

Splitter Magnet in Muon1

(Very slight update on Feb 3rd's slides)

Main Source of Δ (Path Length)

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

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

- Adjacent = $X/\tan \theta$

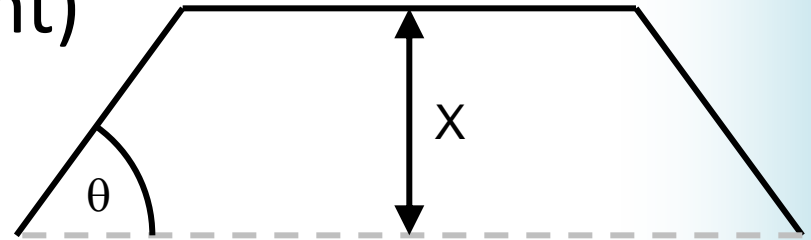
- = $X \cos \theta / \sin \theta$

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

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

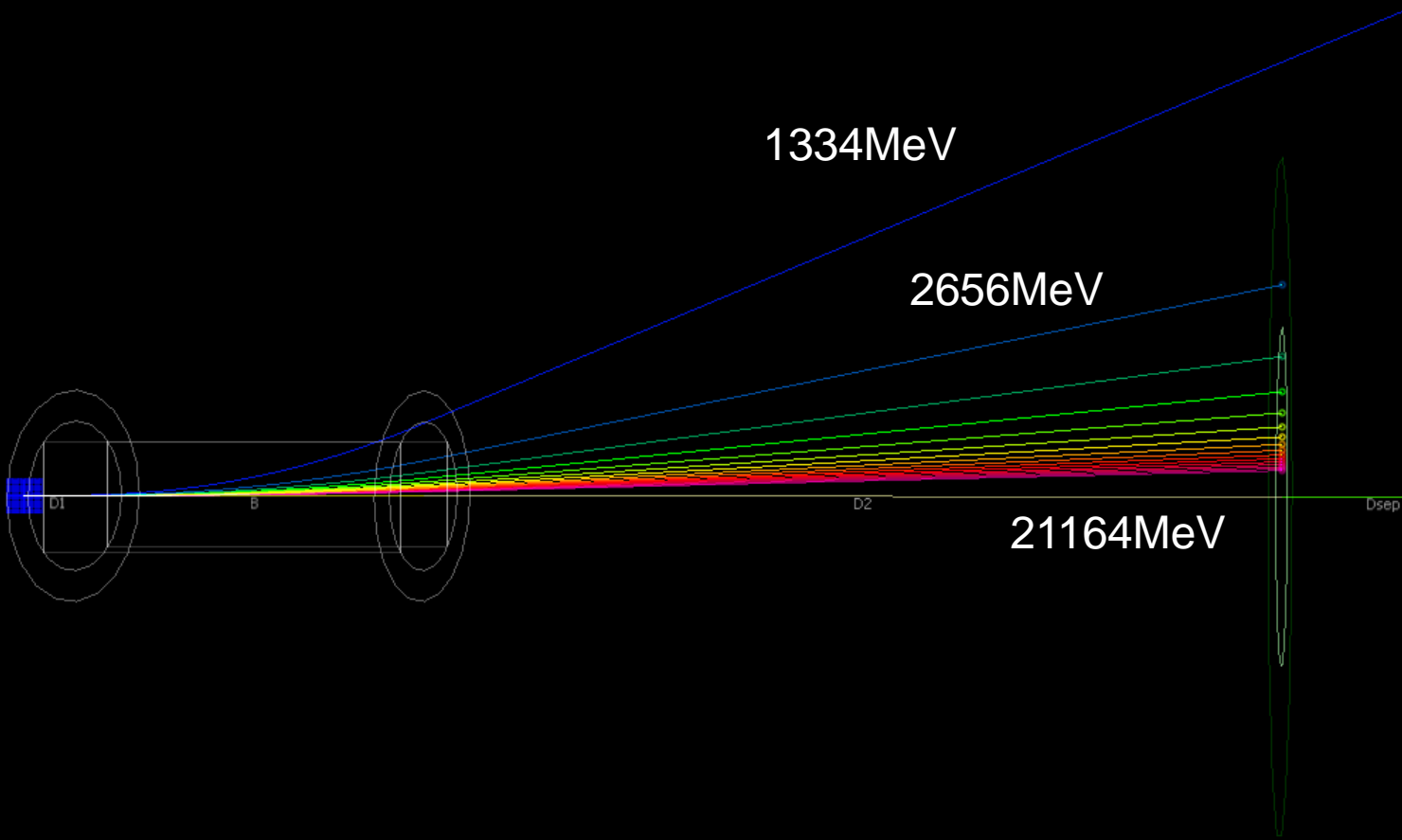
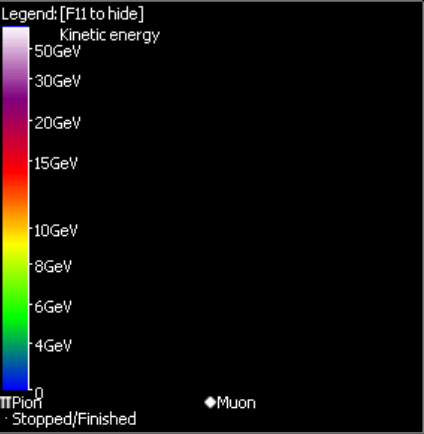
- Thus $\Delta L = X\theta + X\theta^3/12 + X\theta^5/120 + \dots$

- I focus on reducing θ , Nick reduced X

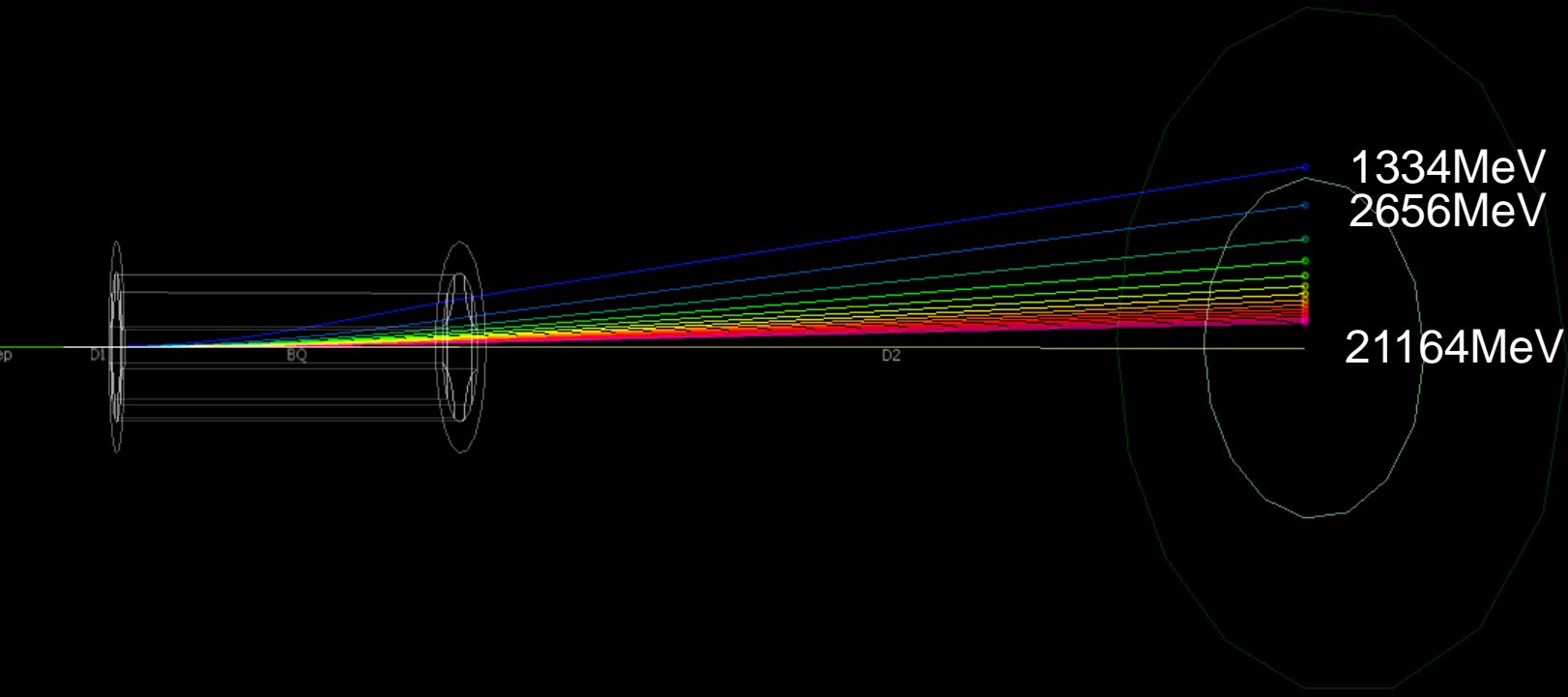


2m 0.92T dipole from Tsoupas design

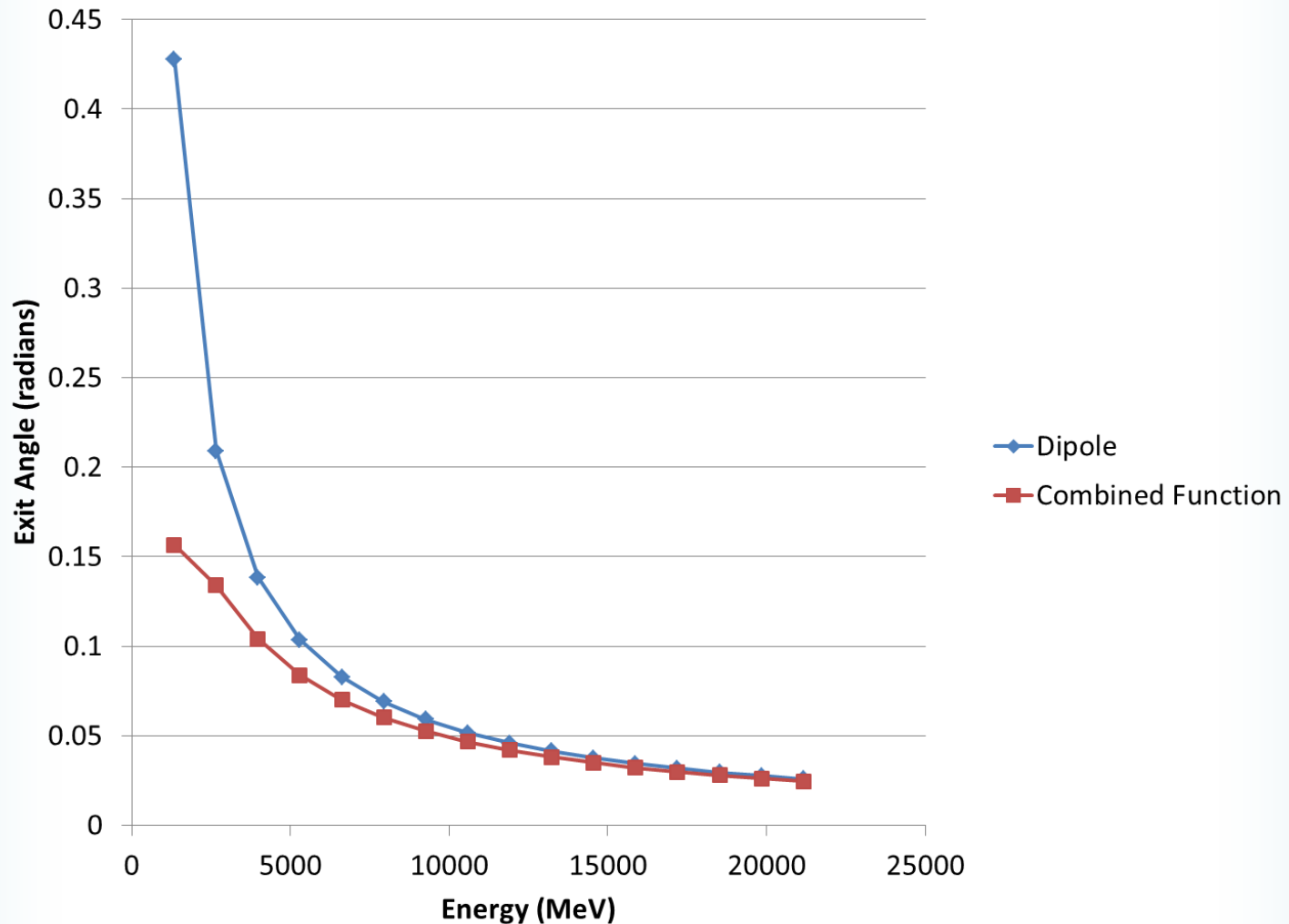
Horizontal and vertical to scale



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%

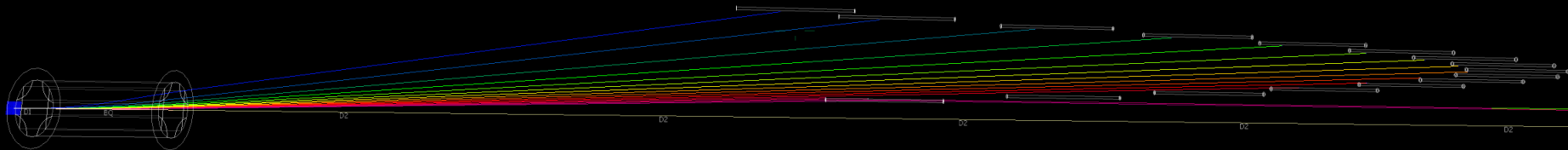
eRHIC/SplitterDipole
Autosave (0.3m) 0.12.500%

Frame-rate: AUTO (1 / 40955)
Particle size: AUTO (0.00000mm)
Results database: 0 bytes (0 bytes since last send)

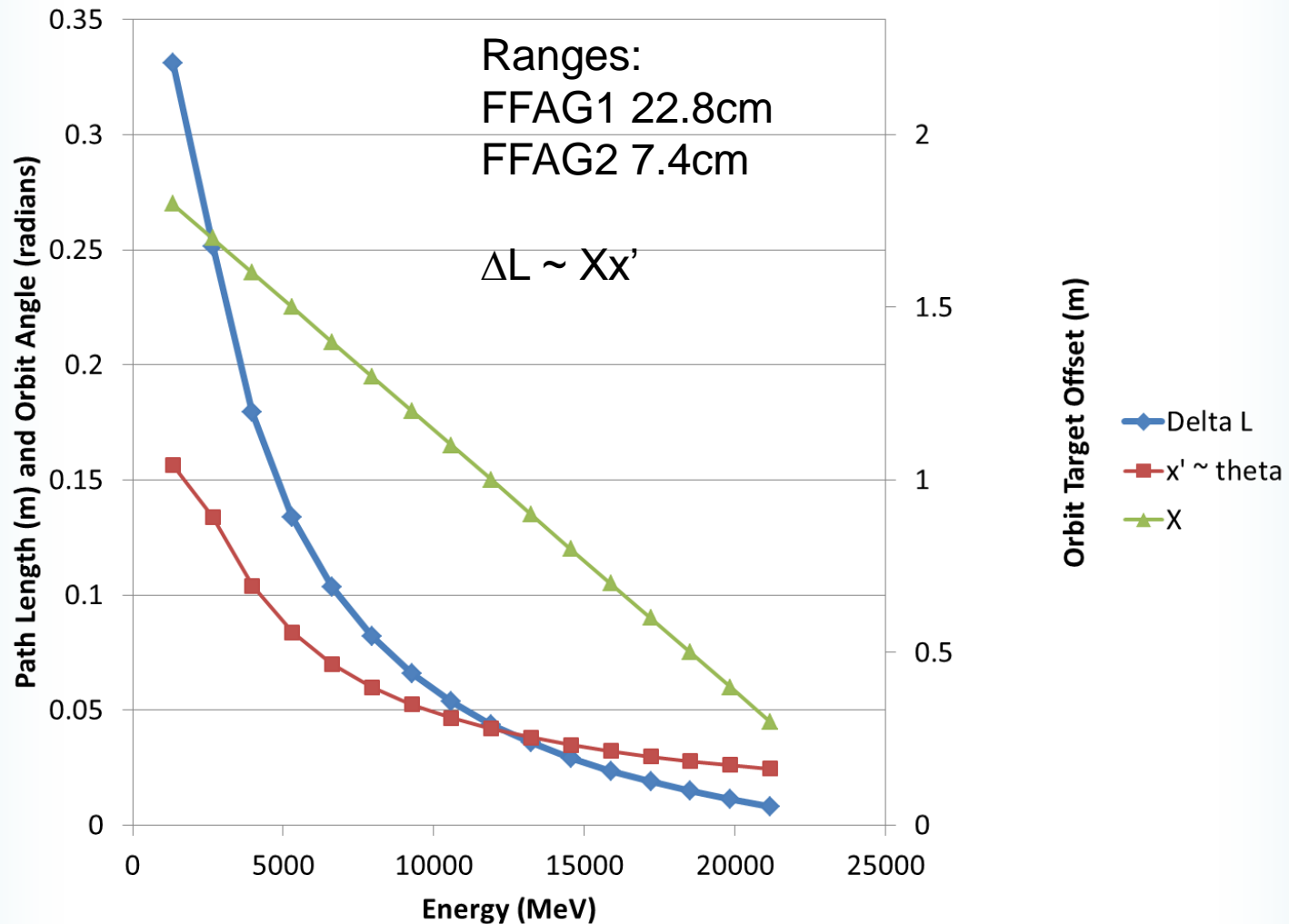
View: AUTO

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

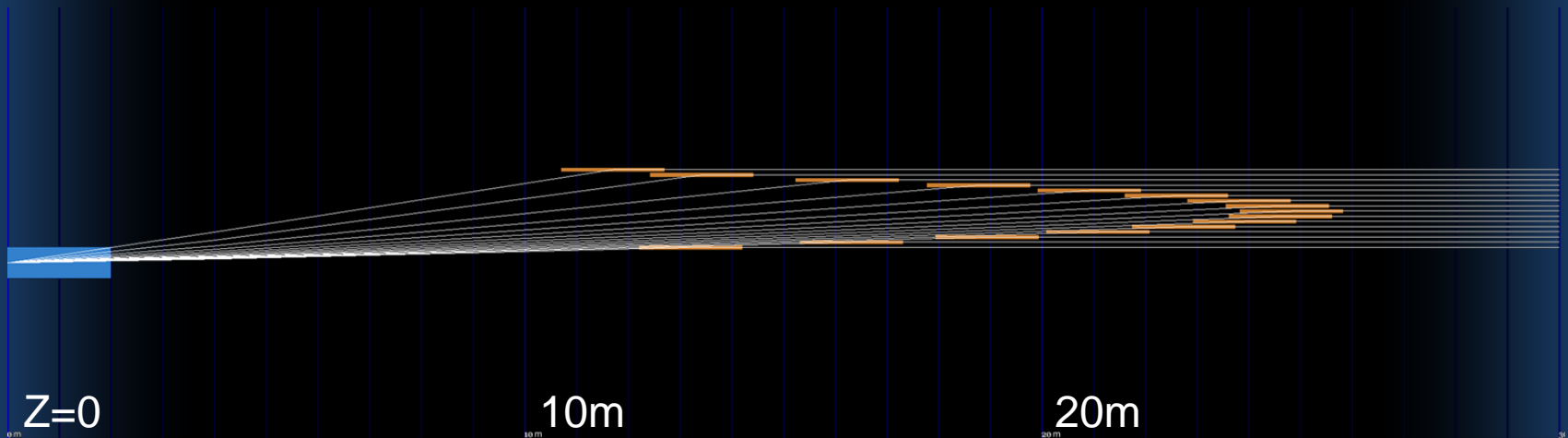
Need to be bent not rectangular, and narrow since
high-energy lines only separated by ~2cm



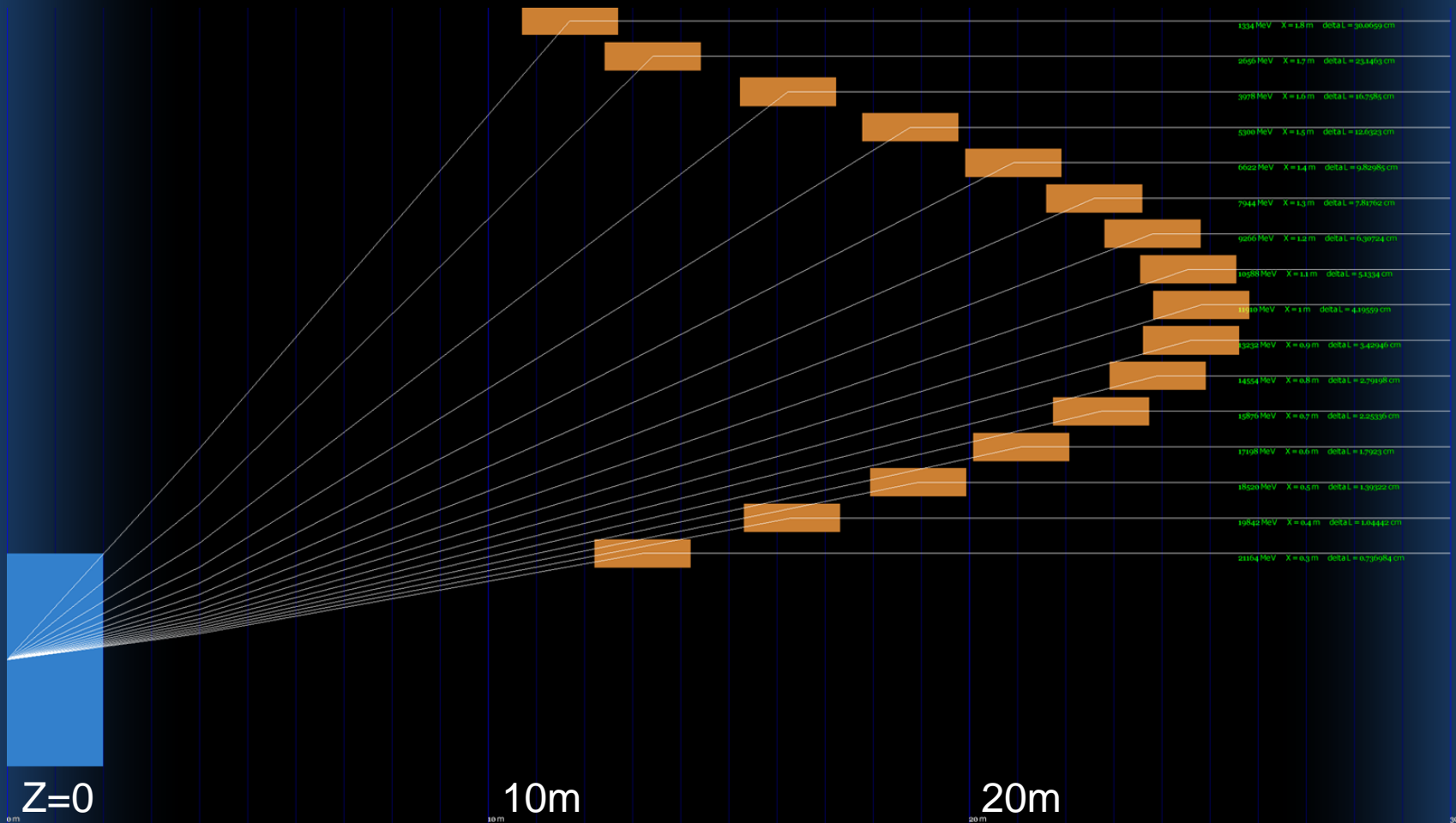
$\Delta(\text{Path Length})$ vs. Energy (C.Fn.)



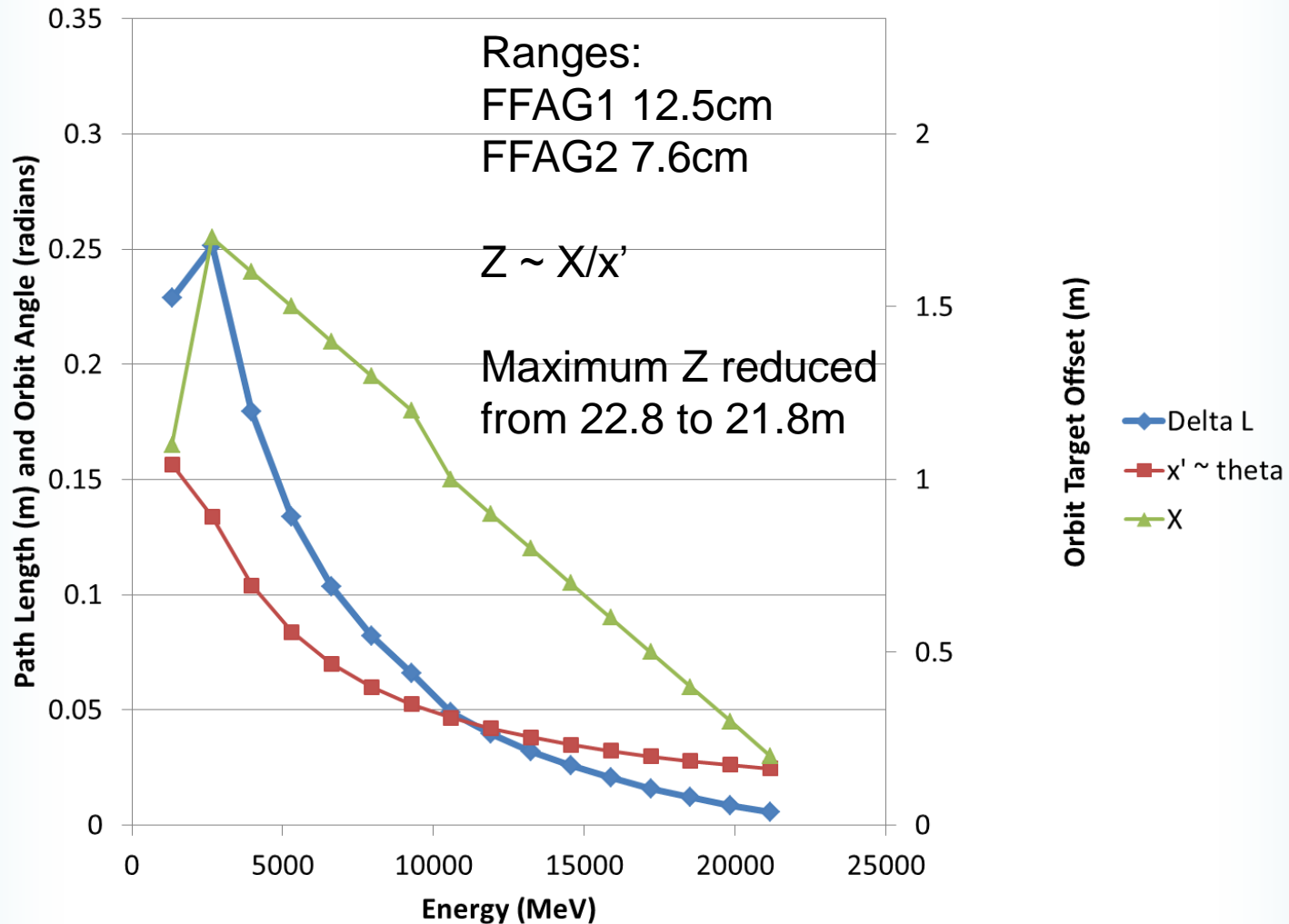
Regular Design (1:1 scale)



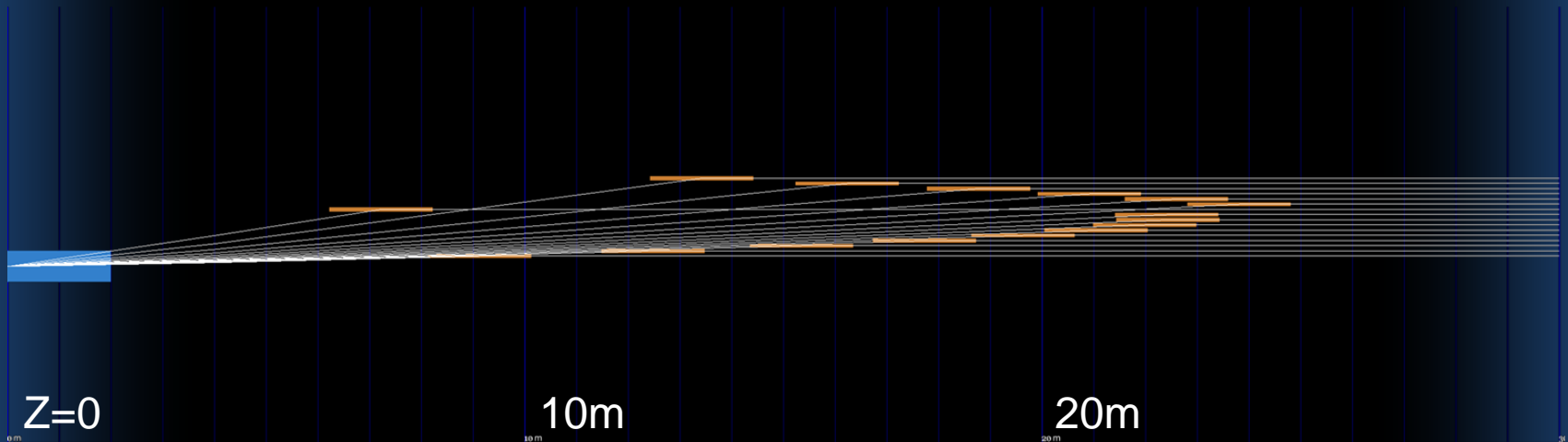
Regular Design (X exaggerated)



Reducing X for Lowest Energy



Reordered Design (1:1 scale)



Reordered Design (X exaggerated)

