Meson Production by a Carbon Target at 3 GeV

X. Ding, UCLA

Target Studies
June 13, 2013
Carbon target with a tilt angle to SC solenoid axis

- Fieldmap: (IDS120h, 13.2m, 20T \(\Rightarrow\) 1.5T)
- Carbon target with a cylindrical shape (or rod). Nuclear Interaction Length (42.9 cm).
- Rod with a small tilt angle to SC Solenoid axis. *Initial setting of target radius at 0.75 cm. Initial setting of tilt angle at 50 mrad.*
- Collection: (50m downstream, 40MeV<KE<180MeV)
- Proton Beam: KE at 3 GeV and launched at z=-100 cm. Beam/target intersection point at z=-37.5 cm.
Meson Production vs Target Length on Solenoid axis

Target radius: 0.75 cm
Beam radius: 0.1875 cm
Beam angle: 50 mrad
Crossing angle: 0 mrad

*Peak value of fit: 72 cm*
Meson Production vs Target Radius

Rod length on SC axis: 72 cm
Crossing angle: 0 mrad

Beam angle: 42 mrad
Target radius = \(4\times\) beam radius (TR/BR = 4.0)

Beam angle: 42 mrad
Target radius = \(3.5\times\) beam radius (TR/BR = 3.5)

Beam angle: 44 mrad
Target radius = \(2.5\times\) beam radius (TR/BR = 2.5)
Meson Production vs Target Radius

Rod length on SC axis: 72 cm
Beam angle: 42mrad
Crossing angle: 0 mrad
Beam radius: \( \frac{1}{4} \) target radius

Peak value of fit: 0.323 cm
Meson Production vs Beam Angle

Rod length on SC axis: 72 cm
Crossing angle: 0 mrad

Target radius=0.346cm (TR/BR=4.0)
Target radius=0.35cm (TR/BR=3.5)
Target radius=0.40cm (TR/BR=2.5)
Meson Production vs Beam Angle

Target radius: 0.346 cm
Target length: 72 cm
Beam radius: 0.0865 cm (¼ target radius)
Crossing angle: 0 mrad

Peak value of fit: 41 mrad
Energy Spectrum

Carbon Target at 3GeV:
- Target length: 72 cm
- Target radius: 0.365 cm
- Beam radius: 0.09125 cm
- Beam angle: 50 mrad
- Beam/target crossing angle: 0 mrad

Mercury Target at 8GeV:
- Target radius: 0.404 cm
- Beam radius: 0.1212 cm
- Beam angle: 117 mrad
- Jet angle: 137.6 mrad
- Beam/Jet crossing angle: 20.6 mrad
Comparison of Production

At 3 GeV, Carbon gives more production than Ga or Hg.
Summary

• Optimized target parameters for carbon target at 3 GeV: Target length on SC axis/72 cm, target radius/0.346cm, beam radius/0.0865cm, Beam angle/42 mrad, Crossing angle/0 mrad.

• At 3 GeV, Carbon target can gives more meson production than Ga or Hg.
BACKUP
Meson Production vs Crossing Angle

Target length: 72 cm
Target radius: 0.346 cm
Beam radius: 0.0865 cm
(¼ target radius)
Beam angle: 42 mrad

Peak value: ~ 0 mrad
Meson Production vs. Beam Radius

Target length: 70cm
Target radius: 0.62 cm
Beam angle: 50 mrad
Crossing angle: 0 mrad
Peak value: Beam radius smaller than a factor of 0.32 of target radius (<=0.20 cm) is favored.
PT Spectrum

Normalized Mesons (Positives + Negatives) at 0m

- Carbon, 3 GeV
- HG, 8 GeV