Front End Chicane with Downstream Absorber

J. Scott Berg
Brookhaven National Laboratory
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Introduction

- Goal: optimize chicane by itself
  - Chicane angle and length
  - Downstream absorber thickness
- Chicane field is 2 T
  - Could be done for other fields
- 25 cm radius aperture downstream of chicane
  - No aperture in chicane

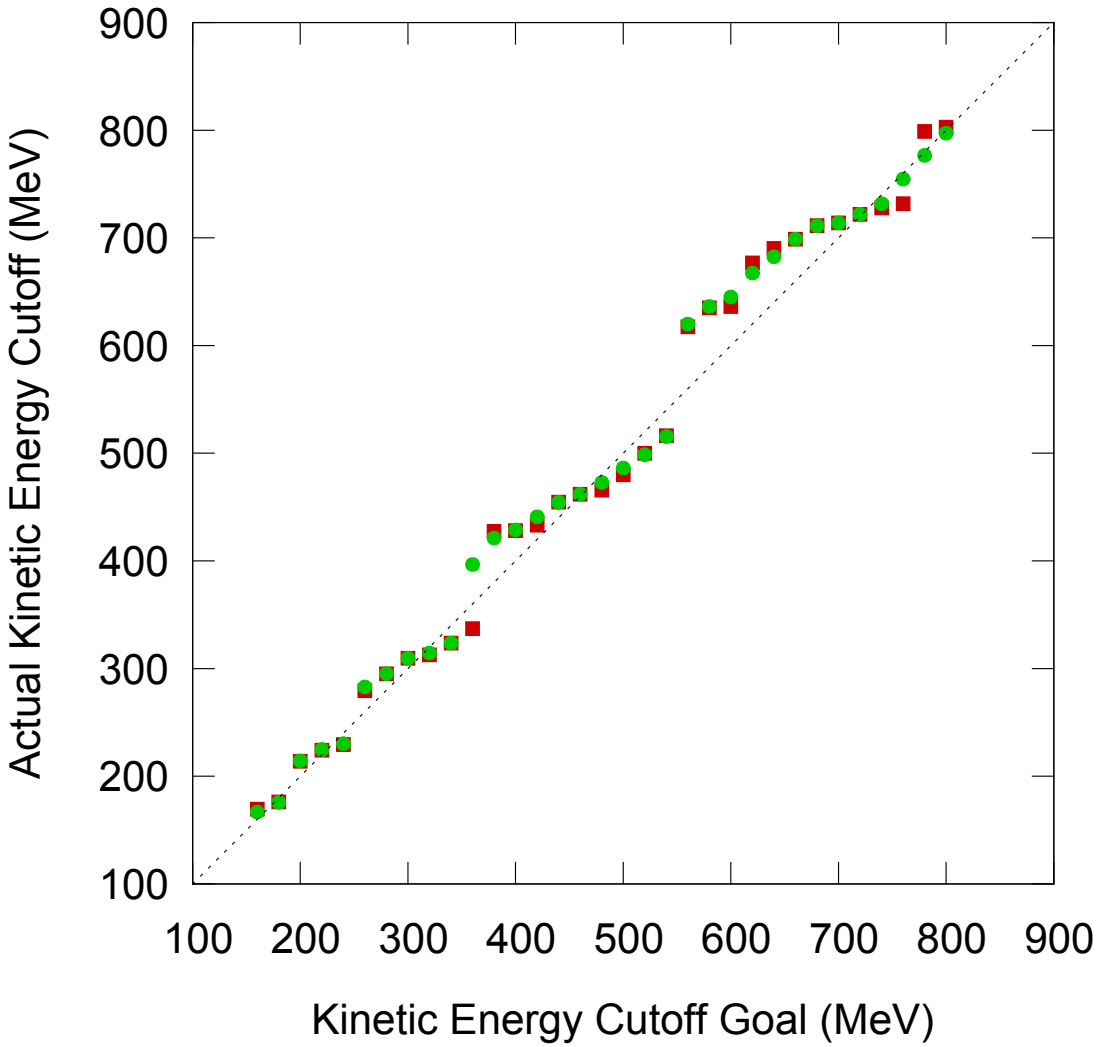
Previous Status

- Developed rule for chicane parameters vs. proton energy cutoff
  - Allow 2 W of protons above this energy per input MW
  - Actual cutoff didn't exactly follow predicted cutoff
    - Possibly due to roundoff in parameters
- Absorber was not included

Proton Energy Cutoff

- Use finer rounding
  - Before: 10 mrad angle, 10 cm length
  - New: 1 mrad angle, 1 cm length
- Results are nearly identical
- Larmor rotations likely entering somehow
- Hints on how to improve performance
  - Apertures in chicane may change this picture
    - Apertures should follow muon beam
  - Change curvature continuously
  - Needs study: may be intrinsic

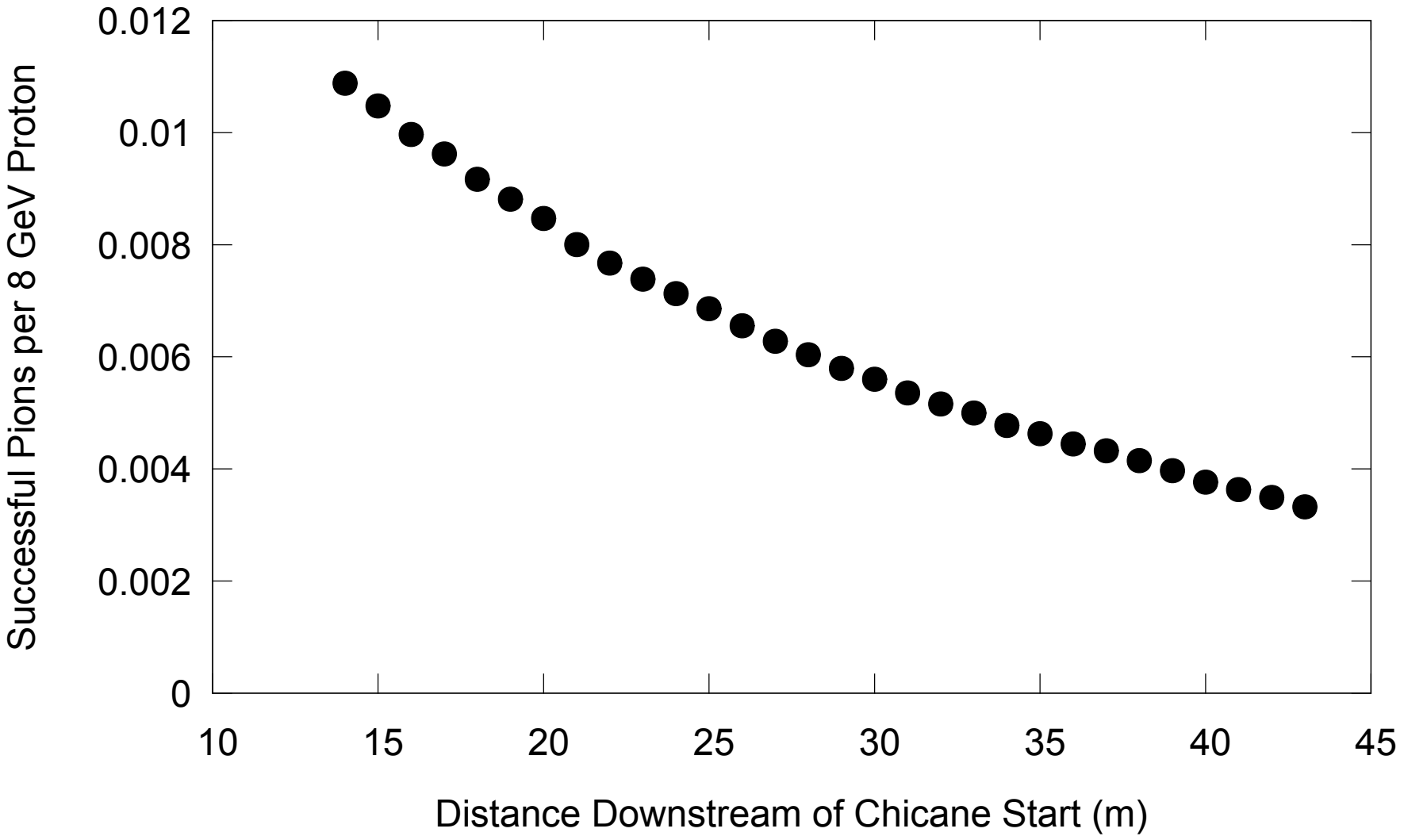
Predicted vs. Acutal Cutoff



Add the Absorber

- Track in G4beamline, downstream from chicane
- Measured criteria 31 m downstream from chicane start
  - Muons from 20 MeV to 390 MeV
  - Proton power
- Varied absorber thickness
- Two absorber positions
  - End of chicane
  - 30 m from chicane start
- Picked four chicane cutoffs
  - Good actual cutoff relative to predicted

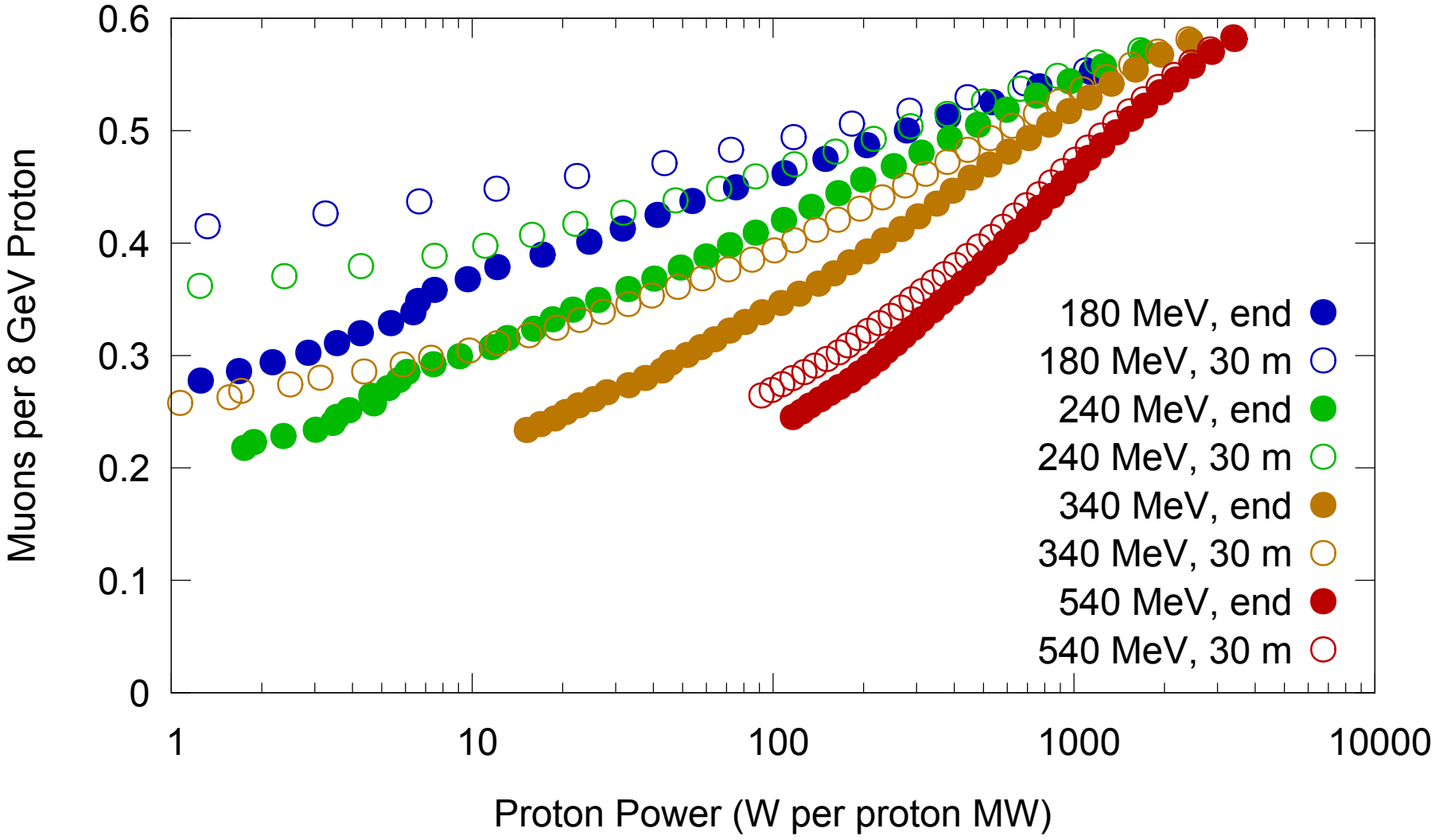
Pions vs. Position



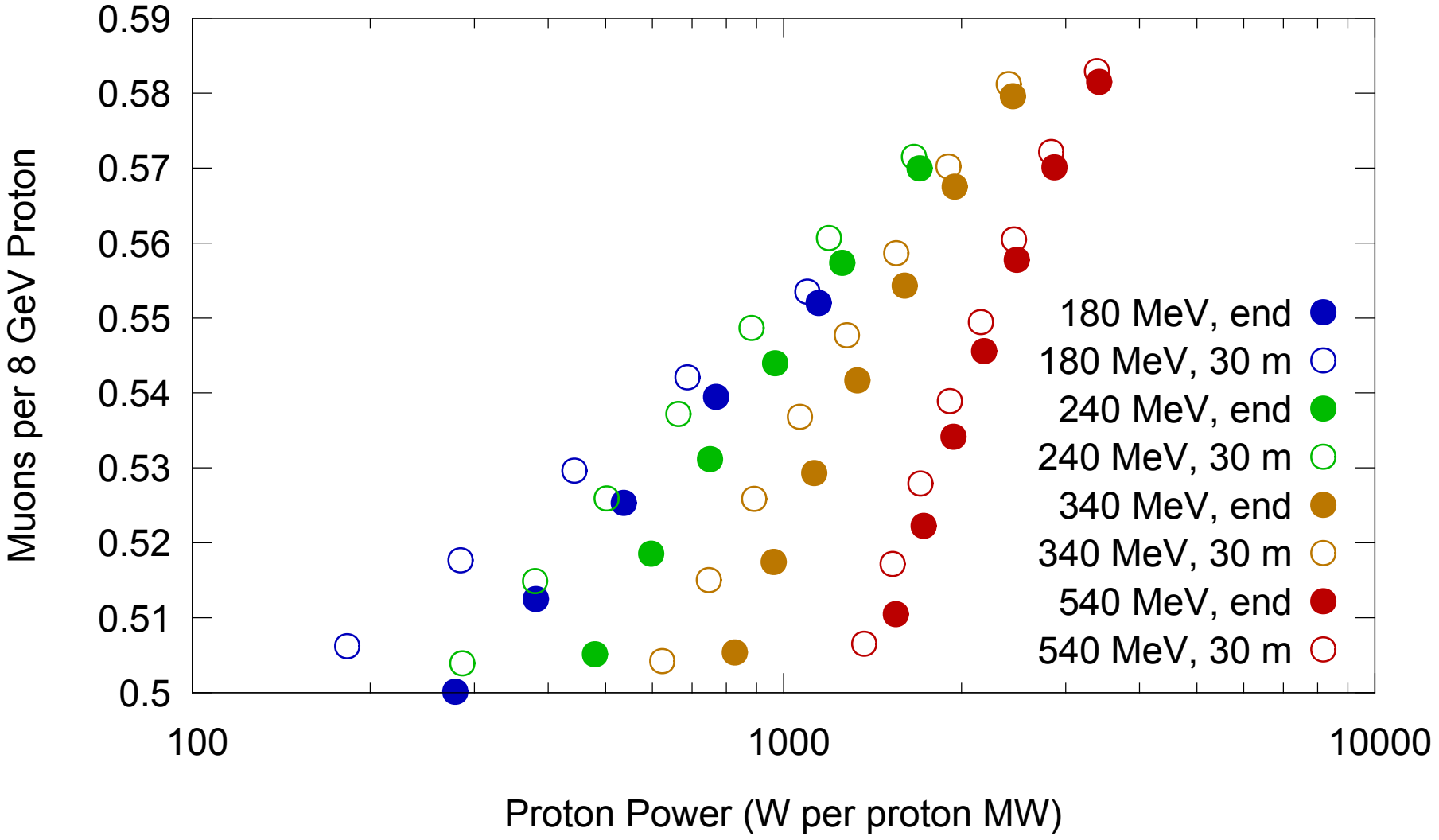
Analysis

- Look at muons vs. proton power
- Favor aggressive chicane
  - Unless you allow a lot of power downstream
- Poor transmission to get to decent proton powers
  - Need to pick tolerable proton power
- Moving absorber downstream helps
  - Effect exaggerated by overweighting high energy?
  - But may not win when NBPR considered
  - Would gain even more by moving further
  - Less benefit for more proton power
- High energy muons overweighted
  - Effective muon loss even higher
  - Aggressive chicane even more strongly favored

Muons vs. Proton Power



Muons vs. Proton Power



Summary

- Have a solution for chicane parameters for a given proton kinetic energy cutoff
  - Some behavior not well analyzed and understood
- Significant tradeoff between muon transmission and downstream proton power
- Aggressive chicane is generally preferred

Next Steps

- Add chicane apertures that track muon beam size
- Better energy weighting of muon transmission
- Scan parameters with aggressive chicane in more detail
- Pass to ICOOL to optimize NBPR
  - Still a function of cutoff
  - Additionally two positions for absorber
- Pick best solution, global optimize in G4beamline
- Repeat for different chicane fields