MUON TARGET PRODUCTION STUDY

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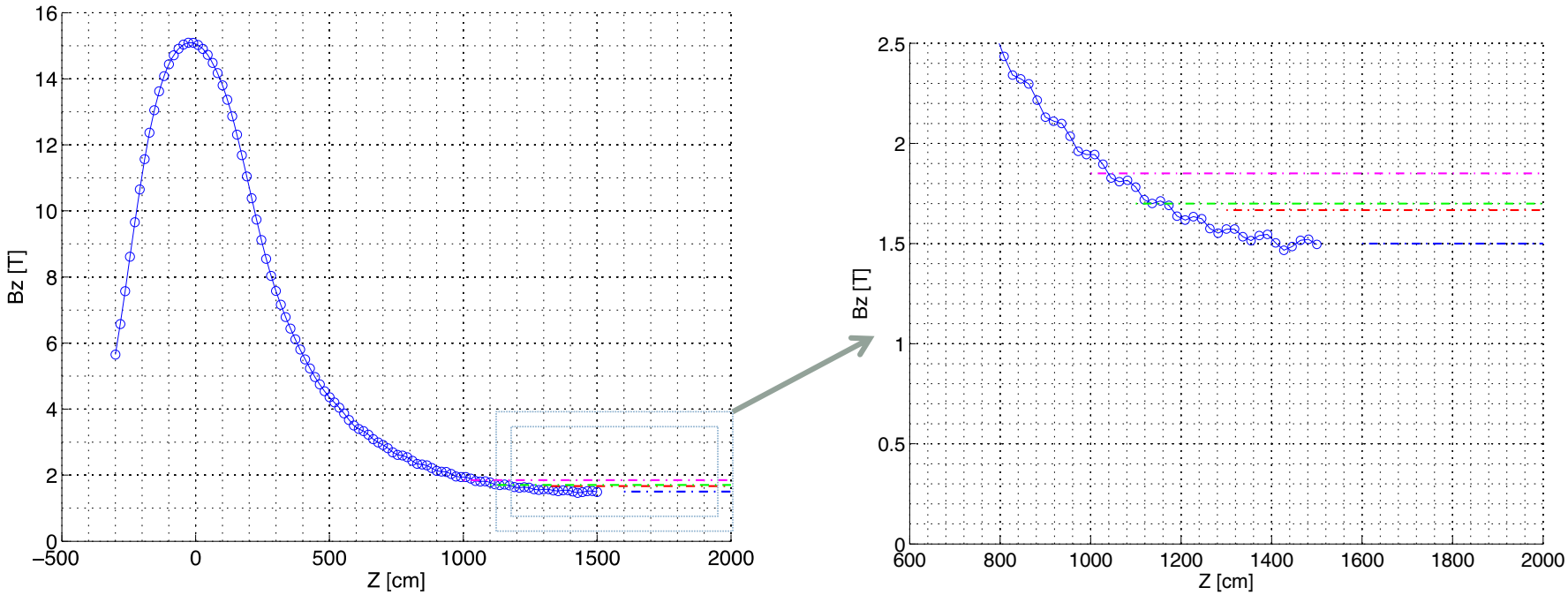
Ding's Optimized Parameters

- Hg Target
  - θ_{Target}=0.137 rad
  - R_{Target}=0.404 cm
- Proton Beam
  - E=8 GeV
  - θ_{Beam}=0.117 rad
  - $\sigma_x=\sigma_y$=0.1212 cm (Gaussian Distribution)
- Solenoid Field
  - IDS120h → 20 T peak field at target position (Z=0)
  - Aperture at Target R=7.5 cm - End aperture R = 30 cm
  - Fixed Field Z = 1862.0 → Bz=1.5 T

- Production: Muons within energy KE cut 40-180 MeV
- 3.27 X 10^4 ($N_{ini}=10^5$)

Target Particle Production with 15 T Peak Solenoid Field

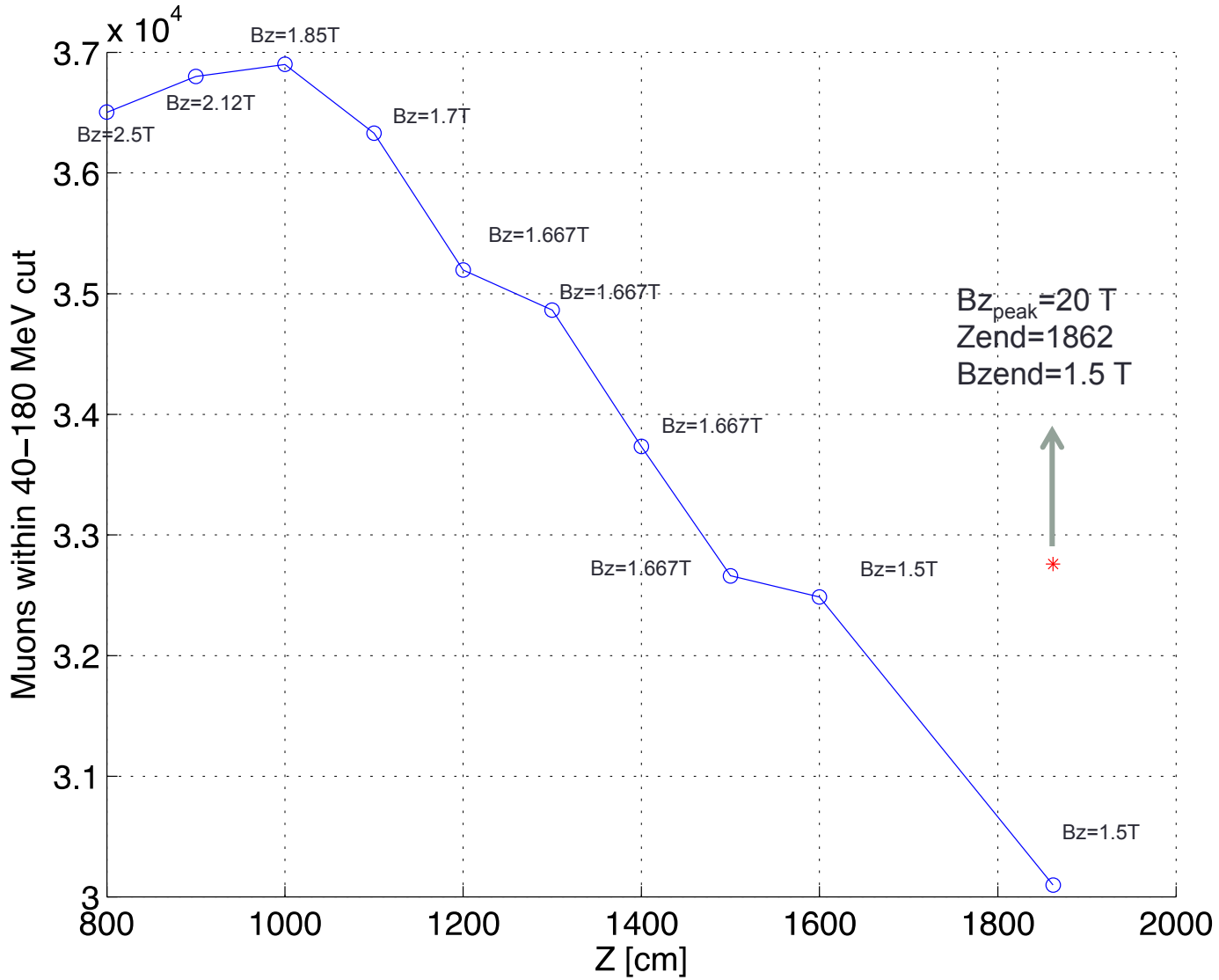
- Particle Capture requirement (P_t ~ 0.225 GeV/c)
- Br = 20 T X **7.5** cm = 150 T cm ----- Br = 15 T X **10** cm = 150 T cm
- Fixed flux requirement (Aperture Requirement)
- Br^2 = 20 X 7.5^2=1125 T cm^2 ------ Br^2 = 15 X 10^2=1500 T cm^2
- MARS simulations with 15 T peak field & new aperture settings (Taper R= 10-30 cm)



IDS120h 15 T Peak Field (10^5 initial N_P)

Z (end of taper) [cm]	Bz [T]	N muons [10^4]
800	2.5	3.65
900	2.12	3.68
1000	1.85	3.692
1100	1.7	3.633
1200	1.66667	3.5195
1300	1.66667	3.4864
1400	1.66667	3.3733
1500	1.66667	3.2661
1600	1.5	3.2486
1862	1.5	3.0098

Muon Production IDS120h 15 T



Conclusion

- Promising results for 15 T Peak field at target
- Final delivery of muons has potential dependency on taper field shape & final const. field decay channel
- To be done:
  - Investigate tapering field
  - Consider length of tapering in optimization