Front End Chicane Parameters

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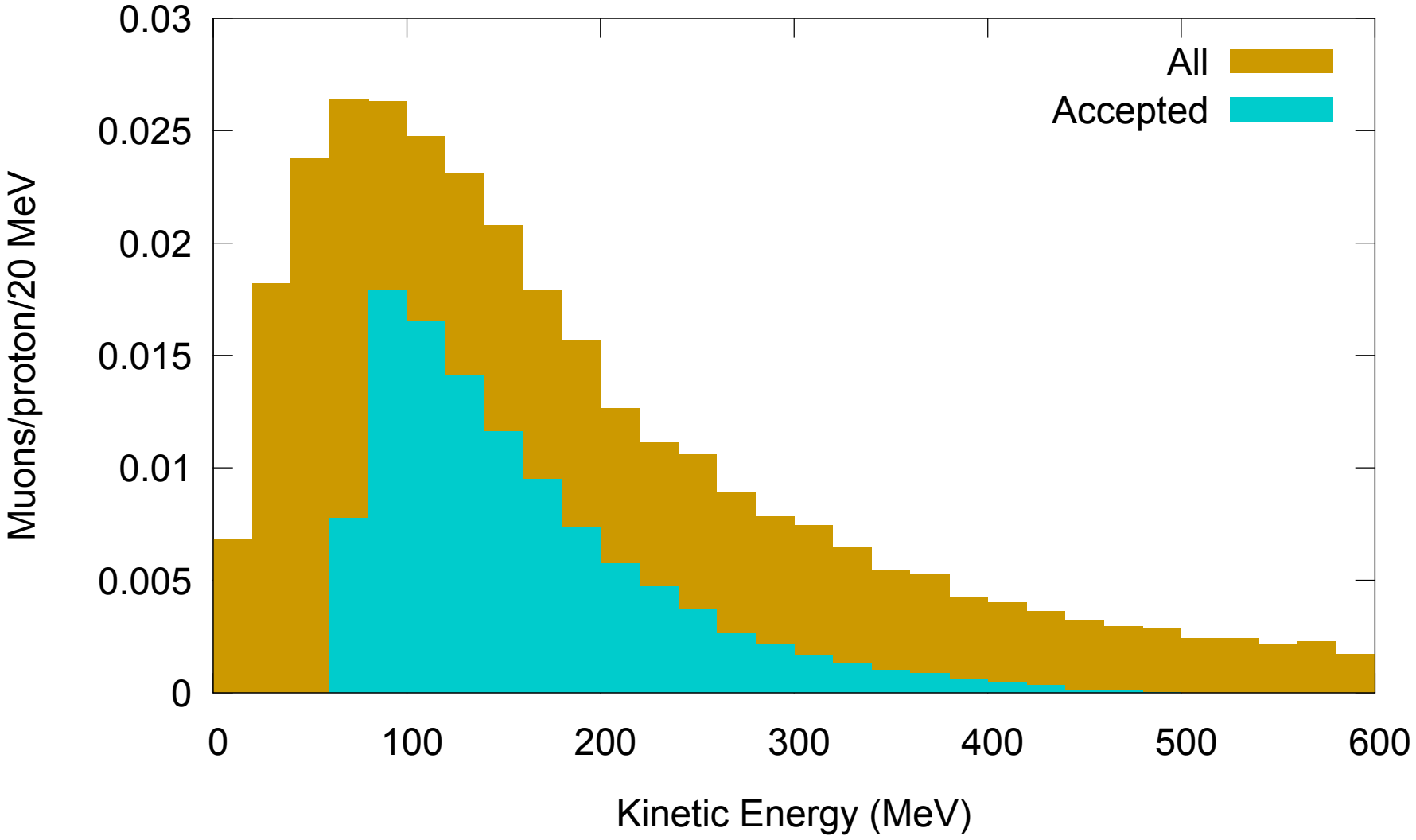
Introduction

- Goal: optimize chicane parameters for high energy cutoff
- Not dealing with absorber for low energy protons
- Chicane field is 2 T
  - Could be done for other fields
- 25 cm radius aperture downstream of chicane
  - No aperture in chicane
- Scanned in chicane length and angle

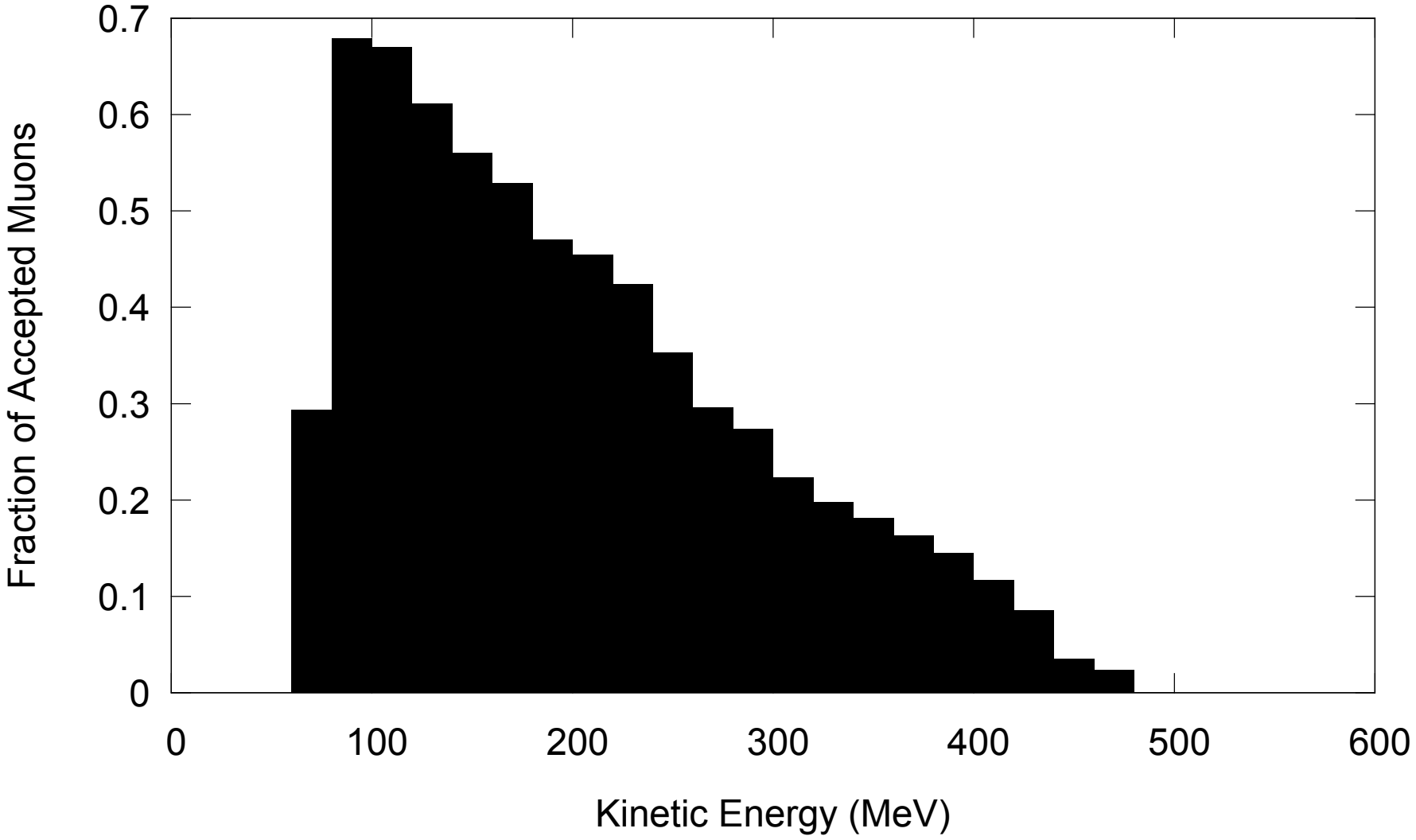
Performance Parameters

- Look at fraction of muons at end of chicane that are captured in cooling
  - Depends on absorber thickness
  - Also depends on NBPR design
  - Also did for pions
- Call "transmission" muons within 80–260 MeV kinetic energy, pions 80–320 MeV
- Initially looked at proton power downstream
- Decided better criterion was energy beyond which all protons were lost
  - Came up with designs that removed more proton energy, but left many high energy protons.

Performance Parameters



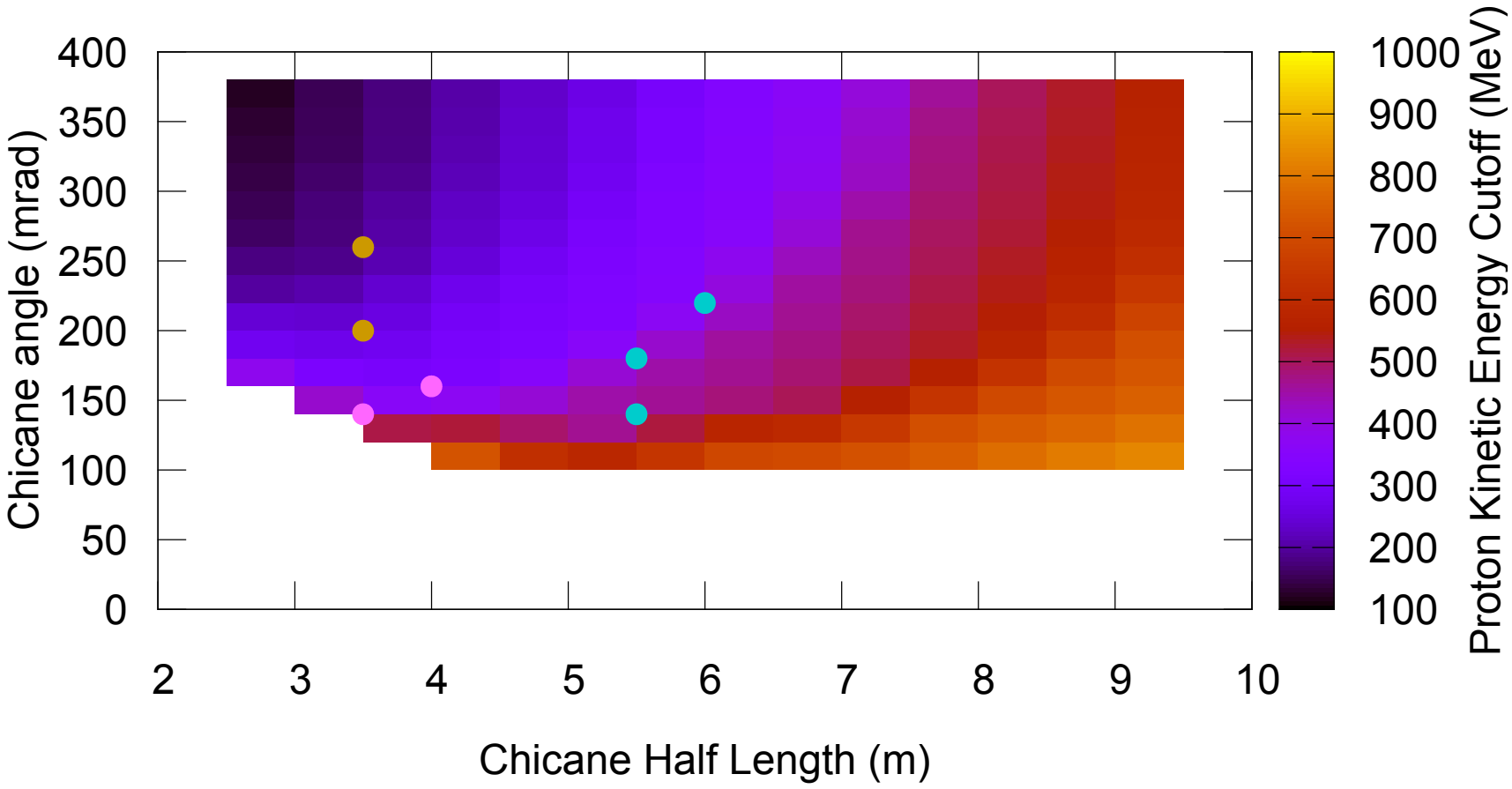
Performance Parameters



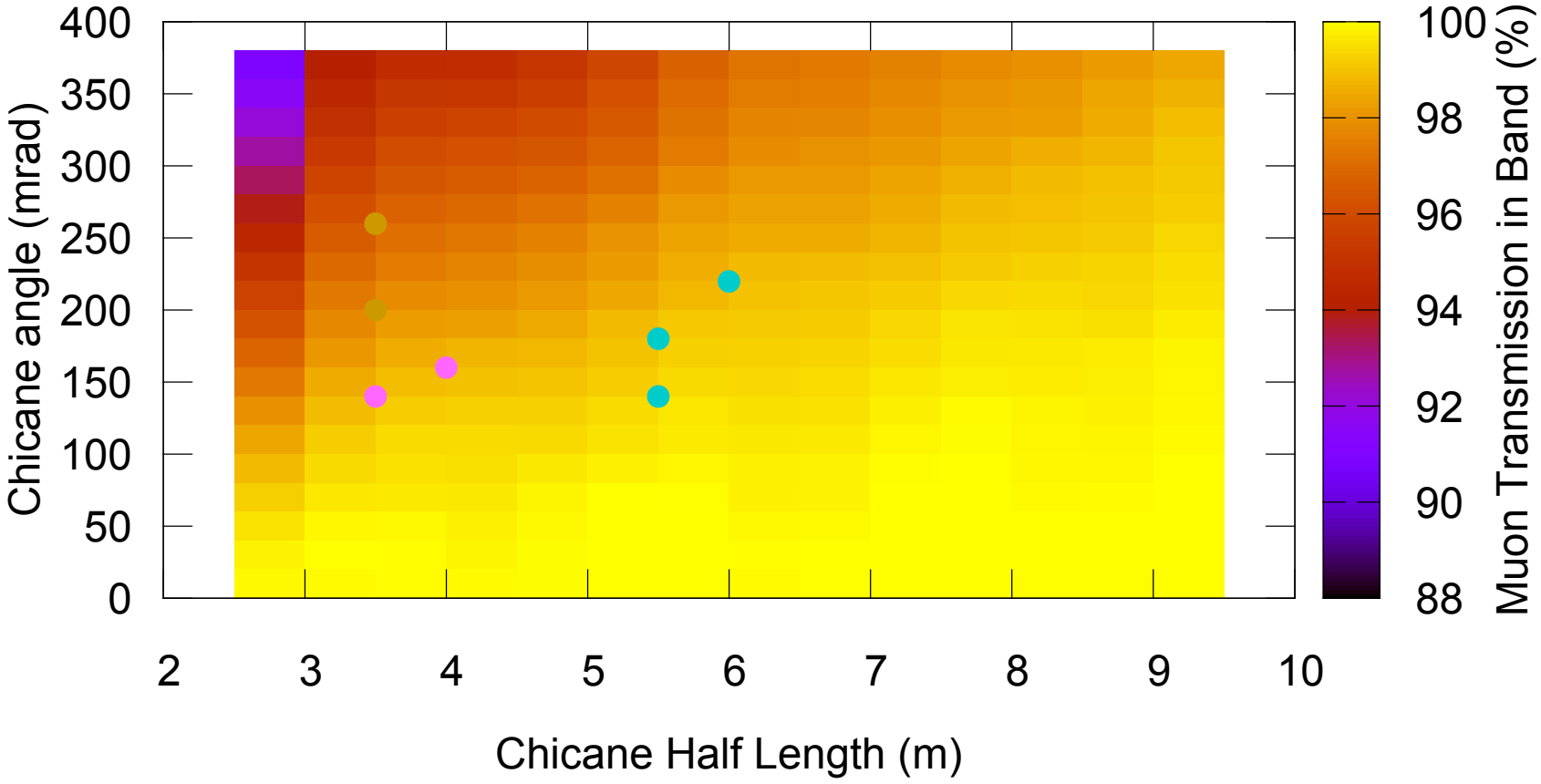
Results

- Can find solutions with best transmission for a given proton energy cutoff
- For higher proton energy cutoffs, two sets of optimal solutions
  - One for shorter chicanes, but look less robust
  - One for longer chicanes
  - Need to analyze these a bit more
  - Optimal clearer for lower proton energy cutoffs

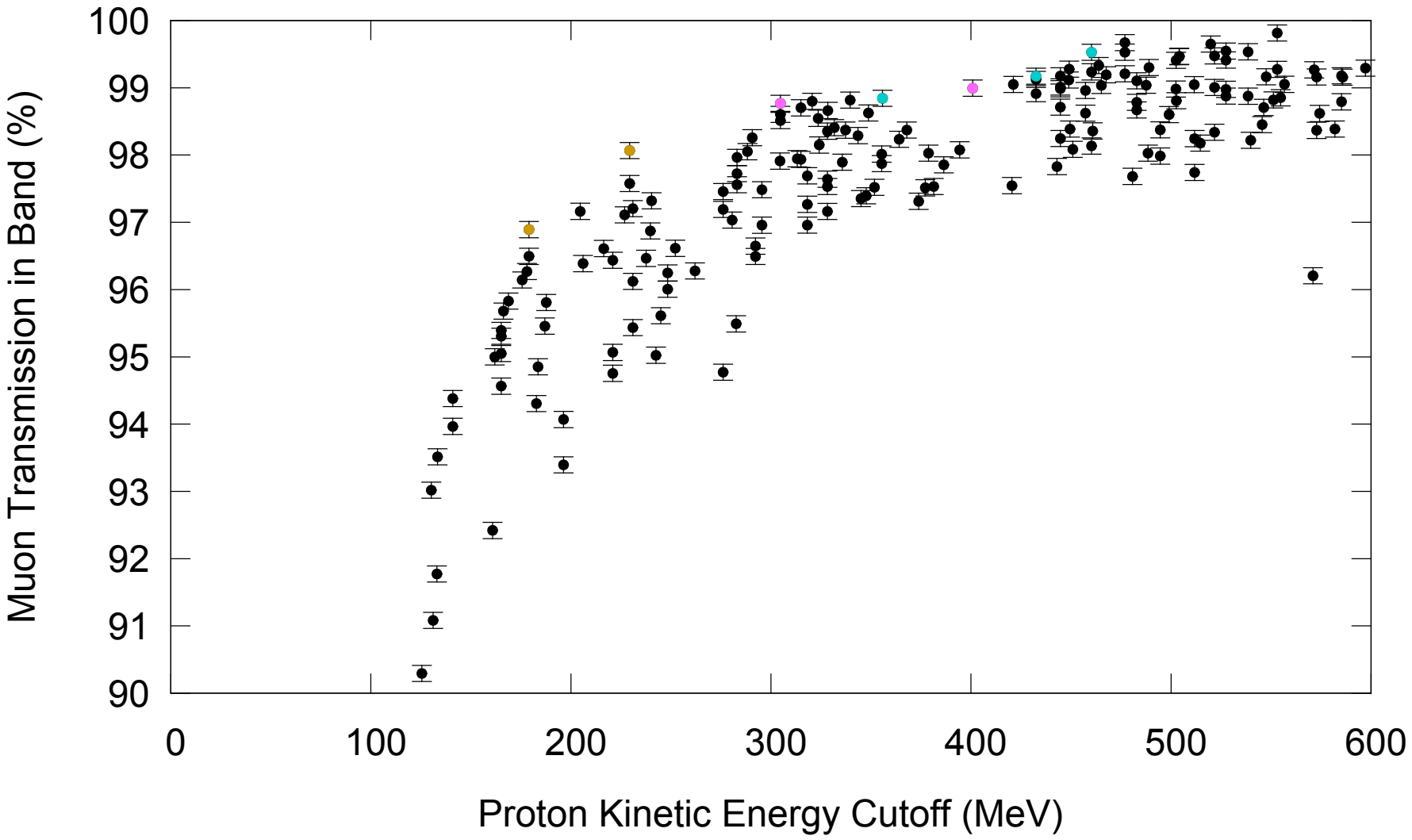
Results


Chicane angle (mrad)
400
350
300
250
200
150
100
50
0
2
3
4
5
6
7
8
9
10
Chicane Half Length (m)
1000
900
800
700
600
500
400
300
200
100
Proton Kinetic Energy Cutoff (MeV)

Results


Chicane angle (mrad)
400
350
300
250
200
150
100
50
0
2
3
4
5
6
7
8
9
10
Chicane Half Length (m)
100
98
96
94
92
90
88
Muon Transmission in Band (%)

Results


Muon Transmission in Band (%)
100
99
98
97
96
95
94
93
92
91
90
0
100
200
300
400
500
600
Proton Kinetic Energy Cutoff (MeV)

Conclusions

- Can find best solutions (in terms of muon transmission) for various proton energy cutoffs
- Best cutoff will depend on downstream details
  - Lower cutoff energy requires less absorber
  - But some loss in muon transmission
    - More than indicated here: higher energy muons also transmitted
- Will need to optimize full system
- Need to understand best parameter regime
- Could look at other fields
- Could pass distributions at end of chicane to G4beamline