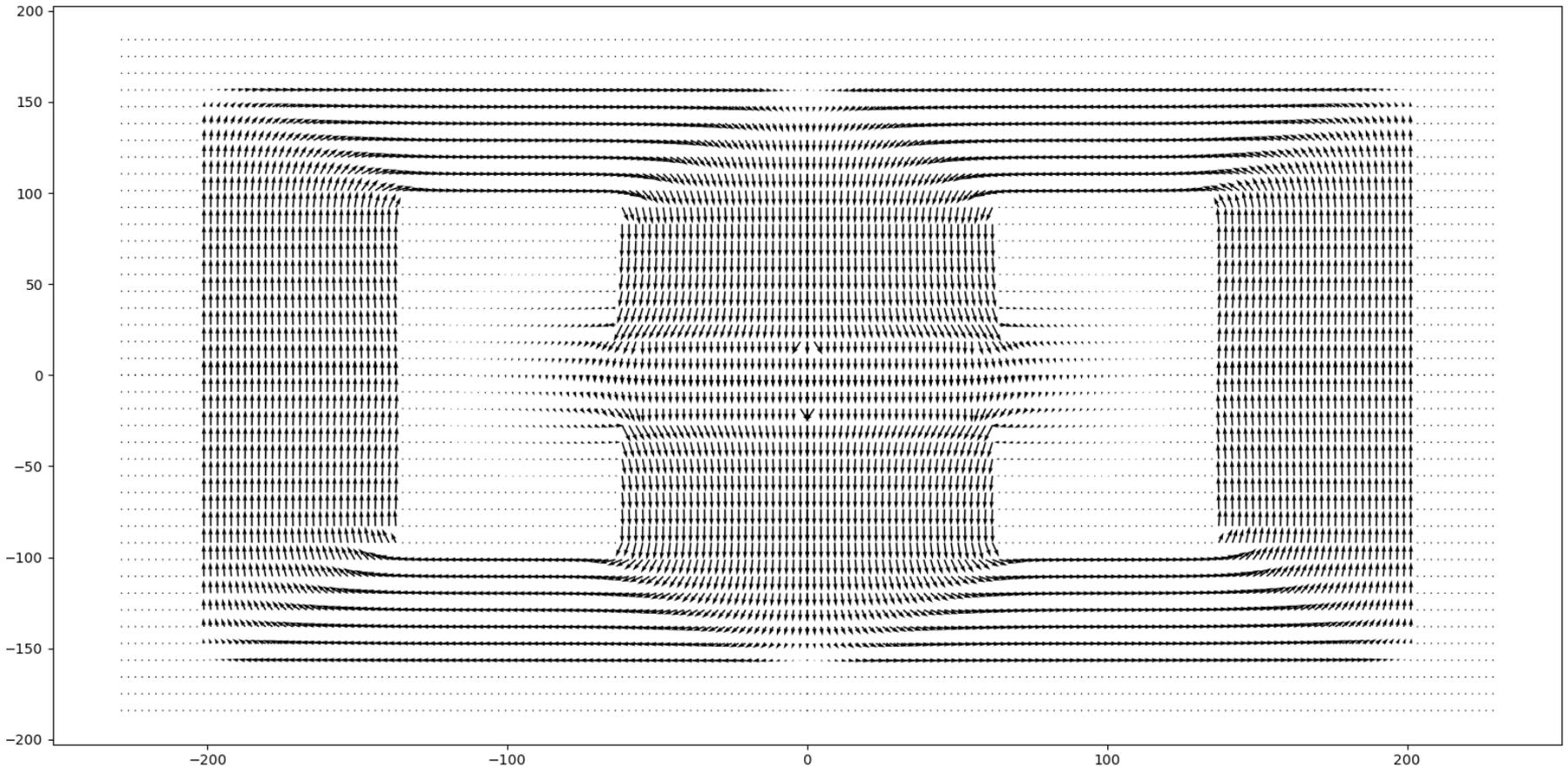
- Figuring out how to use Poisson Superfish.
- Quadrant models exist for all our magnets (thanks Tom!).
- Succeeded in getting Poisson to model yoke fields (see next slide for example)
- Figured out how to get text file with interpolated field data
 - Some artifacting, presumably from FEA mesh and interpolation grid mismatch/aliasing. Can do interpolation by hand if necessary.
- Writing code to extend field points over other 3 quadrants of magnet transverse slice, then write input file for G4BL in “x y z Bx By Bz” format by repeating 2D slice at regular longitudinal intervals.

Magnet yoke field modeling: EPB dipole quadrant



Magnet yoke field modeling: EPB dipole full field

Python script reads in quadrant field-map from Poisson, converts to units of [mm] and [T], then reflects about midplanes depending on pole symmetry (dipole vs. quadrupole). Some artifacting in center of aperture likely due to interpolation grid size.



Summary

- More material in MC7 appears to have had an effect on the muons. Need higher-statistics run to be sure.
- My work on the G4BL model will focus on yoke fields from this point on. I believe we have captured the large pieces of material with sufficient precision at this point.
- G4BL model is up on GitHub for anyone that wants to run or modify or help out: https://github.com/adamwatts112358/NOvA_TB
- Lots more work to go on yoke field modeling, but the path forward is clear now. Tom points out that we want to make sure steel B-H curve is accurate in Poisson. TD Magnet experts provided a measured curve for me.