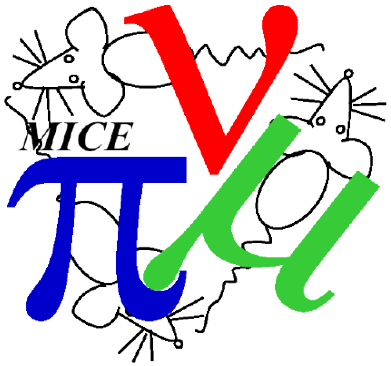
Run Settings



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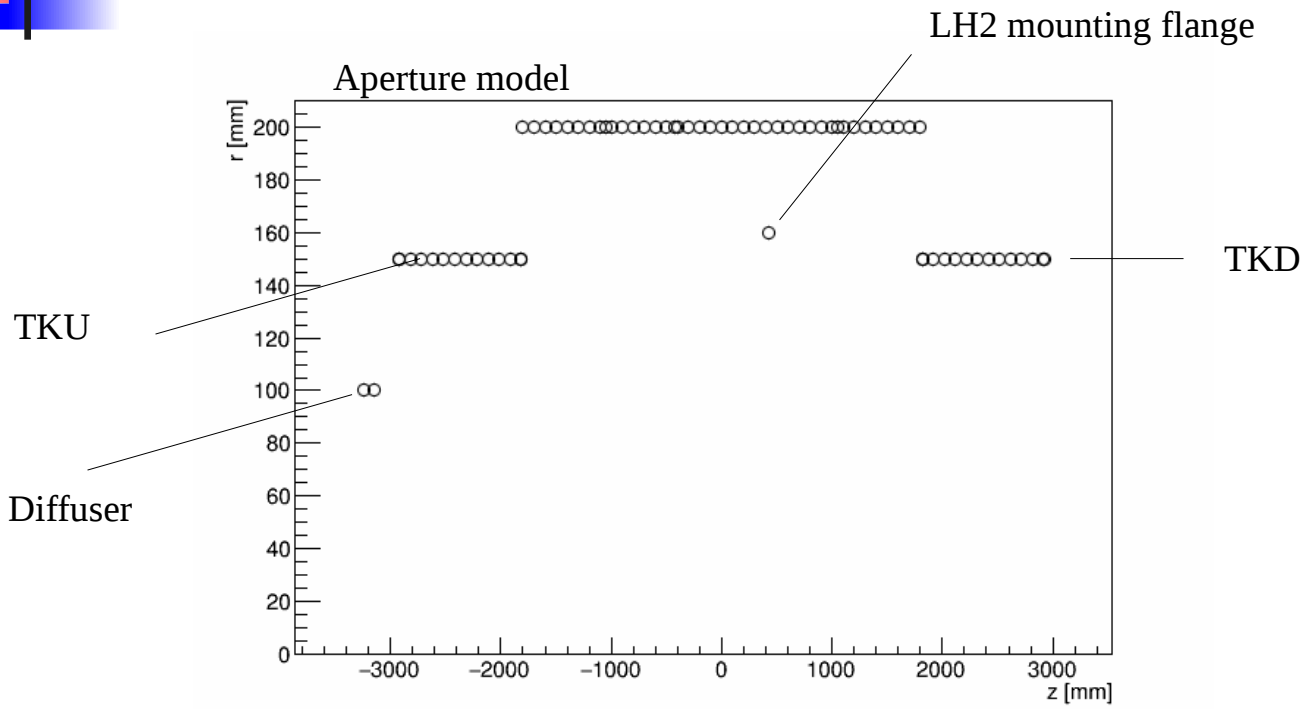
Settings – for consideration

- Propose
  - Fixed beta = 500 mm, fixed momentum = 200 MeV/c, scan emittance (potentially with higher statistics)
  - Fixed beta = ?800 mm, scan momentum, scan emittance
  - Momentum = 200 MeV/c, scan beta
- Note
  - 140 MeV/c has smaller minimum beta
    - Should we do beta scan at 140 MeV/c?
  - Ao has found going to < 3 T may help
- How does this fit in the user run?
  - Compare with data rates for scattering data
  - Require momentum/fiducial/beam sampling cuts…
- Aim for first pass run plan by Tuesday MIPO...

Algorithm

- Throw beam ellipse down MICE beamline 10000 times
  - Throw random magnet currents (why not a grid?)
- Use naive linear model for apertures
- Assume beta is matched at TKU
  - I can remove this constraint with a switch
- Try to map space of acceptance and beta at focus coil
- M2D is switched off and solenoid mode for all solutions
- 3T in SSU and SSD

Constraints



- 253*0.66 < M2U < 253 A
- 100 < M1U < 278 A
- 0 < FC < 114 A
- M1D = M2D = 0 A
- M1U * FC < 7500
- Solenoid mode, 3 T in ECE
- Require match in SSU (beta = 444 mm, alpha = 0)

Trim coils

- Seek to minimise the deviations of Bz from uniform in the tracker region
- Assume superposition of fields from adjacent coils is correct

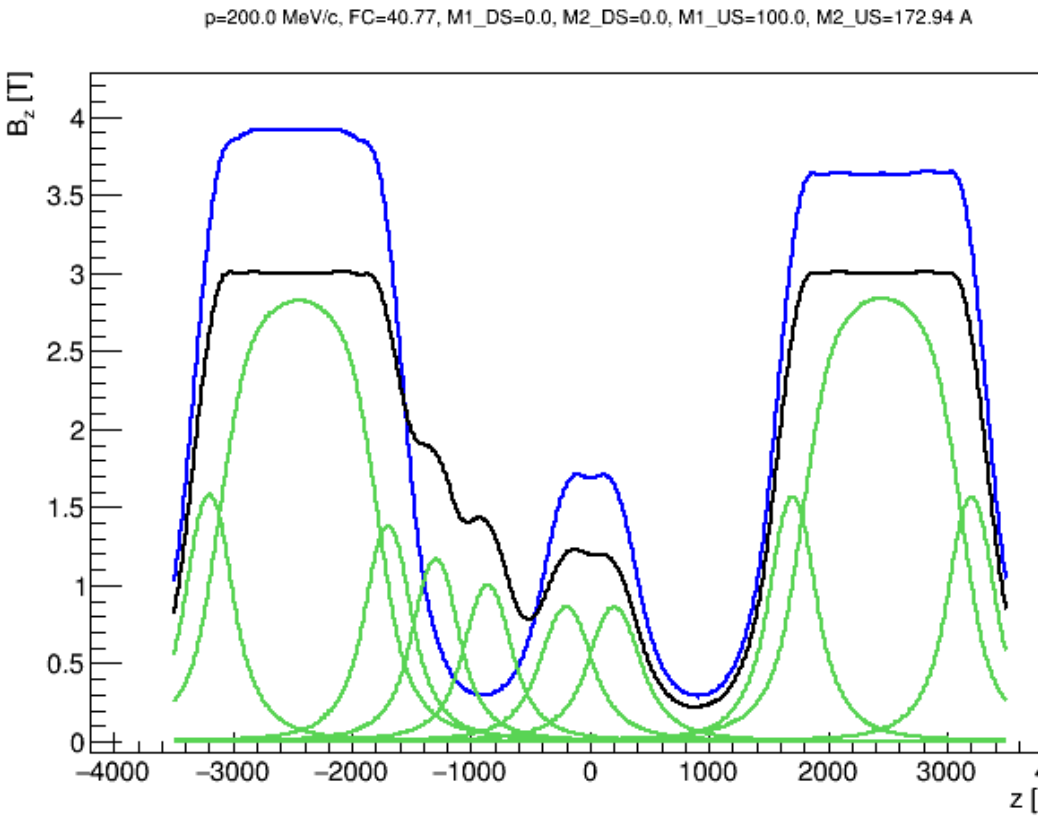
  $$B(z) = J_{E1}\, B_{E1}(z) + J_{CC}\, B_{CC}(z) + J_{E2}\, B_{E2}(z) + B_{M}(z)$$

- Seek to minimise square of residuals between B(z) and nominal field B_0
- Consider linear least squares solution of

  $$B_0 - B_M(z) = J_{E1}\, B_{E1}(z) + J_{CC}\, B_{CC}(z) + J_{E2}\, B_{E2}(z)$$

  - Segmentation every 10 mm
- Example – run settings v5 setting 6.1.1

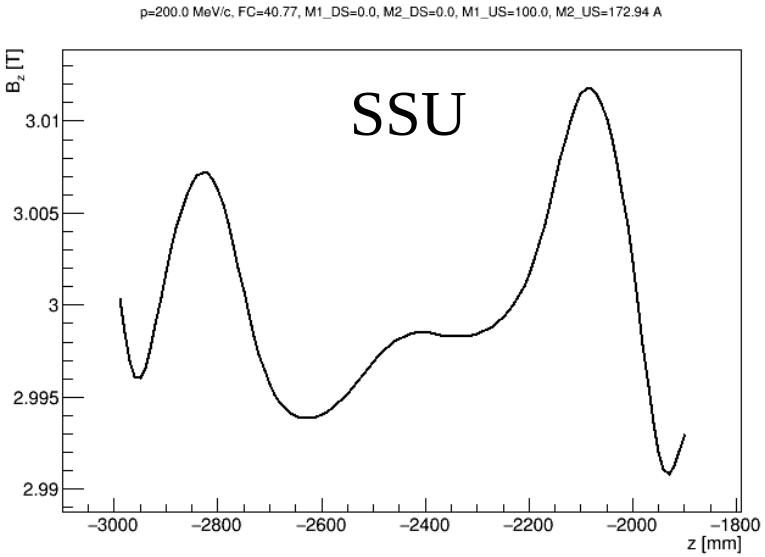
Trim coils

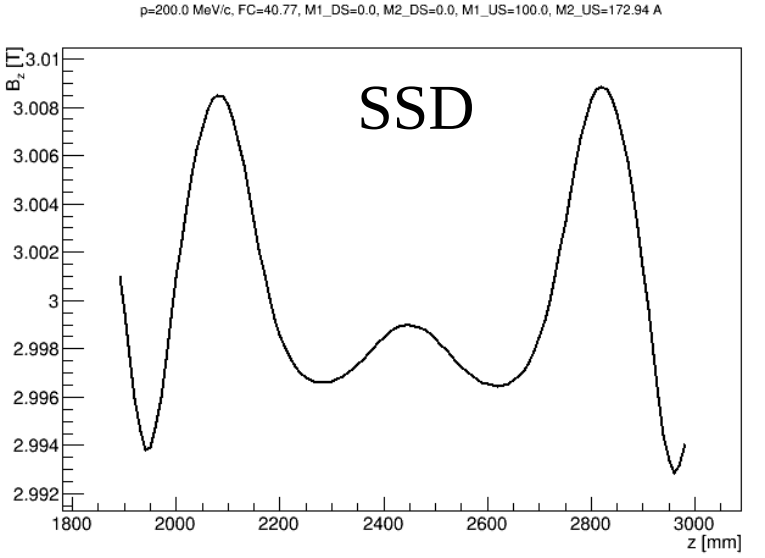


Before fit

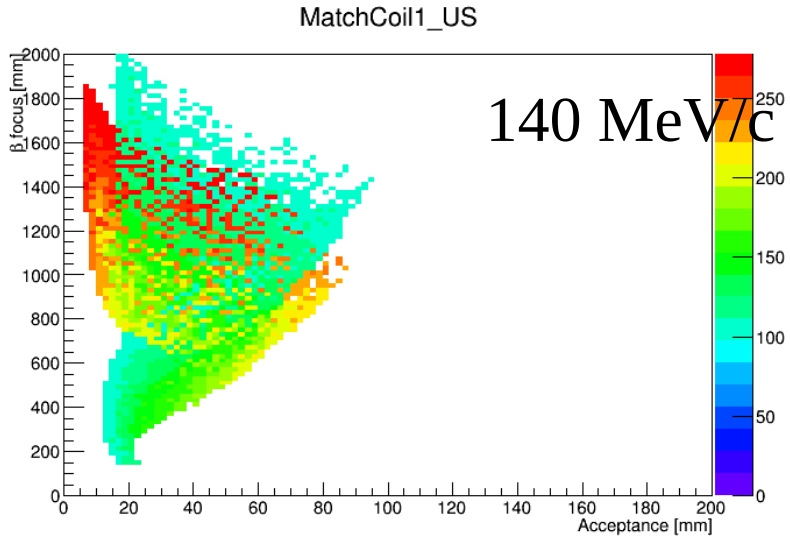
After fit

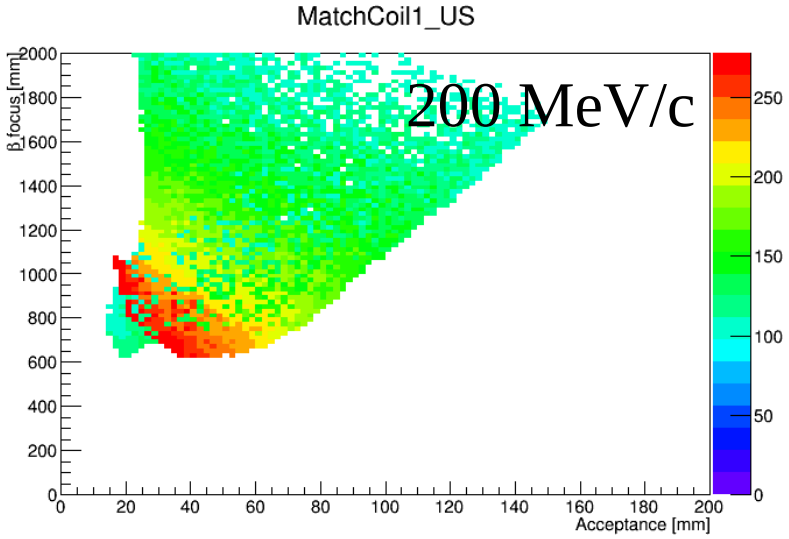
Individual coils

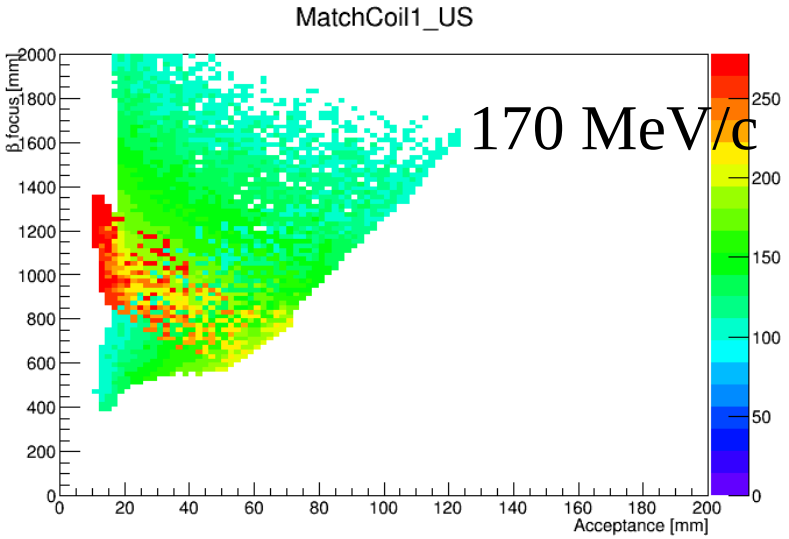


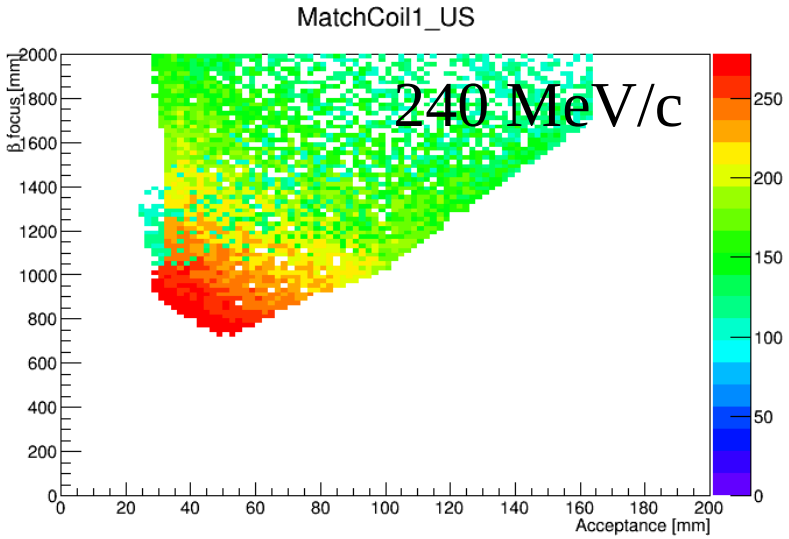


M1*FC 13500 (solenoid)

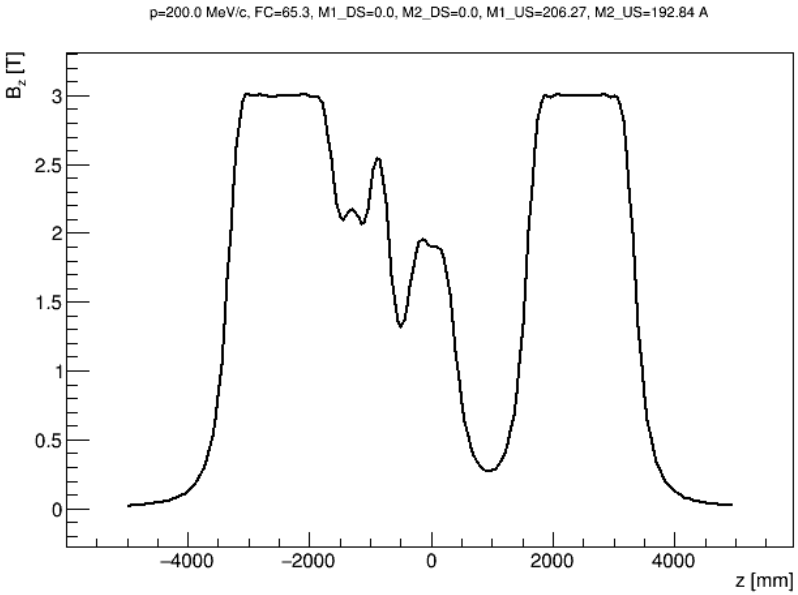


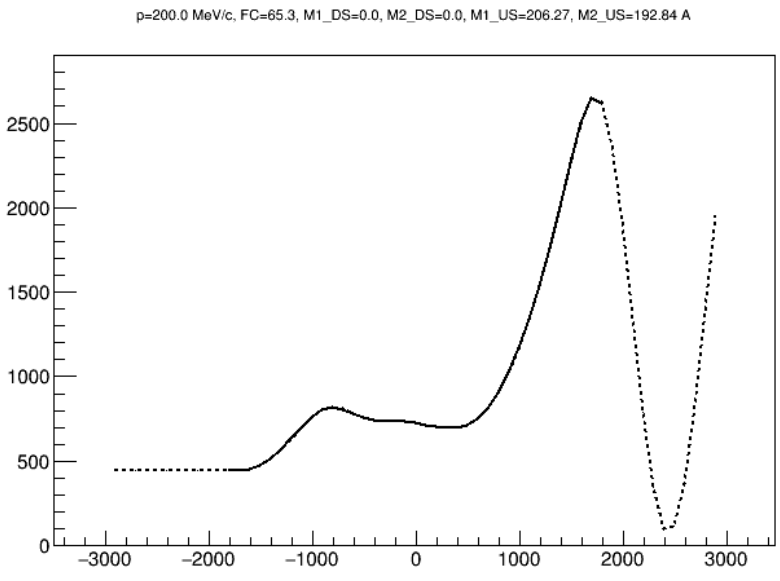






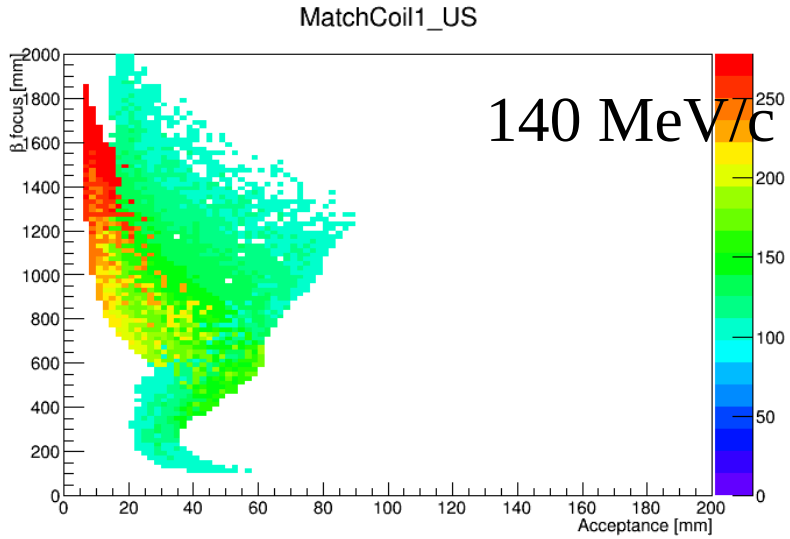
M1*FC 13500 (solenoid)

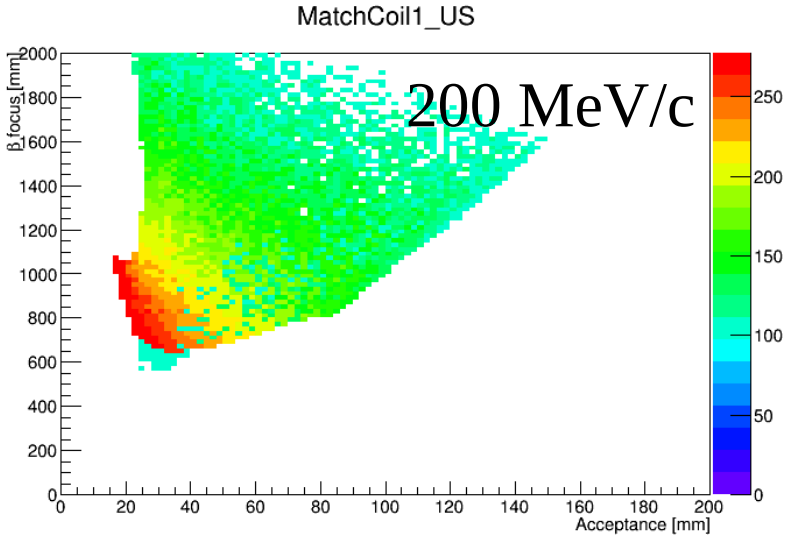


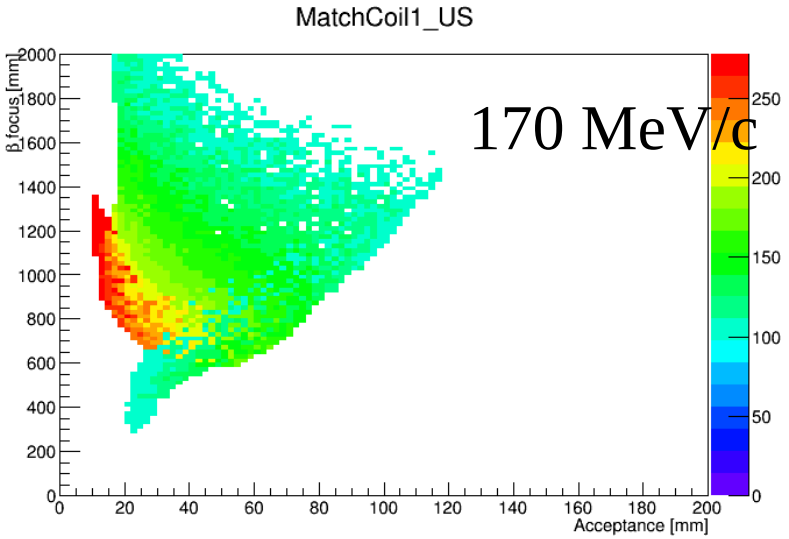


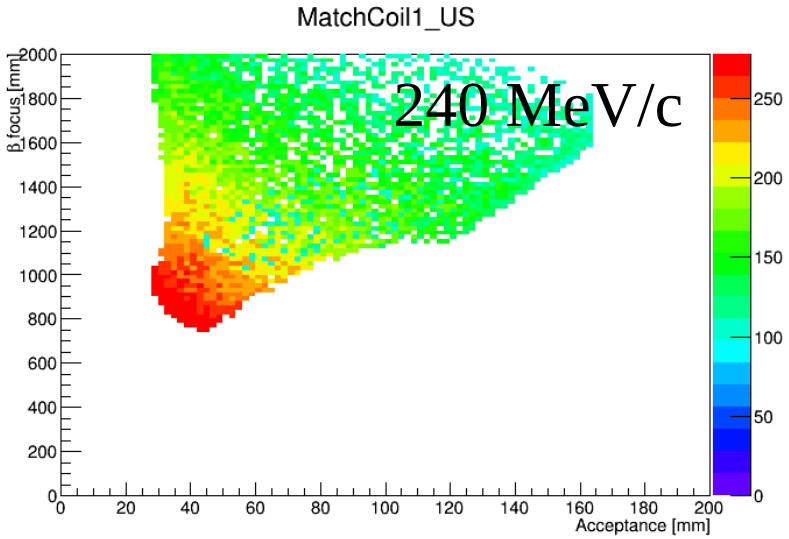
200 MeV/c

M1*FC 20500 (flip)

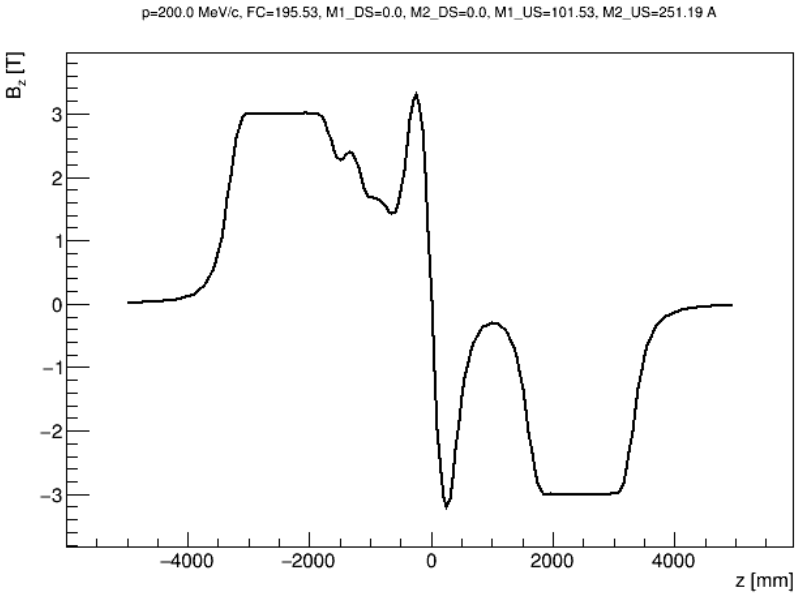


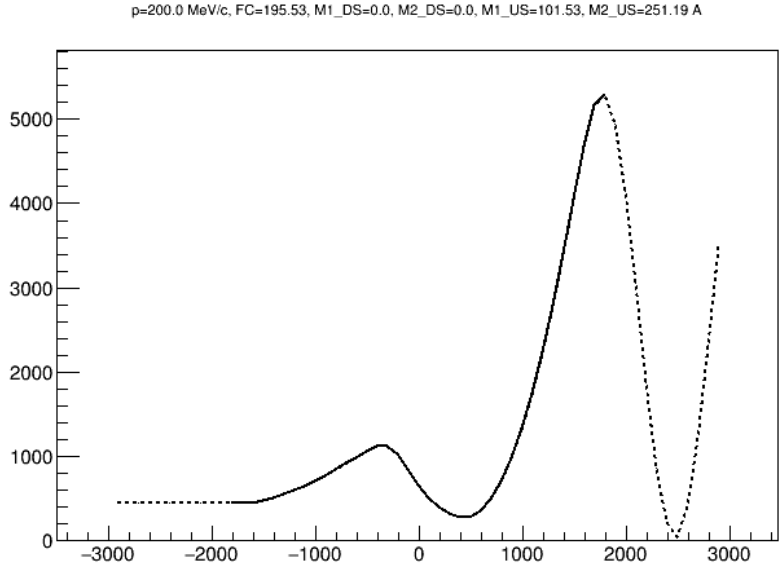






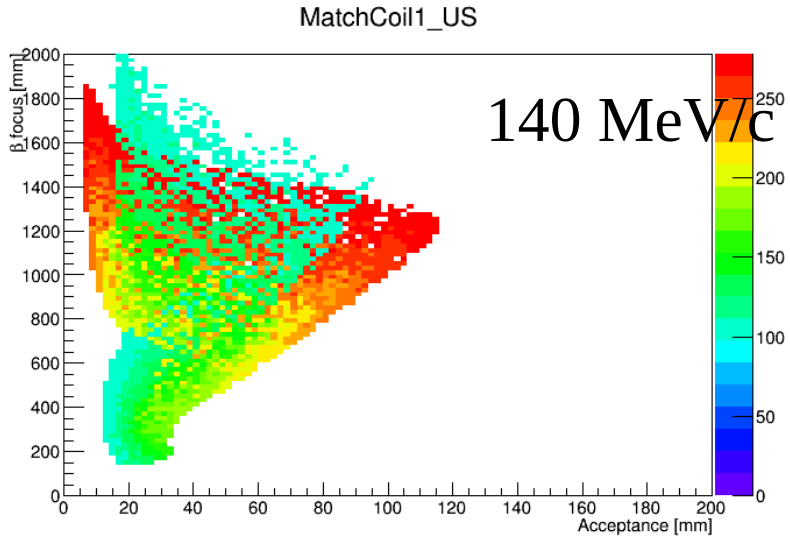
M1*FC 20500 (flip)

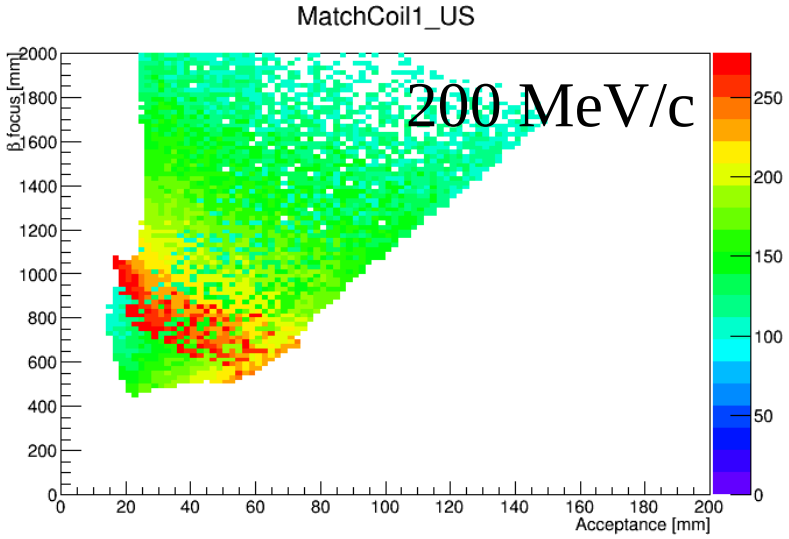


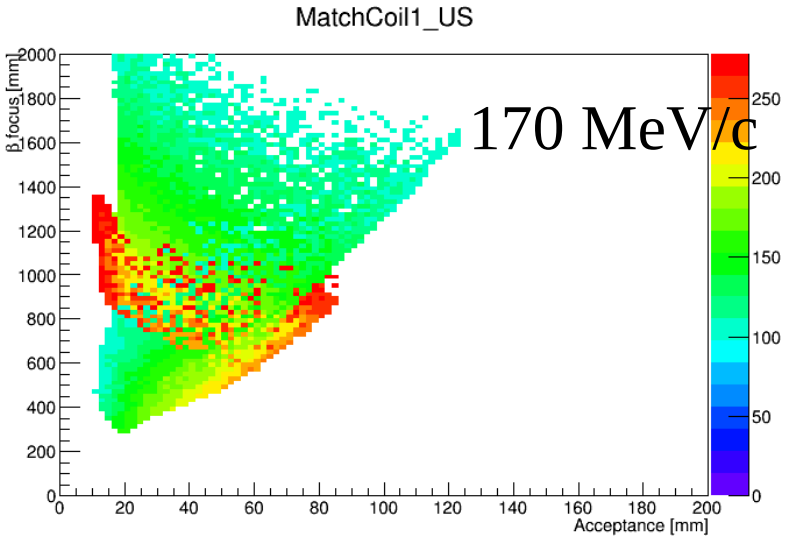


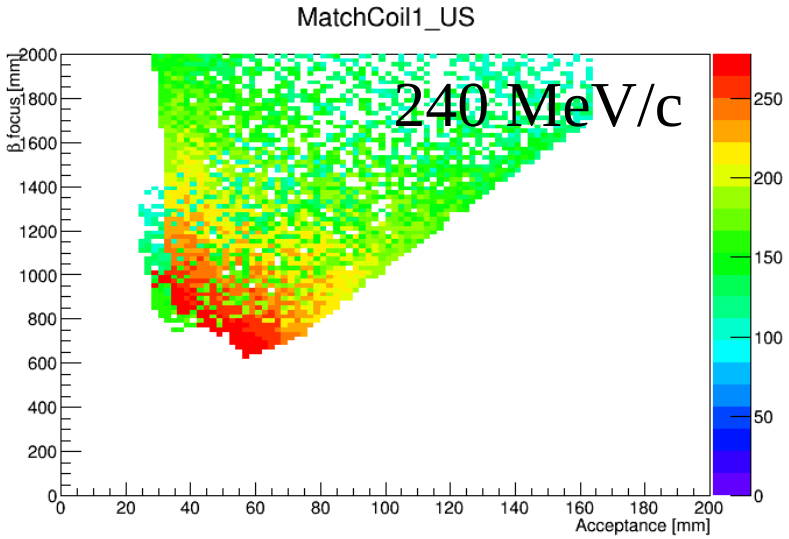
200 MeV/c

M1*FC 18500 (solenoid)

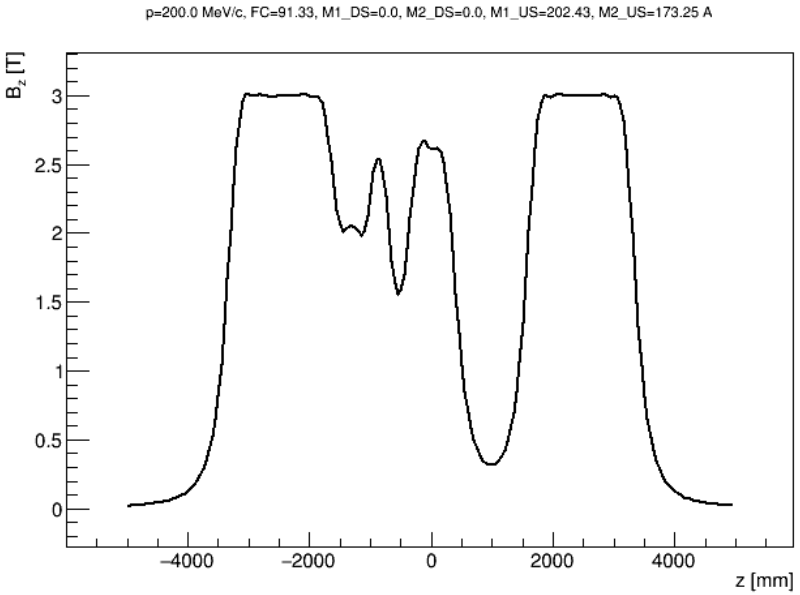


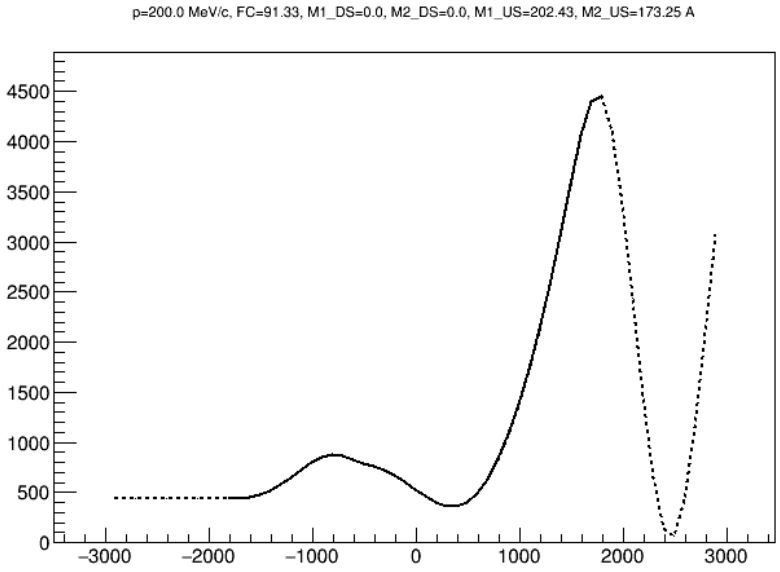






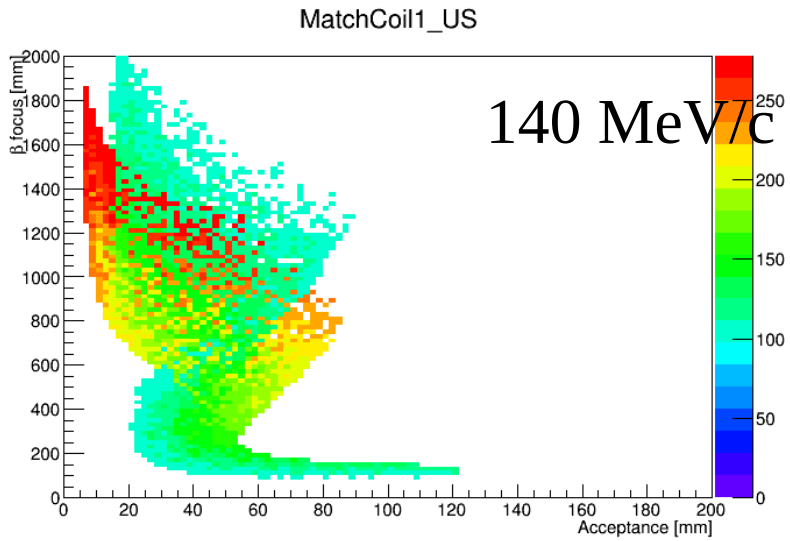
M1*FC 18500 (solenoid)

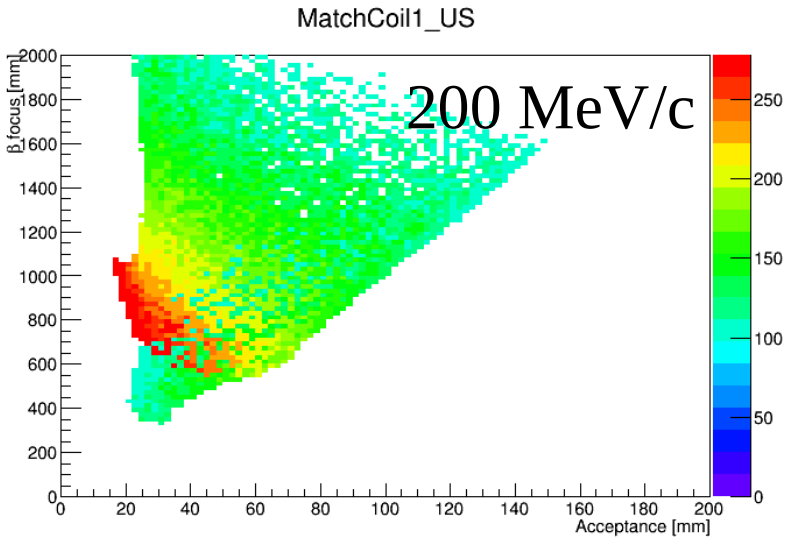


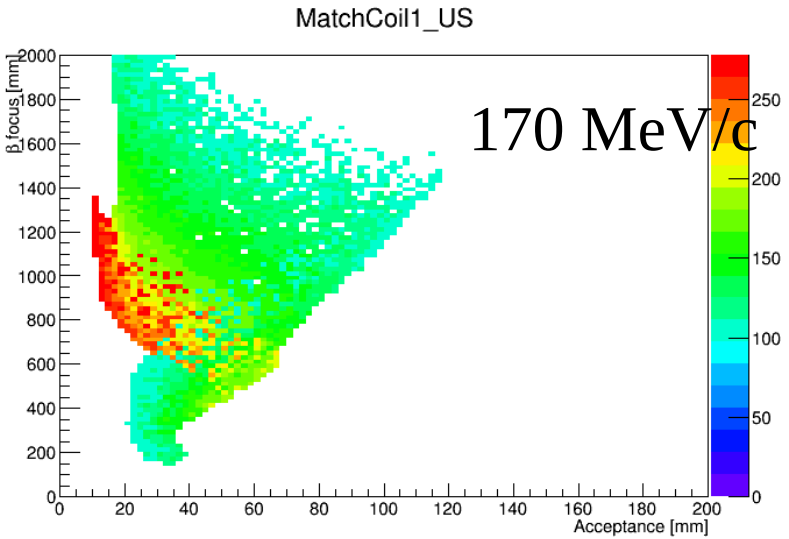


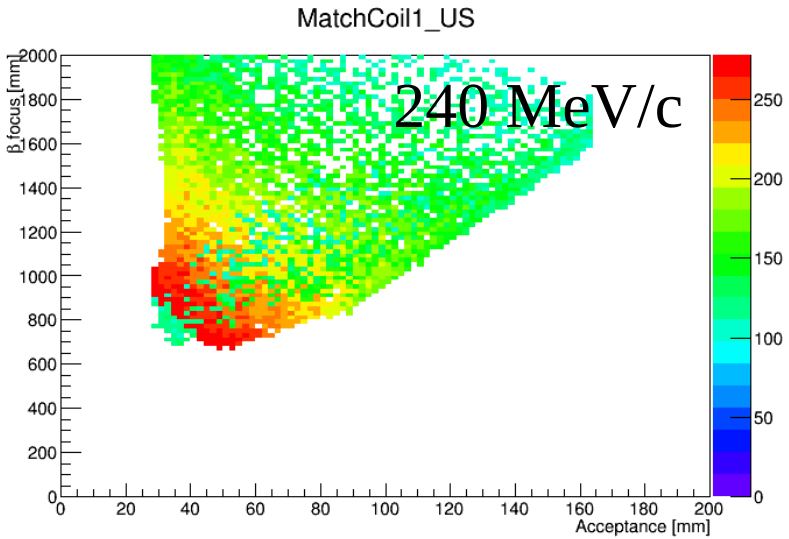
200 MeV/c

M1*FC 28000 (flip)

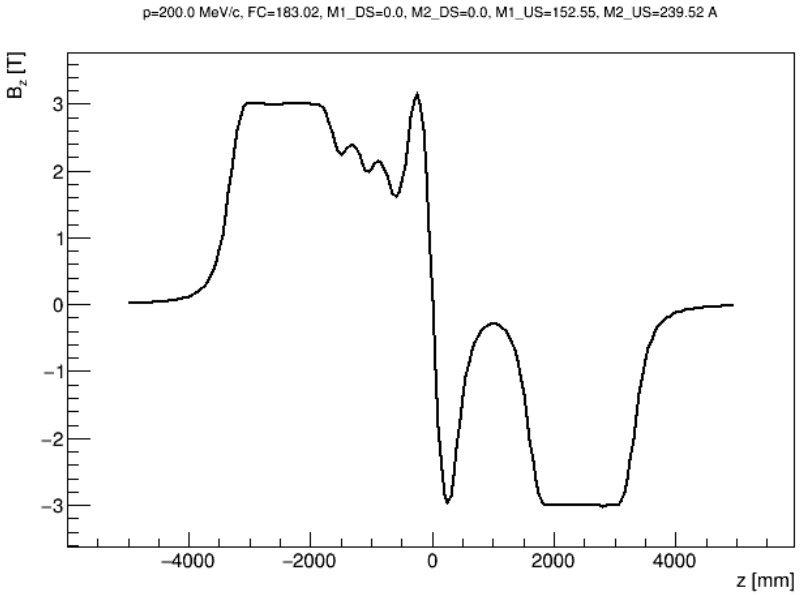


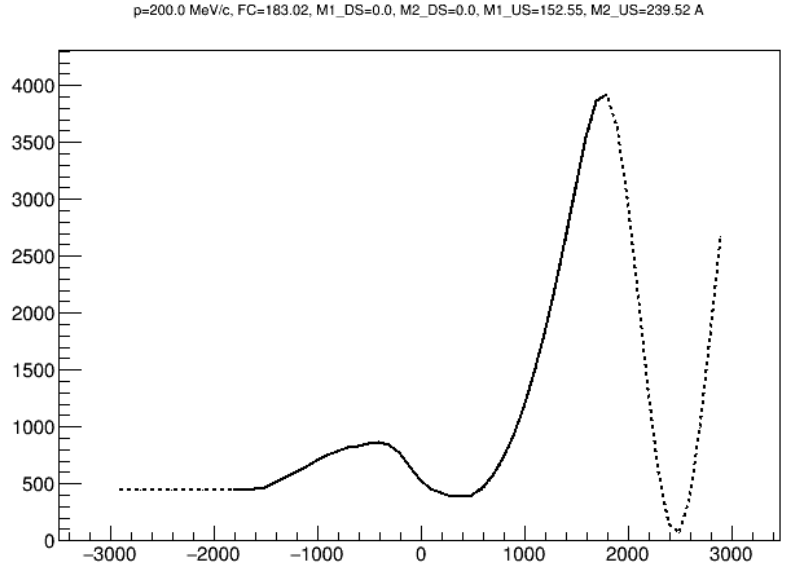






M1*FC 28000 (flip)





200 MeV/c

Thoughts/To do

- Other options:
  - Should we choose something intermediate and run with it for material physics?
    - e.g. M2: 150; M1: 150; FC: 60
    - Transmission would still be quite good, but not “optimal”
  - Would 140 MeV/c as “cooling baseline” be better?
    - What is the resolution at 200 or 140 MeV/c and 3 T?
    - What is the expected cooling performance?
    - What is the width of scattering distribution (for magnet alignment etc)
- To do:
  - ~~Add “optics validation” current scans~~
  - ~~Trim the trim coils~~
  - ~~Stare at “beta function” scans~~ **beta scans withdrawn**
    - ~~Some from “high M1U” series; some from “low M1U” series~~
  - ~~Include PRY effects~~
  - Check magnet geometry is okay – cold shrinkage? Cobb analysis?
  - Full MC

Data taking plan

- Data taking plan, following discussion with magnet folks
  - Commission to, and run, the material physics settings (6.x.y) with no absorber
  - Then review and decide on next move
  - We could, for example, install LiH and do material physics with LiH
  - Or we could do emittance reduction with no absorber (7.x.y)