MARS Target Re-absorption Studies

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Introduction

• Update from last talk:
  – Investigation into structures of the previous π, μ yield vs z plots
    * Secondary peaks from proton beam hitting shielding
  – Checked π, μ yields for one 30 cm W rod vs 60 cm W rod at 50% density
  – Looked at reducing density of W “jet” by 50%

• Reminders:
  – Proton beam (E=10 GeV) is inclined −67 mrad from z axis in \( x - z \) plane;
    \( x \) = vertical direction in MARS, \( z \) = horizontal axis along target
  – First rod centre at \( z = -15 \) cm, same as \( z \) position of (Study-II) Hg jet
    crossing proton beam (and intersecting \( z \) axis).
Proton beam passing through one W rod
\( d = 1 \text{ cm}, \ r_{\text{beam}} = 1.5 \text{ cm} \)

\( \pi \) produced from one rod (and shielding - reason for 2nd peak in yield plots)

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\[\pi\] and \(\mu\) yield for one 30 cm W rod (\(d = 2\) cm); \(r_{\text{beam}} = 1\) cm

\[\pi\] and \(\mu\) yield for one 60 cm W rod at 50\% density (\(d = 2\) cm); \(r_{\text{beam}} = 1\) cm
- W “jet”-beam overlap (∼30 cm) and nominal W jet full length (up to shielding).
- W jet inclined −100 mrad from z axis.
- Beam has radius of 0.15 cm.
- W jet radius is 0.5 cm.
- Absorption ratio = Overlap plot/Nominal plot
• 50% density W “jet”-beam overlap (~30 cm) and nominal 50% density W jet full length (up to shielding).
• W jet inclined −100 mrad from z axis.
  • Beam has radius of 0.15 cm.
  • W jet radius is 0.5 cm; 50% density.
• Absorption ratio = Overlap plot/Nominal plot
Summary

- Not all pions produced in one rod escape it; reason for first peak in the yield plots
  - Peak position is sum of π inside the rod, yield just after peak is (smaller) sum of π just outside the rod

- Secondary peaks in π, μ yield plots from proton beam passing through the target material and hitting the shielding

- Differences between one 30 cm rod and another 60 cm rod at 50% density; the latter has less π, μ yield

- π, μ yields from W “jet” at 50% density slightly less than those for normal density, but not by a factor of two.