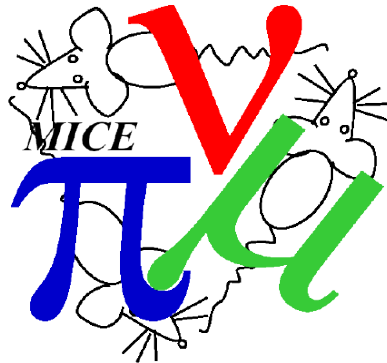




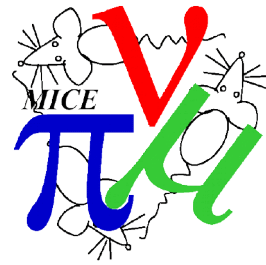
Run Settings



C. Rogers,
ASTeC Intense Beams Group
Rutherford Appleton Laboratory

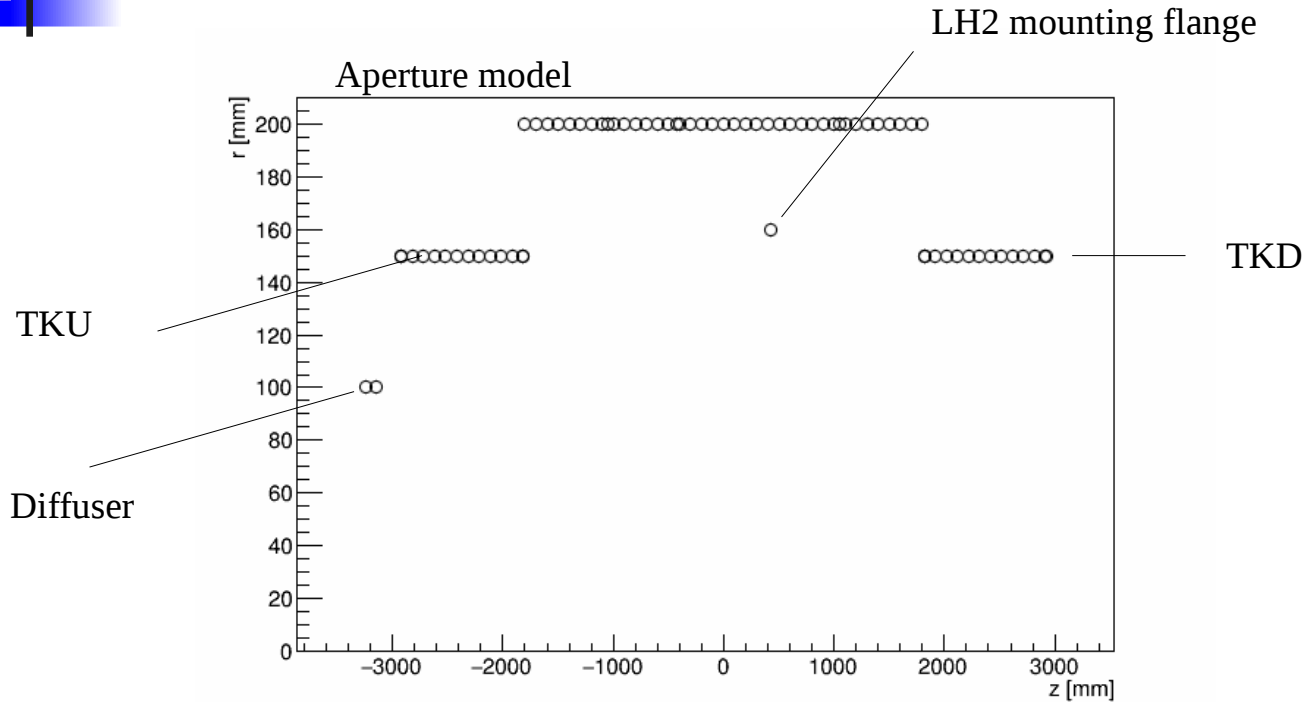
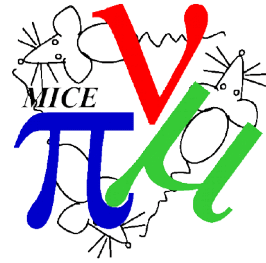


Algorithm



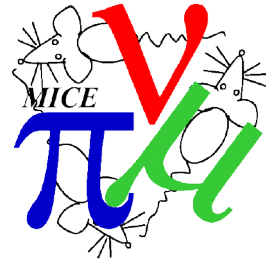
- Throw beam ellipse down MICE beamline 10000 times
 - Throw random magnet currents (why not a grid?)
- Use naive linear model for apertures
- Assume beta is matched at TKU
 - I can remove this constraint with a switch
- Try to map space of acceptance and beta at focus coil
- M2D is switched off and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

Constraints

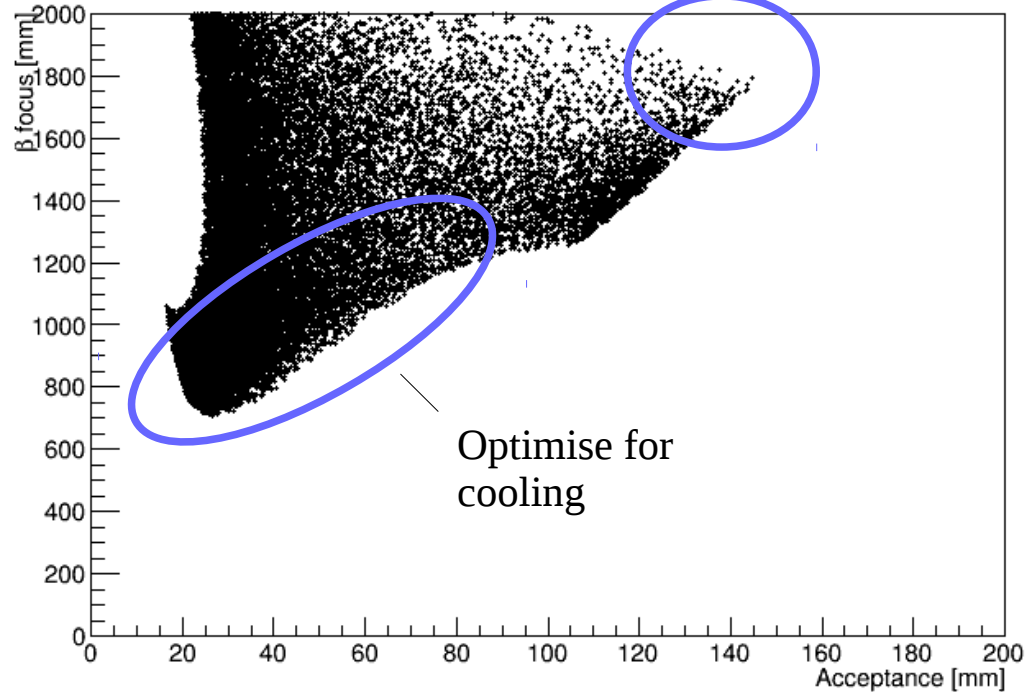


- $253 \cdot 0.66 < M2U < 253 \text{ A}$
- $100 < M1U < 278 \text{ A}$
- $0 < FC < 114 \text{ A}$
- $M1D = M2D = 0 \text{ A}$
- $M1U * FC < 7500$
- Solenoid mode
- Require match in SSU ($\beta = 444 \text{ mm}$, $\alpha = 0$)

200 MeV/c



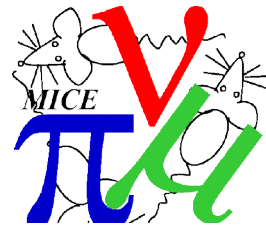
Optimise for
material physics



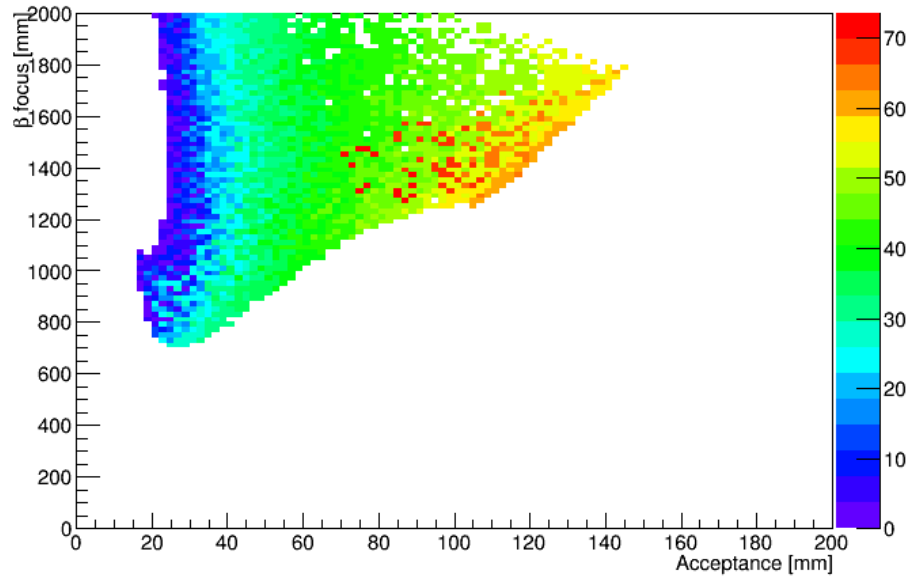
Optimise for
cooling

- Family of solutions
 - Higher acceptance is always best
 - Low beta is best for cooling

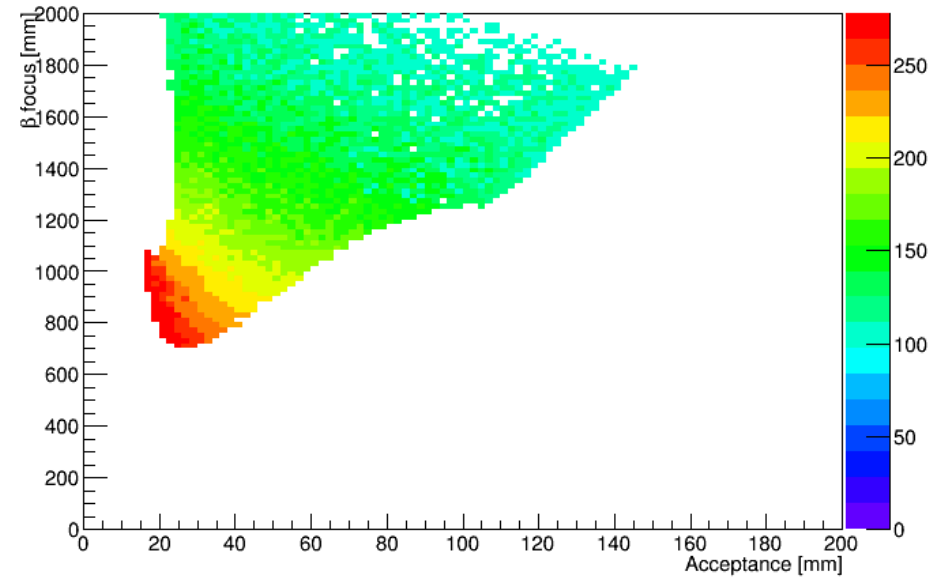
M1U, FC, 200 MeV/c



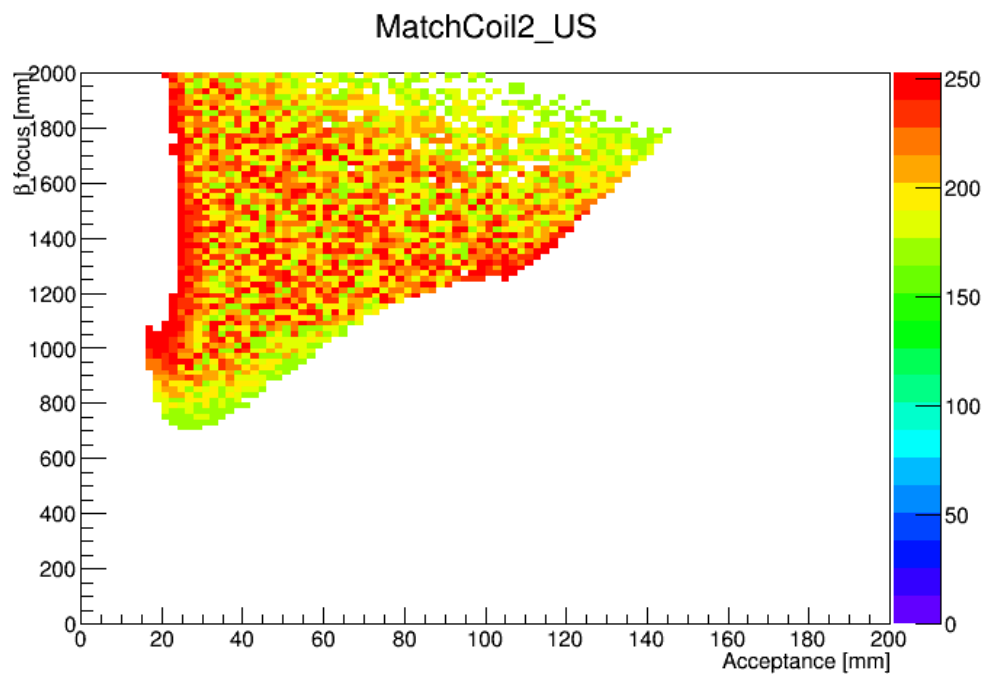
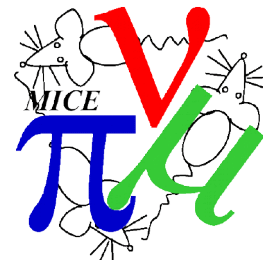
FocusCoil_US



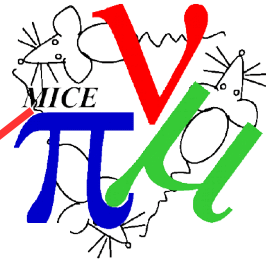
MatchCoil1_US



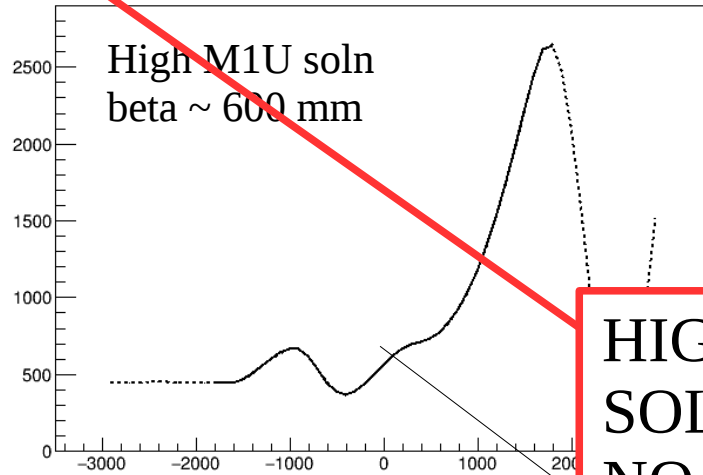
- Force proportional to $M1 \cdot FC$



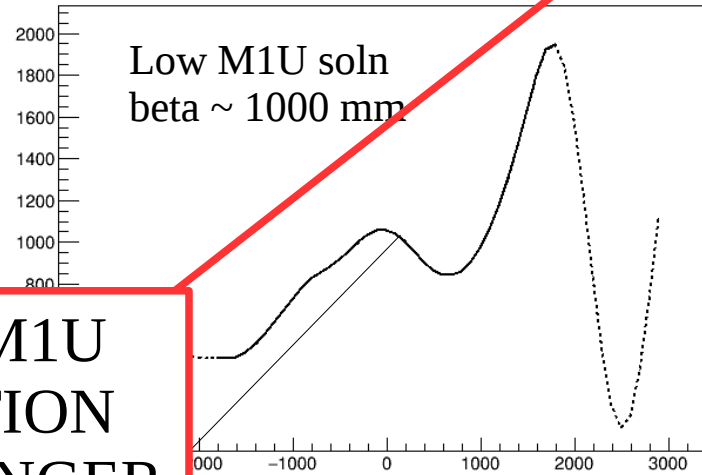
- M2 – for reference



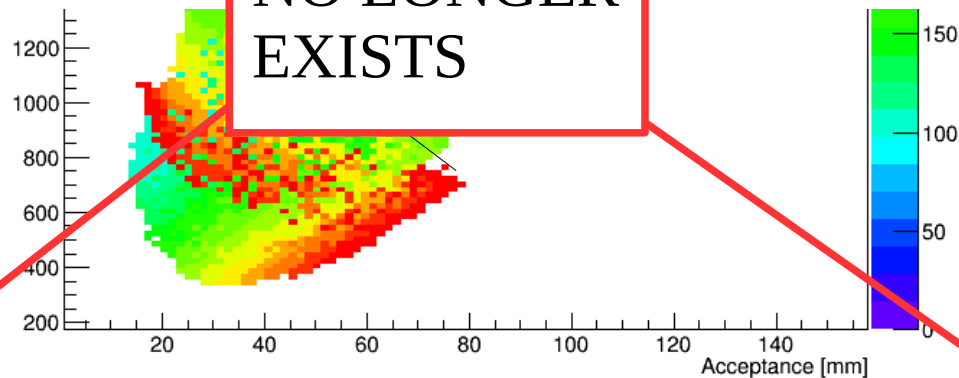
$p=200.0$ MeV/c, FC=91.57, M1_DS=0.0, M2_DS=0.0, M1_US=276.44, M2_US=212.34 A



$p=200.0$ MeV/c, FC=61.17, M1_DS=0.0, M2_DS=0.0, M1_US=160.12, M2_US=23.55 A

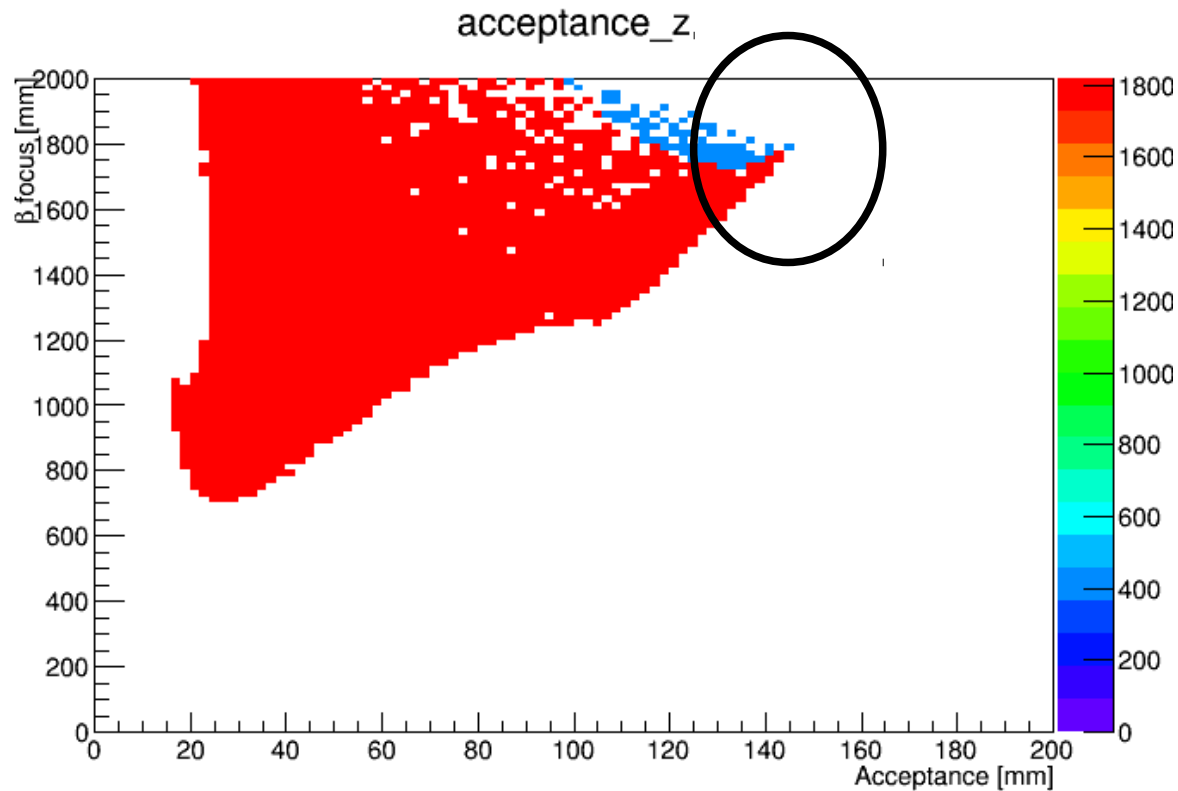
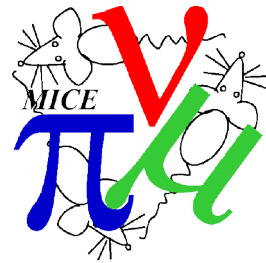


HIGH M1U
SOLUTION
NO LONGER
EXISTS



- Two families of solutions
 - High M1U solution has focus upstream of FC
 - Low M1U solution has focus downstream of FC

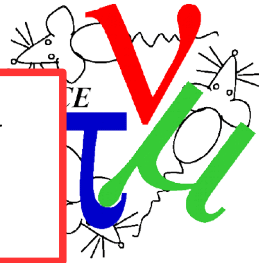
Z position of aperture



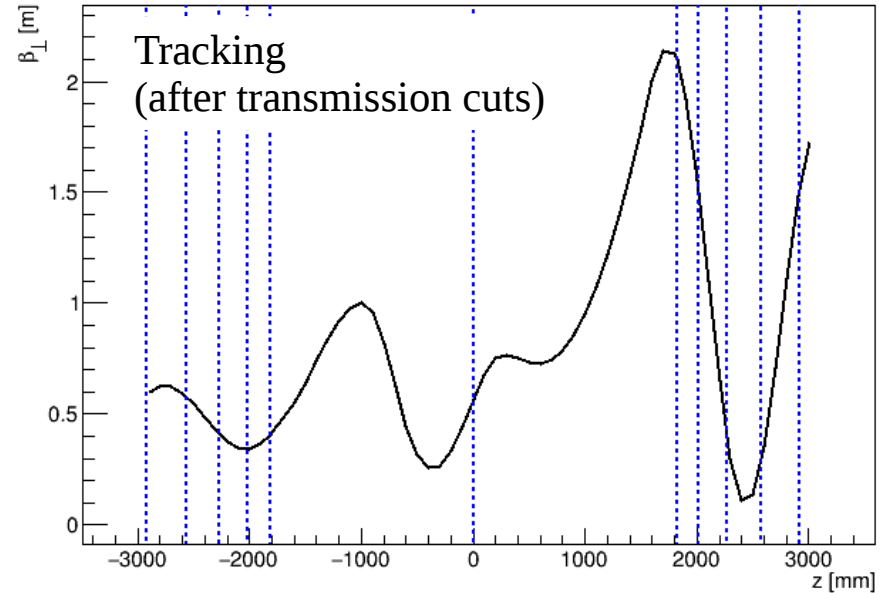
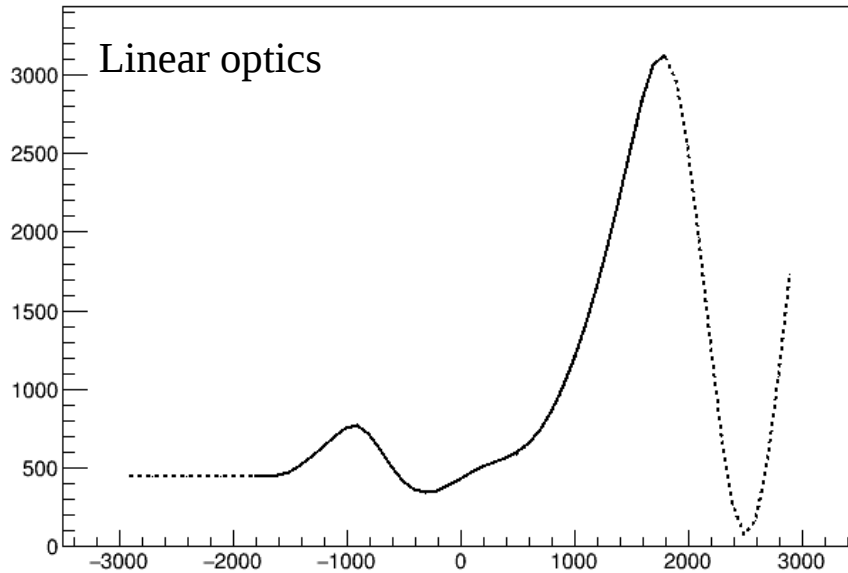
- “Roundness” of the nose is a real feature
 - Colours indicate z position of the limiting aperture [mm]
 - Aperture at high β_{focus} becomes the FC mounting flange

Tracking

THIS MAGNET SETTING
IS NOW EXCLUDED



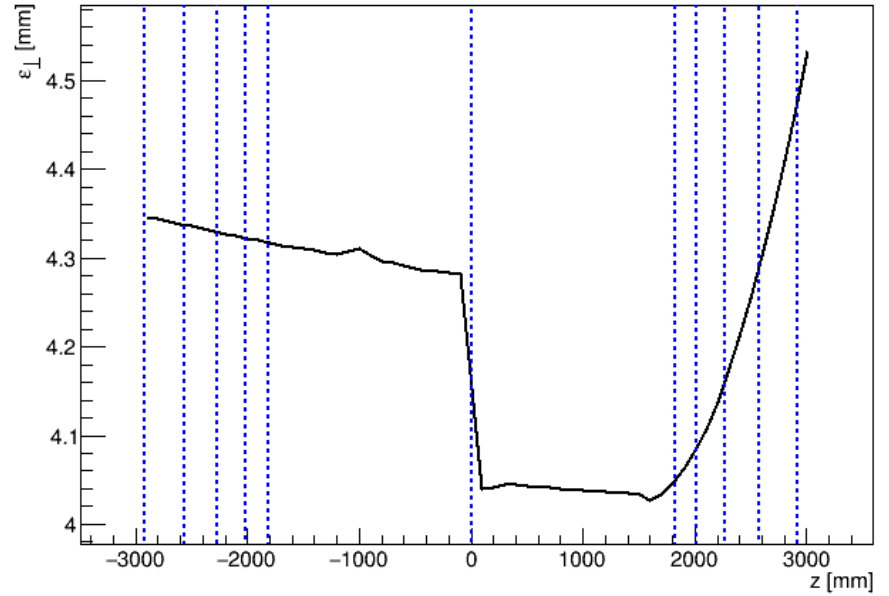
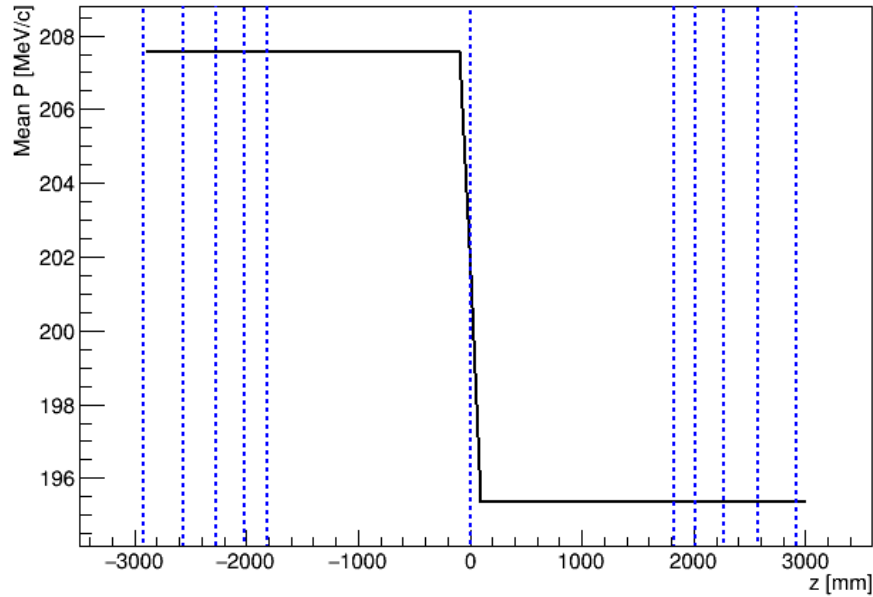
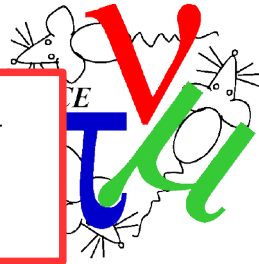
p=200.0 MeV/c, FC=107.76, M1_DS=0.0, M2_DS=0.0, M1_US=277.63, M2_US=169.35 A



- Try tracking a “cooling” beam – look at performance
 - M2U = 277.63 A
 - M1U = 169.35 A
 - FC = 107.76 A
- Simple channel model

Tracking

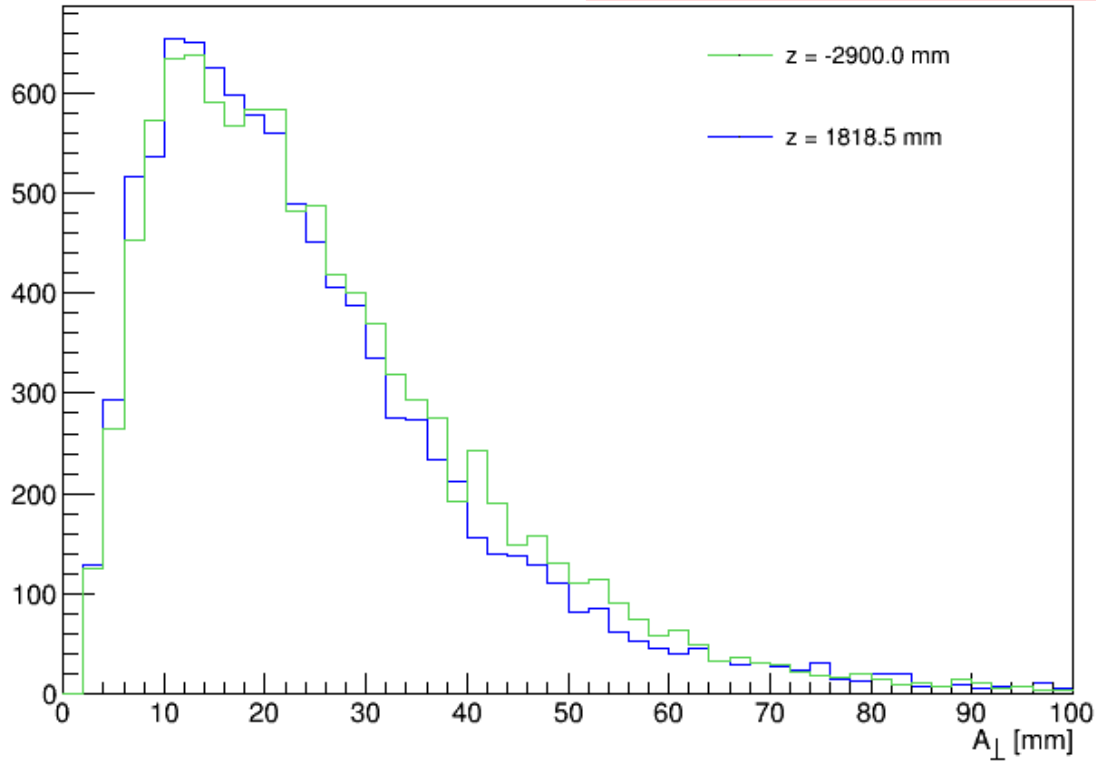
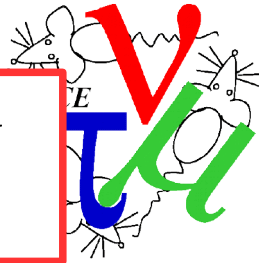
THIS MAGNET SETTING
IS NOW EXCLUDED



- 69.8 % transmission

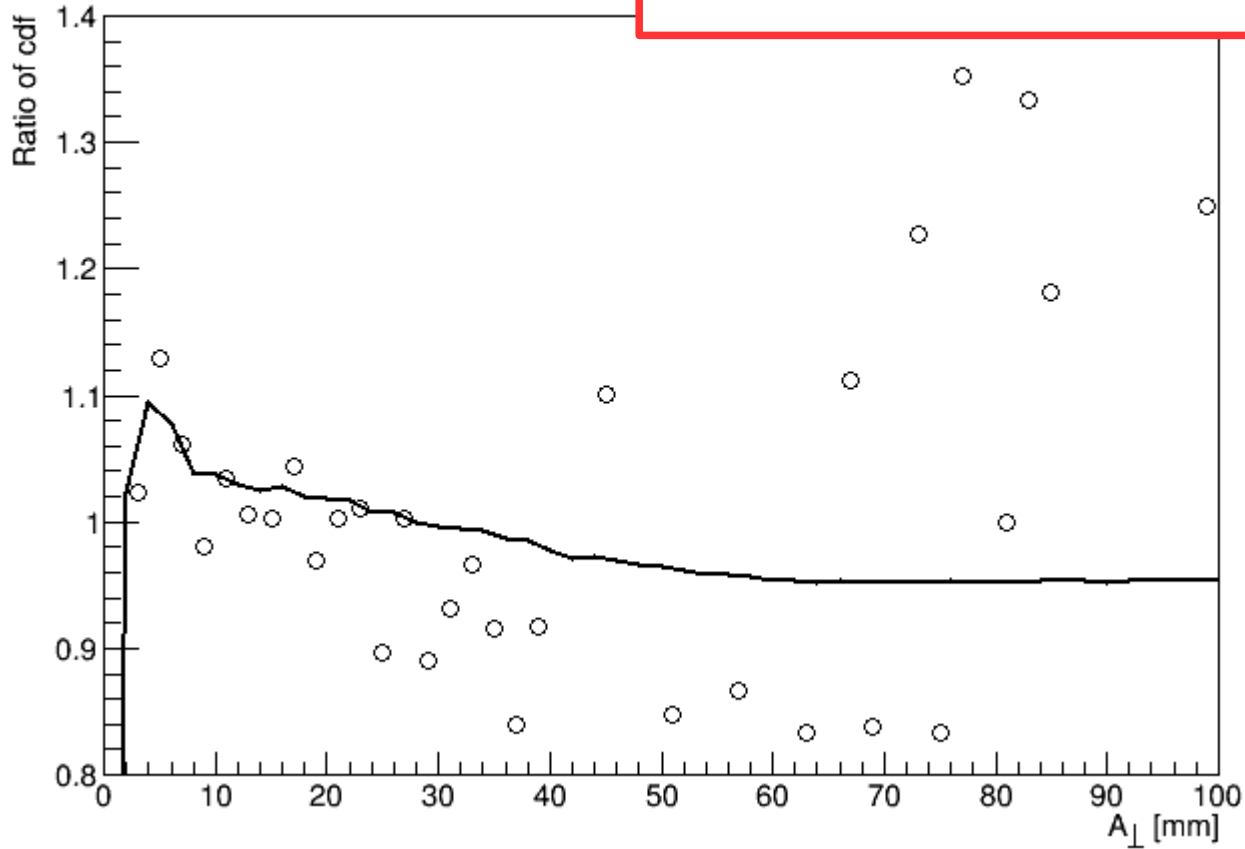
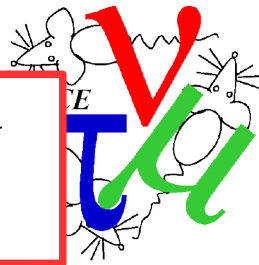
Tracking

THIS MAGNET SETTING
IS NOW EXCLUDED



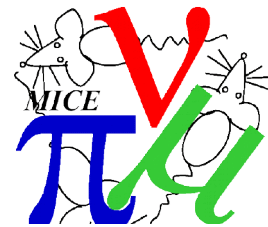
Tracking

THIS MAGNET SETTING
IS NOW EXCLUDED

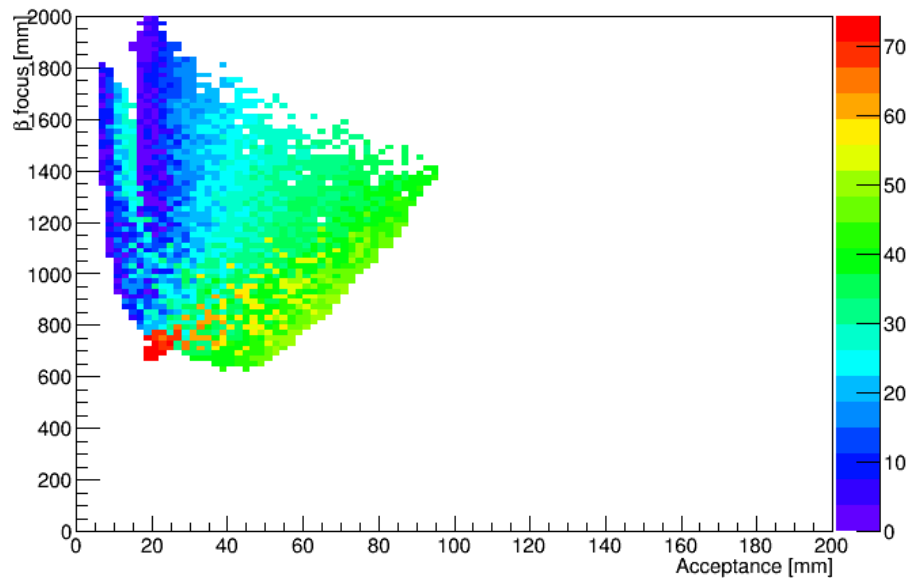


- Points show ratio of each bin
- Line shows ratio of cdf

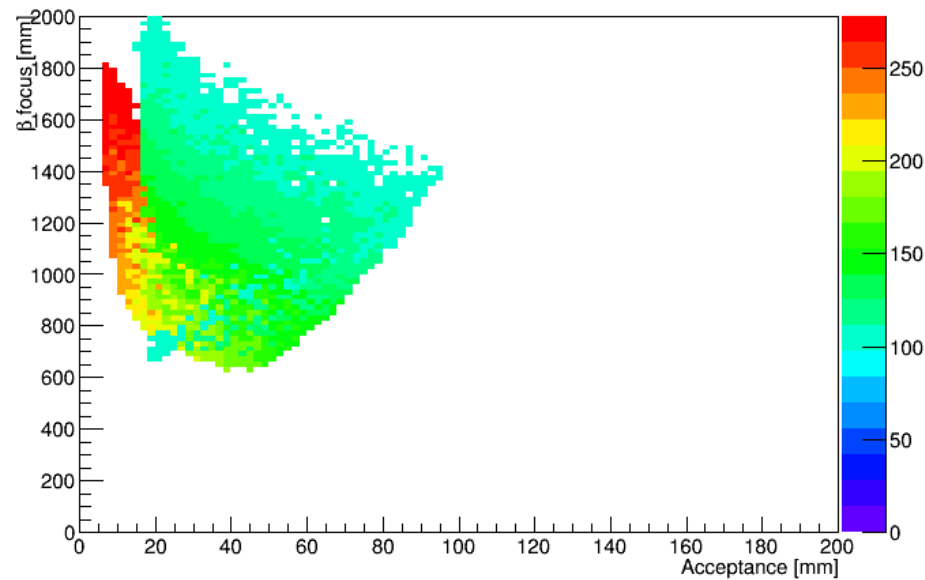
140 MeV/c



FocusCoil_US

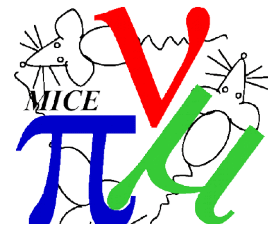


MatchCoil1_US

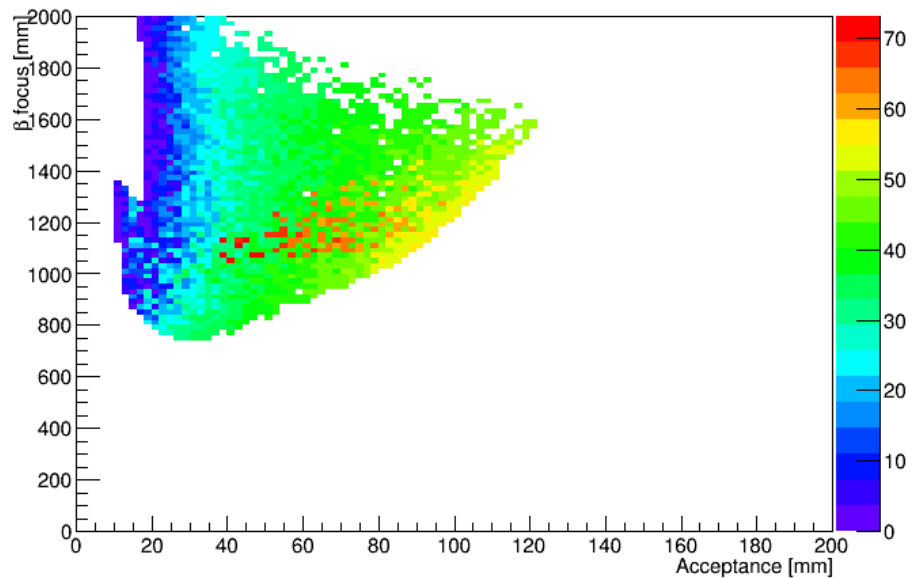


- Force proportional to $M1 * FC$

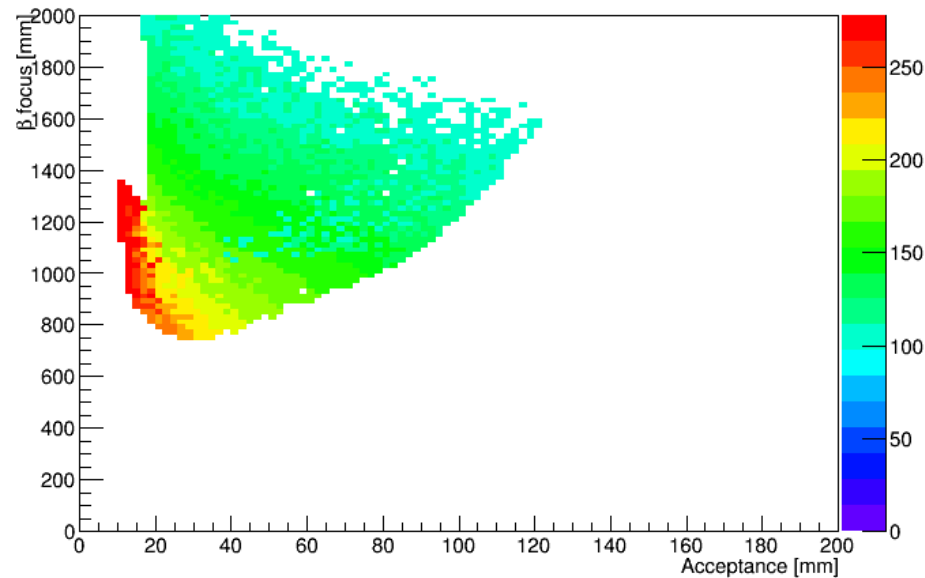
170 MeV/c



FocusCoil_US

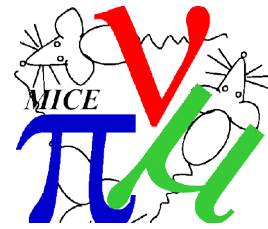


MatchCoil1_US

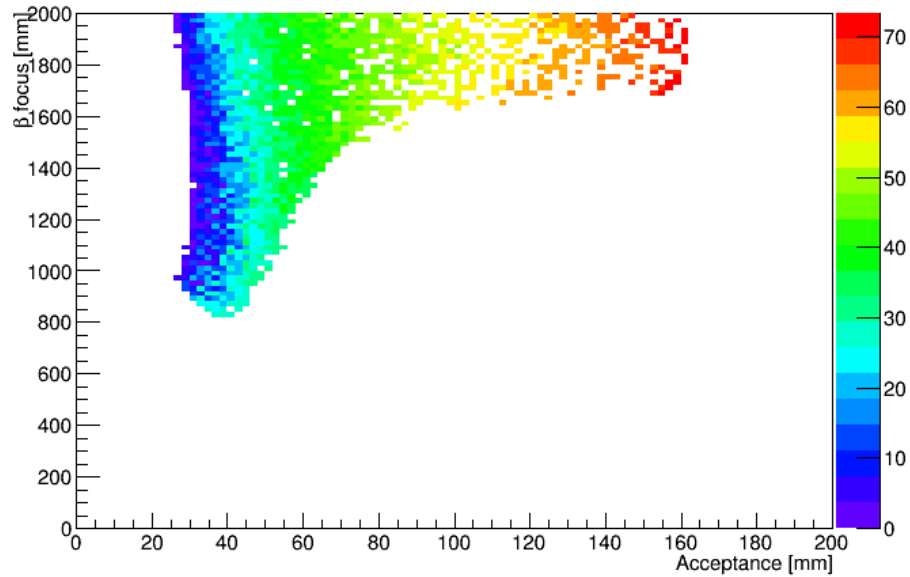


- Force proportional to $M1 * FC$

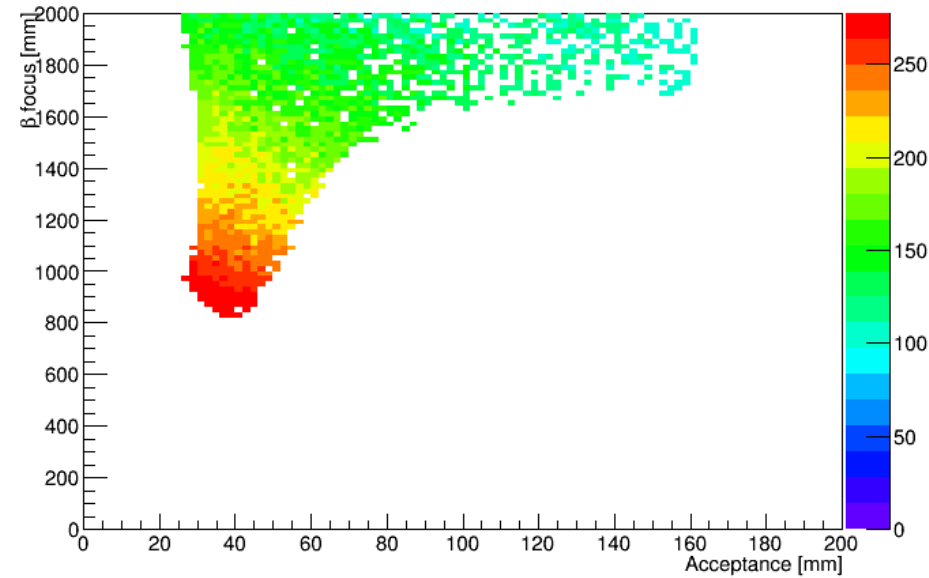
240 MeV/c



FocusCoil_US

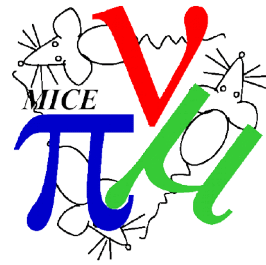


MatchCoil1_US



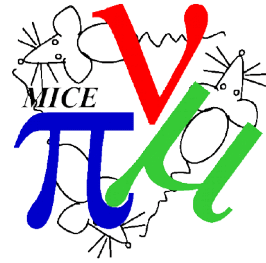
- Force proportional to $M1 * FC$

Thoughts/To do



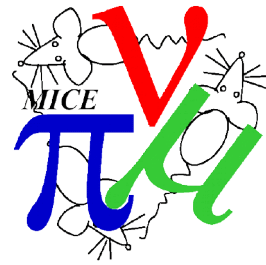
- If $M1U * FC < 7500$ is a real constraint, we need to be creative to observe cooling
- Remove constraint of “match” in SSU
- Work at 140 MeV/c as “baseline”
- Go to “flip mode”
- Go to 2 T in SSU or SSD

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
 - Some from “high M1U” series; some from “low M1U” series
 - Include PRY effects
 - 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)