

# Splitter Magnet in Muon1

# Main Source of $\Delta$ (Path Length)

- $\Delta L = 2(\text{hypot.} - \text{adjacent})$

- Hypot. =  $X/\sin \theta$

- Adjacent =  $X/\tan \theta$

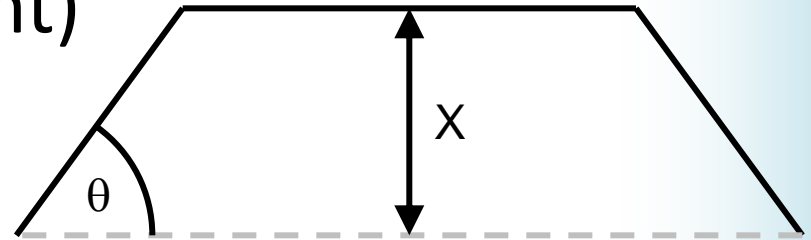
- =  $X \cos \theta / \sin \theta$

- So  $\Delta L = 2X(1 - \cos \theta) / \sin \theta$

- =  $2X(\theta/2 + \theta^3/24 + \theta^5/240 + \dots)$  [Wolfram Alpha]

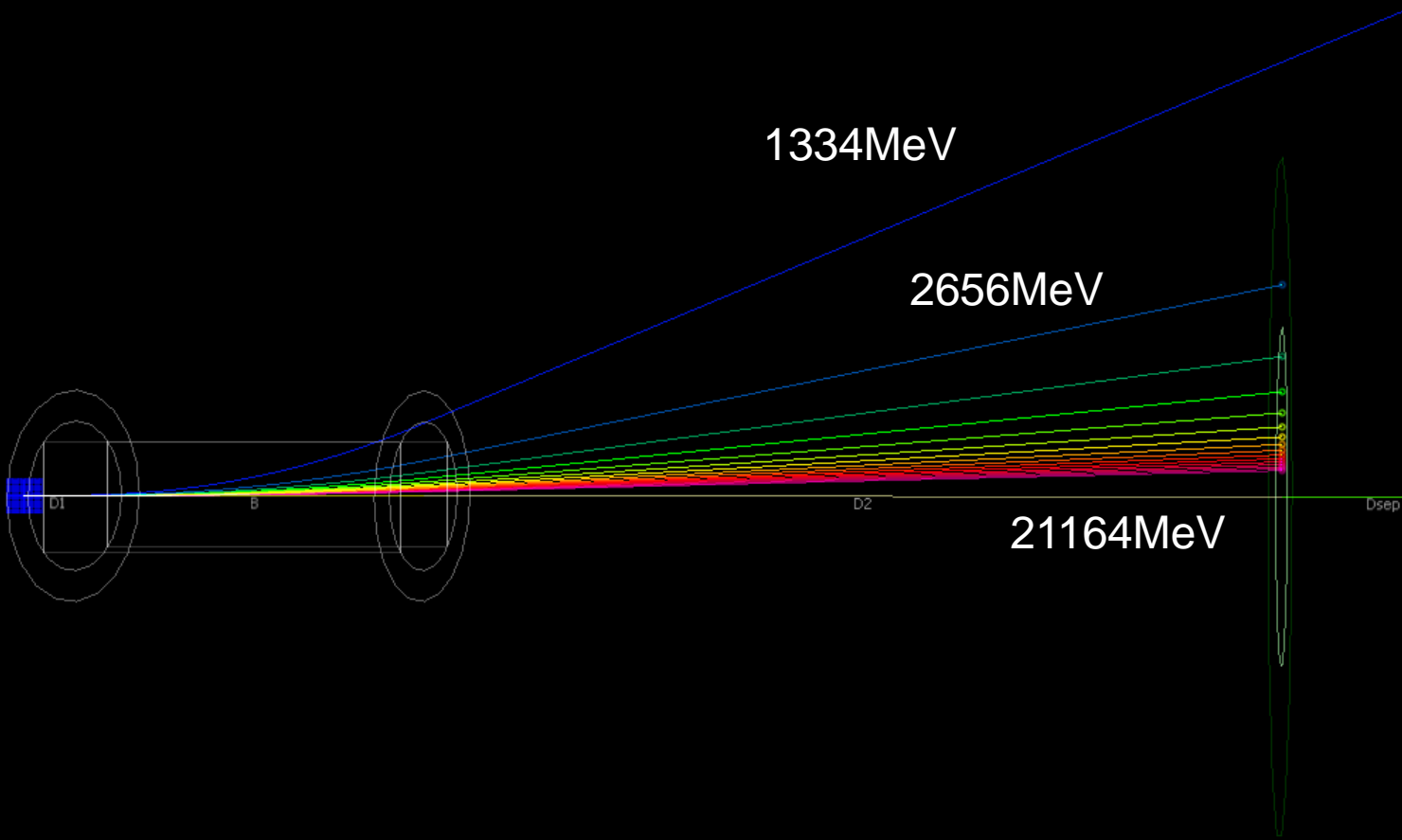
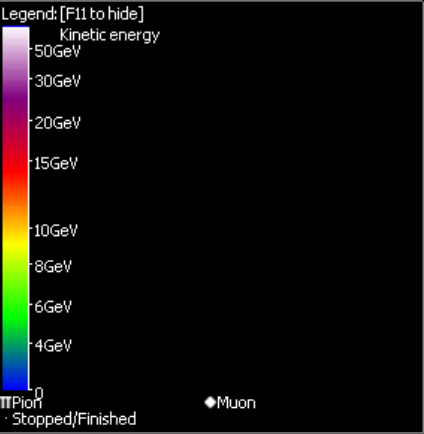
- Thus  $\Delta L = X\theta + X\theta^3/12 + X\theta^5/120 + \dots$

- I focus on reducing  $\theta$ , Nick reduced  $X$

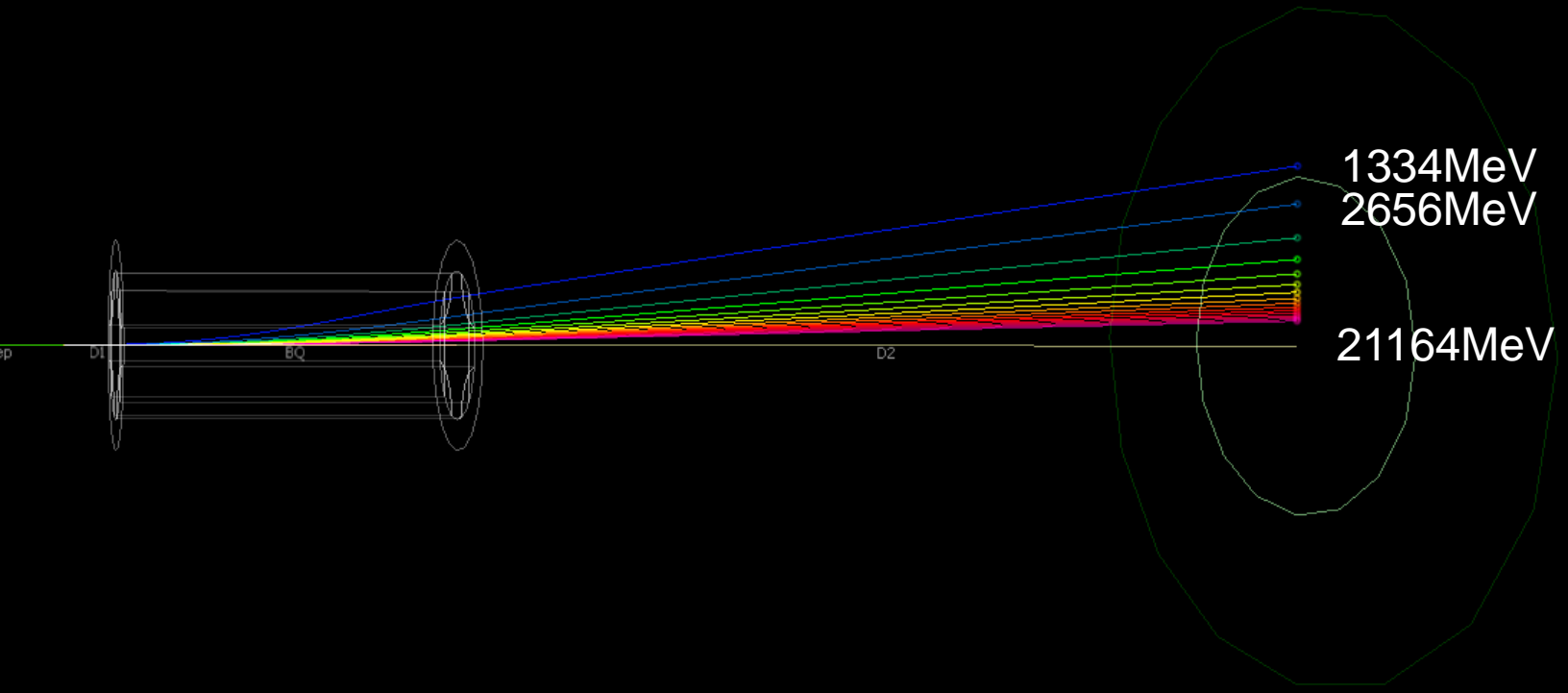


# 2m 0.92T dipole from Tsoupas design

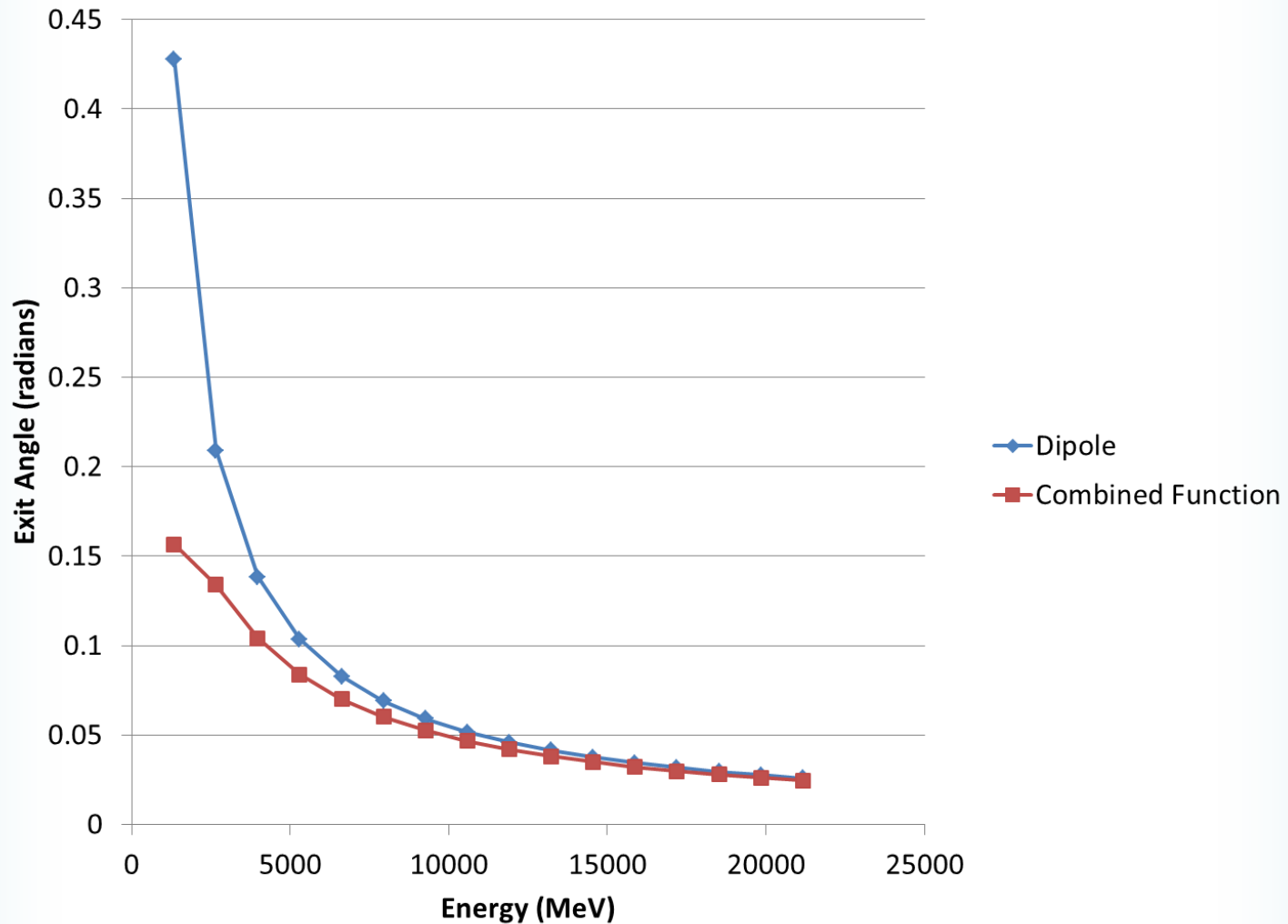
Horizontal and vertical to scale



2m 0.92T dipole with -5T/m gradient  
Higher energies move into lower (and  
even negative) field region



# Exit Angle as Function of Energy



# Dipoles Placed for $X=0.3, 0.4 \dots 1.8\text{m}$

IS  
Failed: 12.50%  
Lost: 0.00% Otherwise lost: 87.50% Wrong way: 0.00%

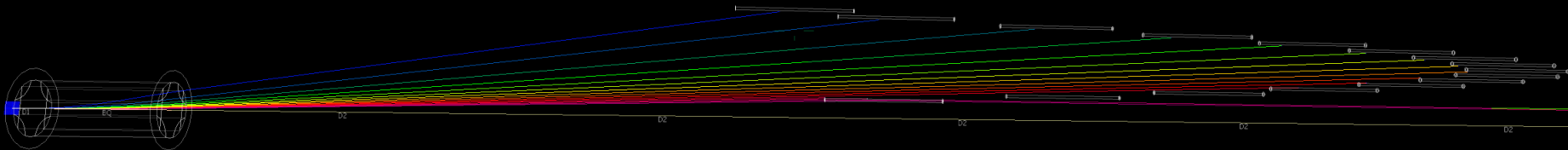
eRHIC/SplitterDipole  
Autosave (0.3m) 0.12.500%

Frame-rate: AUTO (1 / 40855)  
Particle size: AUTO (0.00000mm)  
Results database: 0 bytes (0 bytes since last send)

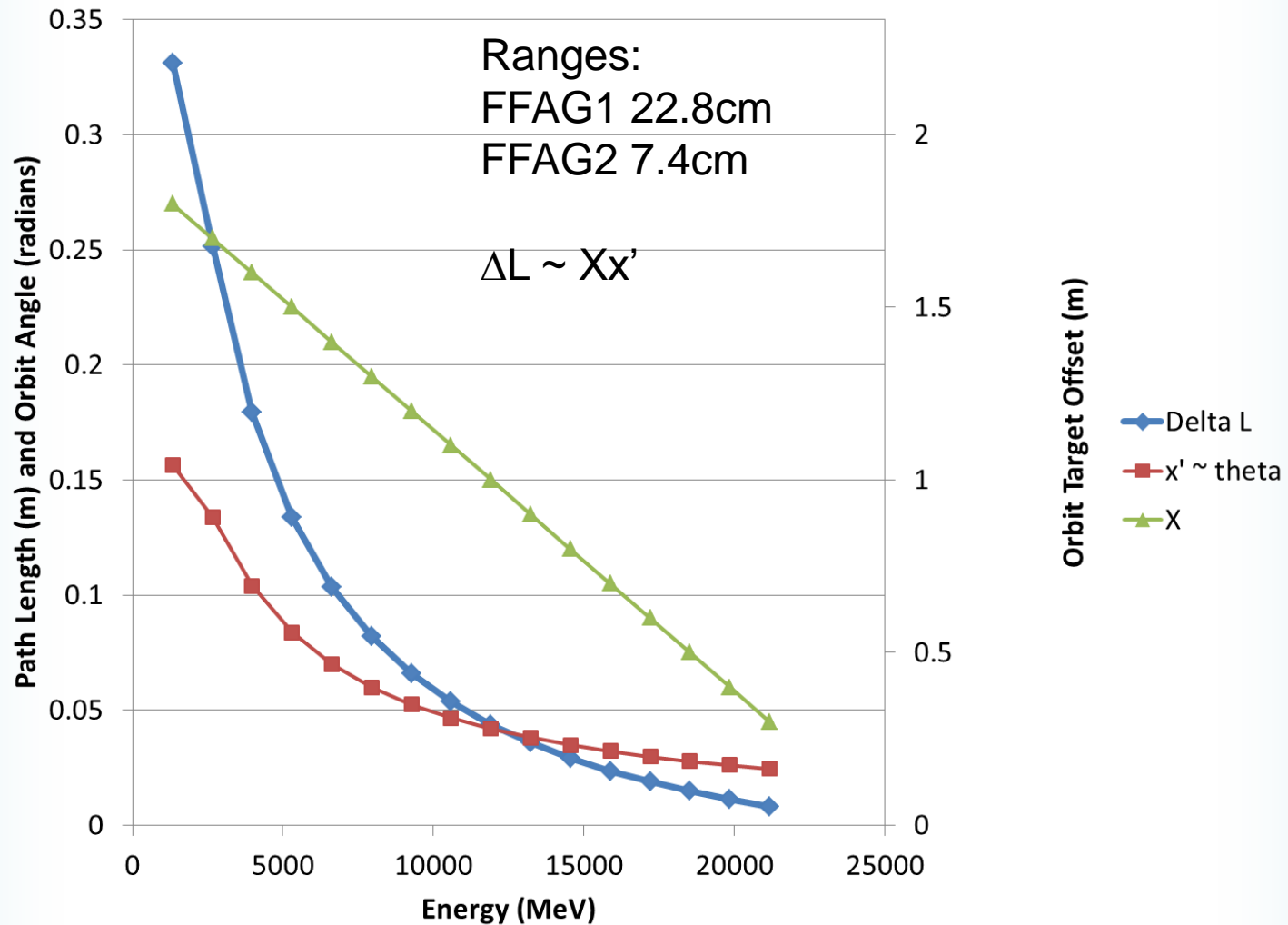
View: AUTO

2m dipoles with 0.344...0.866T are sufficient  
Furthest is centred 22.8m downstream from dipole exit

Need to be bent not rectangular, and narrow since  
high-energy lines only separated by ~2cm



# $\Delta(\text{Path Length})$ vs. Energy (C.Fn.)



# Reducing X for Lowest Energy

