Particle Production of Mercury Target with 15Tto2T5m Configuration at 6.75 GeV

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Target Studies
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Target Setting

- 15Tto2T5m Configuration and Fieldmap (15T➔2T);
- Code: MARS15(2014) with ICEM 4 = 1;
- Proton beam: 6.75 GeV (KE) and launched at z = -100 cm, Focal beam with waist at z= 0 m and emittance of 5 μm;
- Production Collection: (50 m downstream, 40 MeV < KE < 180 MeV).
- Mercury target
- BR/TR=0.3

Energy Card Setting

- ENRG E0 EM EPSTAM EMCHR EMNEU EMIGA EMIEL

  E0: The incident particle kinetic energy;

  EM: The hadron threshold energy (Default: 0.0145 GeV);

  EPSTAM: The star production threshold kinetic energy (Default: 0.03 GeV);

  EMCHR: The threshold energy applied collectively to muons, heavy ions and charged hadrons (Default: 0.001 GeV);

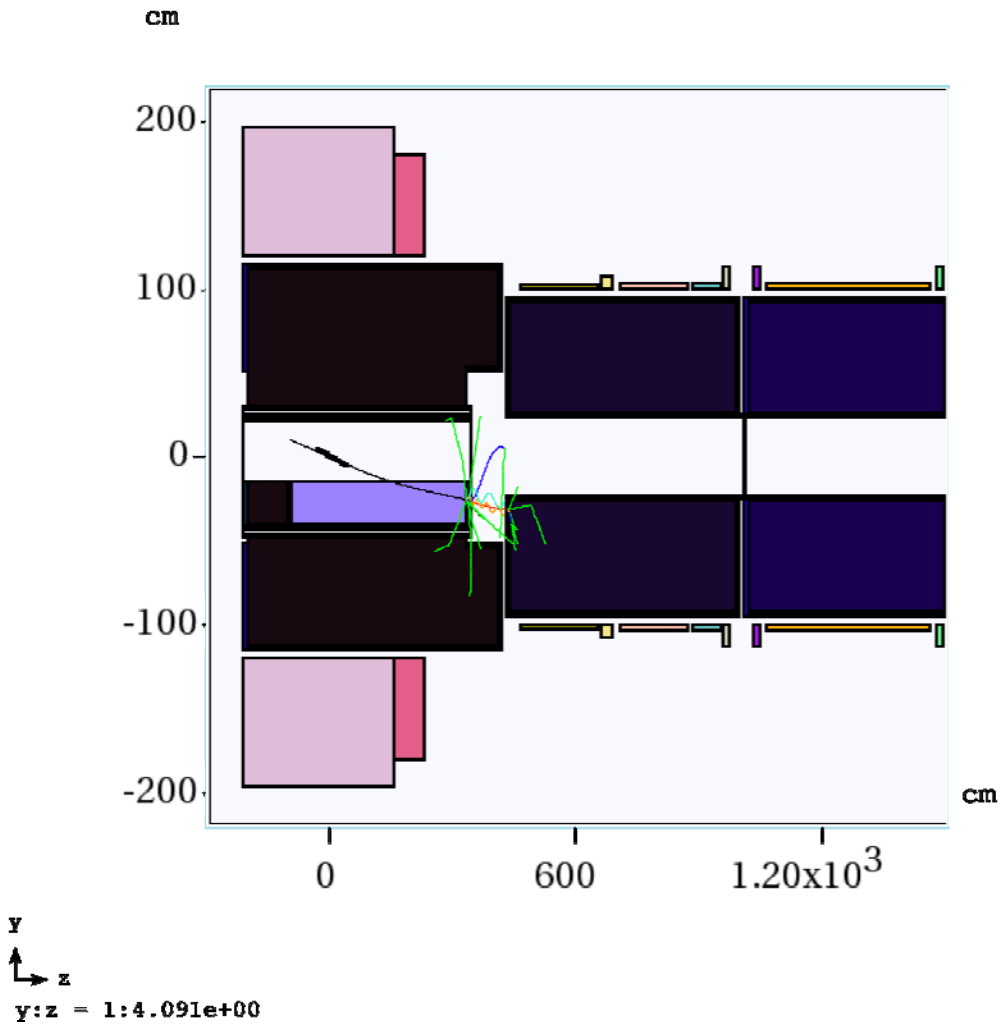
  EMNEU: The threshold energy for neutrons (Default: 10^{-4} GeV)

  EMIGA: The threshold energy for γ (Default: 10^{-4} GeV);

  EMIEL: The threshold energy for $e^{\pm}$ (Default: $5*10^{-4}$ GeV)

  Use non-default setting: ENRG 1 = 6.75, 2 = 0.02, 3 = 0.3, 4 = 0.01, 5 = 0.05, 6 = 0.01, 7 = 0.01

Configuration
(beam is below target)

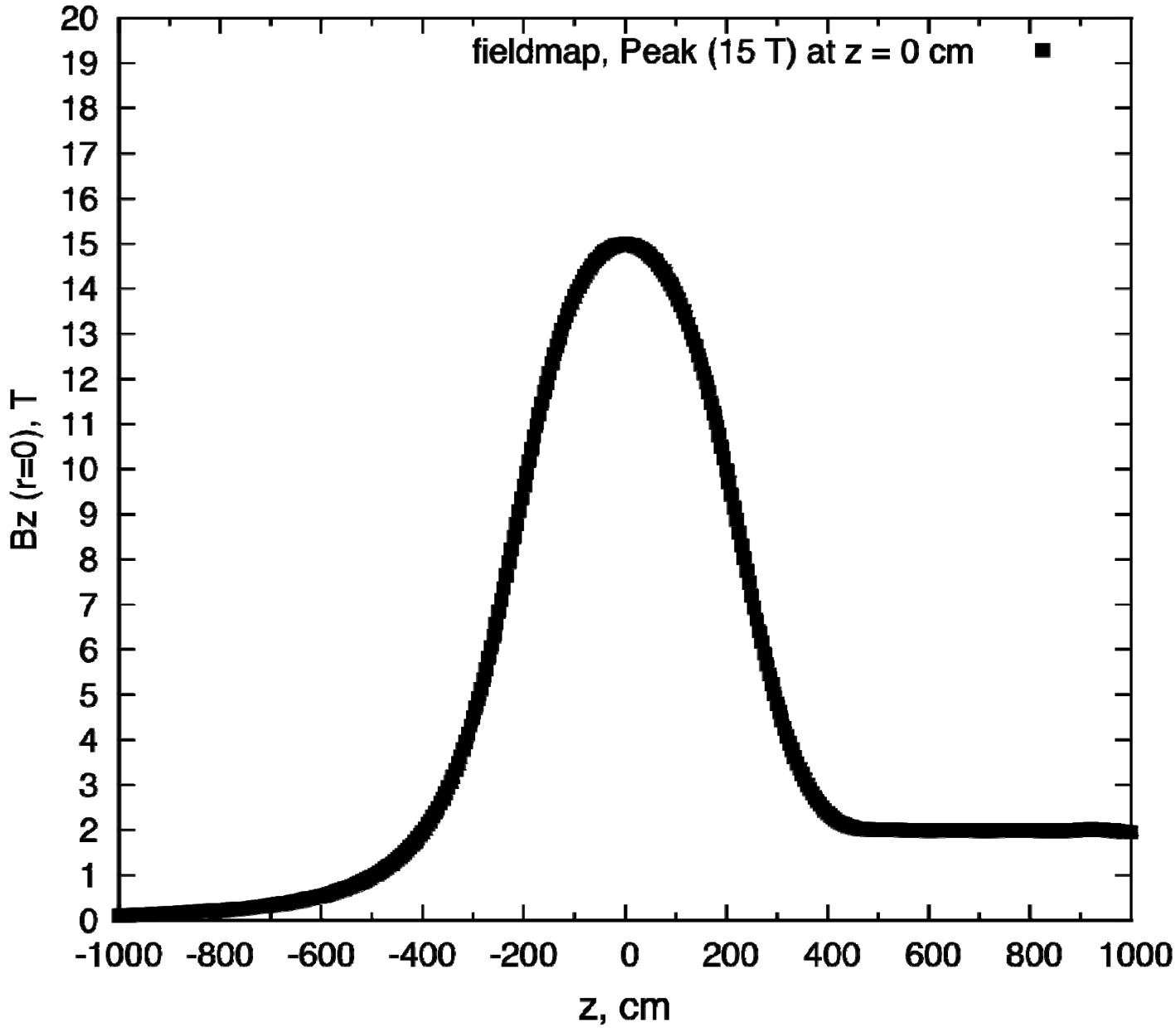


No Resistive Copper;

Beam ray tracking with beam angle of 110 mrad and no beam dump.

Surface of Hg pool: 15 cm.

Fieldmap (SC axis)



Preliminary Production comparison

(10000 events)

- Carbon (length: 80 cm, target radius: 0.8 cm (TR/BR=4); beam angle: 65 mrad; crossing angle: 0 mrad) at 20Tto2T5m;

  Production: 1224

- Hg (target radius: 0.52 cm (TR/BR=4), beam angle: 110 mrad; crossing angle: 26 mrad) at 20Tto2T5m;

  Production: 1609

- Hg (target radius: 0.52 cm (TR/BR=4) , beam angle: 110 mrad; crossing angle: 26 mrad) at 15Tto2T5m

  Production: 1394

Work plan

- Find optimized target (Hg, BR/TR=0.3) parameters of (target radius, beam angle and crossing angle) at 5 μm (and other emittances?) and compare particle production with Carbon target at 20T.
- Consider the gravity effect of Hg jet on meson production.
- Work on Gallium target.