Pion Production at Target

T. Lord, P. Franchini

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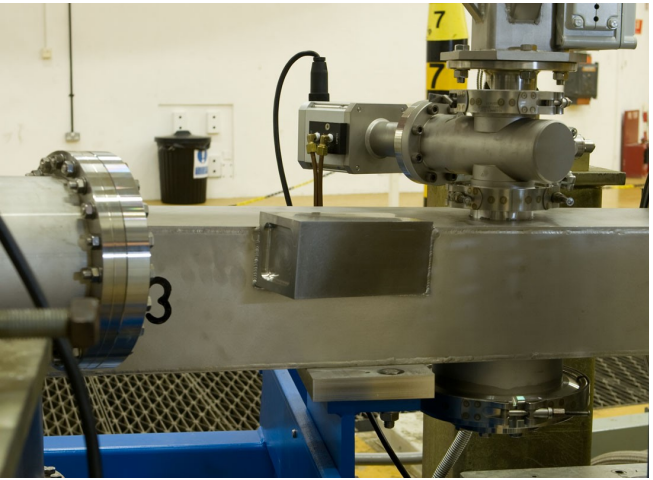
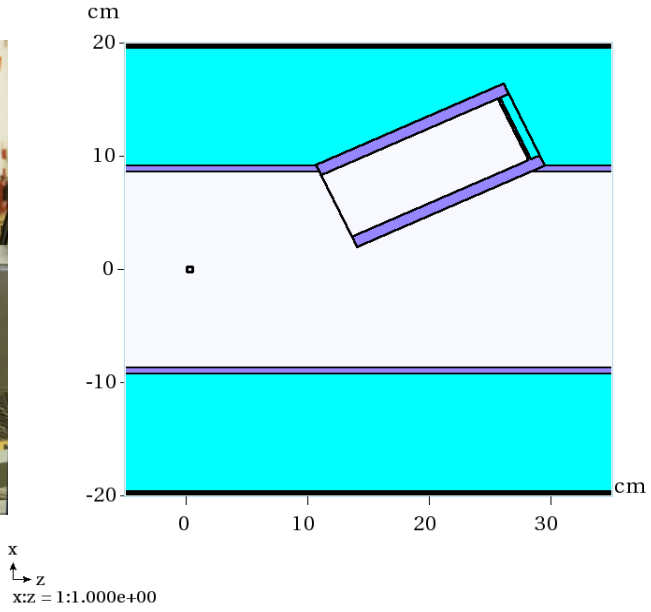
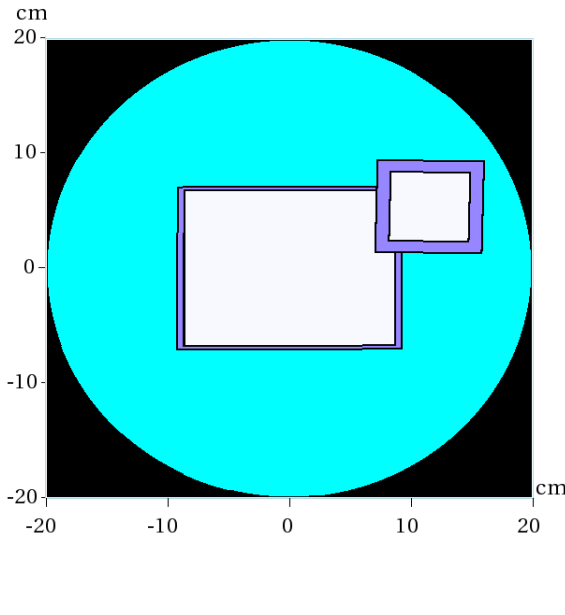
MARS GUI Geometry







MARS Output Pi+ Momentum Distribution
(50cm Downstream in MICE BL from target)

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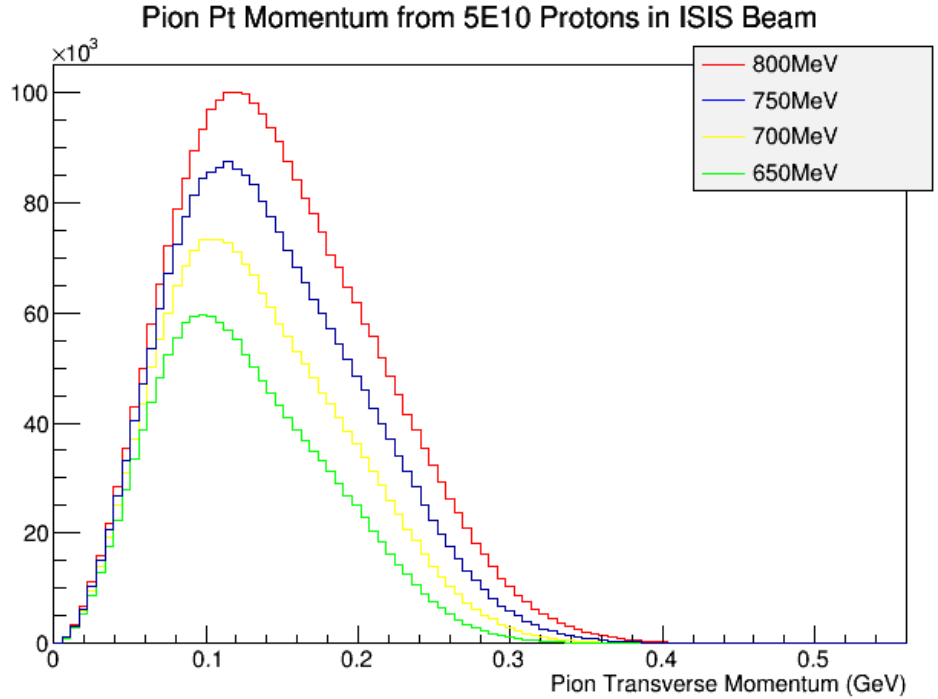
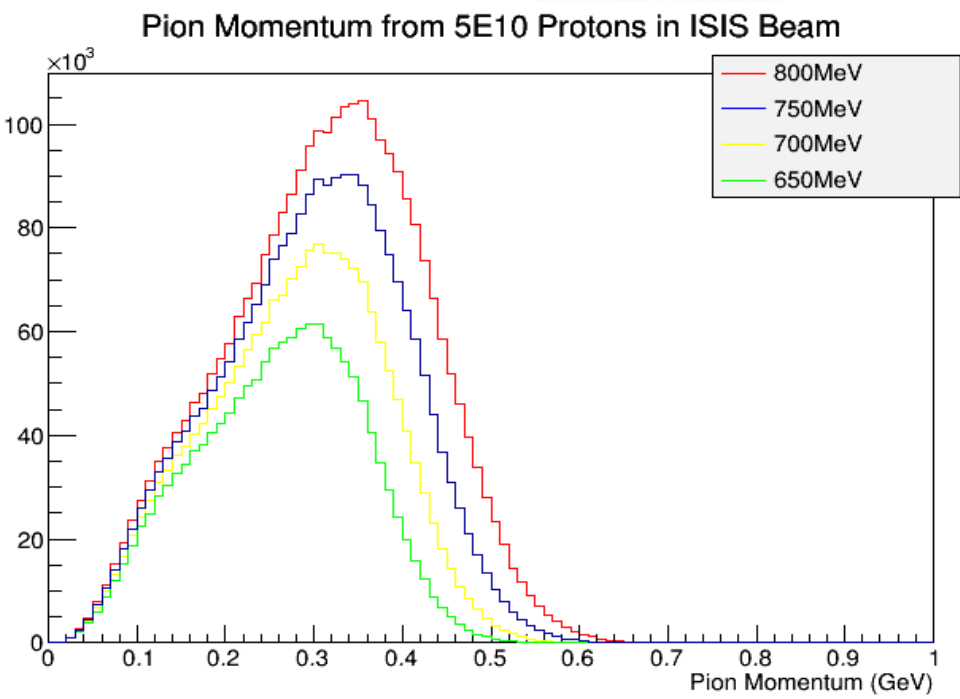
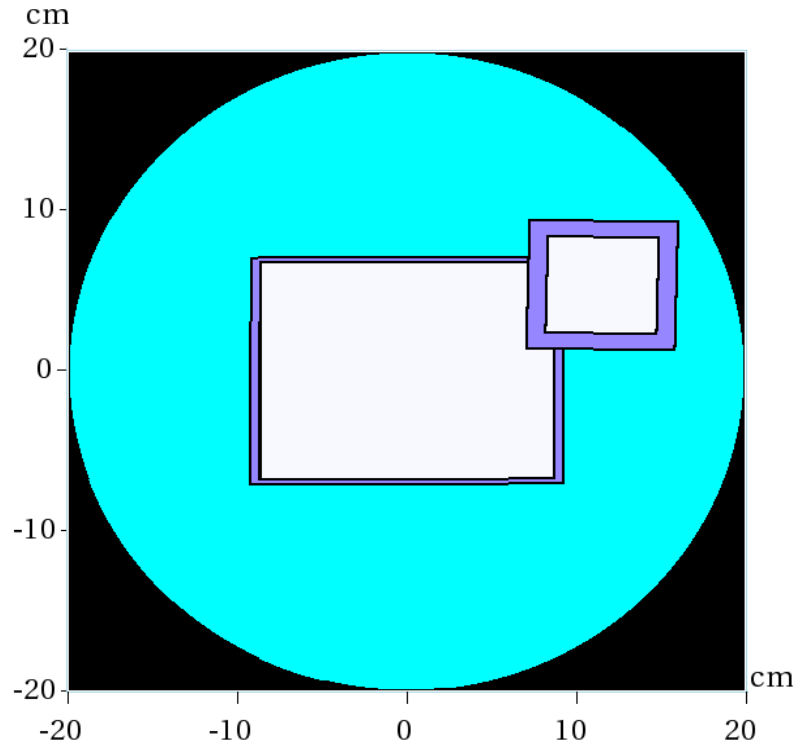
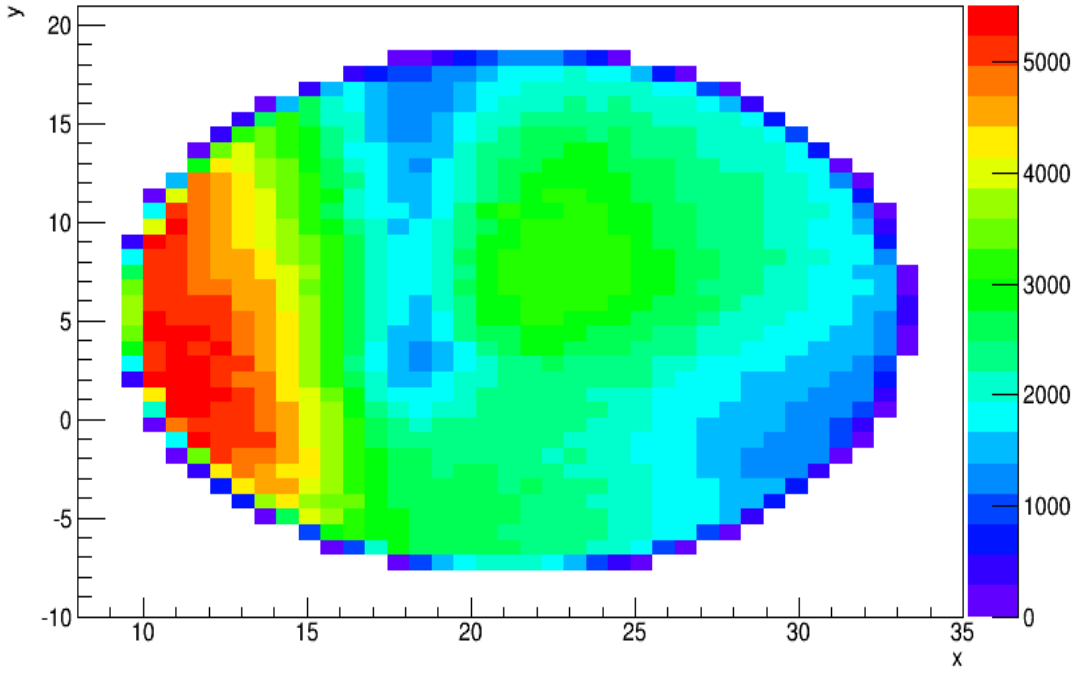




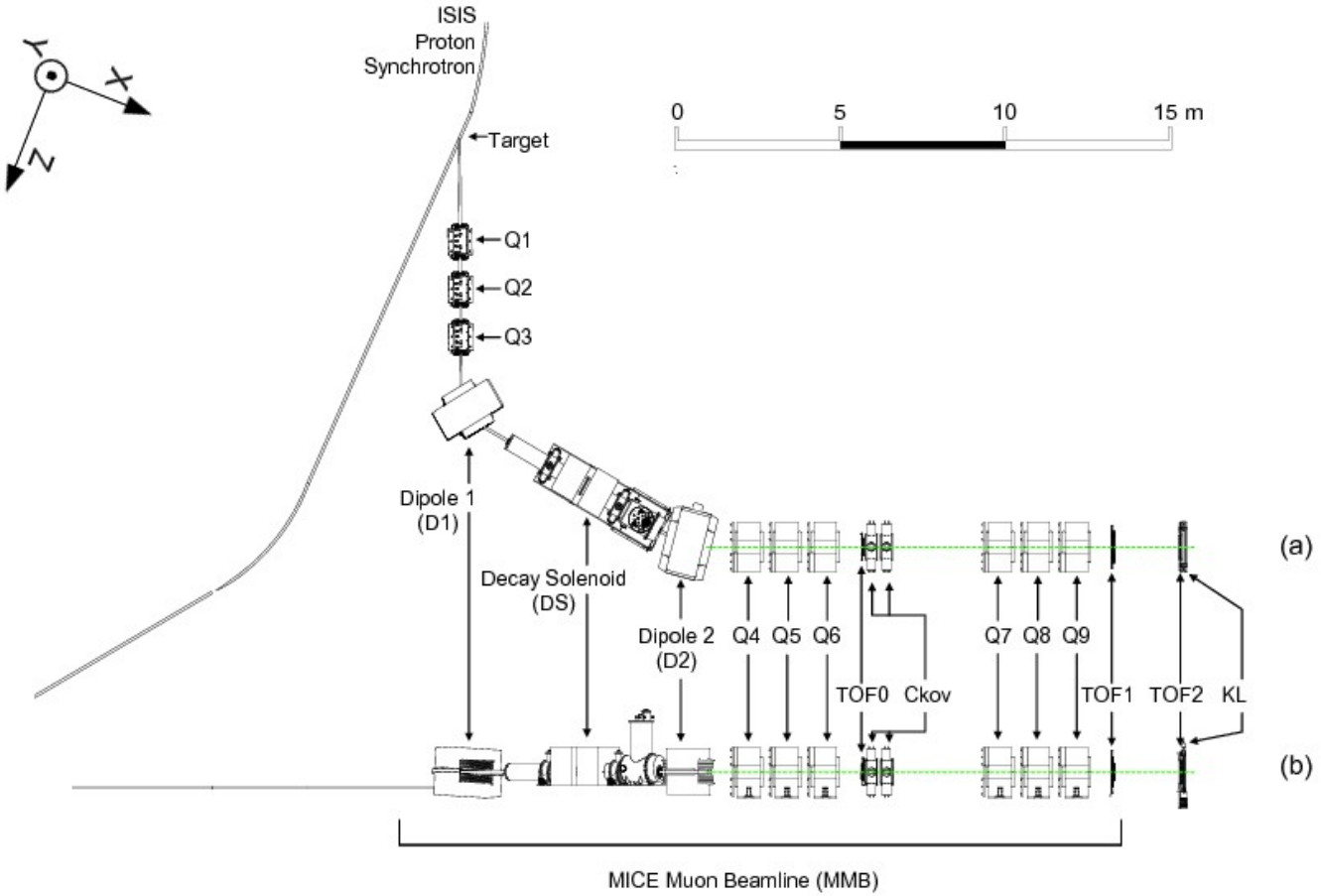
MARS Pi+ Production



MARS Pi+ Output 50cm downstream (in MICE BL) of target



ISIS Beamline Axes



ISIS Beamline Geometry

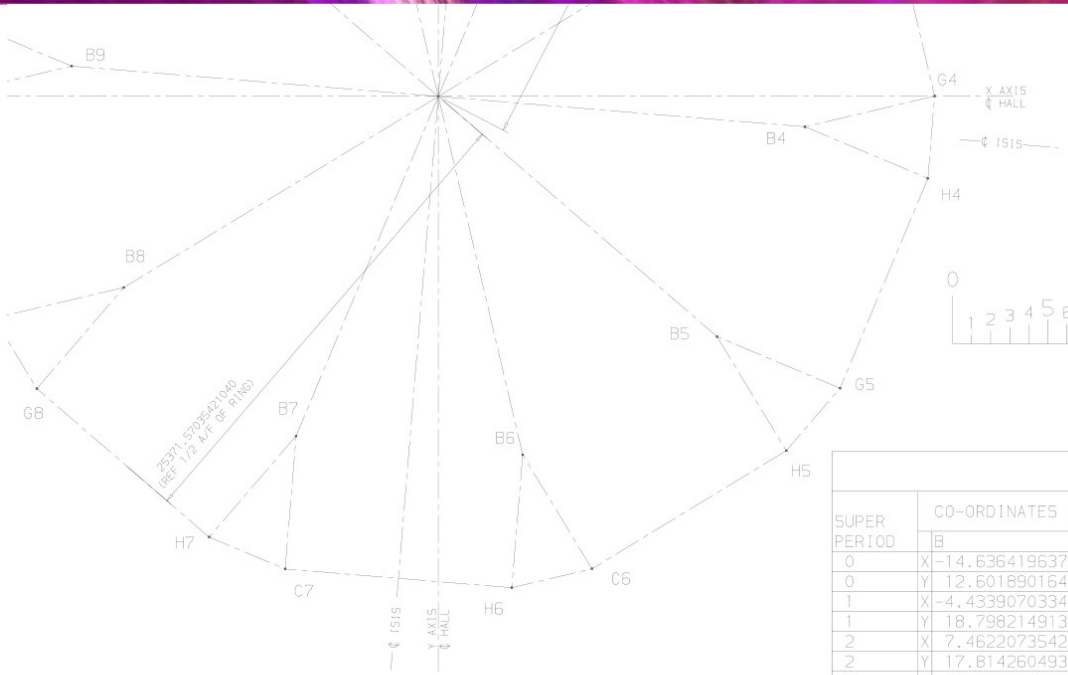
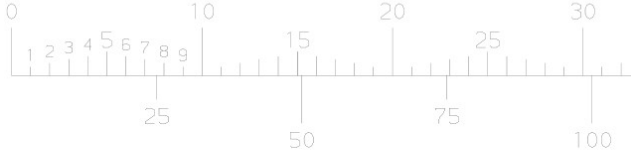


FIG.1b. "HARD EDGE
POINTS "B" "G"" "H



"B" AND "G" AND "H" POINTS
HARD EDGE GEOMETRY
AFTER RADIAL MAGNET MOVE 0.74MM
FOR X,Y,Z COORDINATES SEE RING GEOMETRY TABLE
SEE SHEET 1 FOR OVERALL VIEW OF ISIS

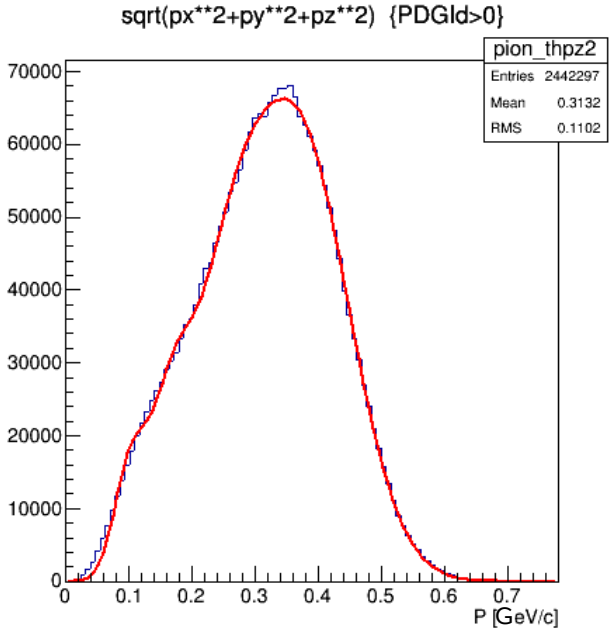
RING GEOMETRY

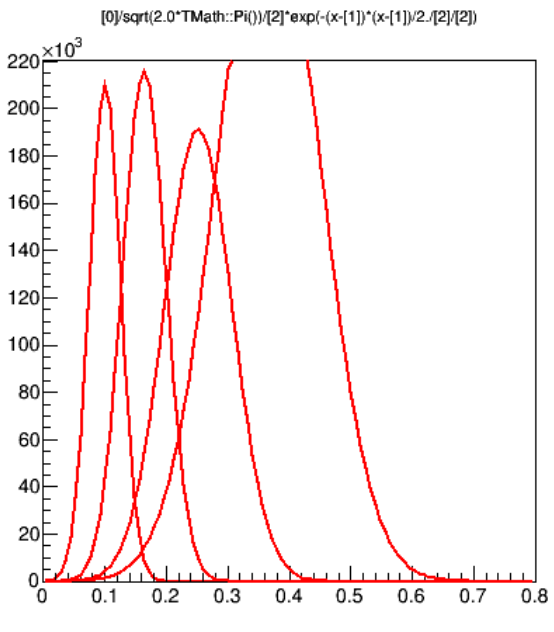
CO-ORDINATES IN METRES ALL WITH Z OF -0.603

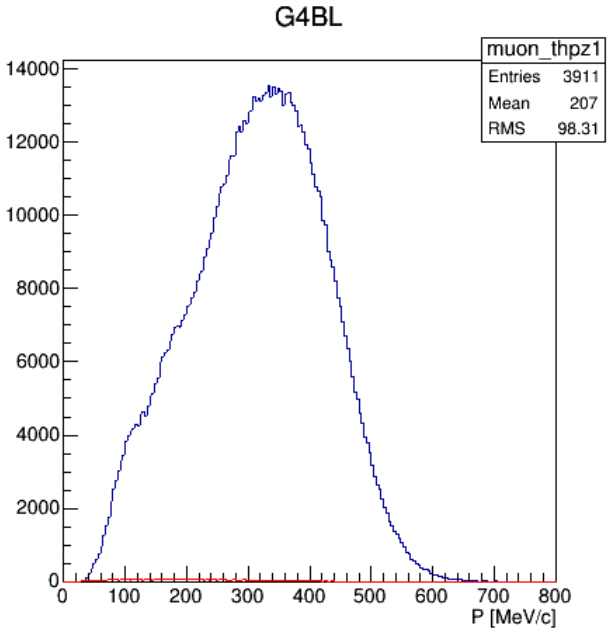
SUPER PERIOD		B		G		H
0	X	-14.6364196374051	X	-21.0954522264142	X	-18.2715625415826
0	Y	12.6018901649732	Y	15.307511344392	Y	18.5873077793597
1	X	-4.43390703348312	X	-8.06904993766055	X	-3.85665921739619
1	Y	18.7982149139405	Y	24.7836325283271	Y	25.7772028714615
2	X	7.46220735427222	X	8.03945517035917	X	12.0313684481
2	Y	17.8142604936077	Y	24.7932484511287	Y	23.1210826015664
3	X	16.508012163795	X	21.0771616543328	X	23.3238035230774
3	Y	10.0258640491613	Y	15.3326861571199	Y	11.6334946345667
4	X	19.2483174134448	X	26.0641087727272	X	25.7073500024538
4	Y	-1.59207169547918	Y	1.55588899262629E-02	Y	-4.29769287489788
5	X	14.6364196374051	X	21.0954522264142	X	18.2715625415826
5	Y	-12.6018901649732	Y	-15.307511344392	Y	-18.5873077793597
6	X	4.43390703348312	X	8.06904993766054	X	3.8566592173962
6	Y	-18.7982149139405	Y	-24.7836325283271	Y	-25.7772028714615
7	X	-7.46220735427223	X	-8.03945517035918	X	-12.0313684481
7	Y	-17.8142604936077	Y	-24.7932484511287	Y	-23.1210826015664
8	X	-16.508012163795	X	-21.0771616543328	X	-23.3238035230774
8	Y	-10.0258640491613	Y	-15.3326861571199	Y	-11.6334946345667
9	X	-19.2483174134448	X	-26.0641087727272	X	-25.7073500024538
9	Y	1.59207169547918	Y	-1.55588899262545E-02	Y	4.29769287489788

Pion Generation in G4BL

- Fit P distribution with 4 Gaussian
- Define the new beam input in G4BL



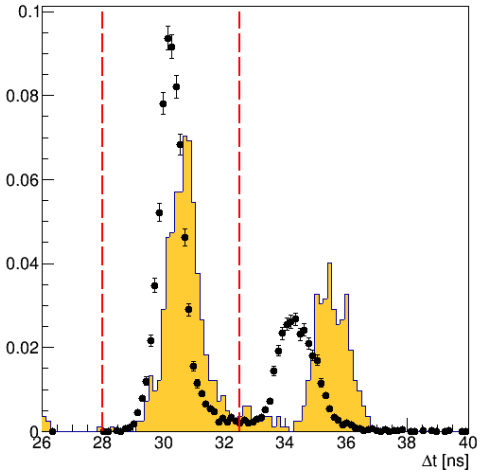


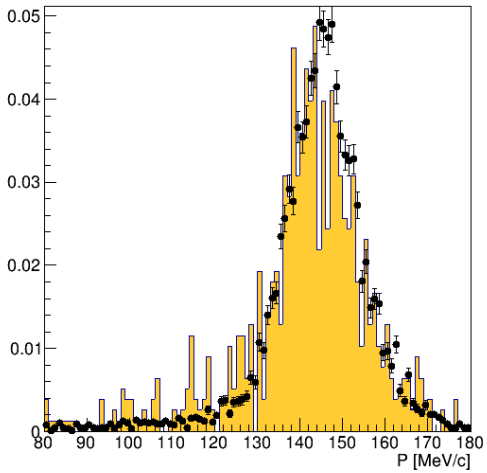


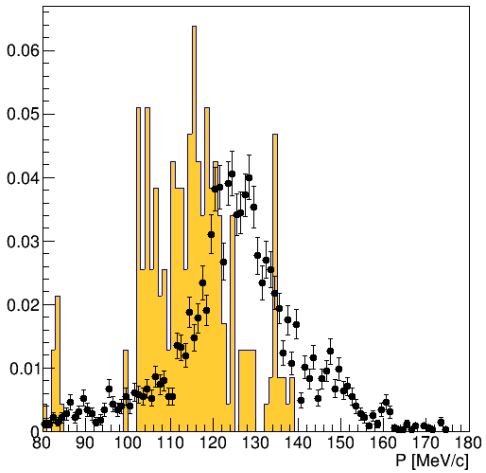
Data/MC Comparison

- 3-140+M3-Test4
- Full G4BL+MAUS simulation chain
- Comparison of
  - Dt(tof0→1)
  - muons P at TKU Station5
  - pions/muons yields

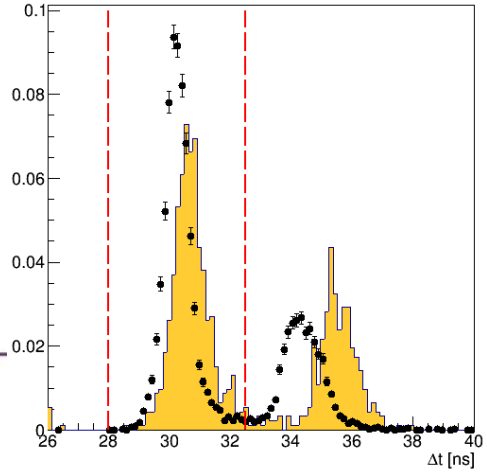
650 MeV

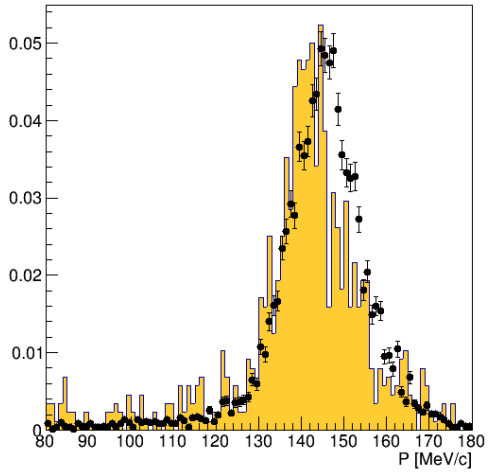


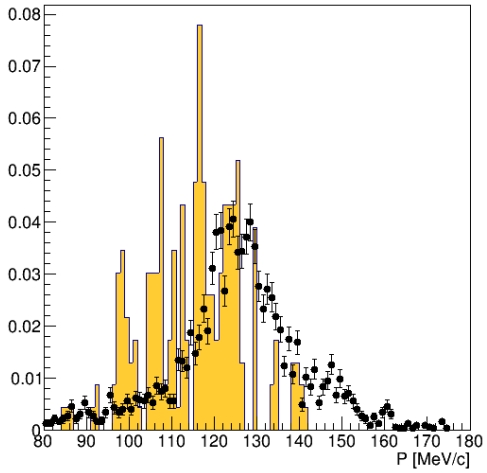




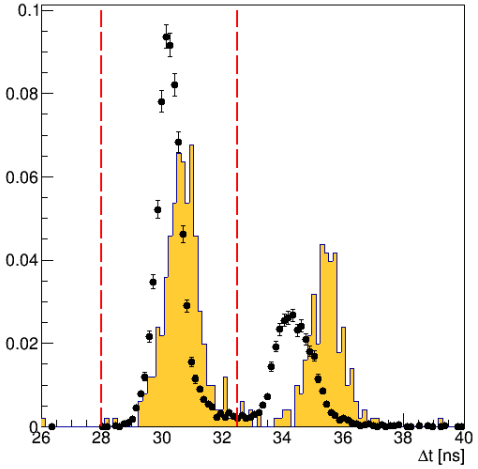
700 MeV

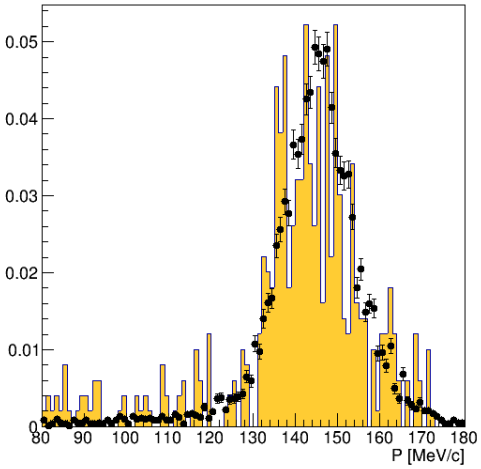


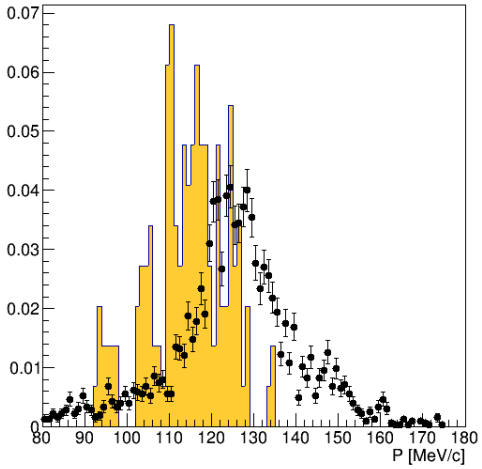




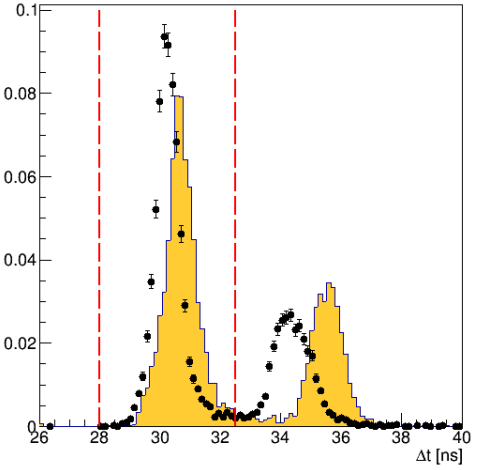
750 MeV

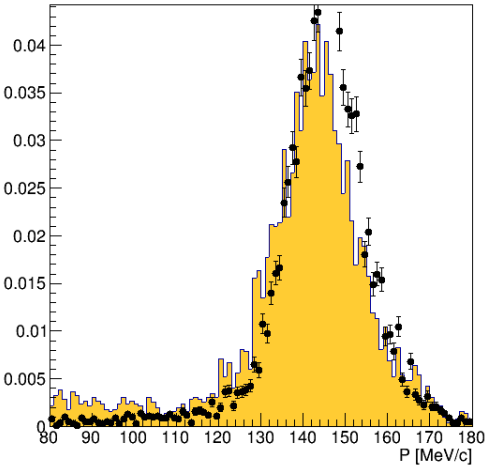


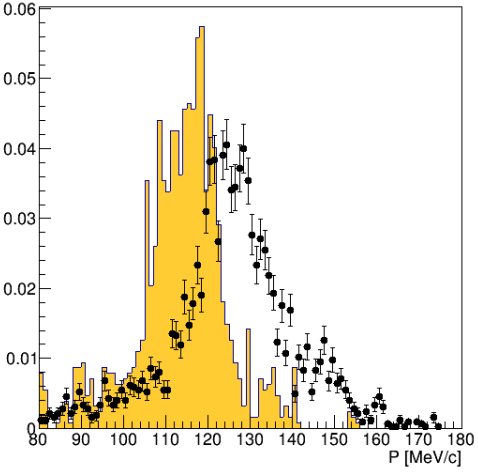




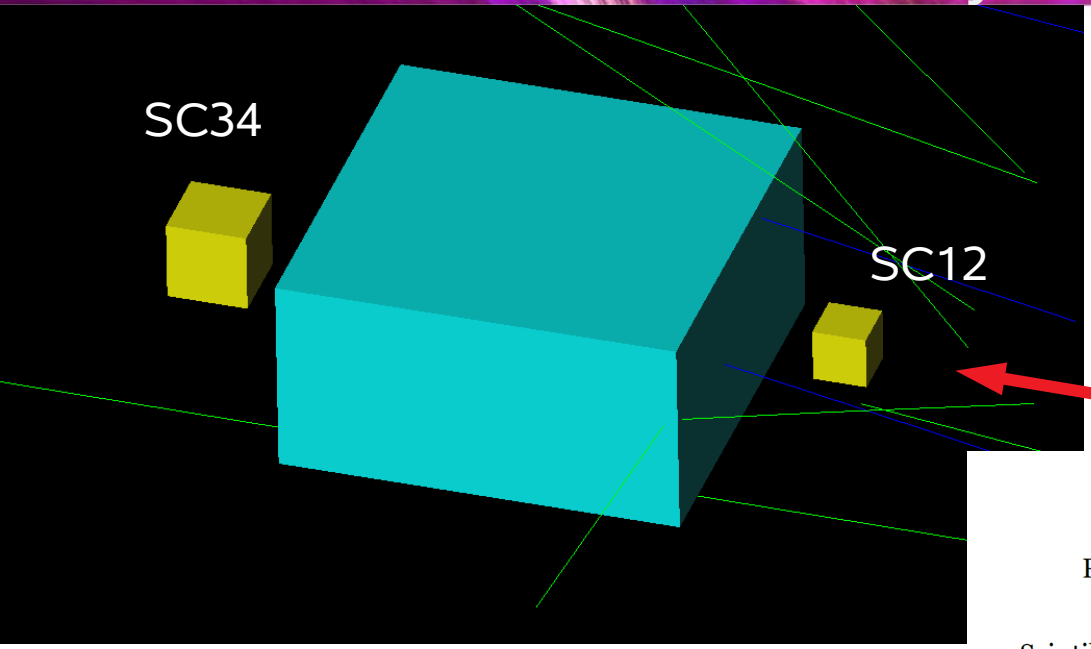
800 MeV

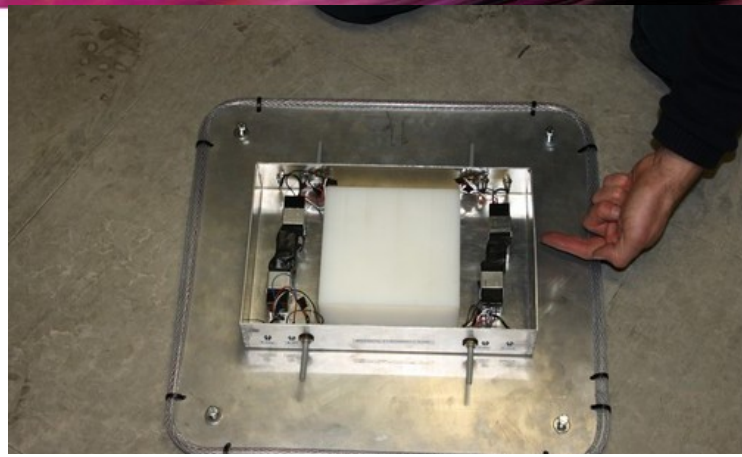




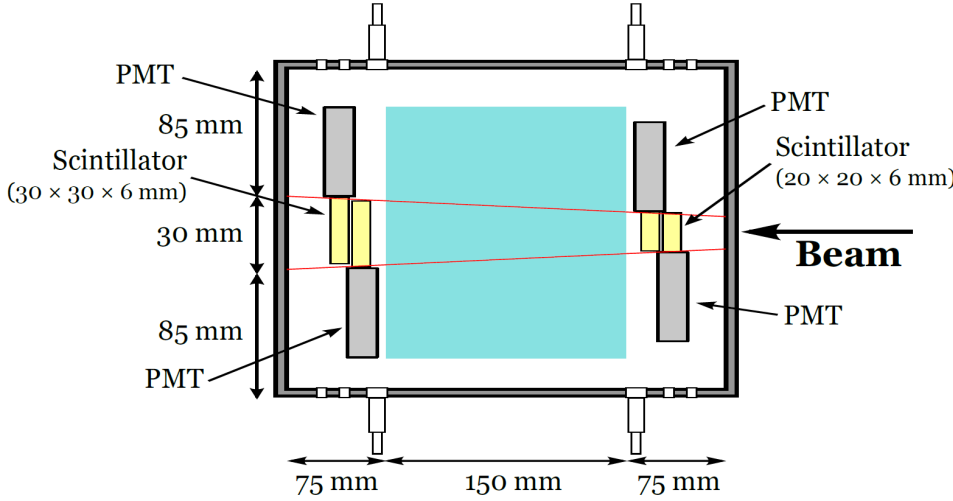


Luminosity monitor





Luminosity monitor box (200 × 300 mm)



Luminosity monitor

- 700 MeV - 1E10 protons in beam
- Fired 405k particles (@ 10m downstream of the target)
  - LM-SC12: 4161
  - LM-SC34: 3944

- 800 MeV - 5E9 protons in beam
- Fired 217K particles (@ 10m downstream of the target)
  - LM-SC12: 2210
  - LM-SC34: 2118

For 1E10, implies:

- LM-SC12: 4420
- LM-SC34: 4236

- Reasonable geometry: same transmission as in the real LM counters ~96%
- Use the LM to understand the simulation

Conclusions

- MARS output seems more physical than old model, pion/muon ratio closer to data

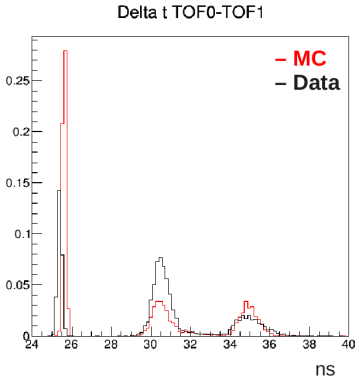
- Some discrepancies in peak positioning, can be tuned with changes to D1 field value, but waiting for D1 survey

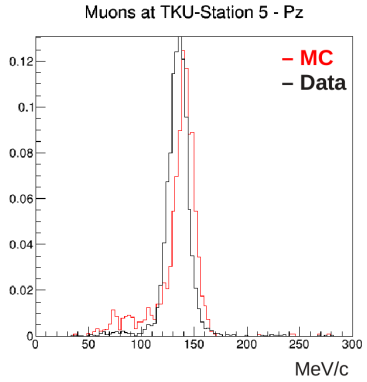
- Some discrepancies may be improved after full analysis routine

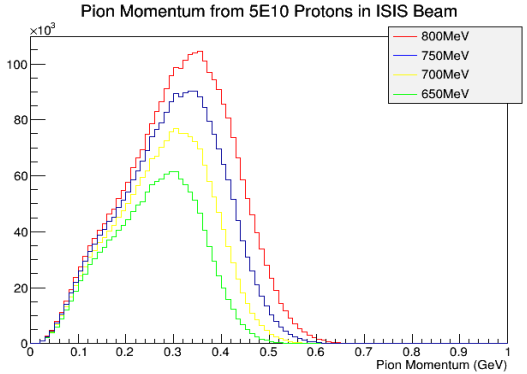
- No hard shoulders in distribution as in other models

- LM presents a good opportunity to check results and normalise output to readings recorded on the CDB

- However flux is energy dependent and may still be worth attempting a model of the dipping target with correlated BCD, collision energy, beamwidths, to improve on reliability for LM checks







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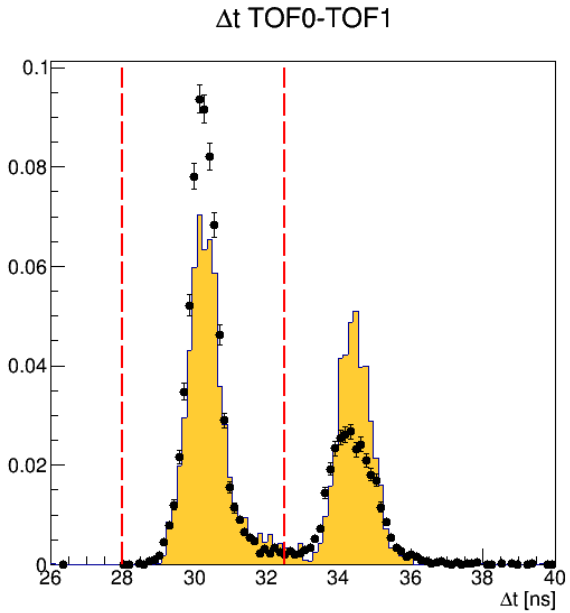
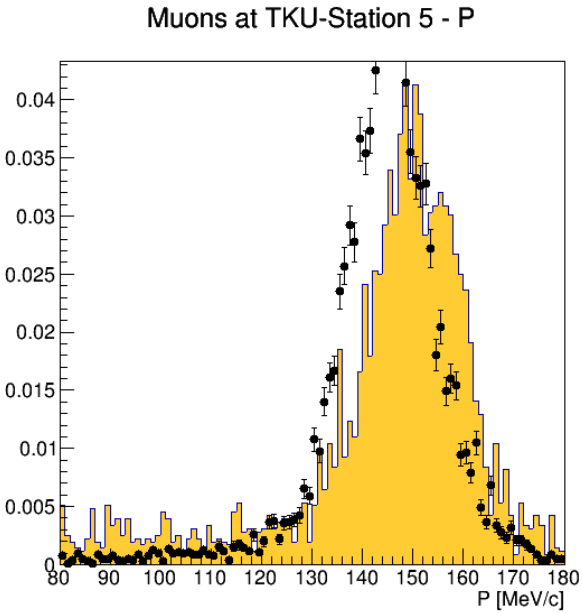
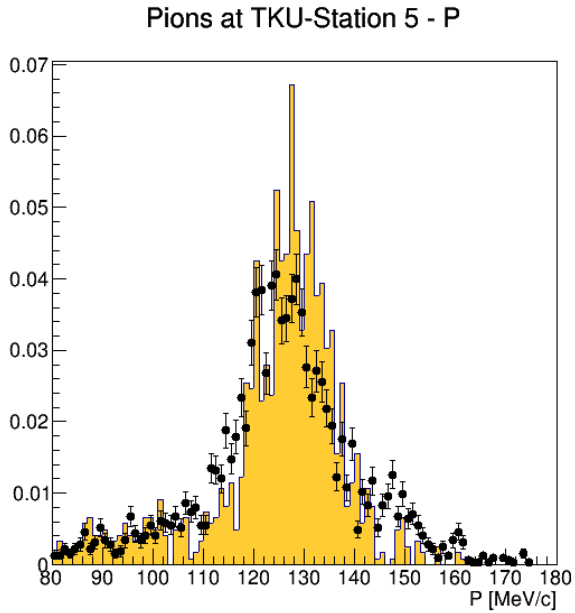
Bonus Slide(s)

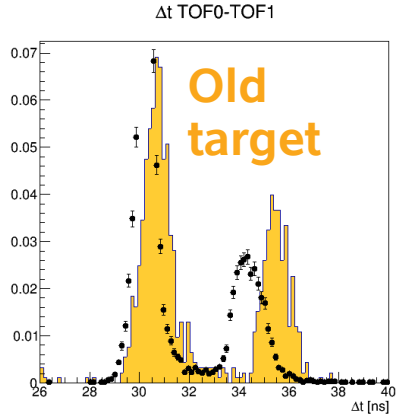
- 800 MeV beam - D1 field + 4%
  - We do move the pions distribution
  - But we move also the muons one

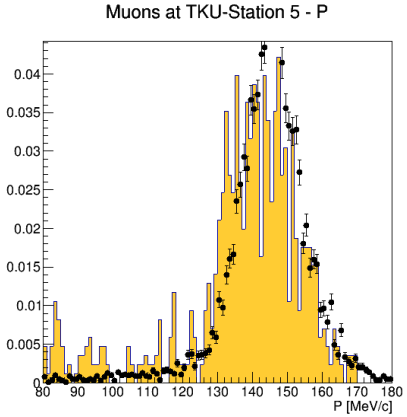


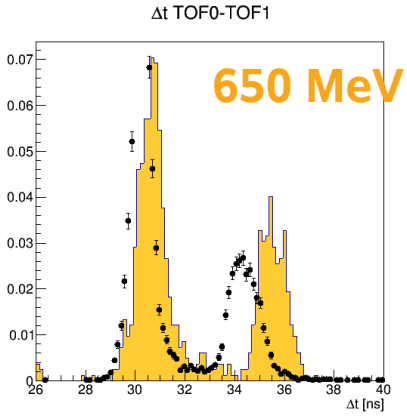


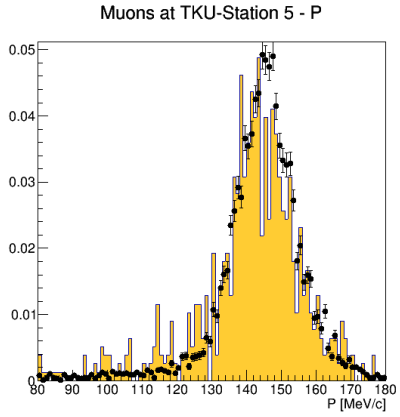


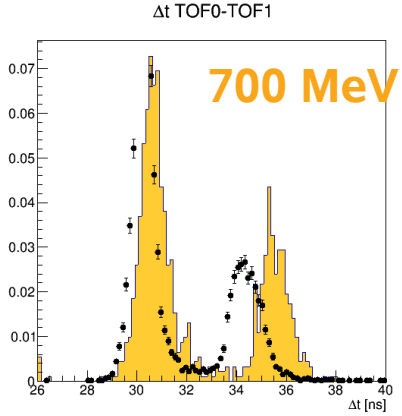
Data/MC comparison

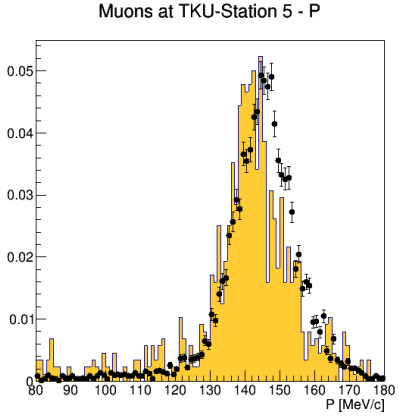


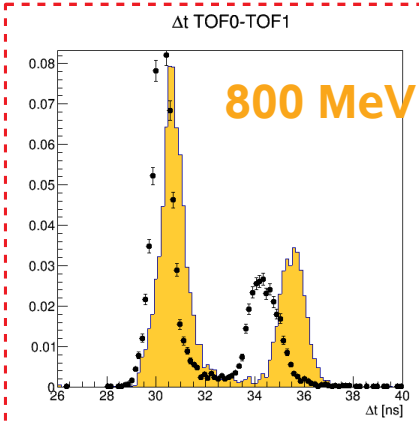


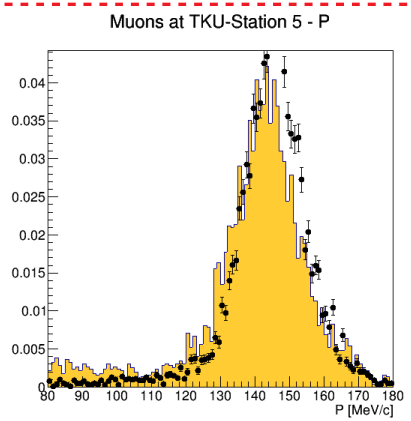






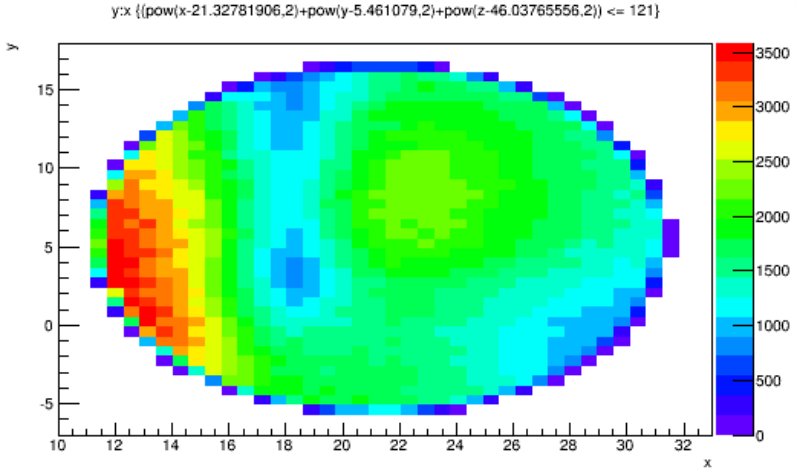


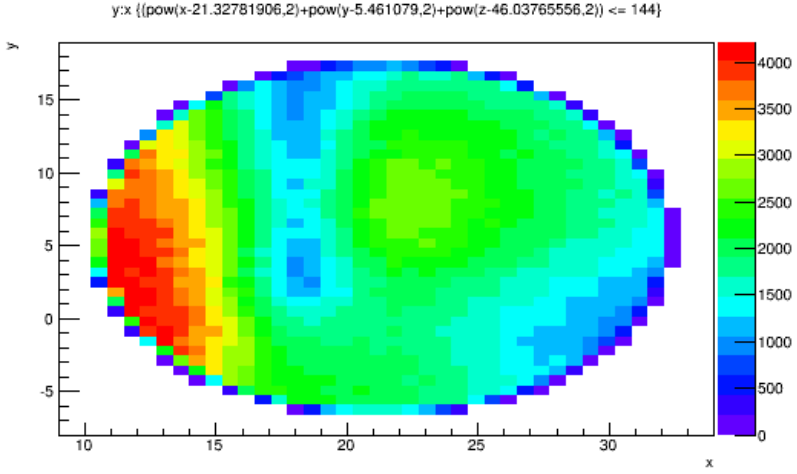




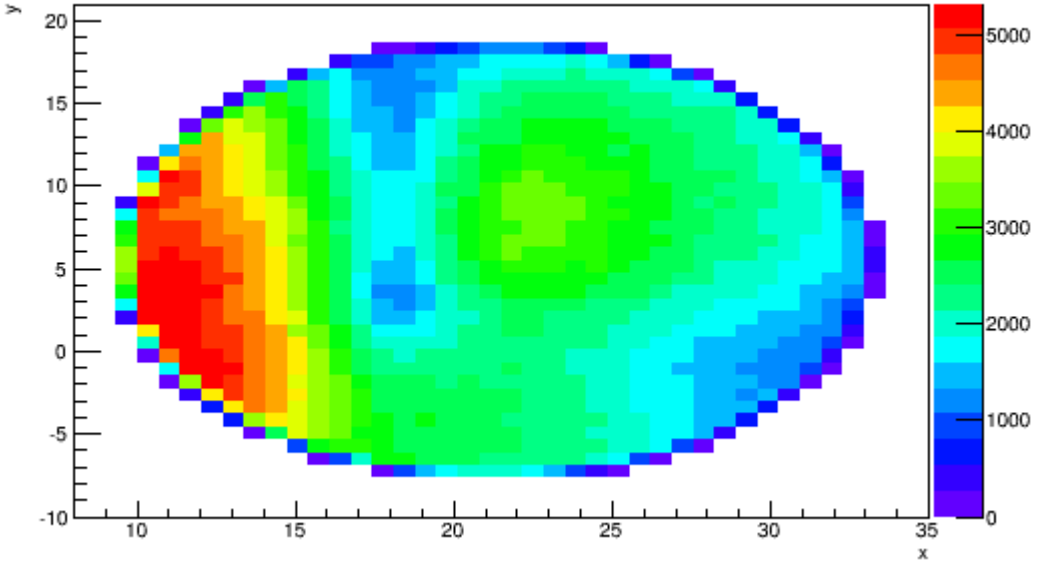
p/m yields compatible with data (~52%) - Highest m/spill ratio

Edge Features





MARS Pi+ Output 50cm downstream (in MICE BL) of target



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