JLEIC Collaboration
29—31 March 2016
Jefferson Lab

Ion-Side Small Angle Detection

Forward, Far-Forward, & Ultra-Forward

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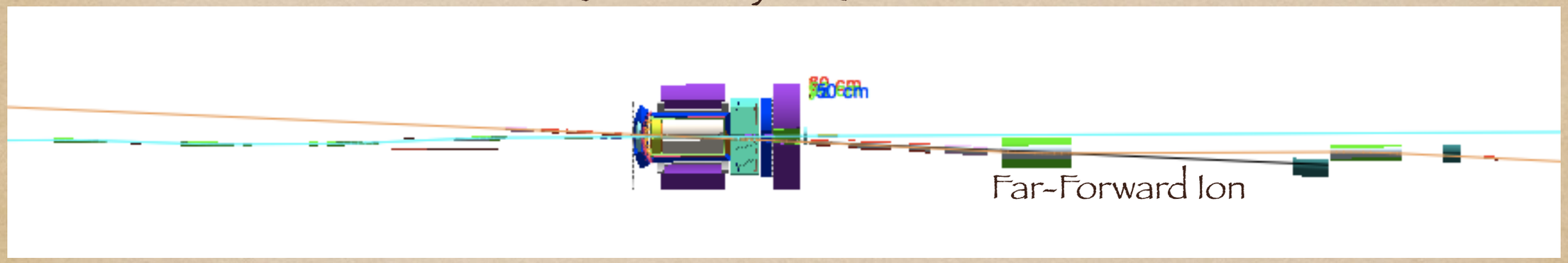
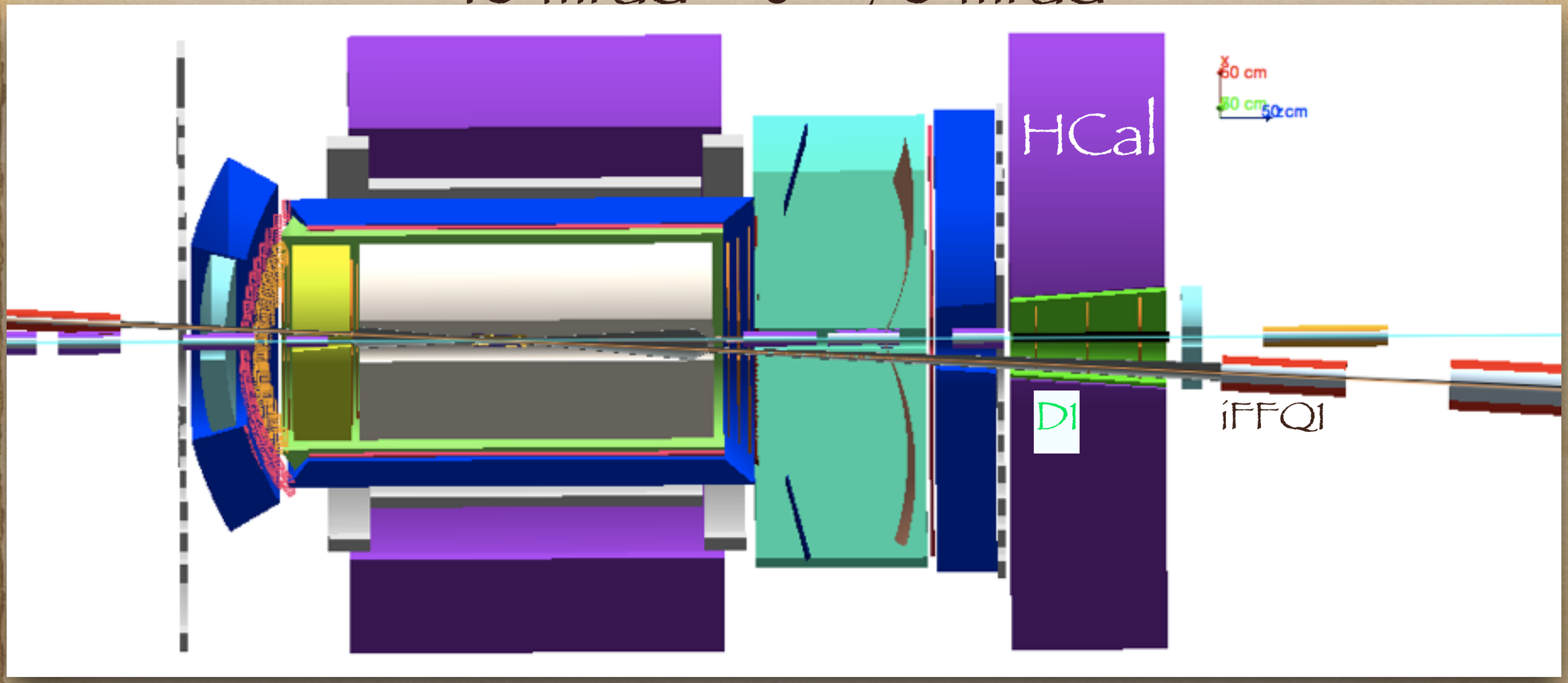
Full Acceptance Detector (-30m, +50 m)



- 3-D imaging:
  - Detect scattered beam particles for $|\delta p|/p > 0.005$ and/or $\theta > 3$ mrad
- Nuclear Final States in Deep Inelastic Scattering:
  - Neutrons in cone (0.5 GeV/c)/(50 GeV/c) = 10 mrad
    - Charged particle fragments from $\delta p/p = -0.5$ (protons) to $\delta p/p = +1.5$ (^{3}H fragment)

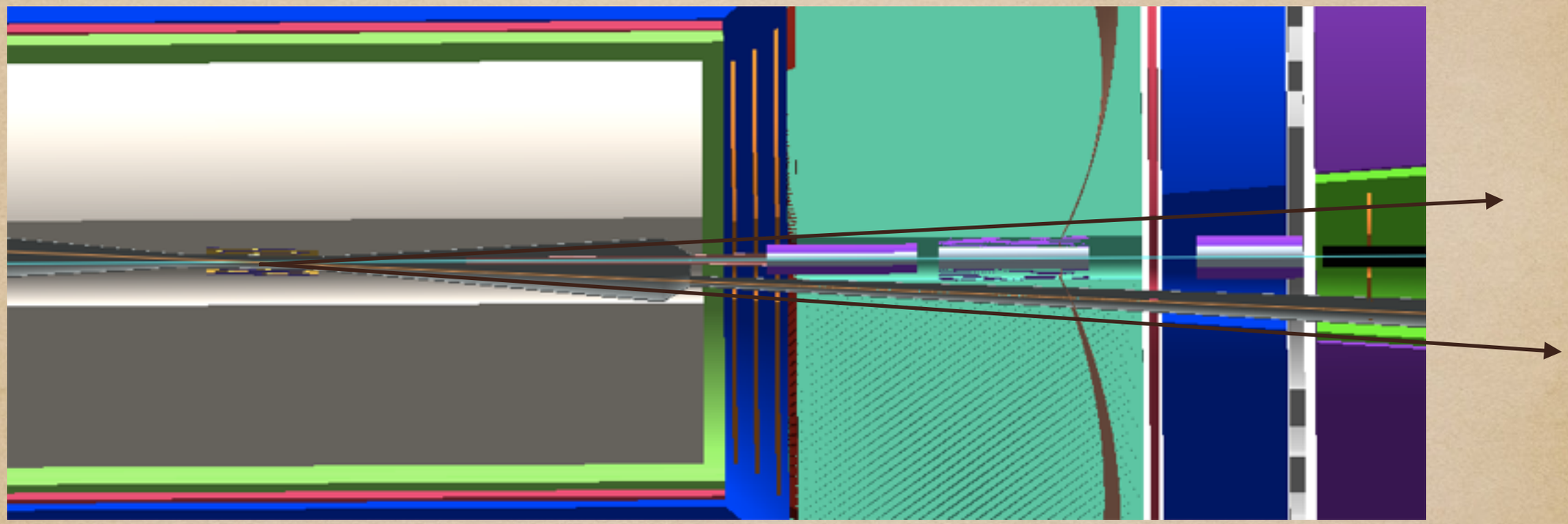
Forward Region

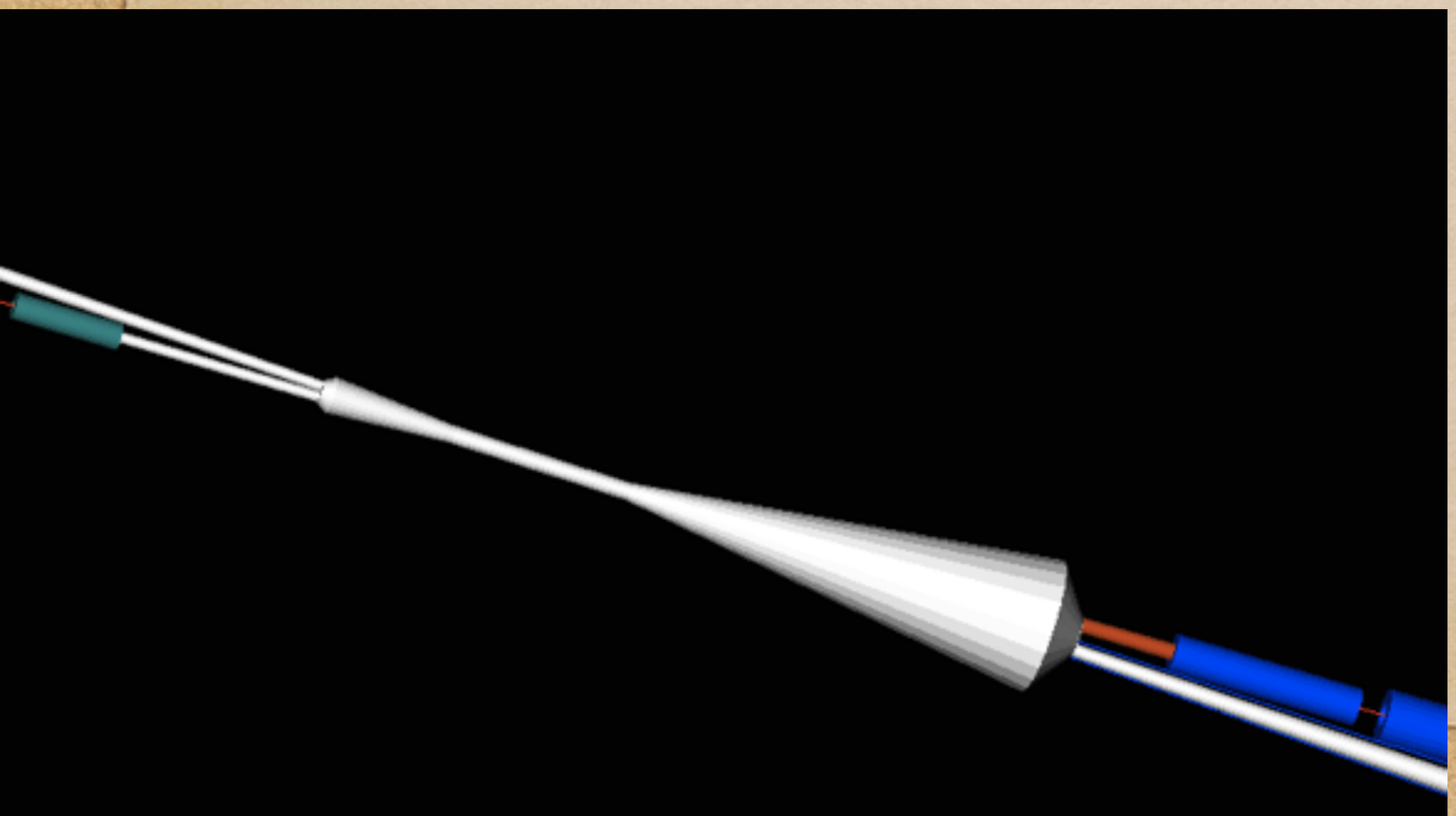
10 mrad < θ < 70 mrad



- Outside iFFQ Acceptance
- 2 Tm (@ 100 GeV/c) Forward Dipole
  - Tracker, $PbWO_4$ EM Calorimeter
  - Flux-exclusion tube or active anti-dipole shield of electron beam.

Beam-Pipe Design for Forward Angle Detection



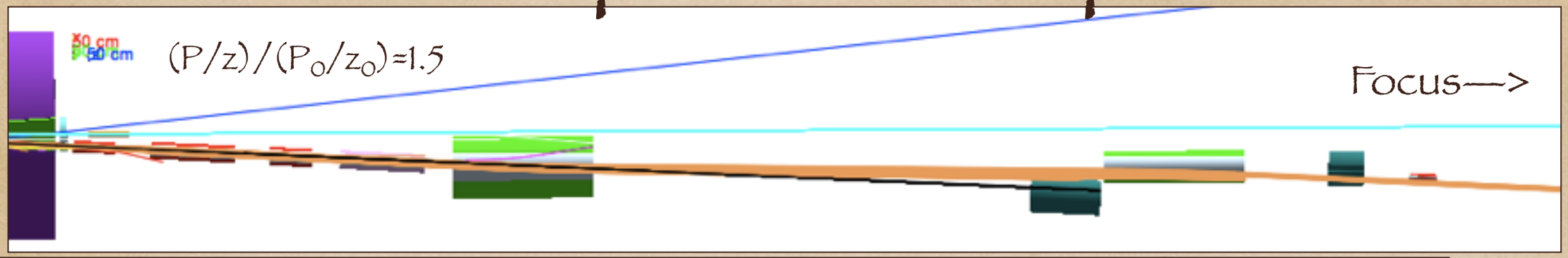


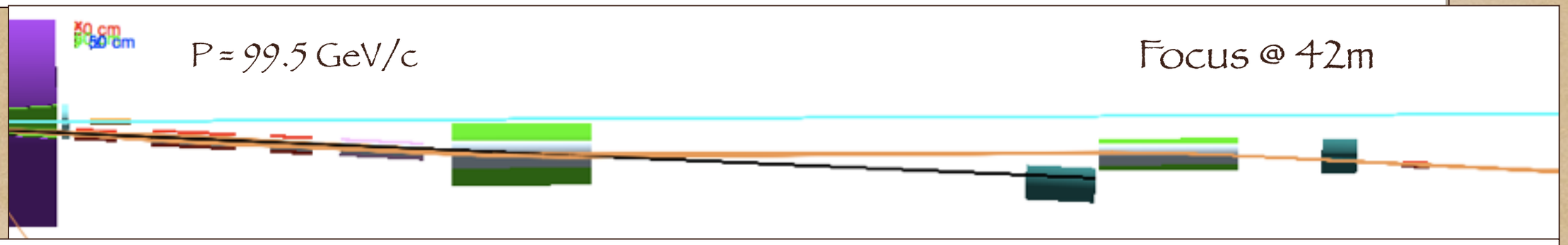
- Central beam chamber aligned at -25 mrad.
- Particles in iFFQ (±10mrad) acceptance don't exit until detected after D2 or D3
  - Particles in D1 acceptance exit through 30° taper at end of 73.5 mrad flare.
  - 30° taper minimizes wake-field
- End-cap particles exit at angles > 50 mrad

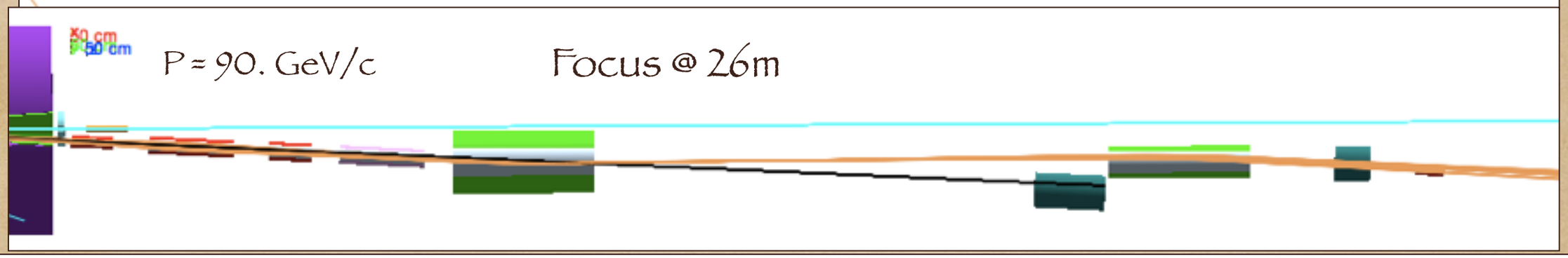
Far-Forward Tracking

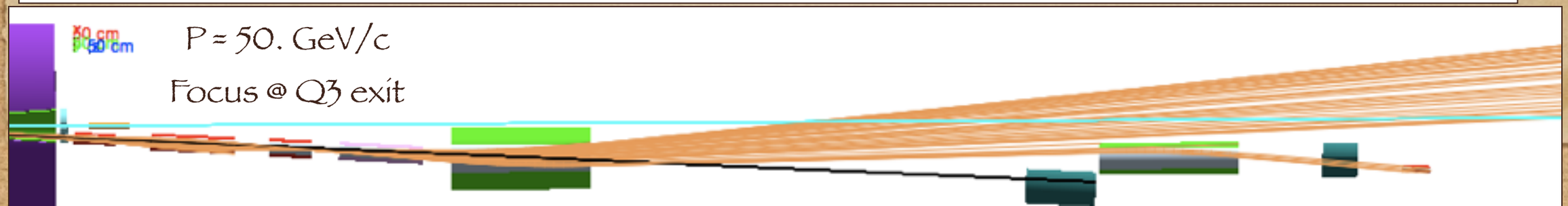
- 50 m long Magnetic Spectrometer
- High dispersion at secondary focus
  - 5 mm separation for dp/p = 0.005
  - Magnification = -0.5
    - Tracking resolution compatible with beam emittance
- Fixed Tracker at Exit of D2
- Pair of horizontal RP between D2 and D3
- Single side RP after D3

Transport Examples

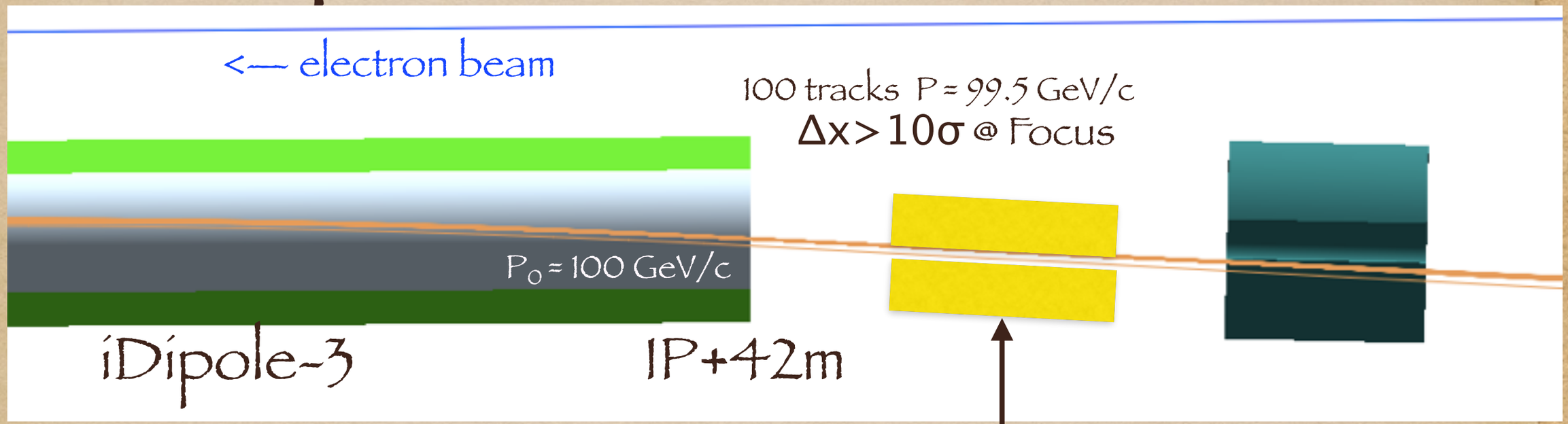




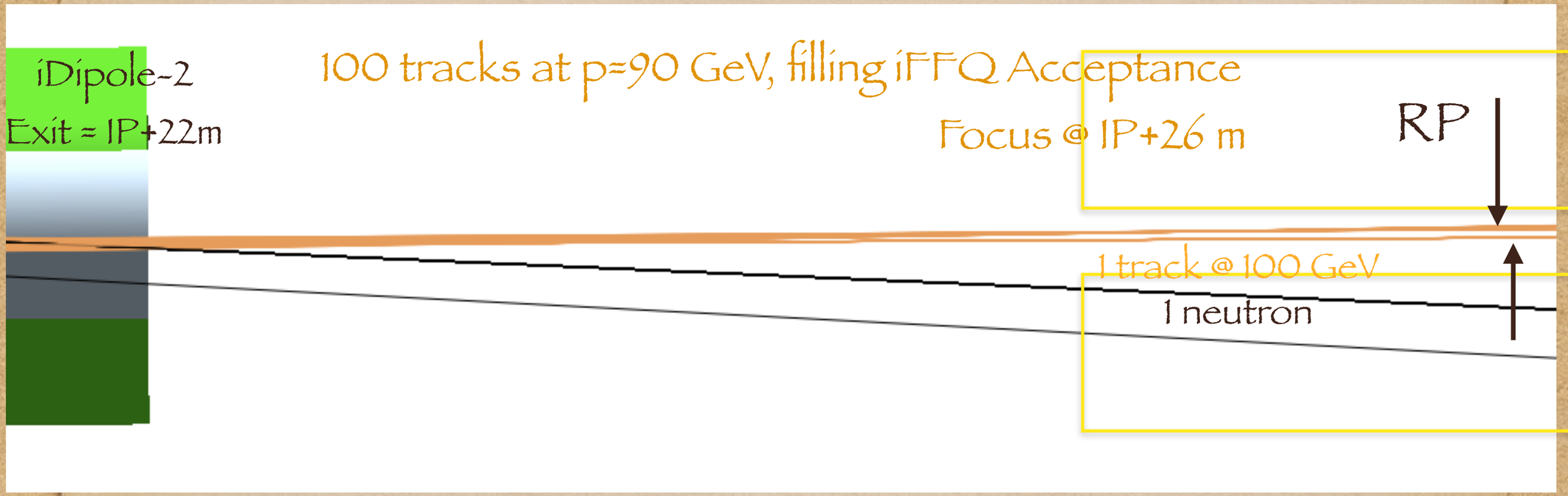




Transport near full momentum



Detection Between D2 and D3



4 cm radius beam pipe accommodates 10sigma BSC for P_0 from 20 to 100 GeV/c