



# Integrating Chicane in G4BeamLine

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# More on G4Beamline Lattice

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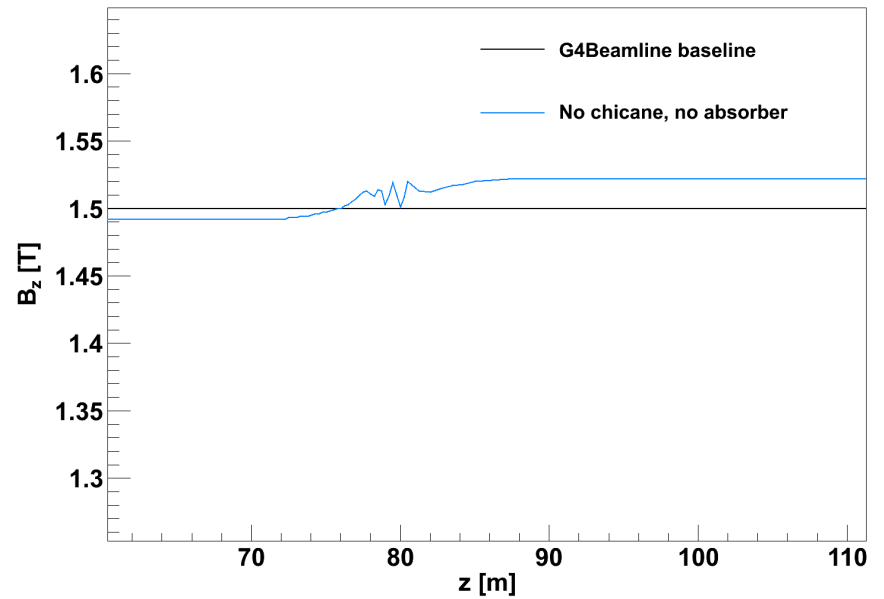
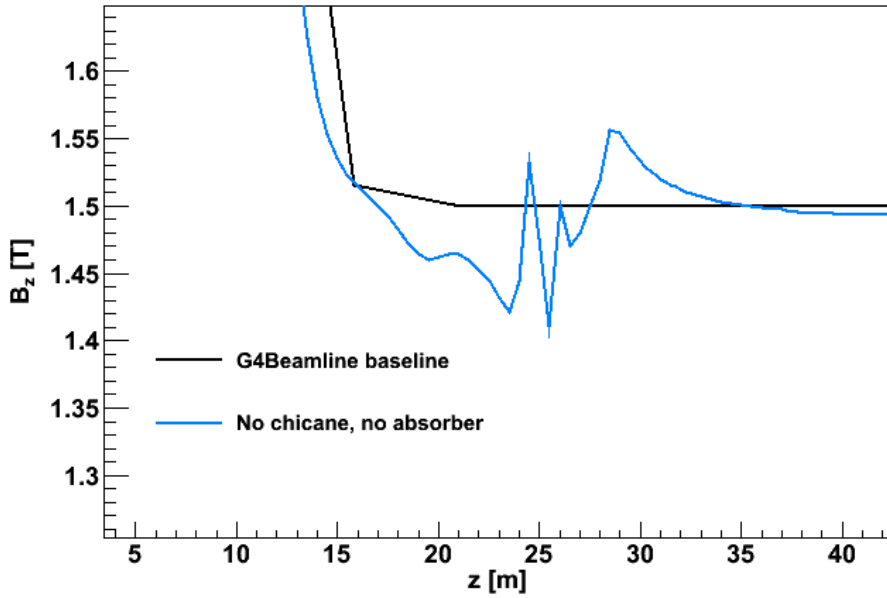


- Effect of coil geometry on G4Beamline lattice
- Placement of proton absorber – straight lattice
- Placement of proton absorber – chicane
- Optimisation
- Proton power deposition with chicane/absorber system

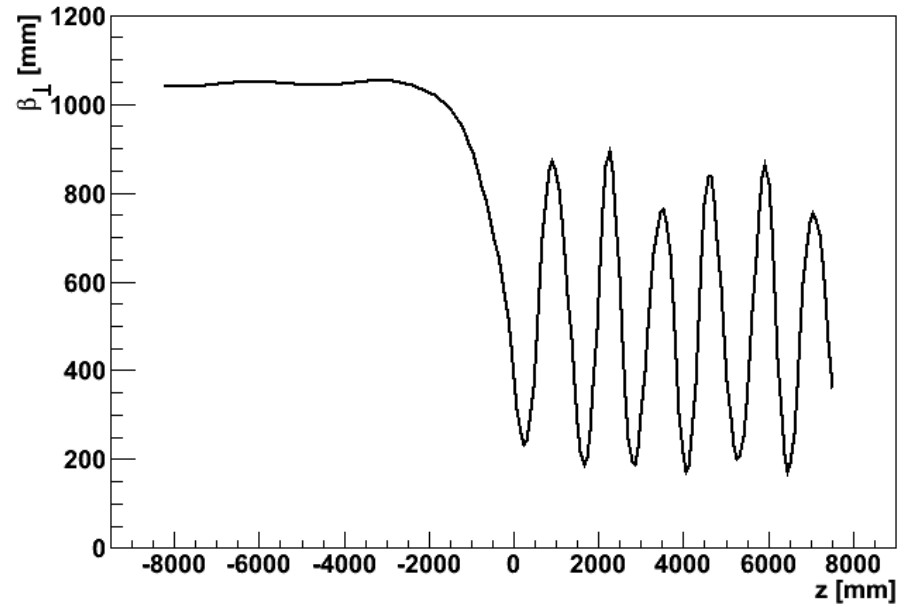
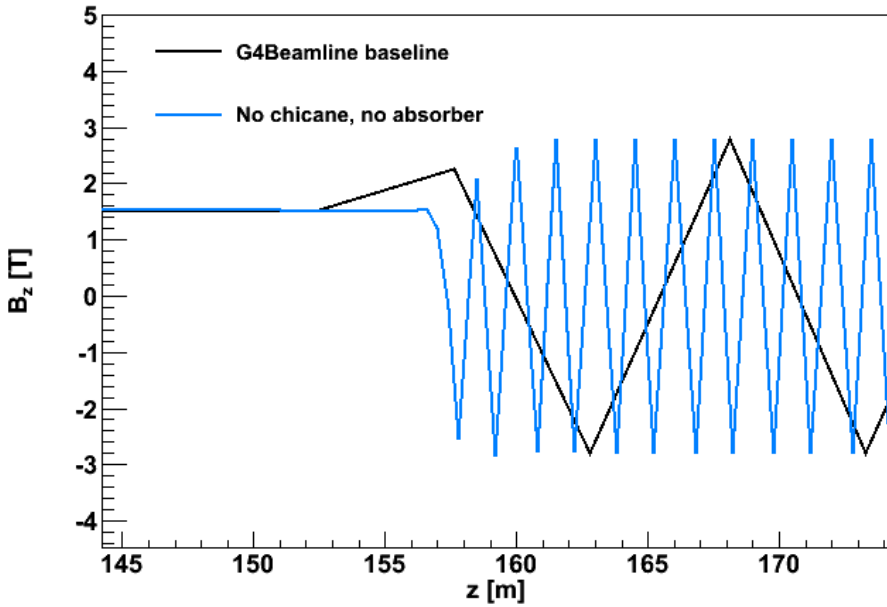
# Effect of coil geometry on G4BL

- Now have a full coil geometry implemented in G4BL
  - Removed constant 1.5 T field
  - Replaced with two sections of coils inspired by FS2A lattice
    - Small coil 430 mm inner radius for Drift
    - Large coil 650 mm inner radius for Buncher/Rotator (to accomodate RF)
  - Three bits of “matching”
    1. Matching from capture solenoid into 1.5 T region
    2. Matching from small coils to large coils
    3. Matching from large coils to cooling lattice
  - Necessary precursor to implementing chicane

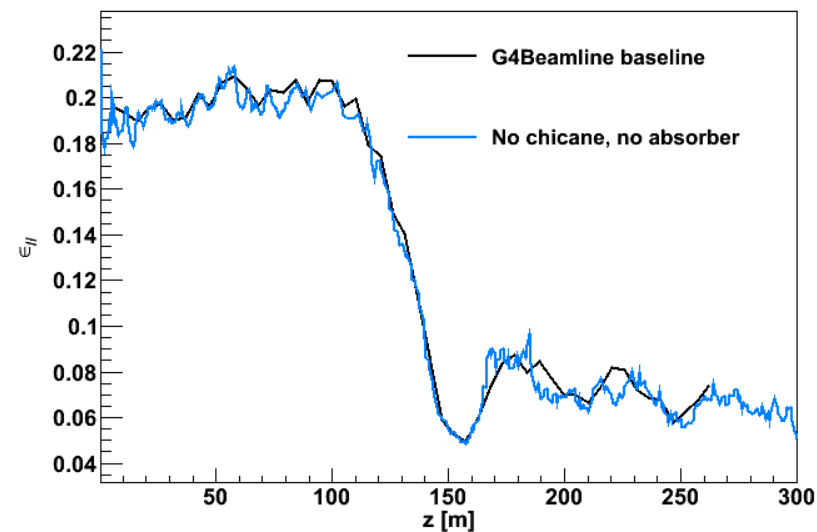
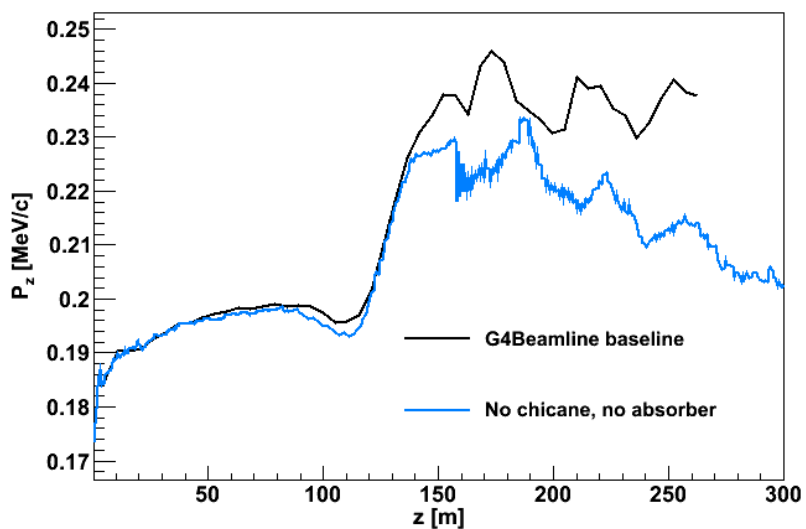
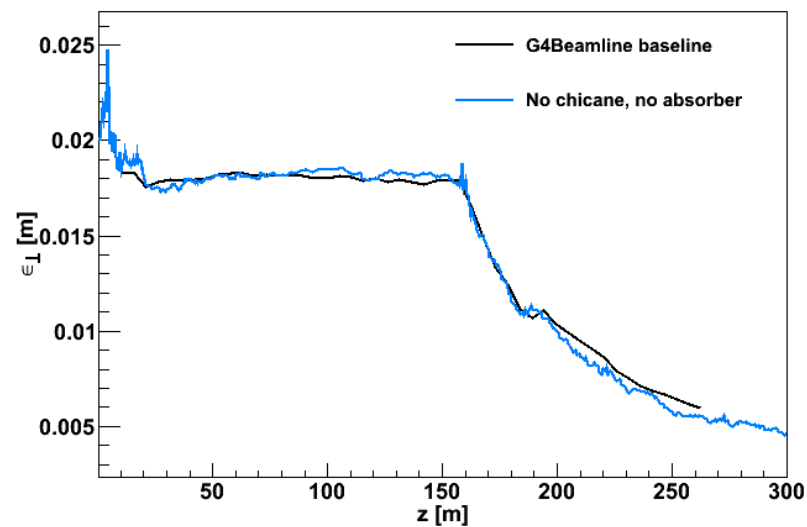
# Matching - Capture -> 1.5 T



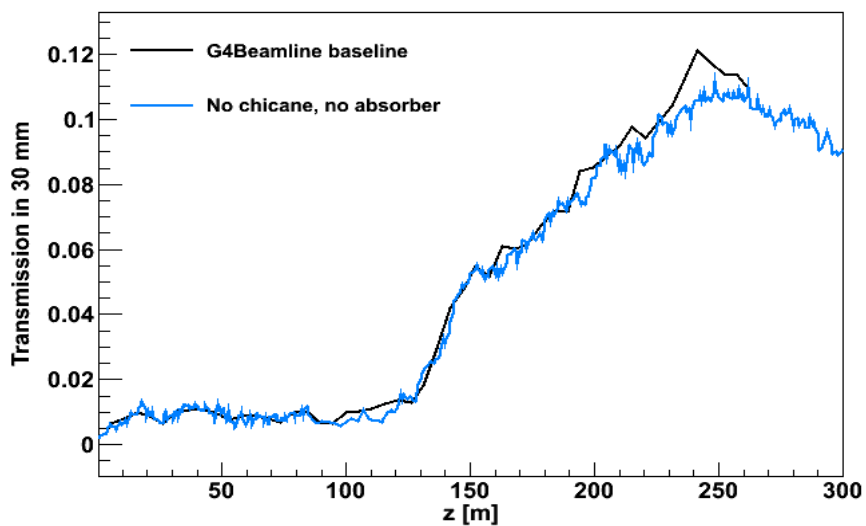
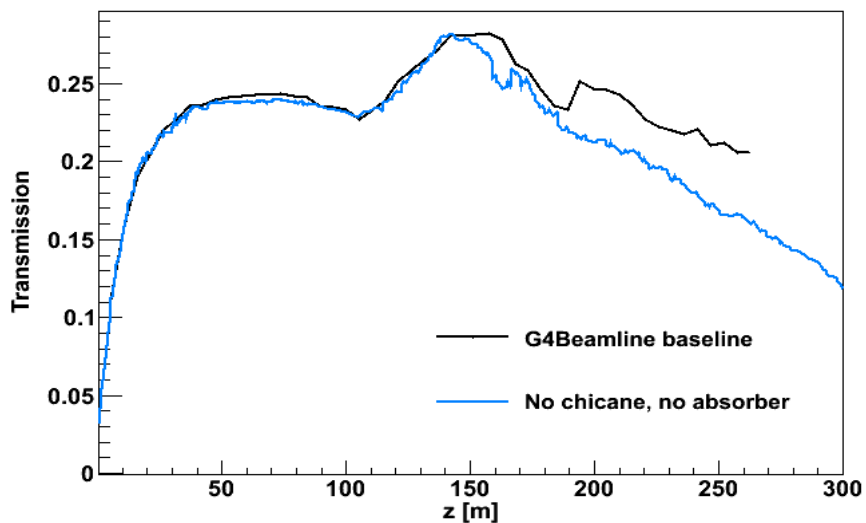
# Matching – 1.5 T -> Cooling



# Performance



# Performance



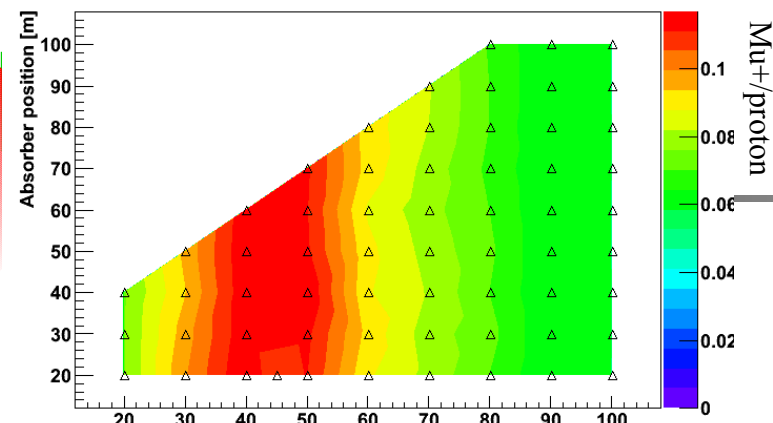
# Optimisation of combined proton absorber, chicane system



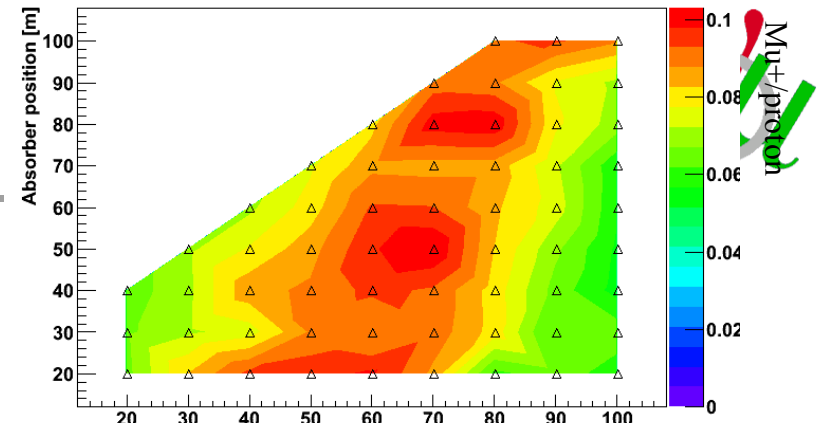
- When proton absorber and chicane included, optimise over 4 parameters
  - Proton absorber thickness
  - Drift length
  - Absorber position
  - Chicane angle
- Start with just proton absorber
- Then just chicane
- Then full system
- (Optimisation not finished)



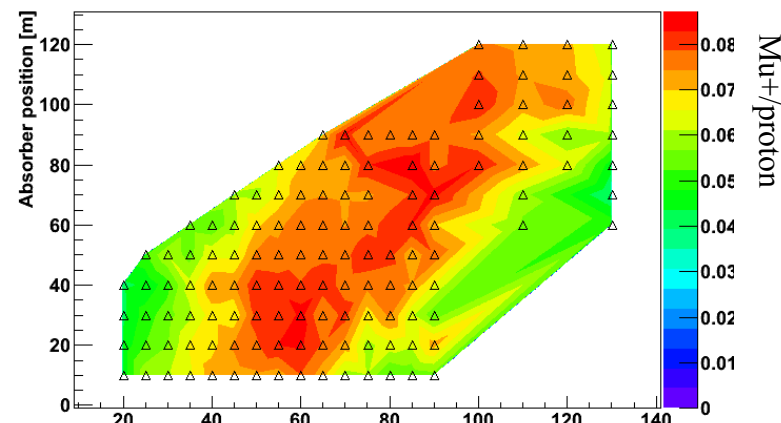
Absorber thickness 1e-08 mm



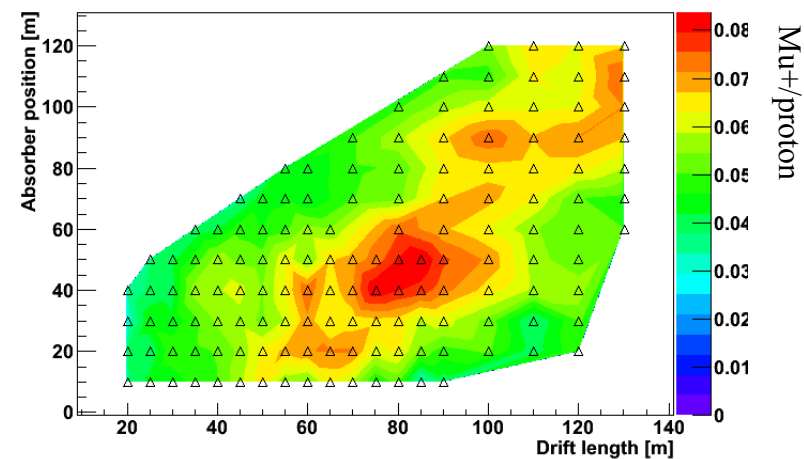
Absorber thickness 50.0 mm



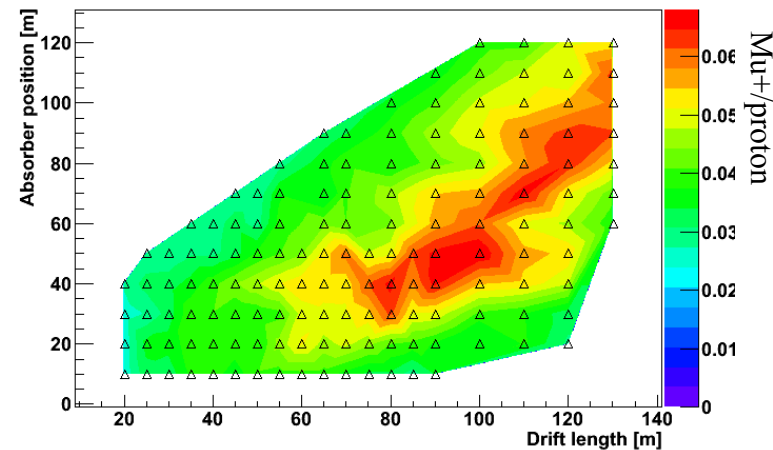
Absorber thickness 100.0 mm



Absorber thickness 200.0 mm



Absorber thickness 300.0 mm

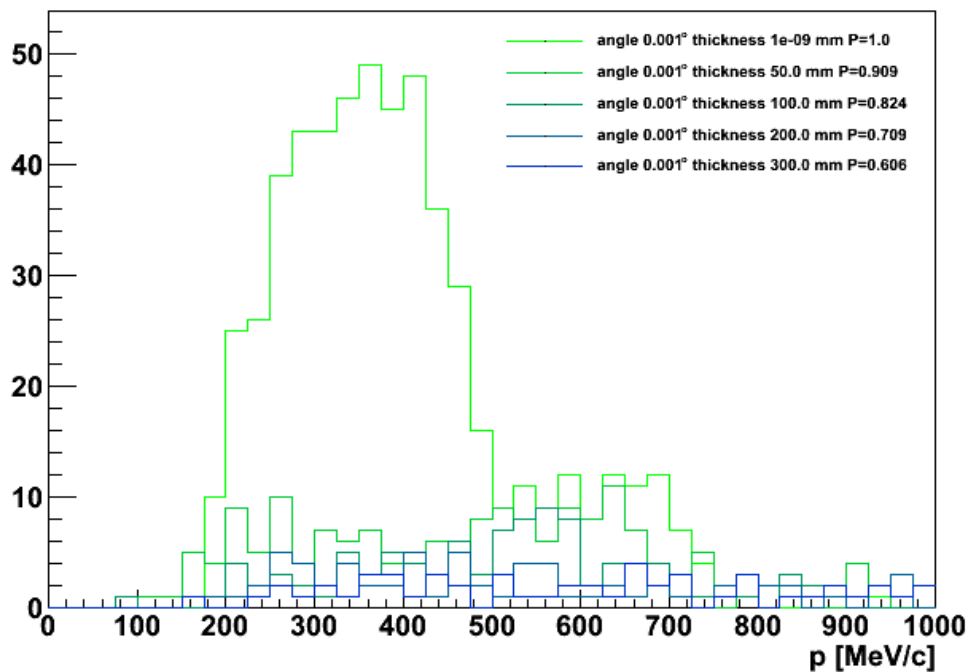


- Add proton absorber
- Try to fix longitudinal phase space
  - Optimise on position of absorber
  - Optimise on length of drift

# Proton absorber, No Chicane



proton with  $r < 400.0$  mm



- Compare with power remaining in proton beam



# Proton absorber, No Chicane

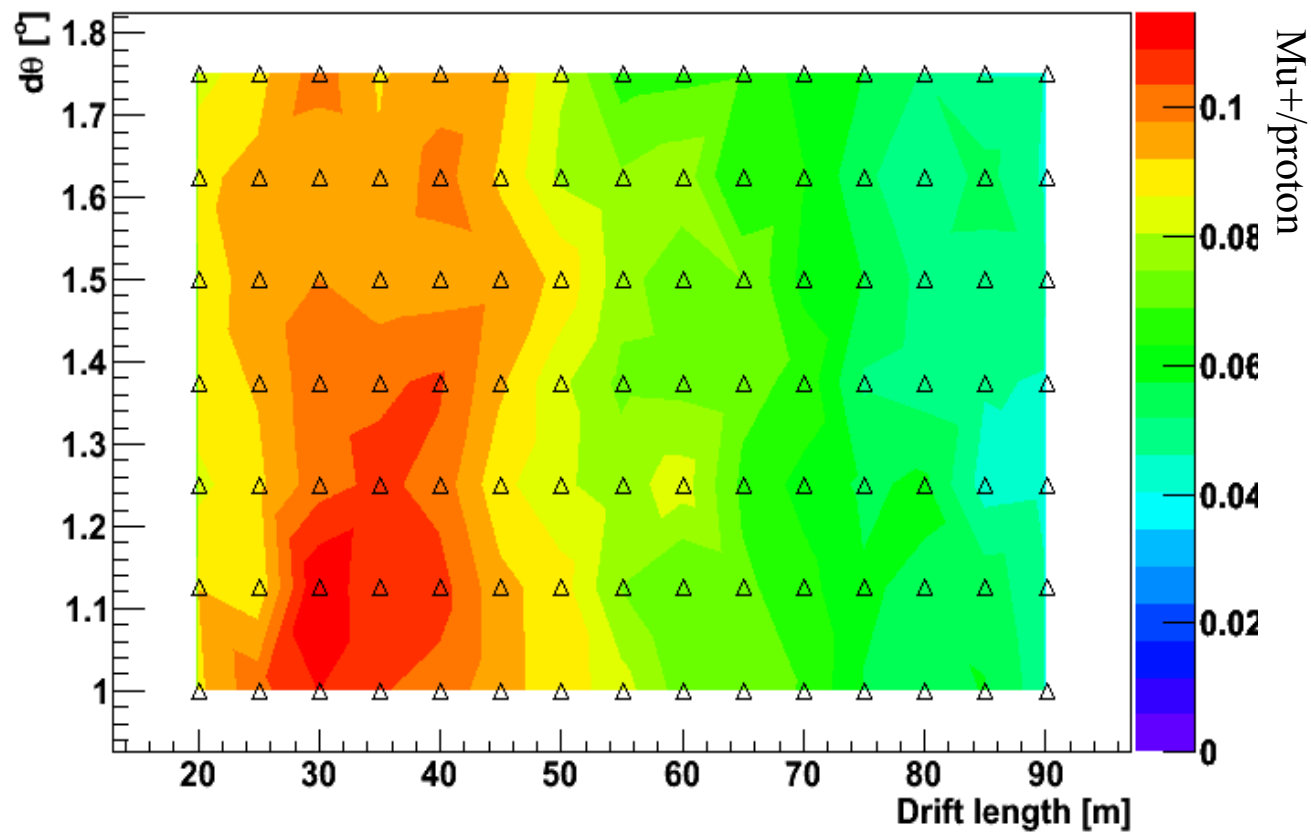


Proton absorber thickness [mm]	Maximum rate (mu+/proton)	Proton beam power [%]
0	0.1171	100
50	0.103	90.9
100	0.08714	82.4
200	0.08374	70.9
300	0.06805	60.6

- Ultimate figure(s) of merit is mu+/proton compared to proton beam power leaking into downstream accelerator

# Chicane, no proton absorber

Absorber thickness 1e-09 mm





# Chicane, no proton absorber

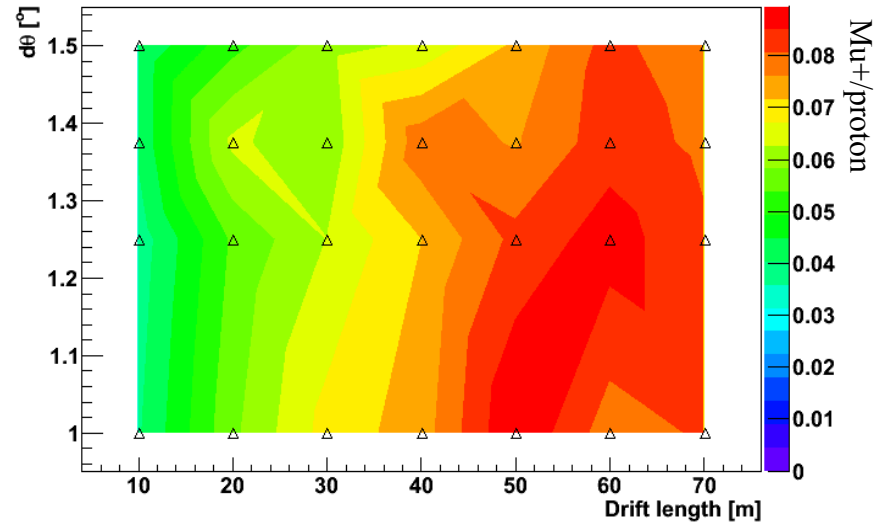


Chicane $d\theta$ [°]	Maximum rate (mu+/proton)	Proton beam power [%]
0	0.1171	?
1.0	0.1091	?
1.25	0.1047	?
1.5	0.0975	?
1.75	0.1006	?

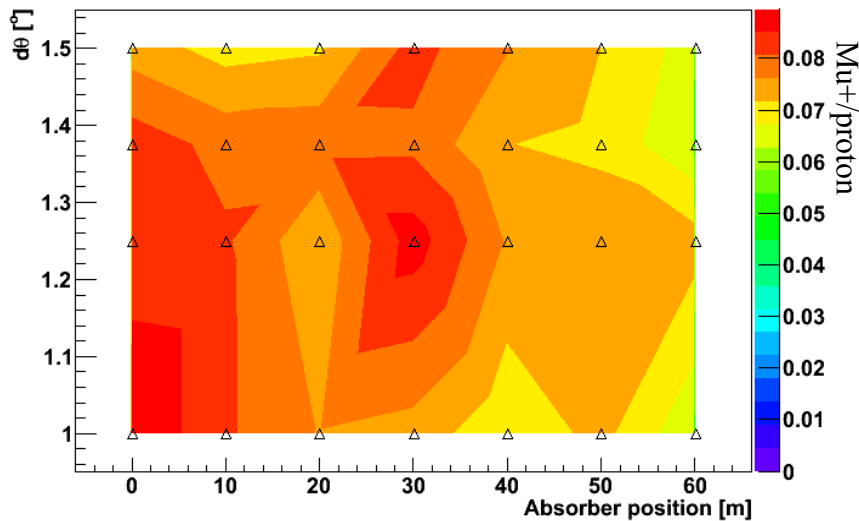
# 100 mm proton absorber + chicane



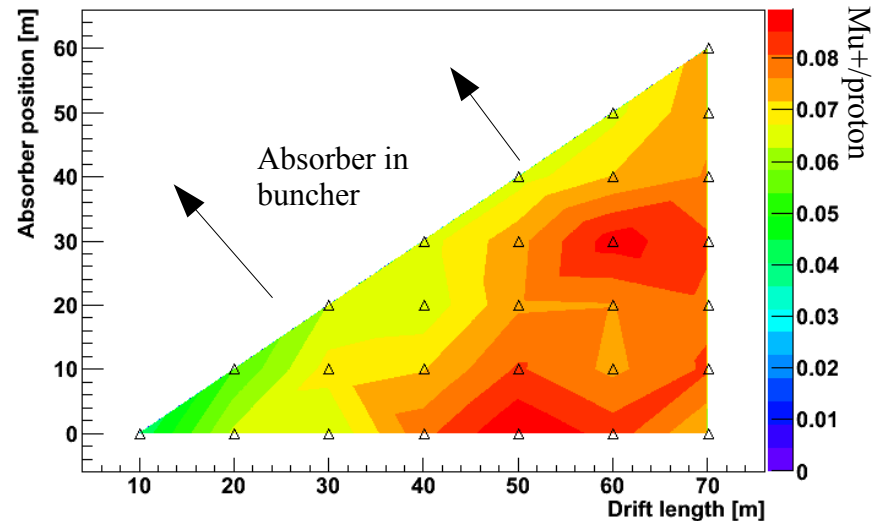
Absorber thickness 100.0 mm



Absorber thickness 100.0 mm



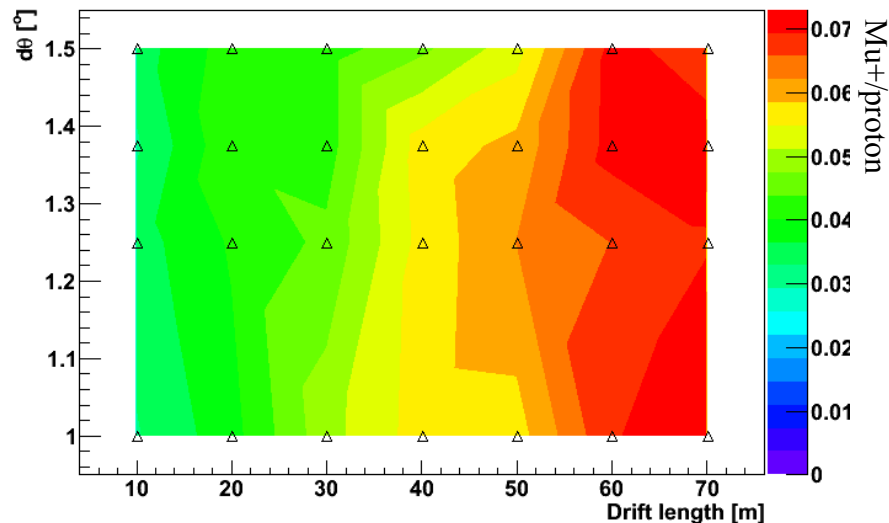
Absorber thickness 100.0 mm



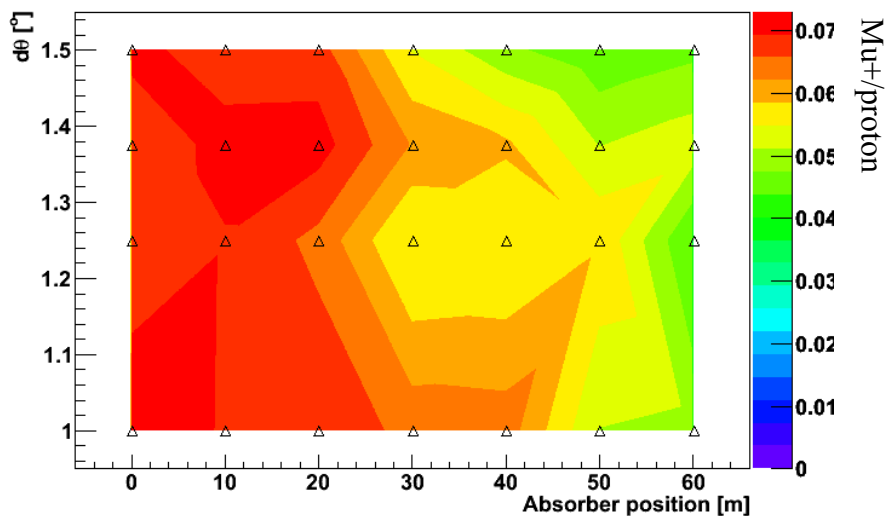
# 200 mm proton absorber + chicane



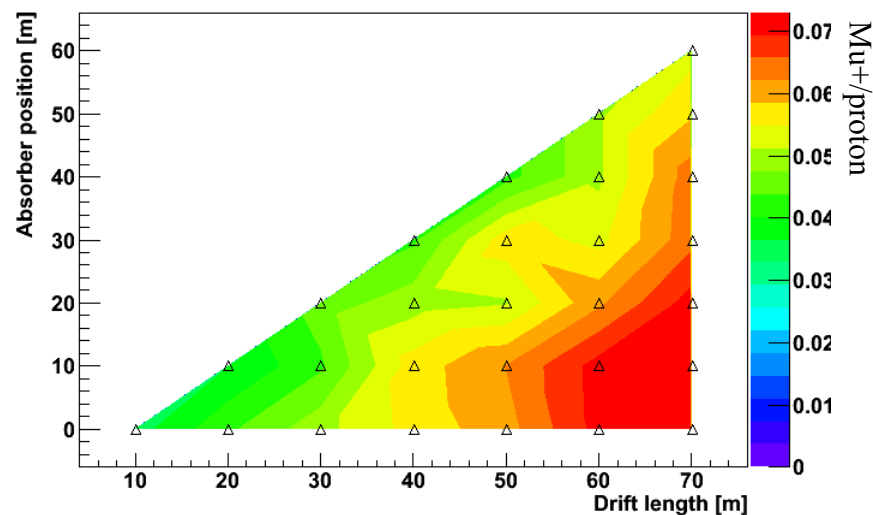
Absorber thickness 200.0 mm



Absorber thickness 200.0 mm



Absorber thickness 200.0 mm





# Chicane, no proton absorber

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Clean up of input deck

- Optimisation ongoing
- Final step:
  - Plot  $d\theta$  vs absorber thickness vs muon rate
  - Plot  $d\theta$  vs absorber thickness vs proton power
  - Choose parameters, rebaseline
- Looks like we will get a hit on muon rate