Meson Production by a Carbon Target at 3 GeV

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Target Studies

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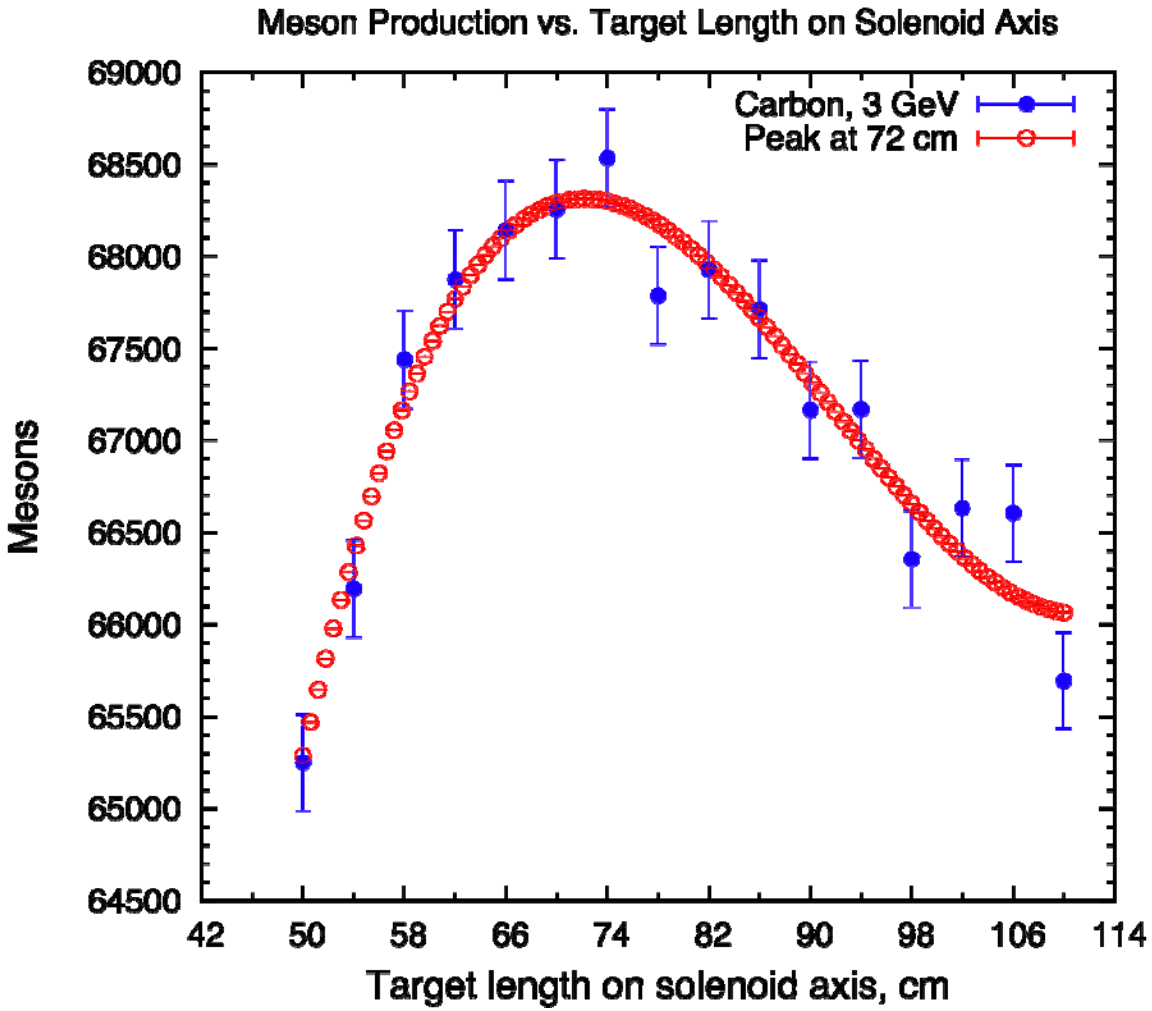
Carbon target with a tilt angle to SC solenoid axis

- Fieldmap: (IDS120h, 13.2m, 20T➔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.

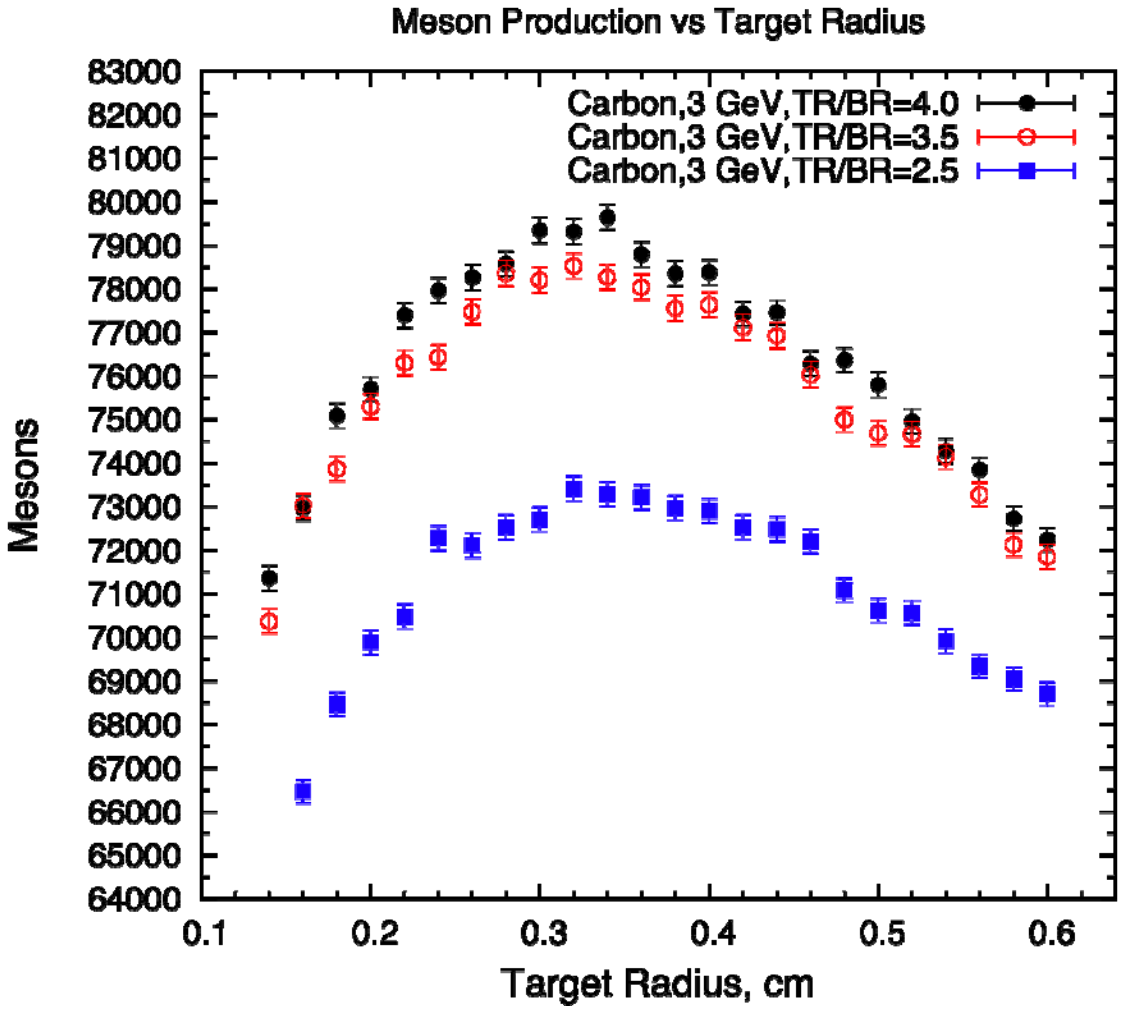
Meson Production vs Target Length on Solenoid axis



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

Peak value of fit: 72 cm

Meson Production vs Target Radius



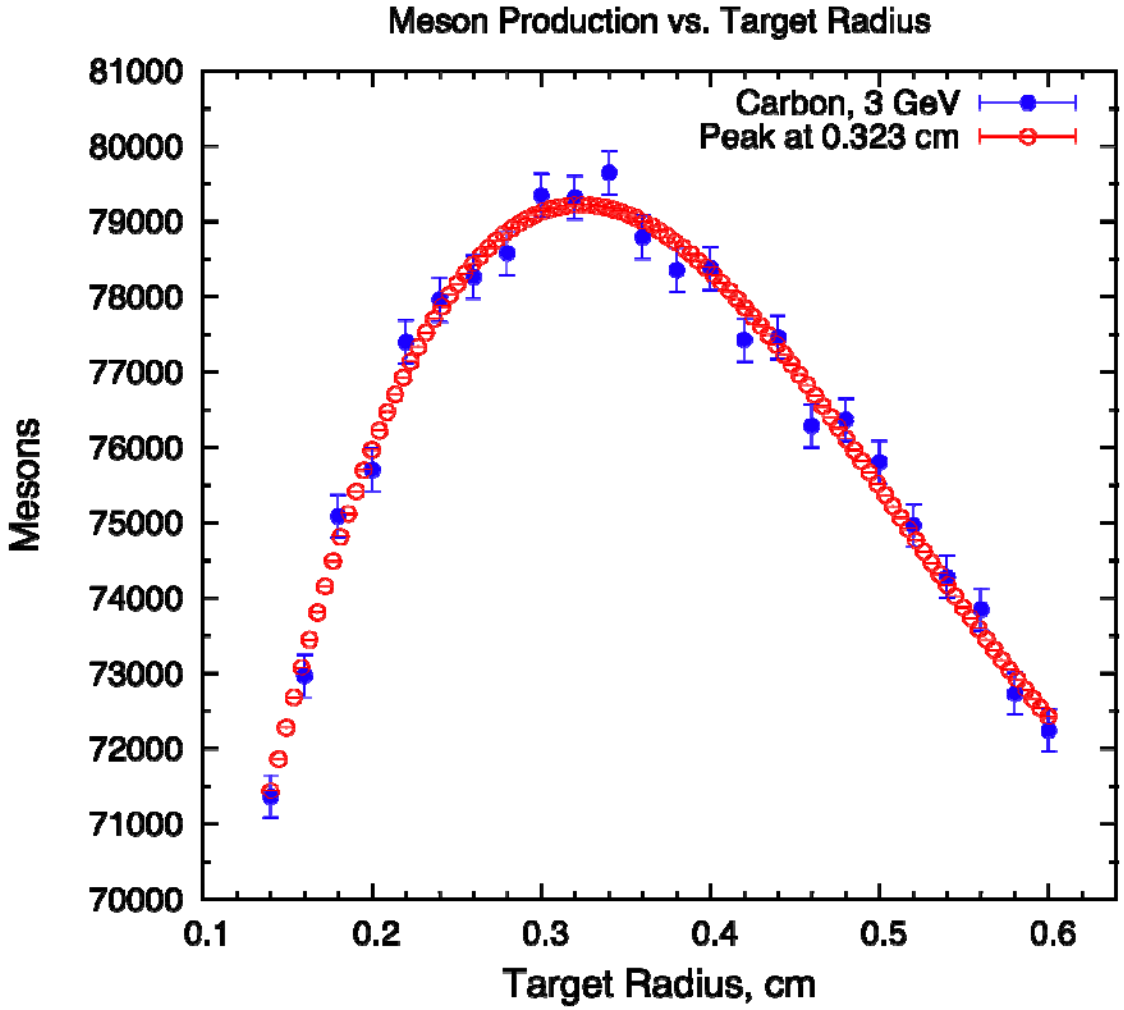
Rod length on SC axis: 72 cm
Crossing angle: 0 mrad

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

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

Beam angle: 44mrad
Target radius=2.5*beam radius (TR/BR=2.5)

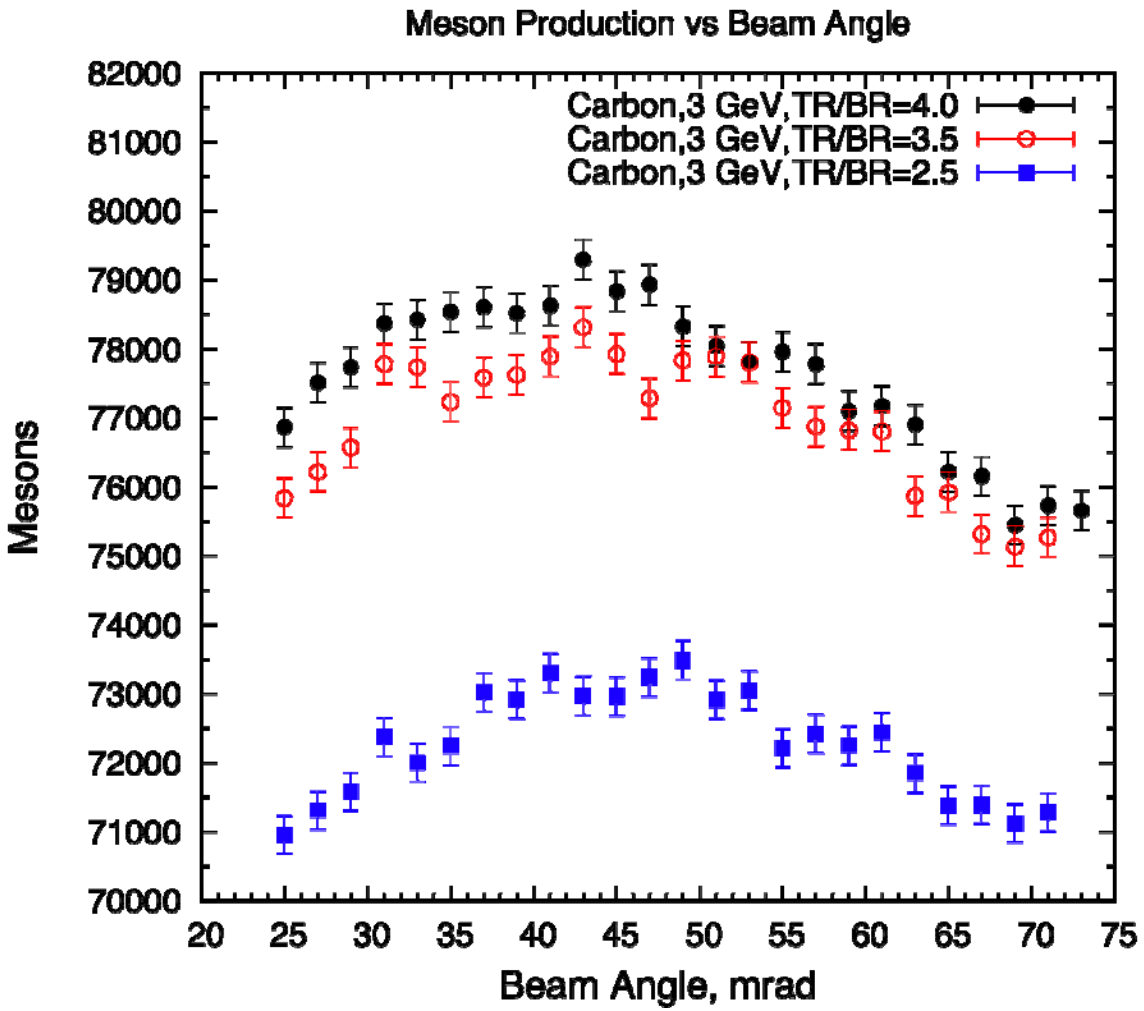
Meson Production vs Target Radius



Rod length on SC axis: 72 cm
Beam angle: 42mrad
Crossing angle: 0 mrad
Beam radius: ¼ target radius

Peak value of fit: 0.323 cm

Meson Production vs Beam Angle



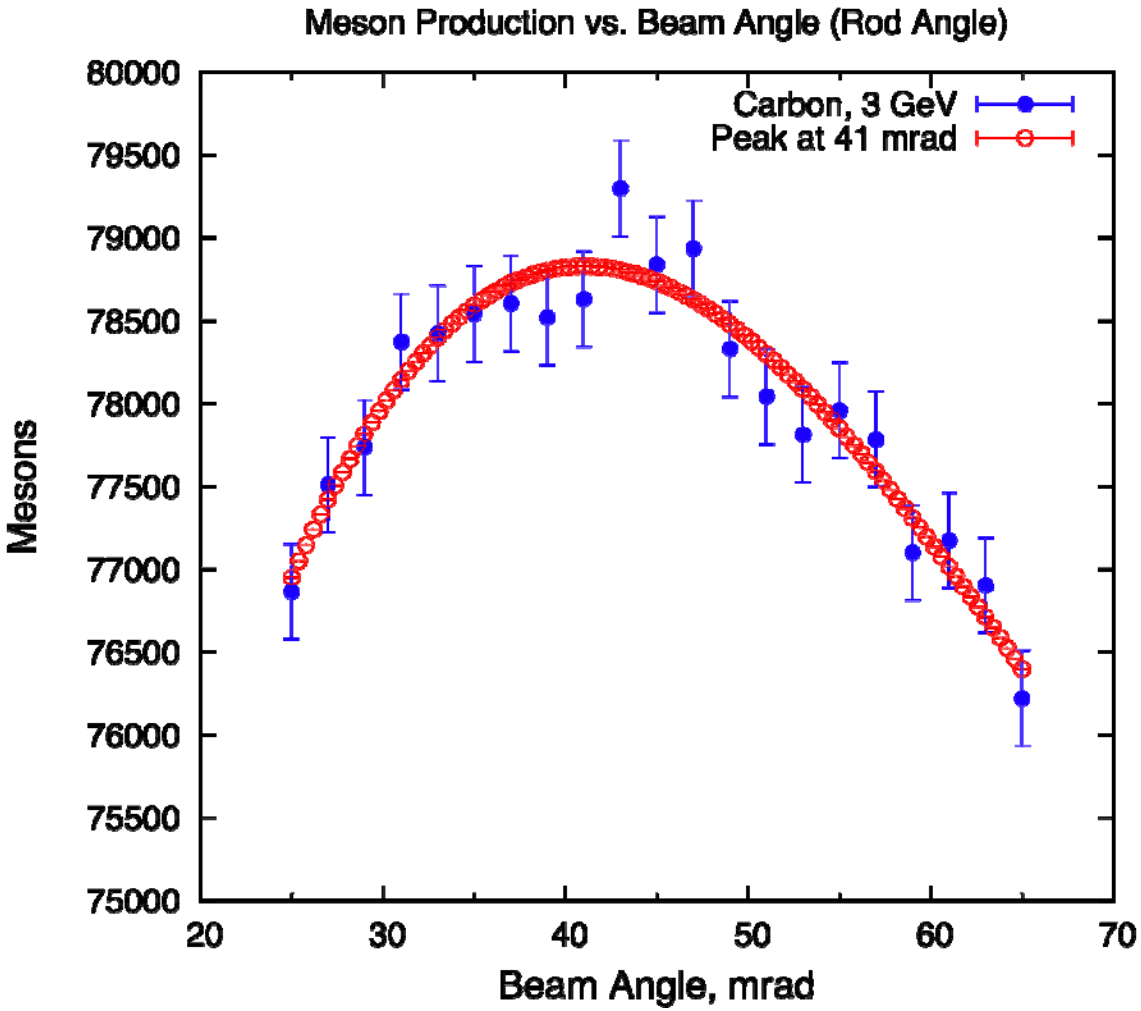
Rod length on SC axis: 72 cm
Crossing angle: 0 mrad

Target radius=0.346cm (TR/BR=4.0)

Target radius=0.35cm (TR/BR=3.5)

Target radius=0.40cm (TR/BR=2.5)

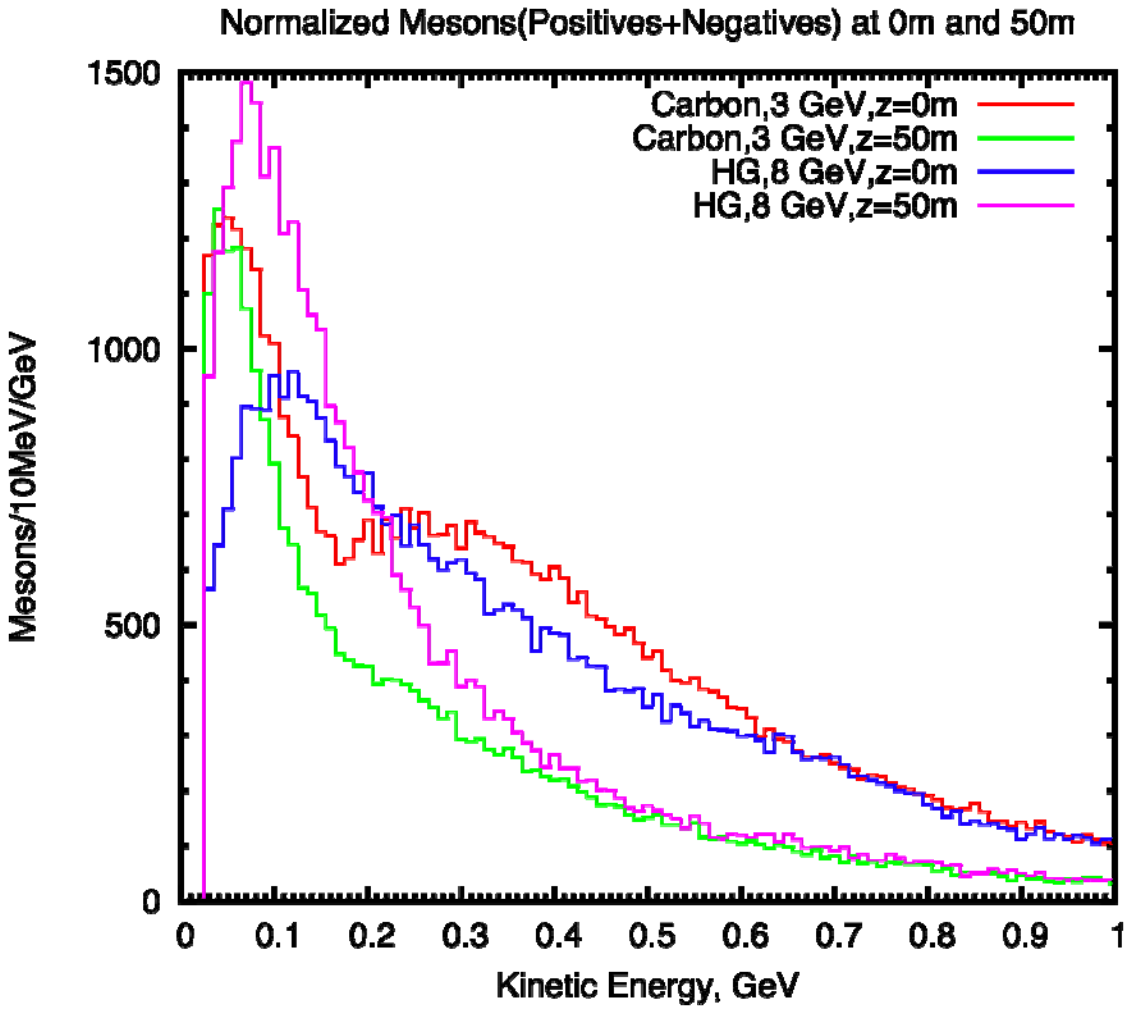
Meson Production vs Beam Angle



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

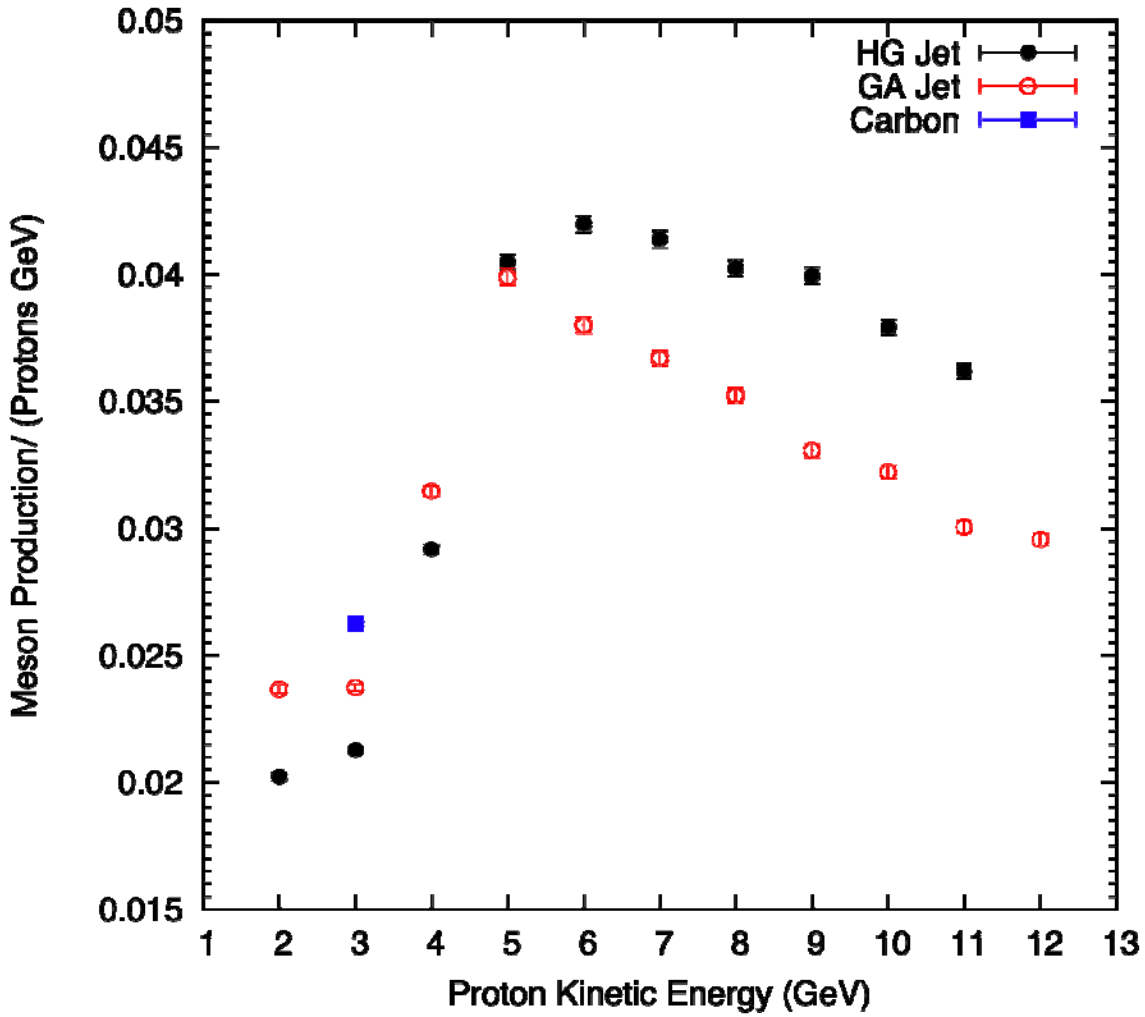
Energy Spectrum



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

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

Comparison of Production



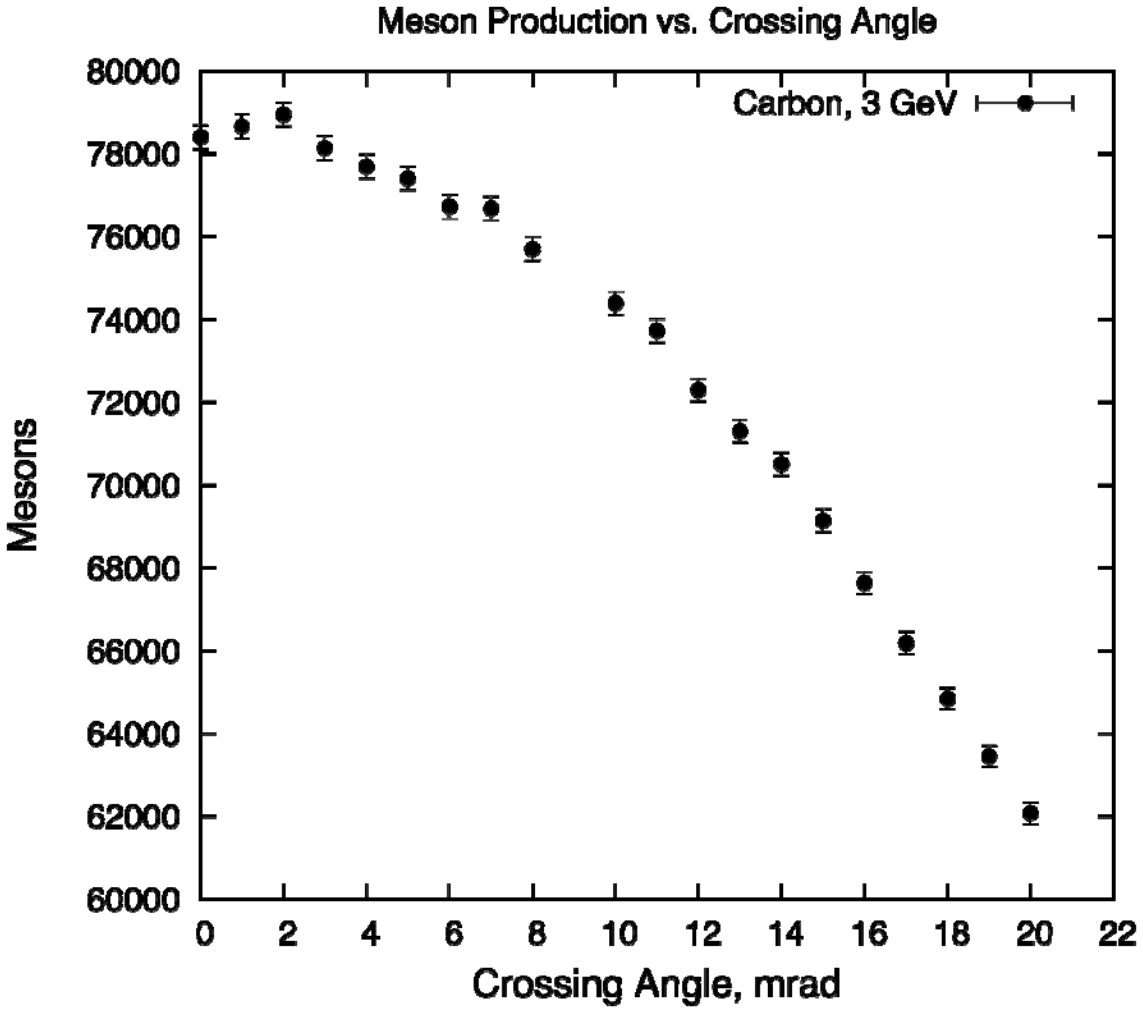
At 3 GeV,
Carbon gives more production than Ga or Hg.

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

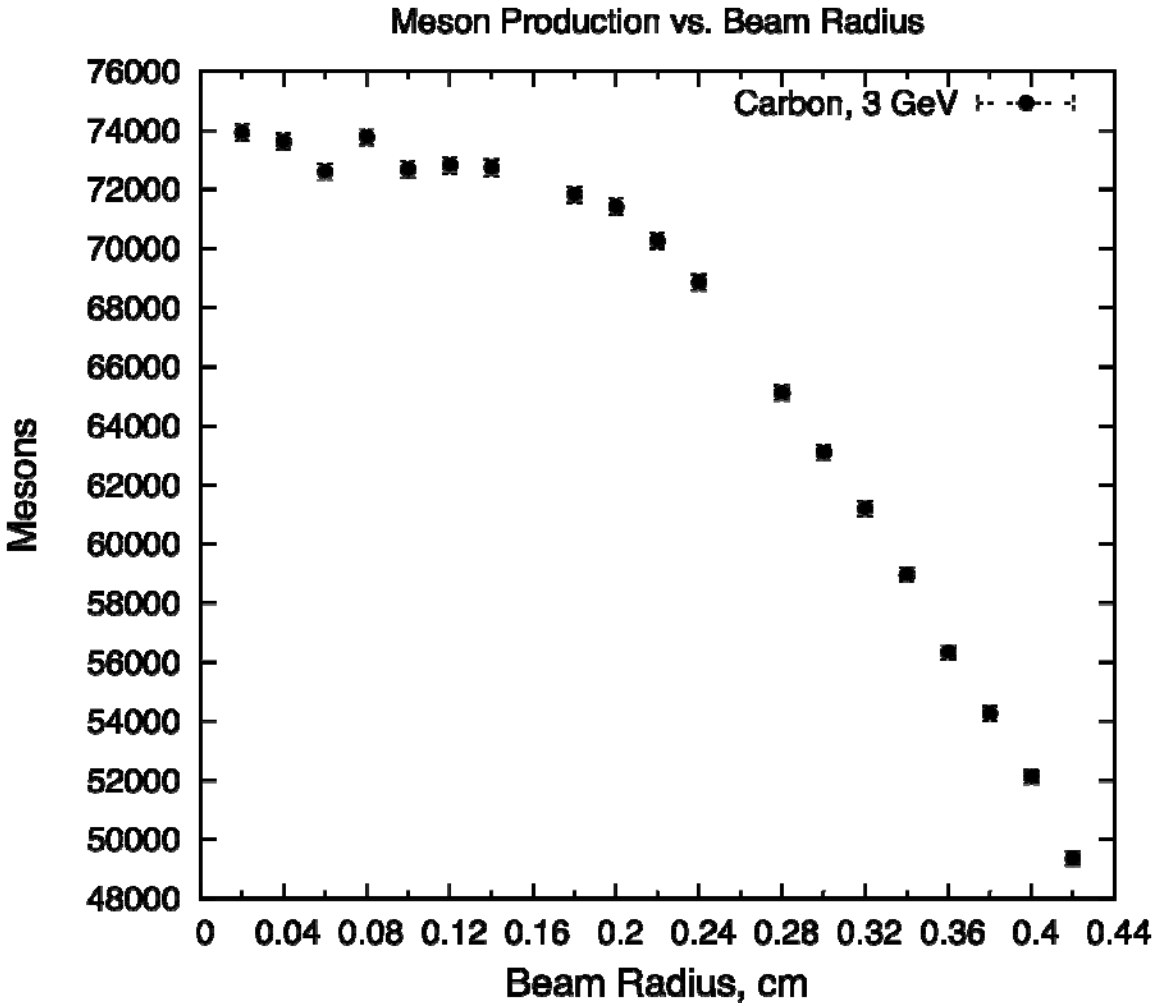
Meson Production vs Crossing Angle



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

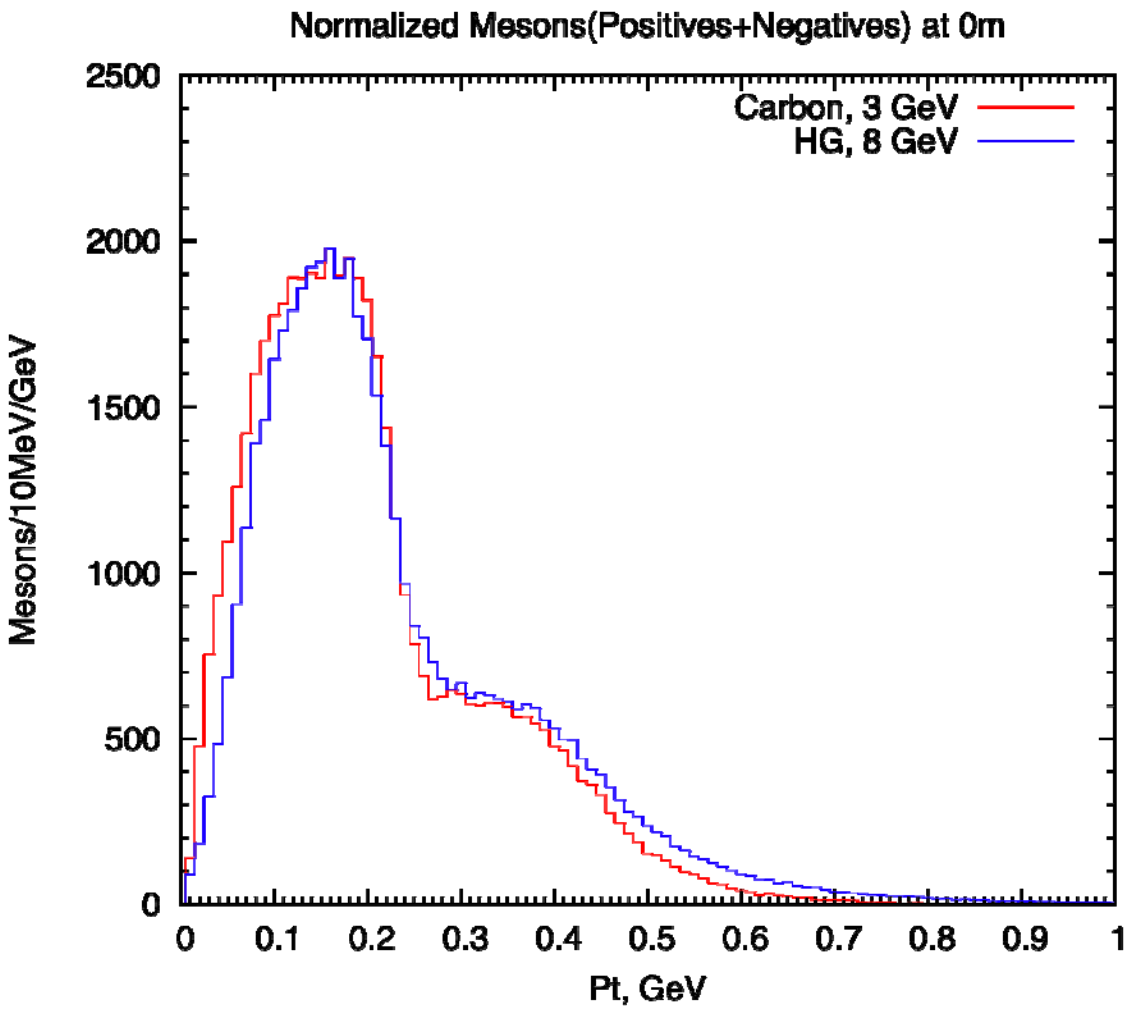
Meson Production vs. Beam Radius



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
Mesons/10MeV/GeV
2500
2000
1500
1000
500
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Pt, GeV