Particle Production of Carbon Target with 20Tto2T5m Configuration at 6.75 GeV (Updated)

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Target Studies
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Target Setting

- 20T to 2T5 m Configuration (initial beam pipe radius of 13 cm) and Fieldmap (20T ➔ 2T) and no beam dump;
- 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 5μm;
- Production Collection: (1.2 m downstream, 40 MeV < KE < 180 MeV).
- Graphite density = 1.8
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 $\gamma$ (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**
Particle Production vs Target Length

Co-linear of target and beam.

TR=0.7 cm and TR/BR=4

Target angle at 130 mrad
Particle Production vs Target Radius

Co-linear of target and beam.

TR/BR=4

Target angle at 130 mrad

20T to 2T5m: target length at 80 cm
Particle Production vs Beam Angle
(20Tto2T5m Configuration)

20Tto2T5m: Co-linear of target and beam.

TR/BR=4
target length at 80 cm and target radius at 0.7 cm

[Optimization for radius 0.9 cm has not converged yet.]
Energy Spectra of $\pi^\pm$, $K^\pm$, $\mu^\pm$

Which KE range is used for particle collection at $z=1.2\,\text{m}$ and $z=5\,\text{m}$?

(1.2 m downstream, 40 MeV $< \text{KE} < 180\,\text{MeV}$) seems not suitable.
Positive yield is a little higher than negative yield.
Remaining Protons

![Graph showing remaining protons versus kinetic energy for different distances.](image)
Single Particle Tracking (no target) (XZ plot)
Single Particle Tracking (no target) (YZ plot)
Beam Dump (z range: 40-100 cm?)

Z=40 cm, x=-0.814 cm, y=-5.144 cm; Z=100 cm, x=-4.58 cm, y=-11.918 cm
X=-tan(0.062)*(z-40)-0.814; Y=-tan(0.1124)*(z-40)-5.144
Beam Dump (same radius to target radius?)