Target Studies July 11-17, 2014

I. Effect of Increased Beam Emittance

II. Shielding of the Final Focus Quads

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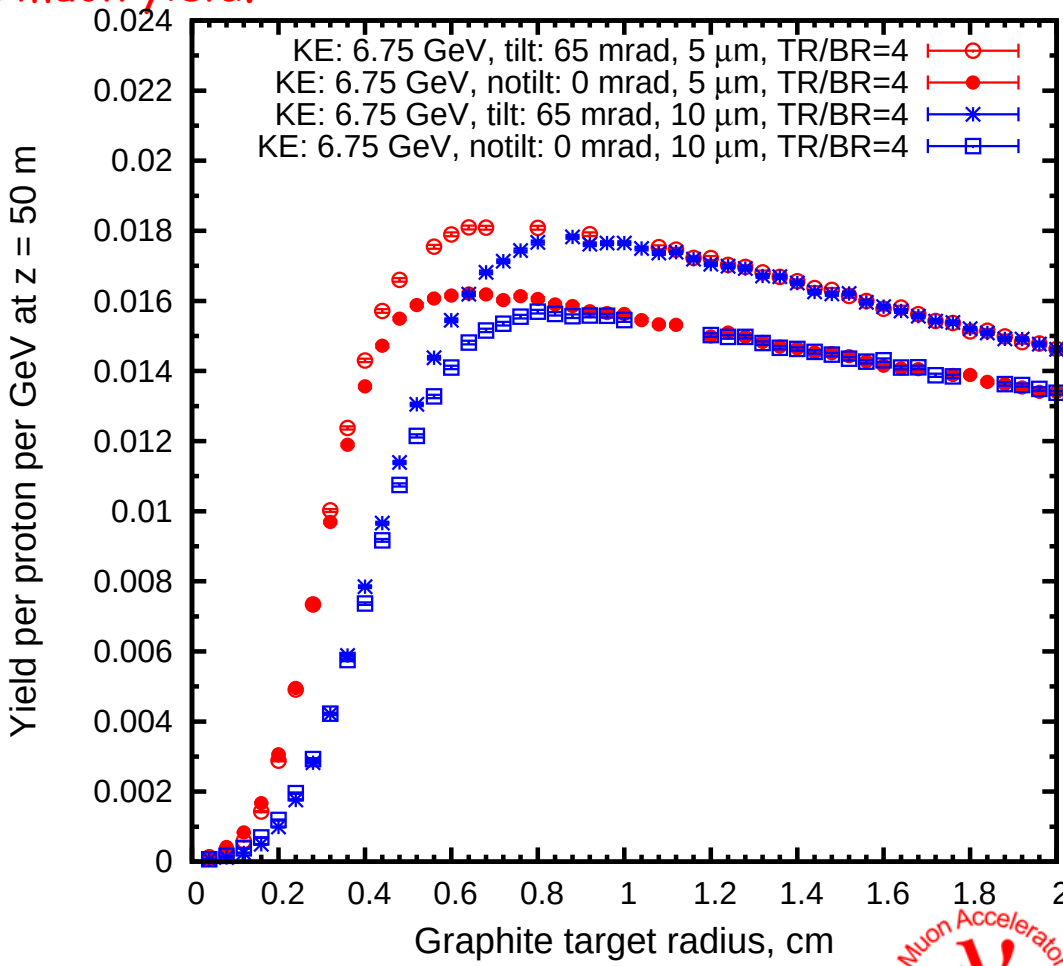
Effect of Increased Beam Emittance (X. Ding)

At 6.75 GeV kinetic energy, beams of nominal geometric transverse emittance = 5 μm may not be possible with powers above 1 MW at 60 Hz rep rate (K. Gollwitzer), due to space-charge emittance blowup.

The longer graphite target (80 cm), compared to 30 cm for a mercury target, may permit use of larger emittance beam with little loss in muon yield.

Optimization via MARS15 indicates only slight loss in yield on doubling the transverse emittance from 5 to 10 μm.

Slightly larger target/beam radius is favored at larger emittance, ⇒ smaller β*,
⇒ Larger beam size in the Final-Focus quads.



Shielding of the Final Focus Quads (N. Souchlas)

Fringe field of the 20-T Target System solenoid is still 1 T at z = -5 m, the possible location of the last Final-Focus quad, ⇒ Use superconducting quads,

⇒ Must shield against radiation from the target.

Preliminary MARS15 study indicates that a shield ~ 1 m long may be sufficient to protect the quad coils if their radius is ~ 12 cm (whereas coils with minimal radius of ~ 8 cm still intercept too much radiation that passes back up th⌣