Solenoid vs. horn focus for Neutrinos

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Assumptions in Solenoid Design

Ideal taper is claimed to be:

$$B_{\text{ideal}} = \frac{B_o}{1 + kz}$$

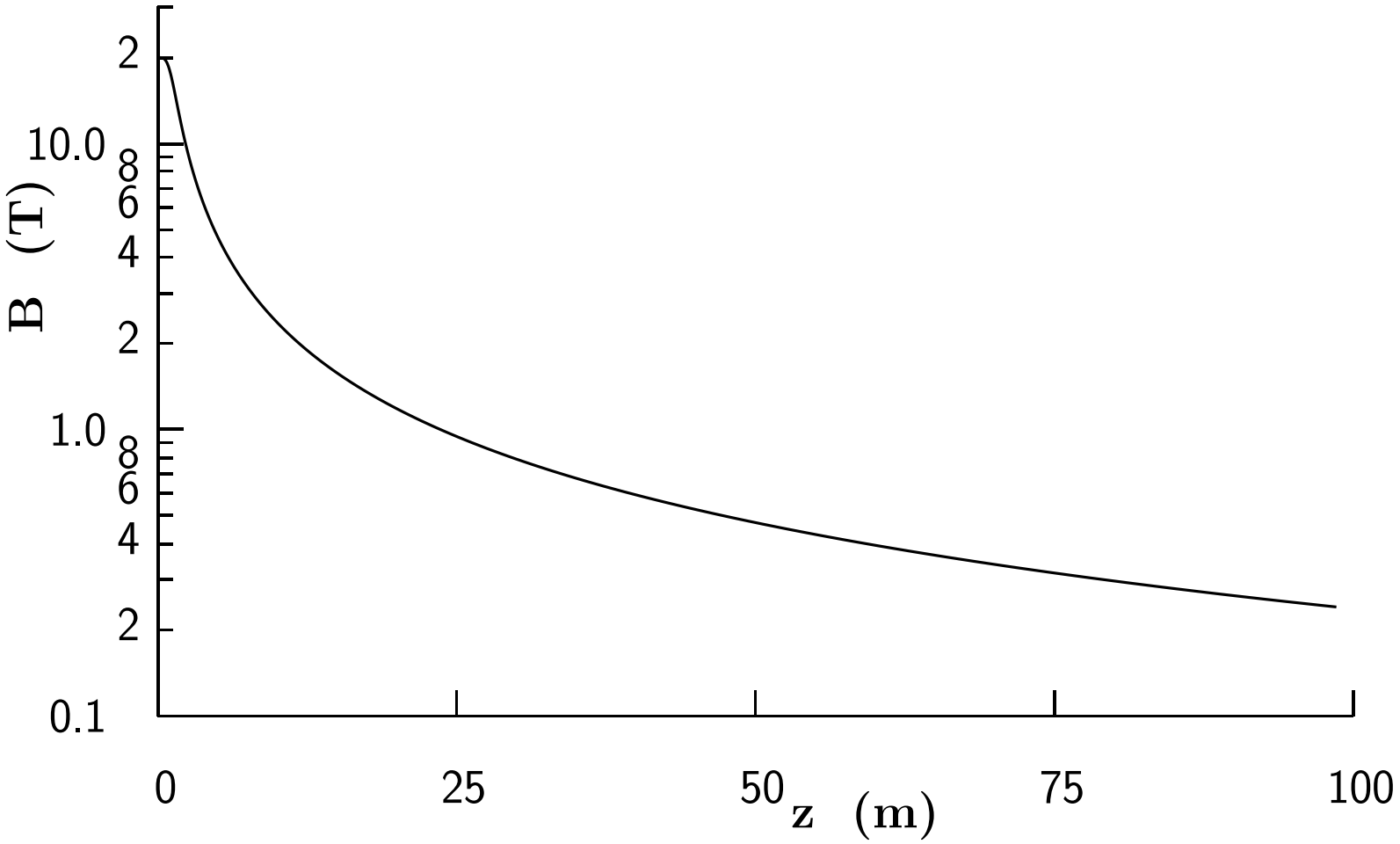
But match to initial flat 20 T is abrupt

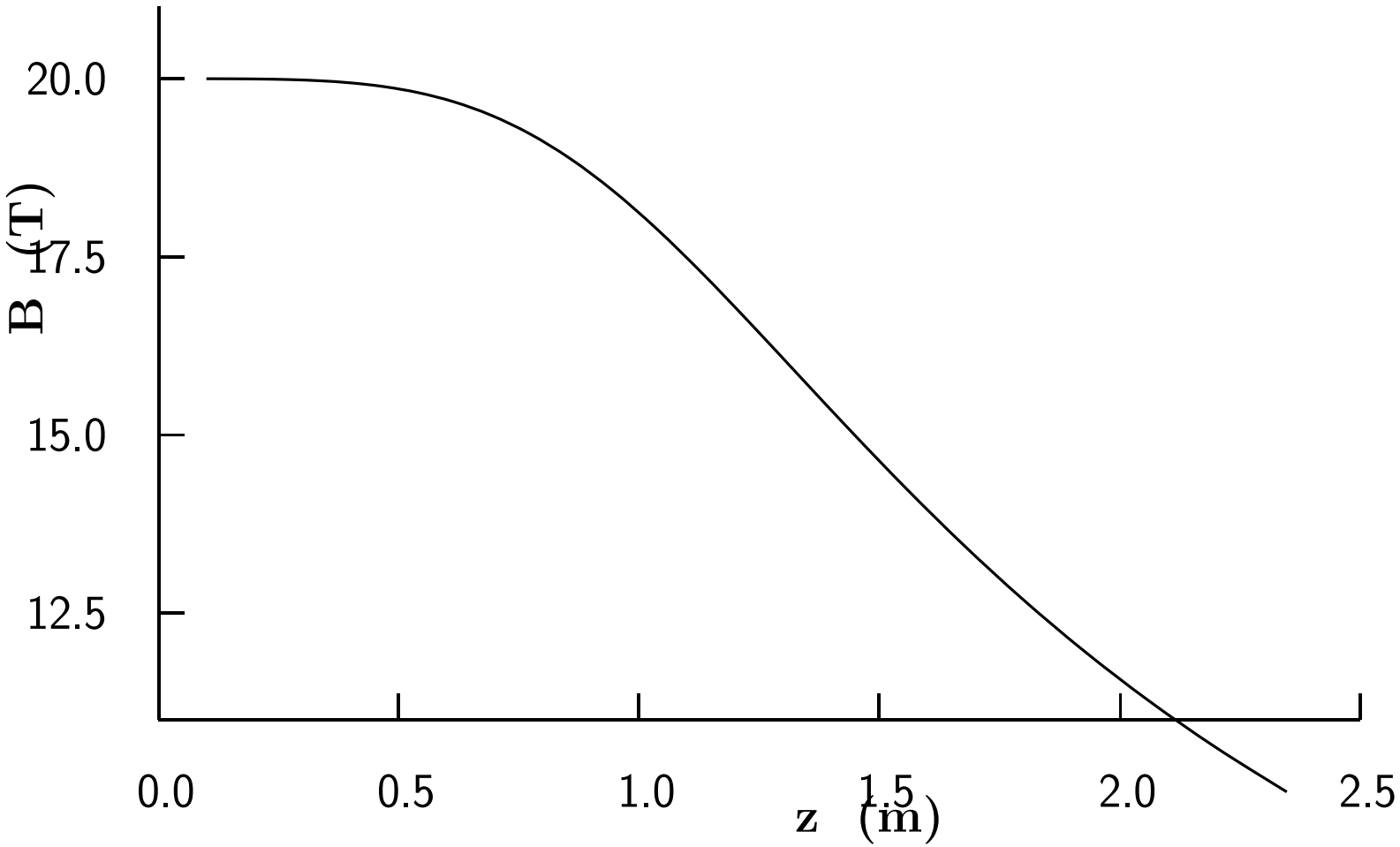
$$B = \sqrt{\frac{1}{(1/B_{\text{ideal}}^2 + 1/B_o^2)}}$$

Initial Try:

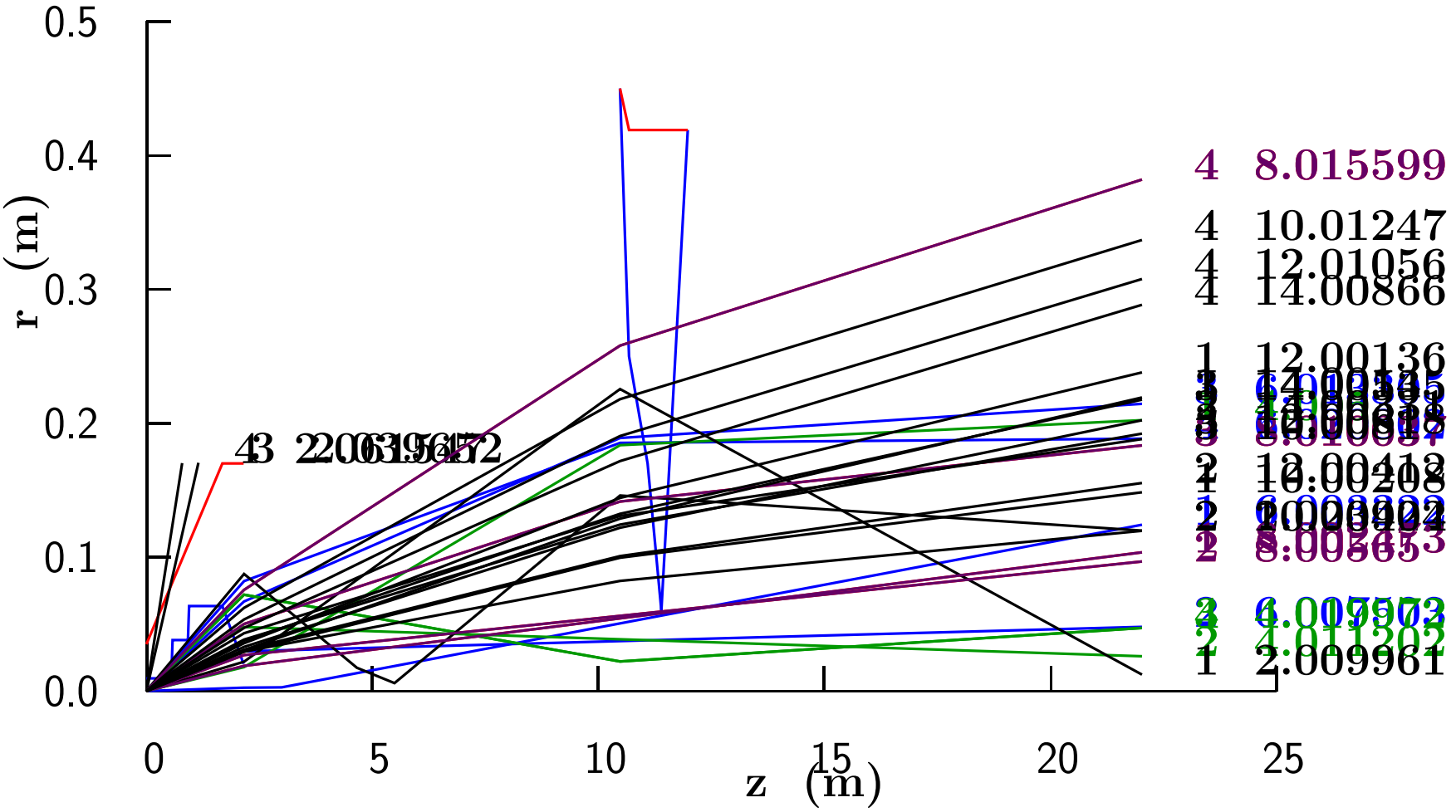
- taper over 100 m
- taper B down by 100
  reduce $< p_t >$ by 10 from 300 to 30 MeV/c
- extend initial flat field to get final focus at 6 GeV
- look at each end of 80 cm target

Solenoid Fields



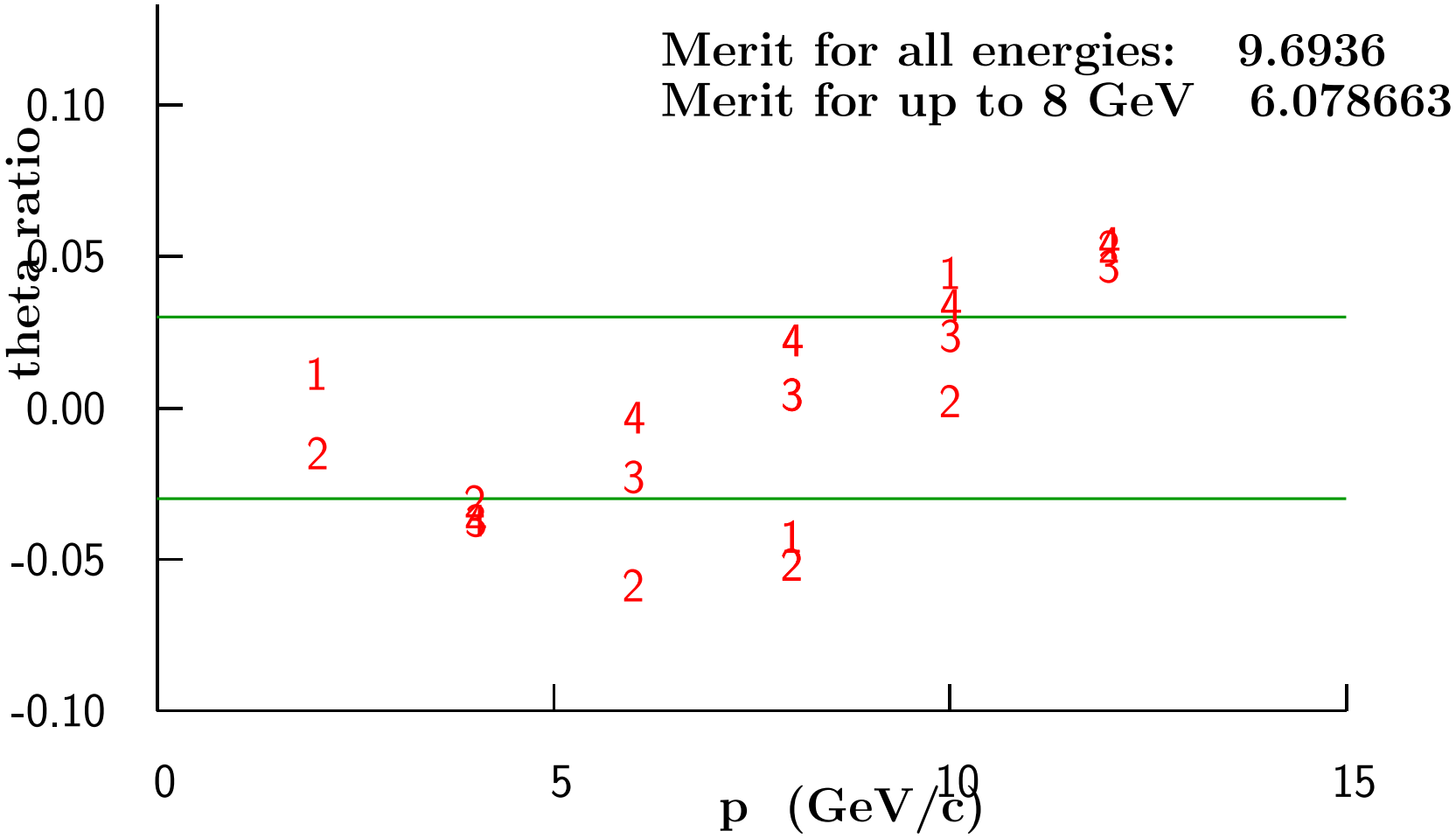

20.0
17.5
15.0
12.5
B (T)
0.0
0.5
1.0
1.5
2.0
2.5
z (m)

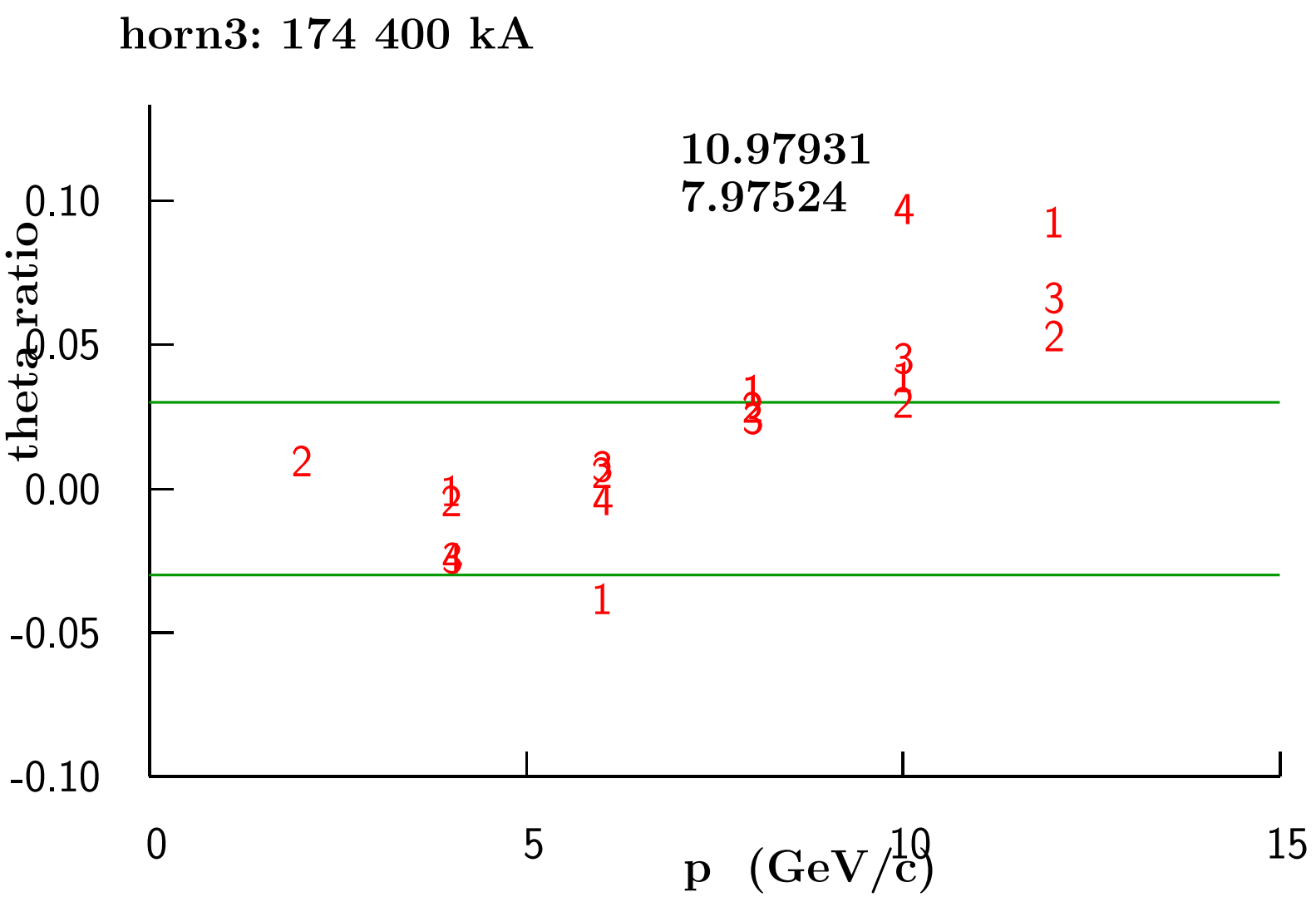
Horn picture

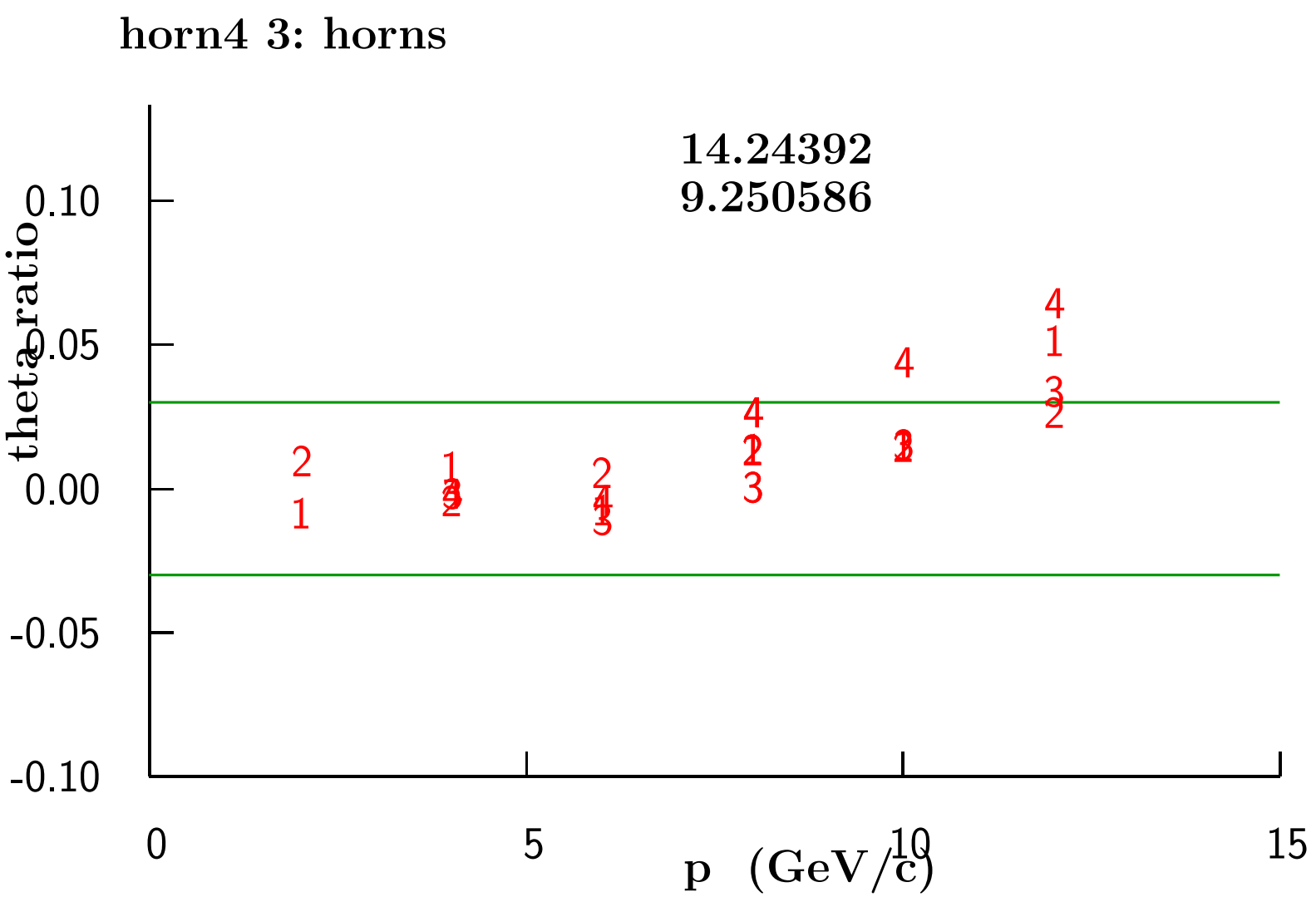


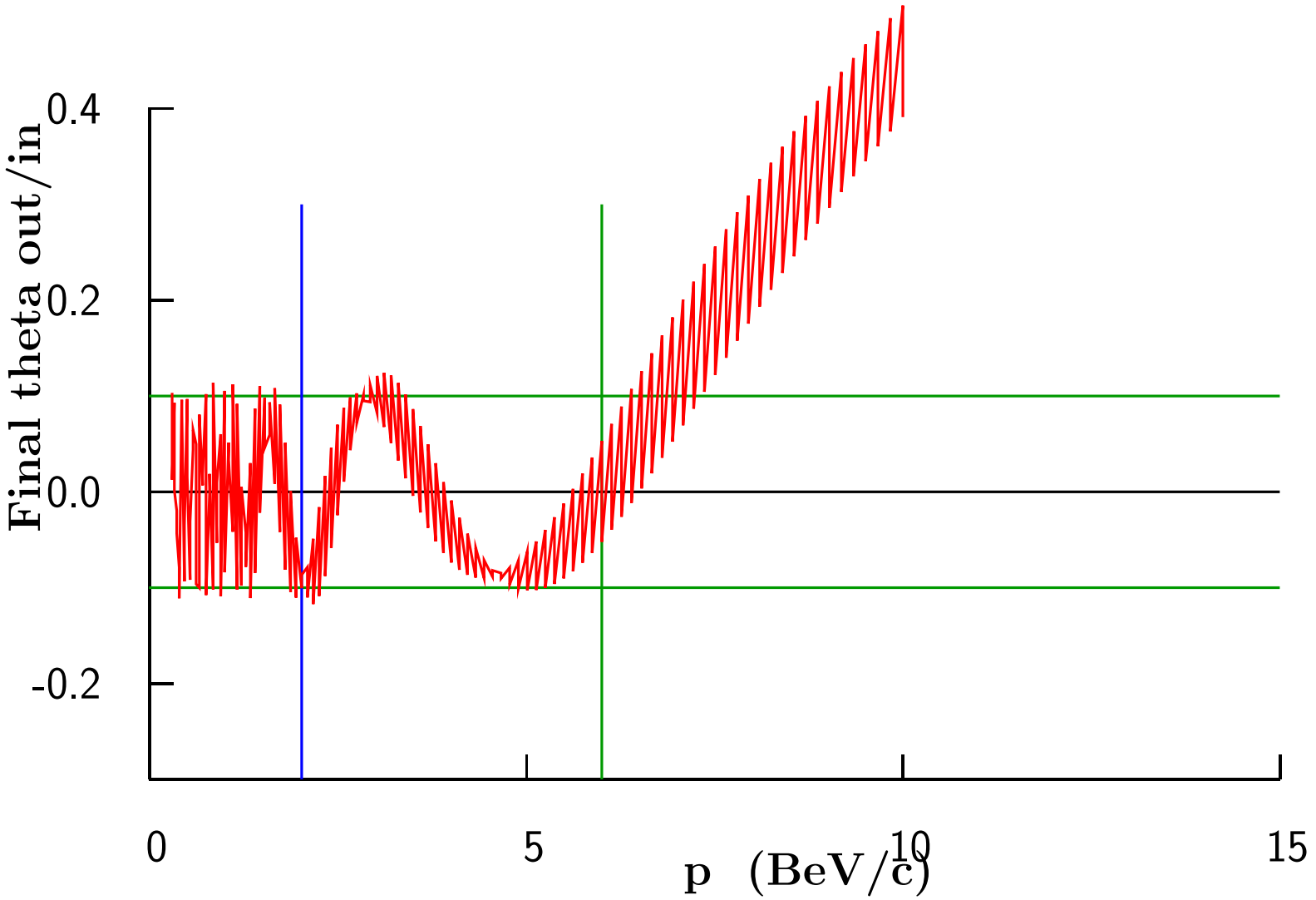
Horn vs. Solenoid Focusing

horn0: 250 250 kA




horn3: 174 400 kA
10.97931
7.97524
theta_ratio
0.10
0.05
0.00
-0.05
-0.10
0
5
10
15
p (GeV/c)

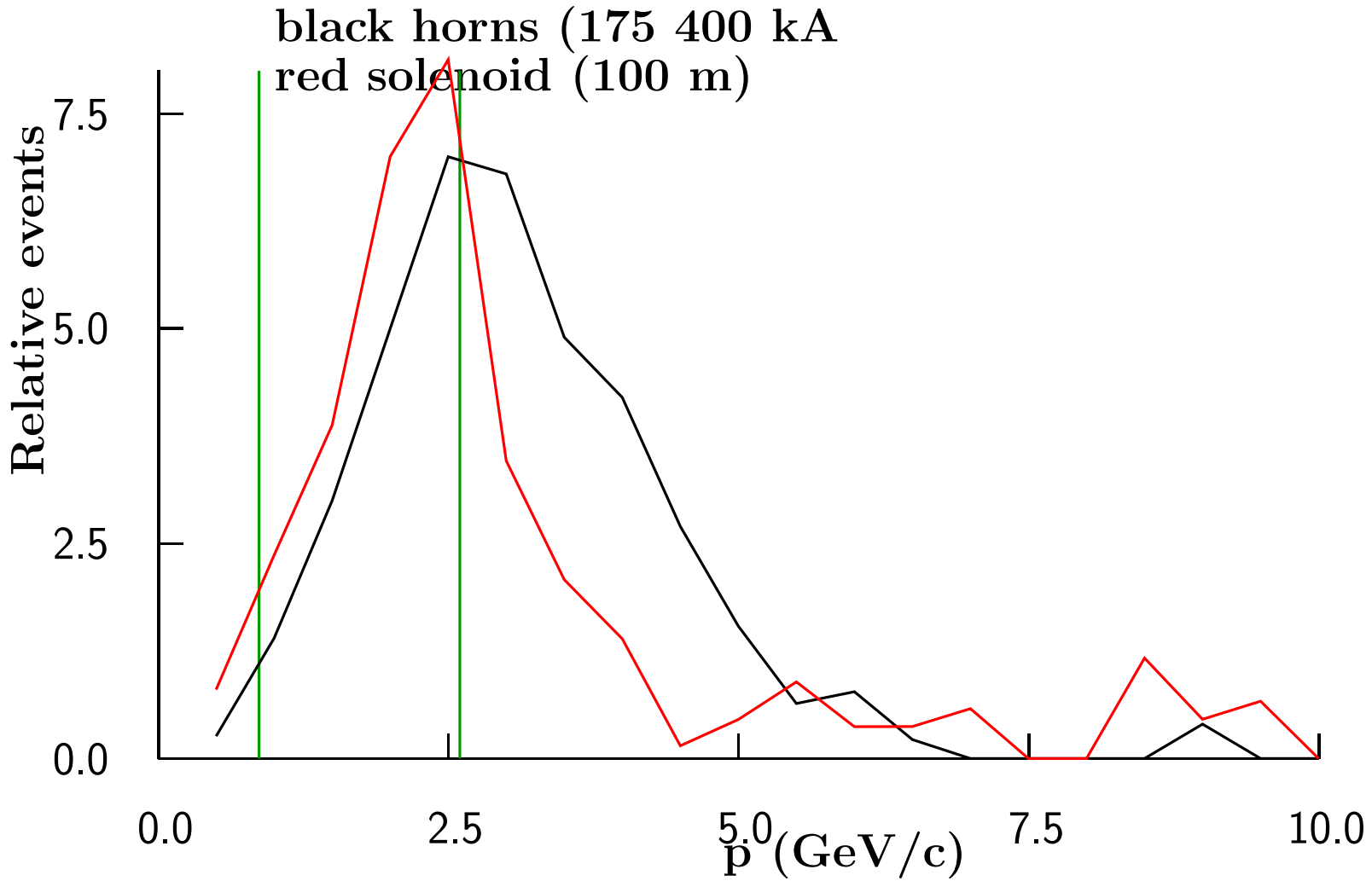

horn4 3: horns
14.24392
9.250586
theta ratio
0.10
0.05
0.00
-0.05
-0.10
0
5
10
15
p (GeV/c)


Final theta out/in
0.4
0.2
0.0
-0.2
0
5
10
15
p (BeV/c)

Neutrino flux calculation assumptions

- MARS 14 pion production from H. Kirk
- C target 80 cm long, 1 cm rad
- initial 20 T has 7.5 cm radius,
- no radial cut thereafter !!!
- 380 m decay tunnel
- 2 m radius decy tunnel

Horn vs Solenoid Neutrinos (PRELIMINARY)



Conclusion

- Solenoid may be superior at low momenta
- Solenoid is worse at high momenta (good?)
- Solenoid could be improved if larger bore affordable
- Horn system could be improved at low momenta if re optimized
- More work needed