



Run Settings



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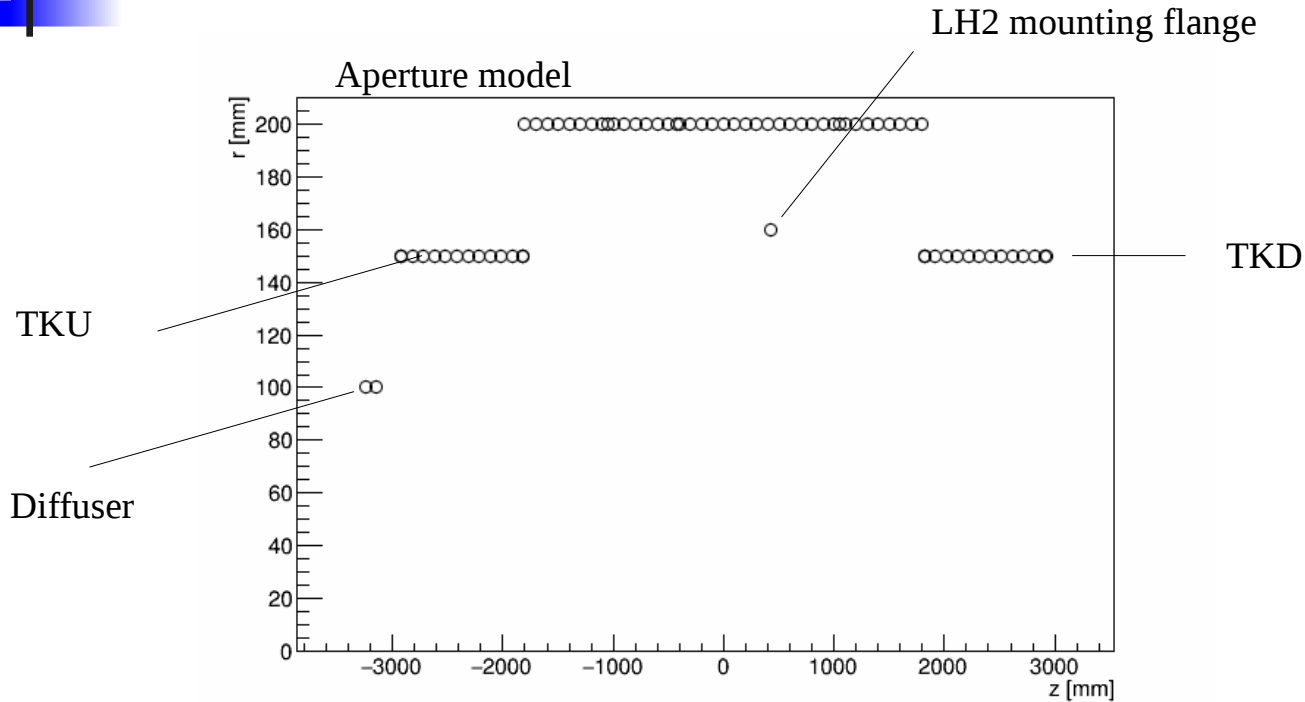
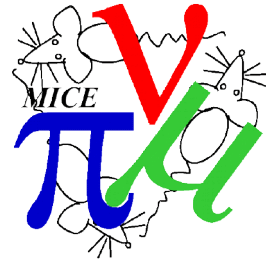


Algorithm



- 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

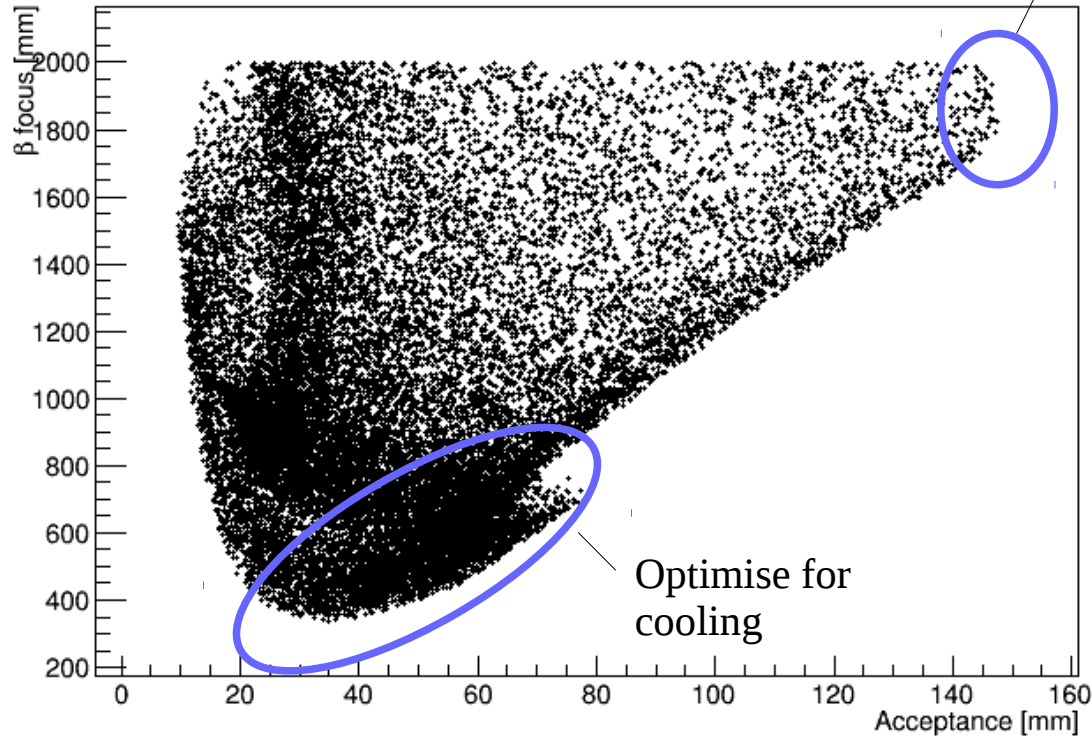


- $253 \cdot 0.66 < M2U < 253$ A
- $0 < M1U < 278$ A
- $0 < FC < 114$ A
- Solenoid mode
- Require match in SSU (beta = 444 mm, alpha = 0)

200 MeV/c

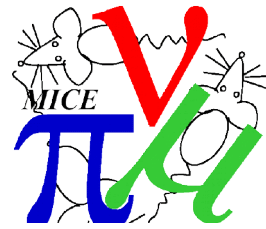


Optimise for material physics

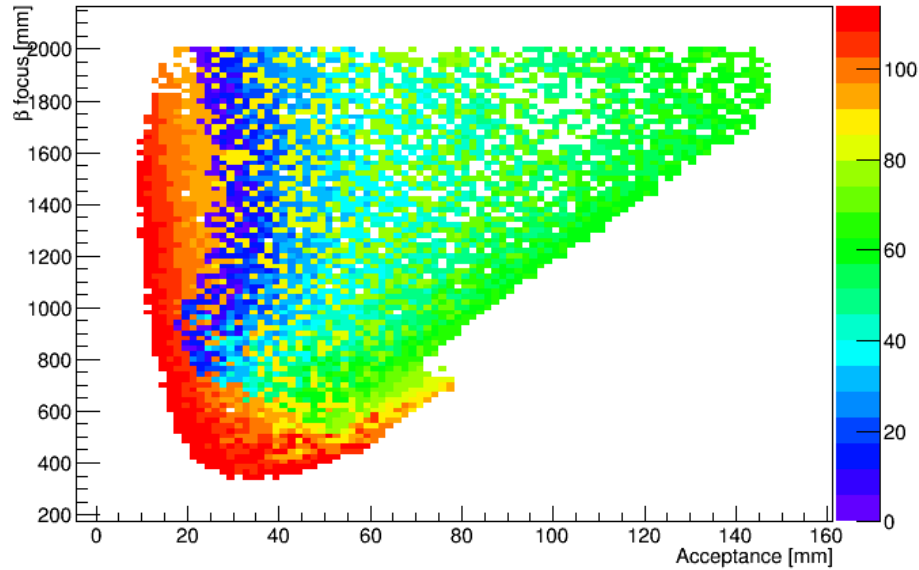


- Family of solutions
 - Higher acceptance is always best
 - Low beta is best for cooling

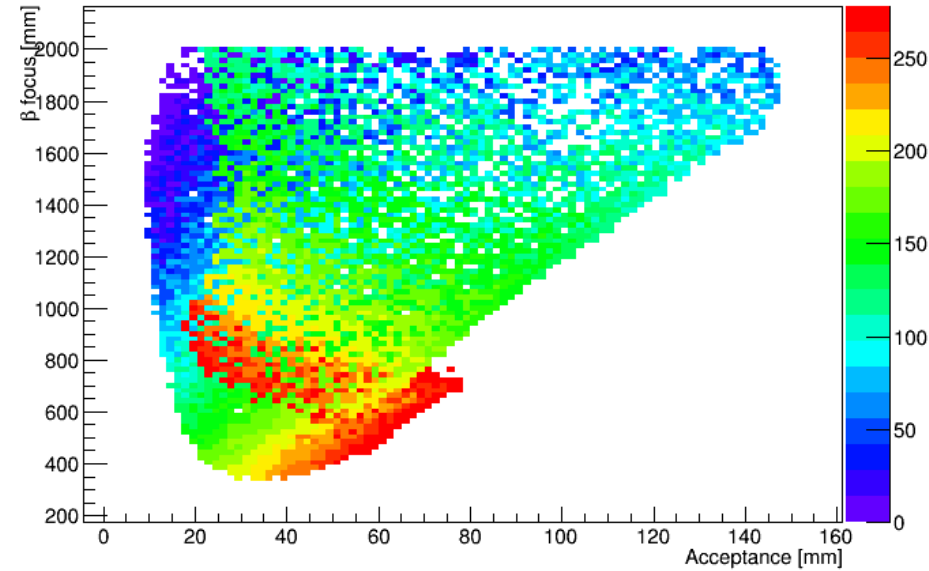
M1U, FC, 200 MeV/c



FocusCoil_US

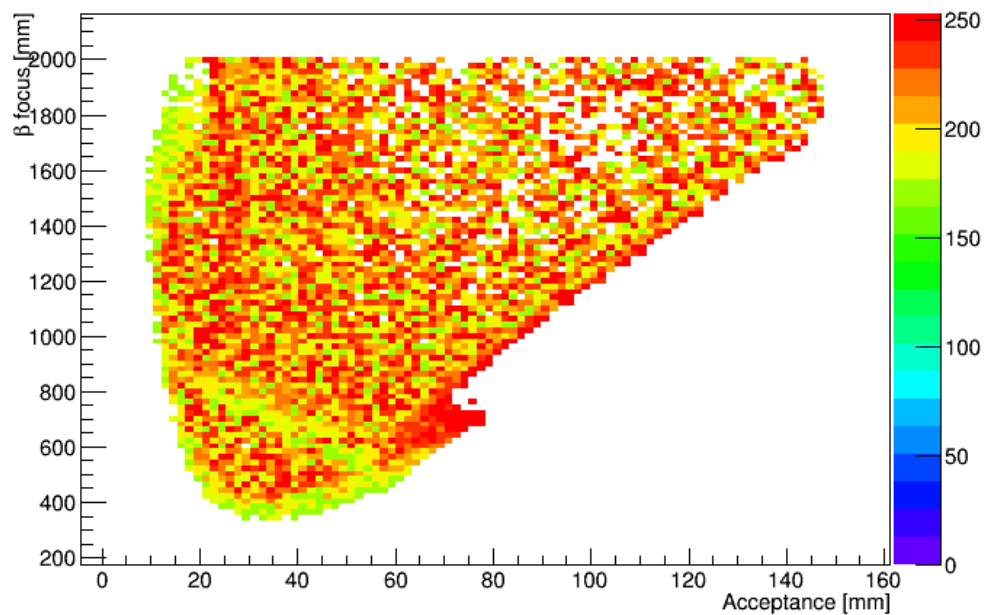


MatchCoil1_US

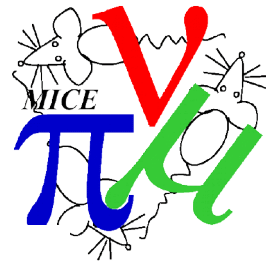


- Force proportional to $M1 \cdot FC$

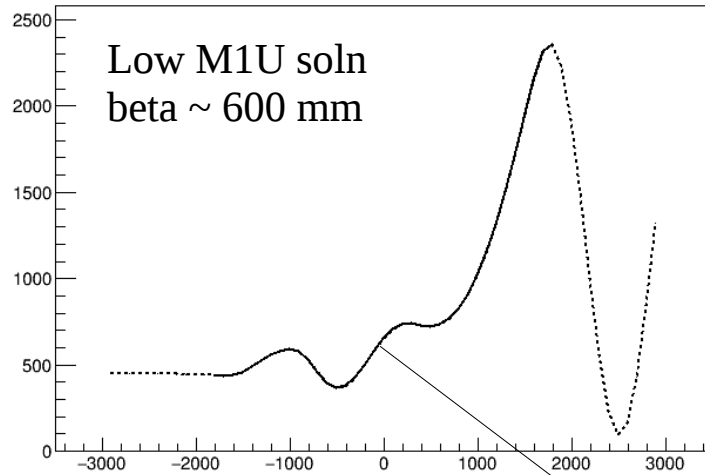
MatchCoil2_US



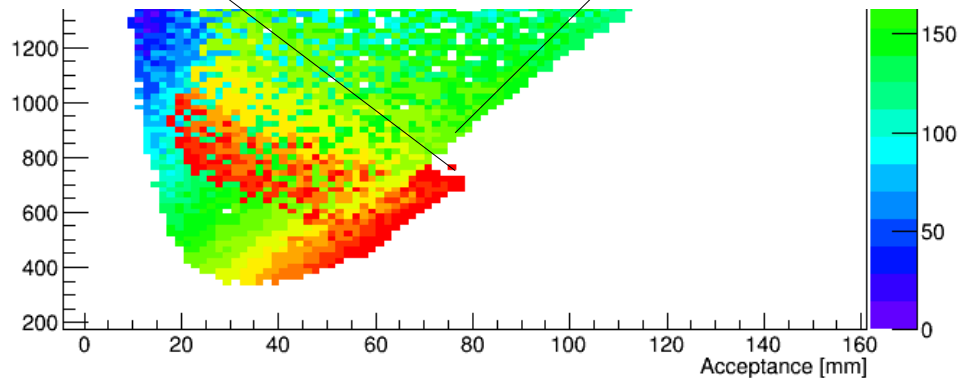
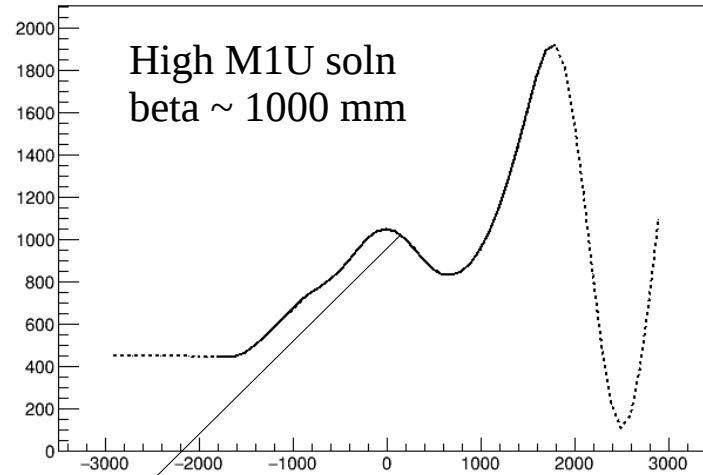
- M2 – for reference



p=200.0 MeV/c, FC=91.27, M1_DS=0.0, M2_DS=0.0, M1_US=277.28, M2_US=251.2 A

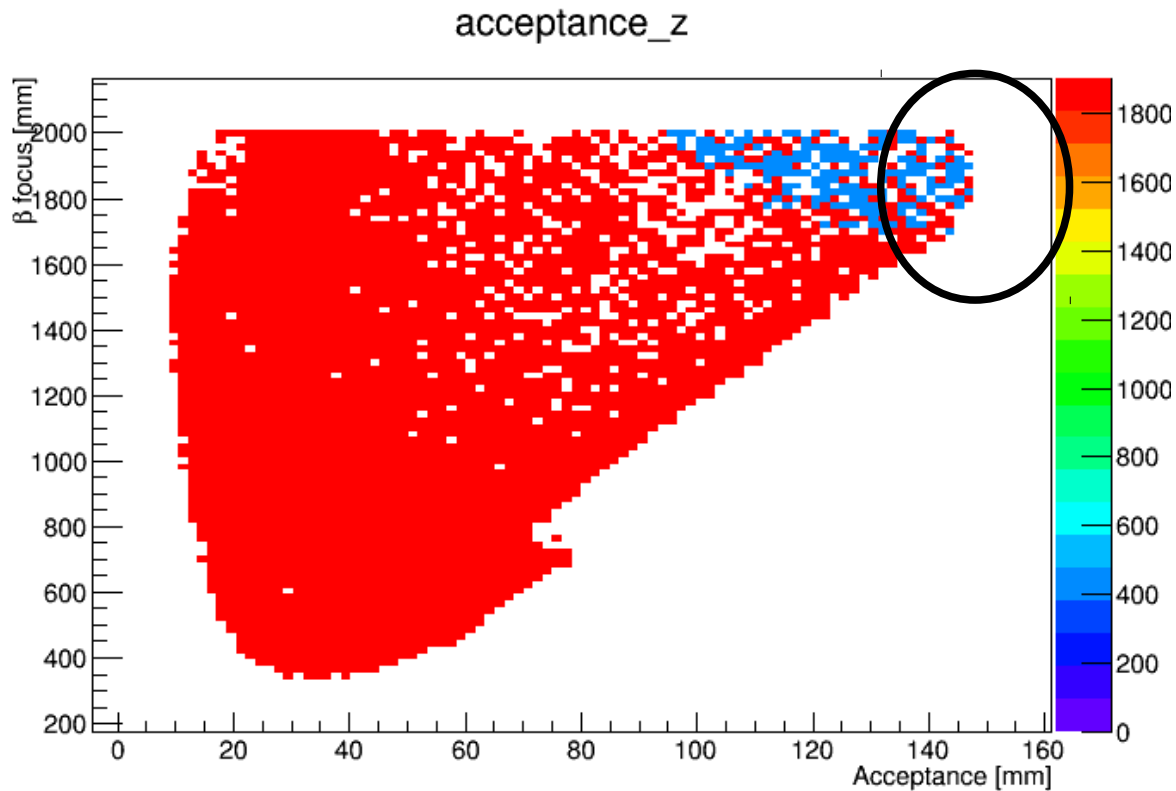
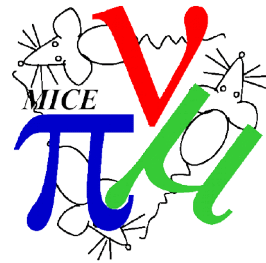


p=200.0 MeV/c, FC=64.08, M1_DS=0.0, M2_DS=0.0, M1_US=155.98, M2_US=252.79 A



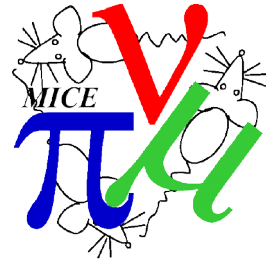
- Two families of solutions
 - High M1U solution has focus upstream of FC
 - Low M1U solution has focus downstream of FC

Z position of aperture

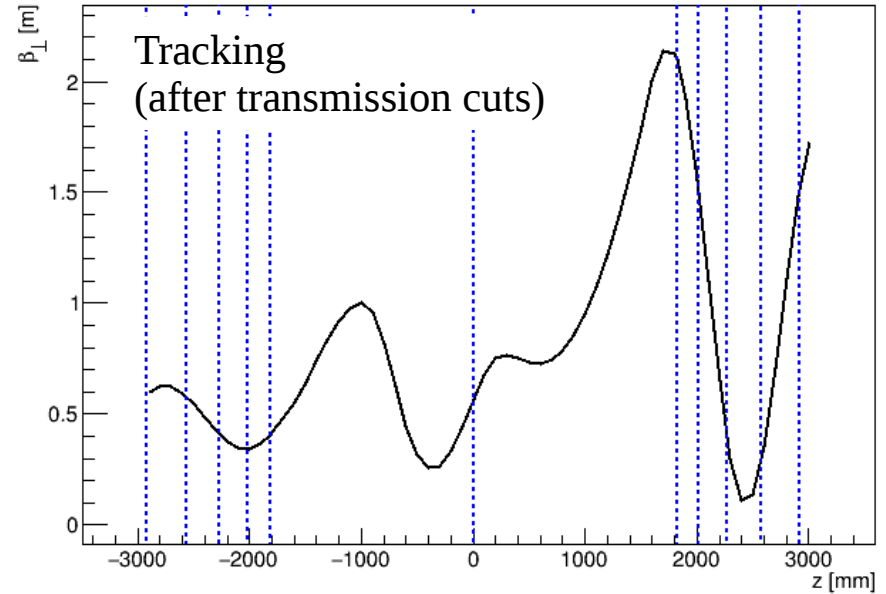
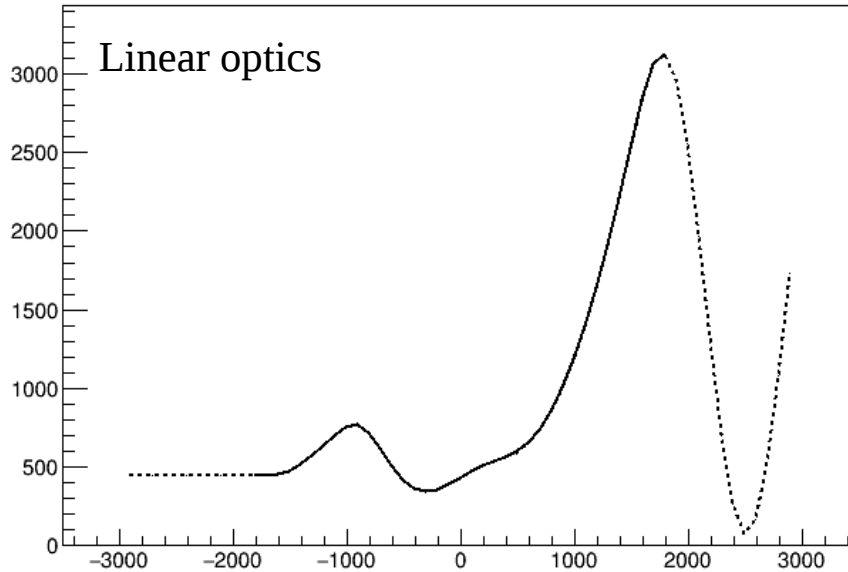


- “Roundness” of the nose is a real feature
 - Plot “vertical axis” is z position of the limiting aperture [mm]
 - Aperture at high β_{focus} becomes the FC mounting flange

Tracking

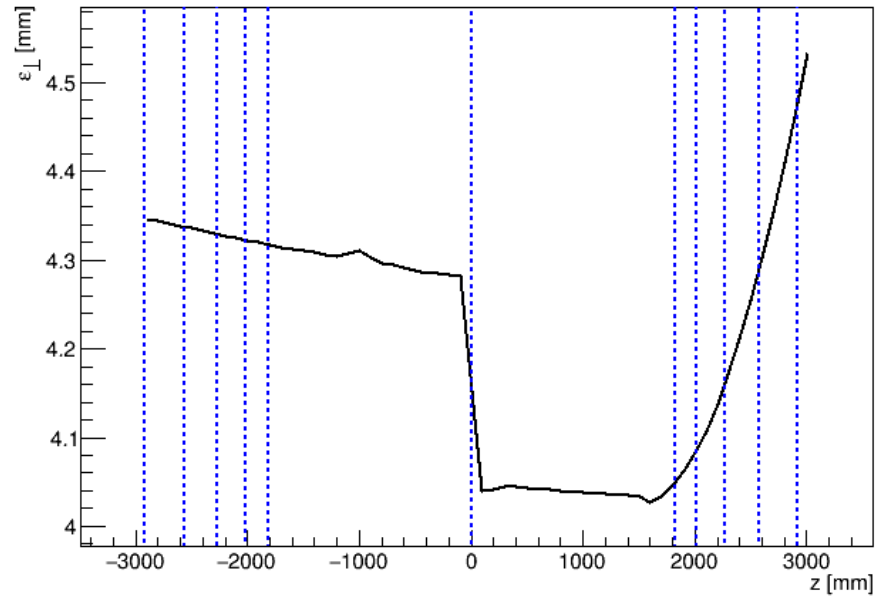
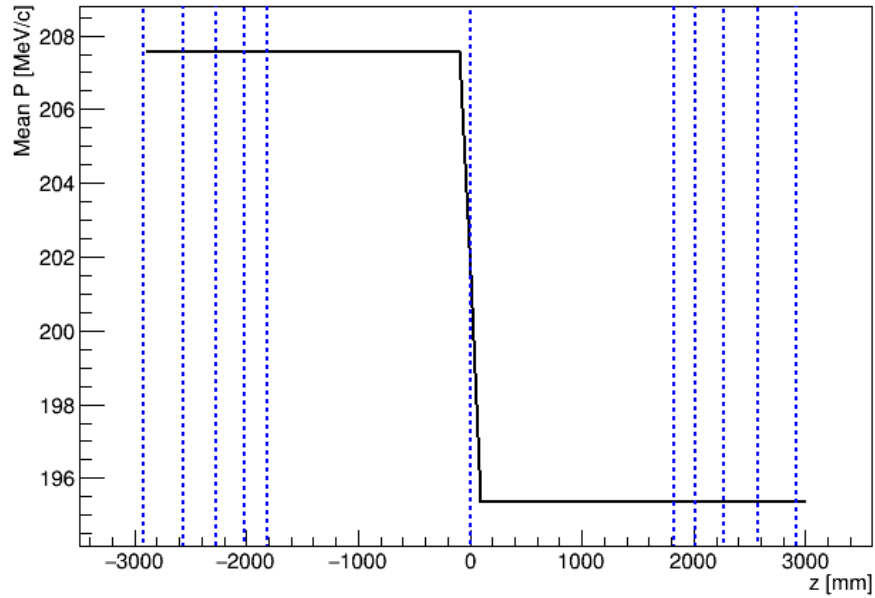


p=200.0 MeV/c, FC=107.76, M1_DS=0.0, M2_DS=0.0, M1_US=277.63, M2_US=169.35 A



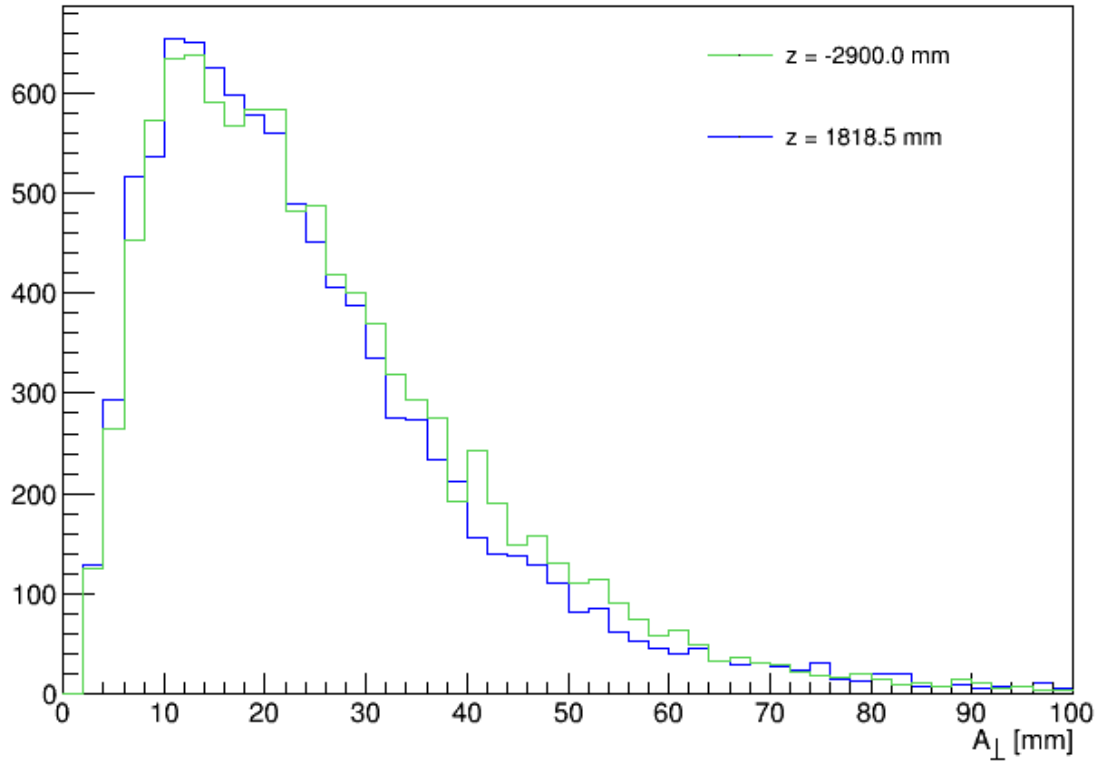
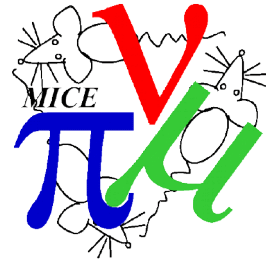
- Try tracking a “cooling” beam – look at performance
 - M2U = 277.63 A
 - M1U = 169.35 A
 - FC = 107.76 A
- Simple channel model

Tracking

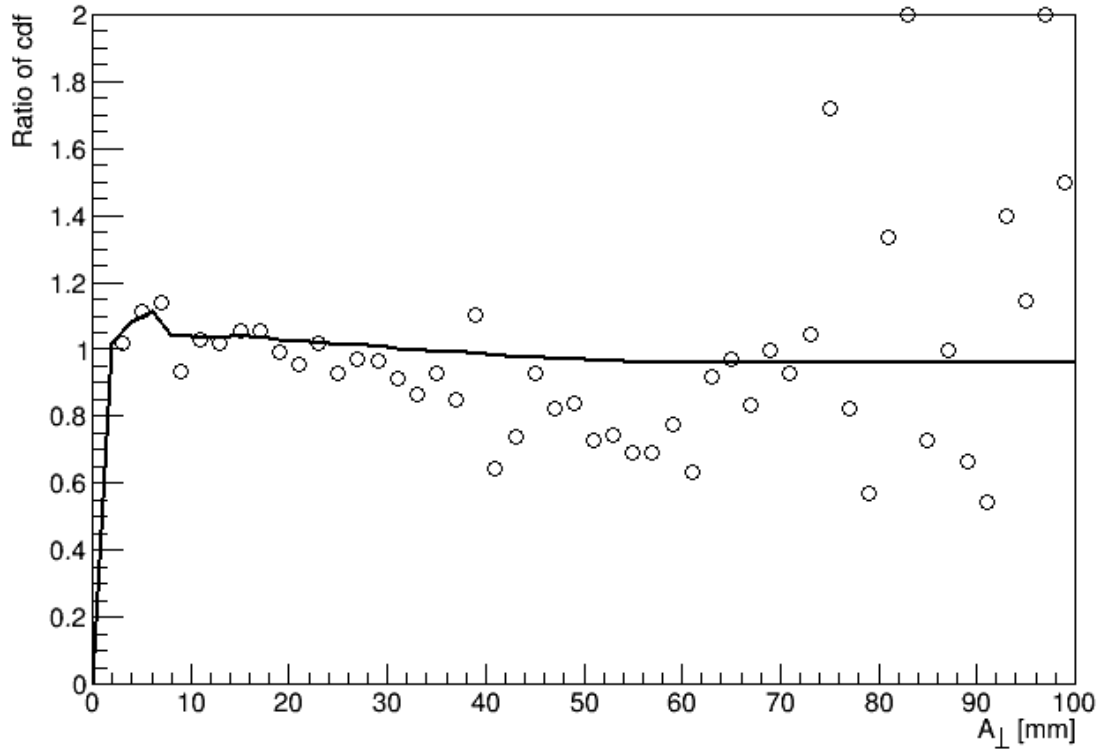


- 69.8 % transmission

Tracking

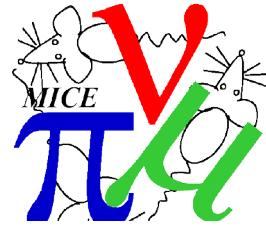


Tracking

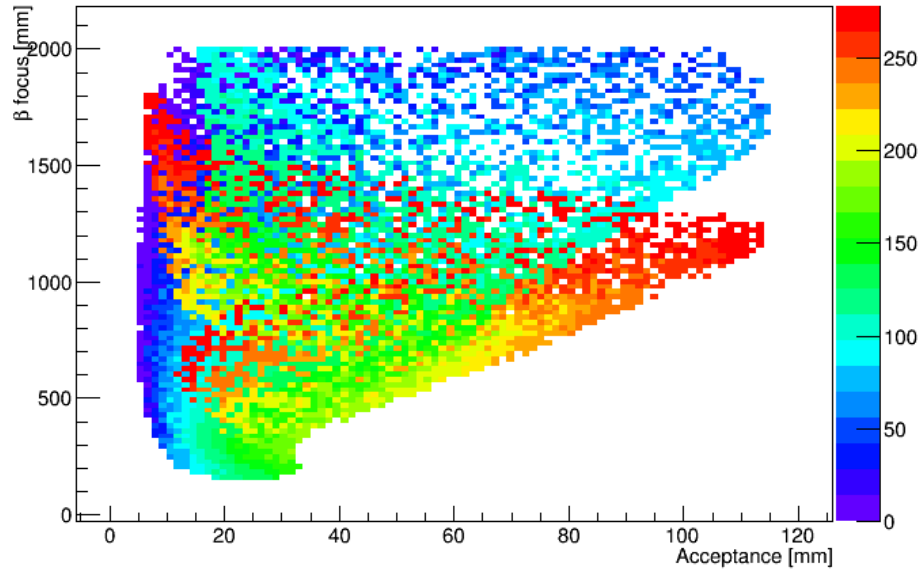


- Points show ratio of each bin
- Line shows ratio of cdf

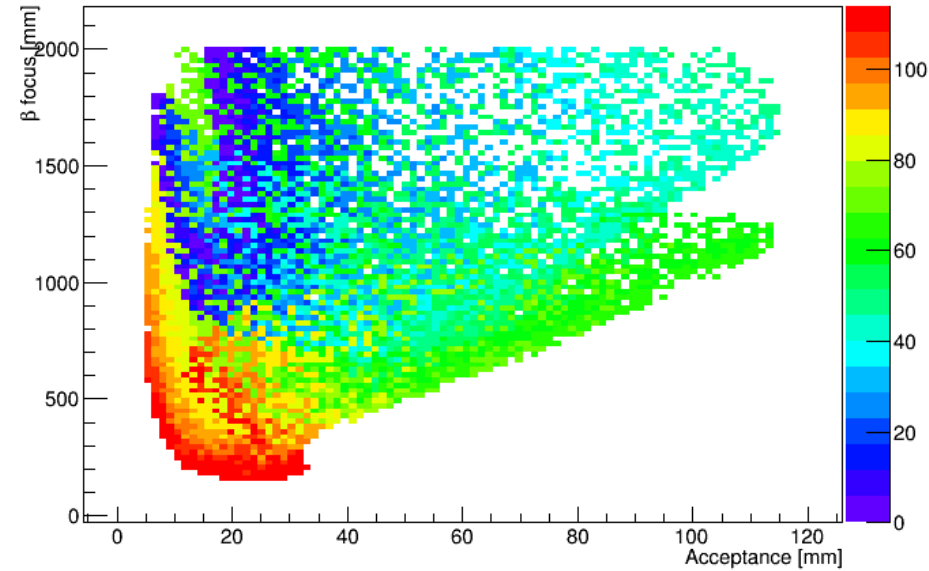
140 MeV/c



MatchCoil1_US

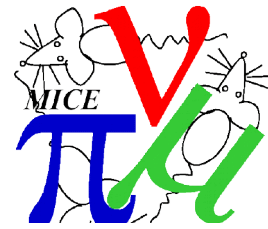


FocusCoil_US

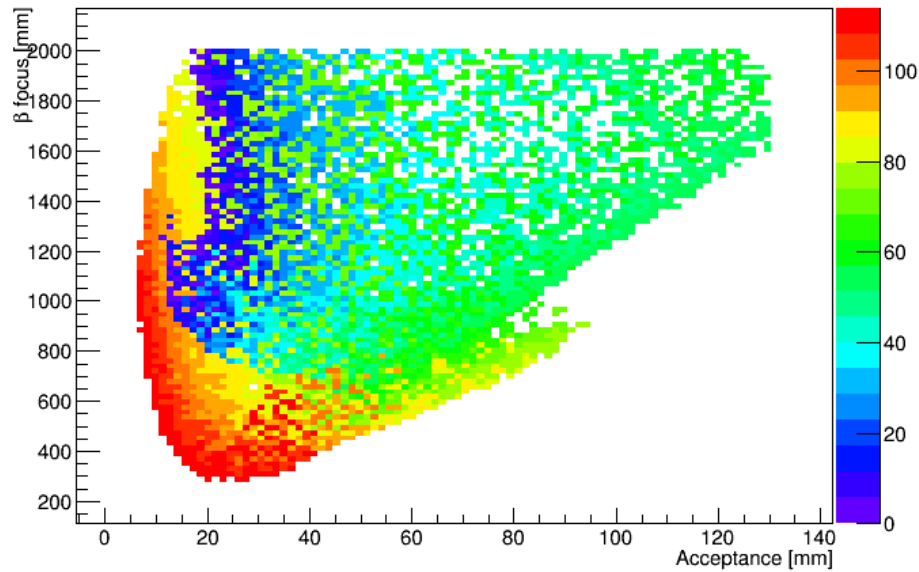


- Force proportional to $M1 \cdot FC$

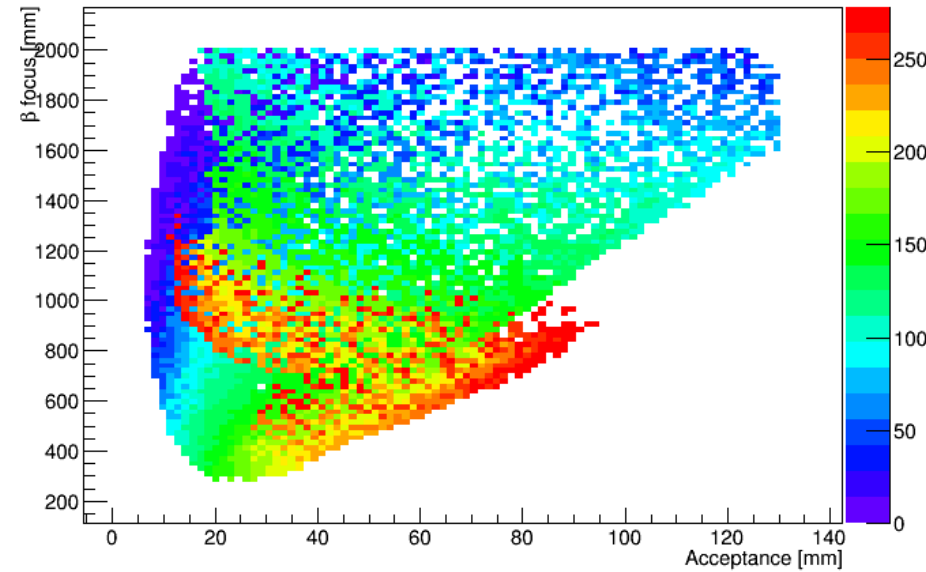
170 MeV/c



FocusCoil_US

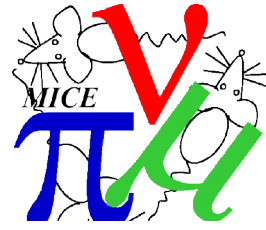


MatchCoil1_US

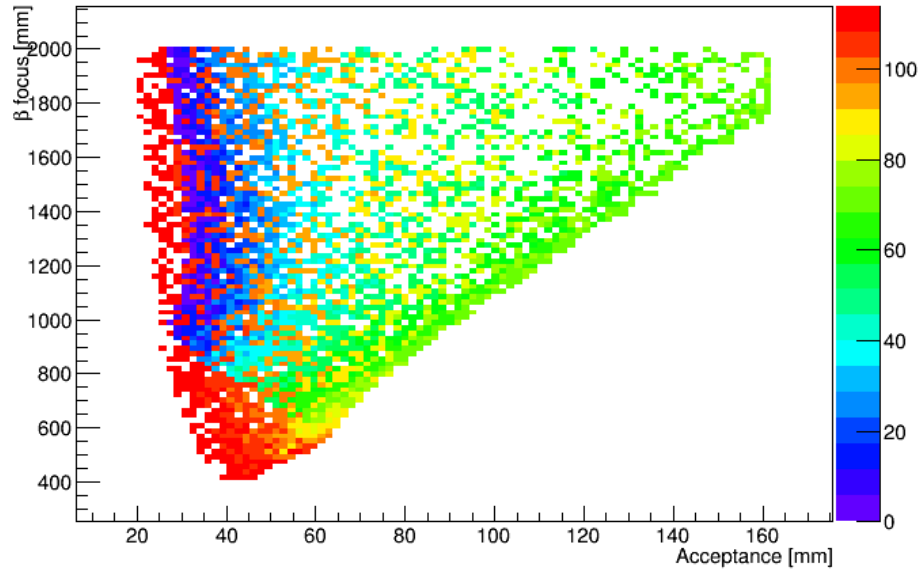


- Force proportional to $M1 \cdot FC$

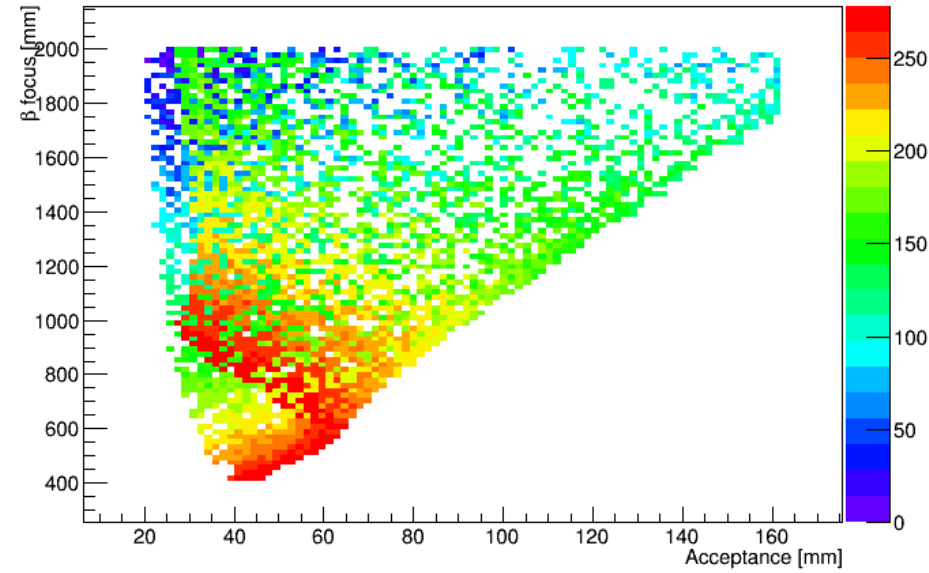
240 MeV/c



FocusCoil_US

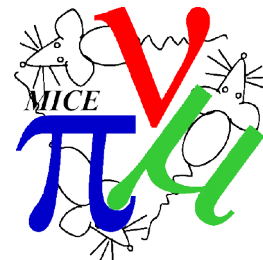


MatchCoil1_US



- Force proportional to $M1 * FC$

Settings



6. Material Physics

Setting	BL	E2	CC	E1	M2	M1	FC	M1	M2	E1	CC	E2	Notes
6.1.1	3-140+M3-Test2	189.75	205.50	175.50	232.62	42.05	45.12	0.00	0.00	175.50	205.50	189.75	
6.1.2	3-170+M3-Test1	189.75	205.50	175.50	179.92	57.68	56.13	0.00	0.00	175.50	205.50	189.75	
6.1.3	3-200+M3-Test1	189.75	205.50	175.50	200.48	64.61	62.73	0.00	0.00	175.50	205.50	189.75	
6.1.4	3-240+M3-Test1	189.75	205.50	175.50	180.20	123.57	56.44	0.00	0.00	175.50	205.50	189.75	
Setting	BL	E2	CC	E1	M2	M1	FC	M1	M2	E1	CC	E2	Notes
6.2.1	3-200+M3-Test1	189.75	205.50	175.50	200.48	64.61	62.73	0.00	0.00	175.50	205.50	189.75	BL in -ve polarity

7. Emittance Reduction

Setting	BL	E2	CC	E1	M2	M1	FC	M1	M2	E1	CC	E2	Notes
7.1.1	3-200+M3-Test1	189.75	205.5	175.5	171.2	193.87	68.19	0	0	175.5	205.5	189.75	Em 2 mm, beta 500, 200 MeV/c
7.1.2	?	189.75	205.5	175.5	171.2	193.87	68.19	0	0	175.5	205.5	189.75	Em 6 mm, beta 500, 200 MeV/c
7.1.3	?	189.75	205.5	175.5	171.2	193.87	68.19	0	0	175.5	205.5	189.75	Em 10 mm, beta 500, 200 MeV/c

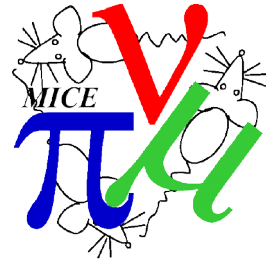
Setting	BL	E2	CC	E1	M2	M1	FC	M1	M2	E1	CC	E2	Notes
7.2.1	?	189.75	205.5	175.5	173.5	277.16	98.78	0	0	175.5	205.5	189.75	Em 6 mm, beta 500, 140 MeV/c
7.2.2	?	189.75	205.50	175.50	173.5	277.16	98.78	0.00	0.00	175.50	205.50	189.75	Em 6 mm, beta 500, 170 MeV/c
7.2.3	?	189.75	205.50	175.50	173.5	277.16	98.78	0.00	0.00	175.50	205.50	189.75	Em 6 mm, beta 500, 240 MeV/c

Setting	BL	E2	CC	E1	M2	M1	FC	M1	M2	E1	CC	E2	Notes
7.3.1	3-200+M3-Test1	189.75	205.50	175.50	167.87	265.06	113.05	0.00	0.00	175.50	205.50	189.75	Em 6 mm, beta 400, 200 MeV/c
7.3.2	3-200+M3-Test1	189.75	205.50	175.50	212.34	275.56	91.57	0.00	0.00	175.50	205.50	189.75	Em 6 mm, beta 600, 200 MeV/c
7.3.3	3-200+M3-Test1	189.75	205.50	175.50	251.20	277.28	91.27	0.00	0.00	175.50	205.50	189.75	Em 6 mm, beta 800, 200 MeV/c

Setting	BL	E2	CC	E1	M2	M1	FC	M1	M2	E1	CC	E2	Notes
7.4.1	3-200+M3-Test1	189.75	205.5	175.5	173.5	277.16	98.78	0	0	175.5	205.5	189.75	BL in -ve polarity
7.4.2	?	189.75	205.50	175.50	173.5	277.16	98.78	0.00	0.00	175.50	205.50	189.75	BL in -ve polarity
7.4.3	?	189.75	205.50	175.50	173.5	277.16	98.78	0.00	0.00	175.50	205.50	189.75	BL in -ve polarity



To do



- To do:
 - Question – 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”
 - Trim the trim coils
 - 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)
 - Then review and decide on next move
 - We could, for example, install LiH and do LiH material physics settings