



# **protoDUNE Beam Group Update**

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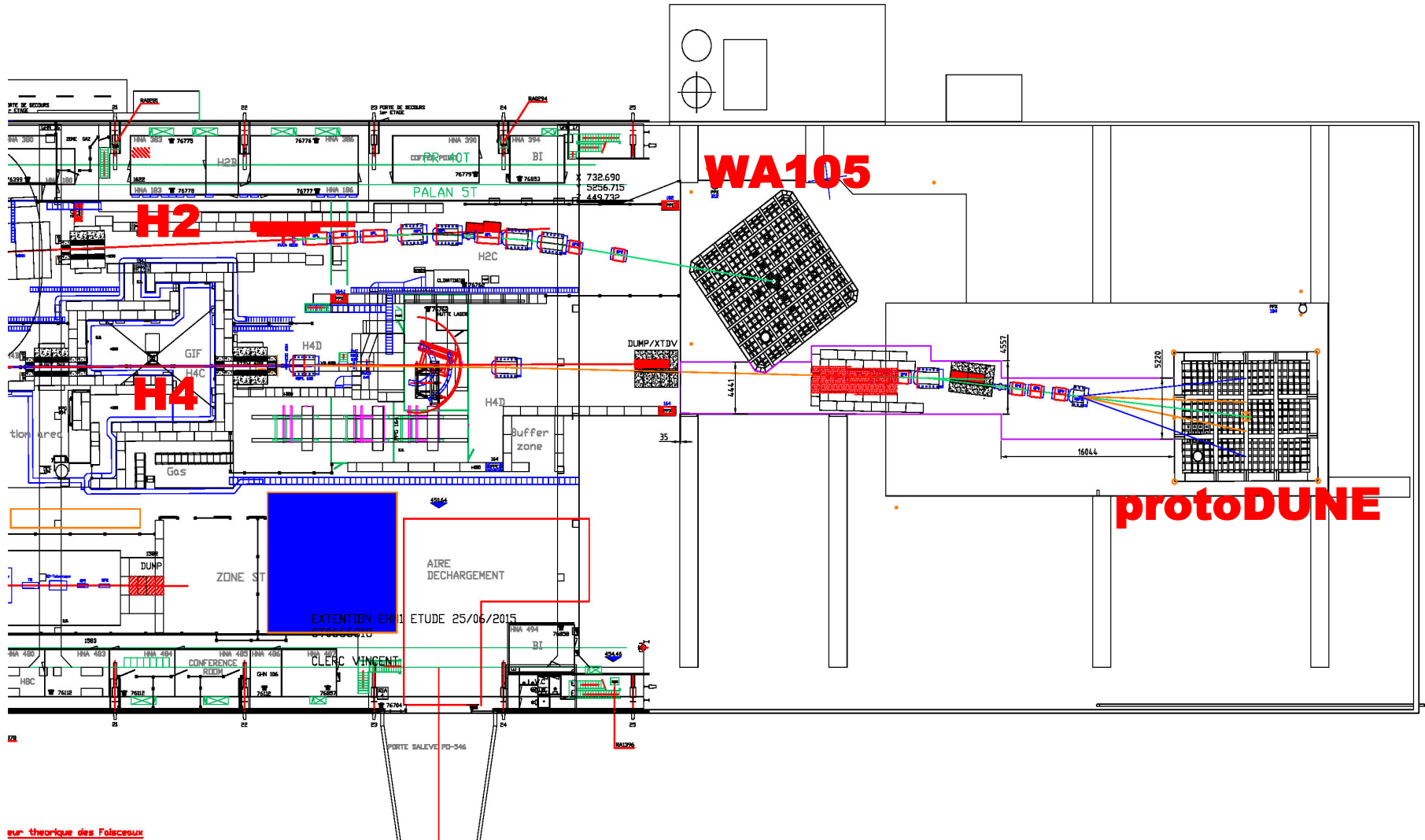
**Sept 25 , 2015**

# Beam “Requirements”

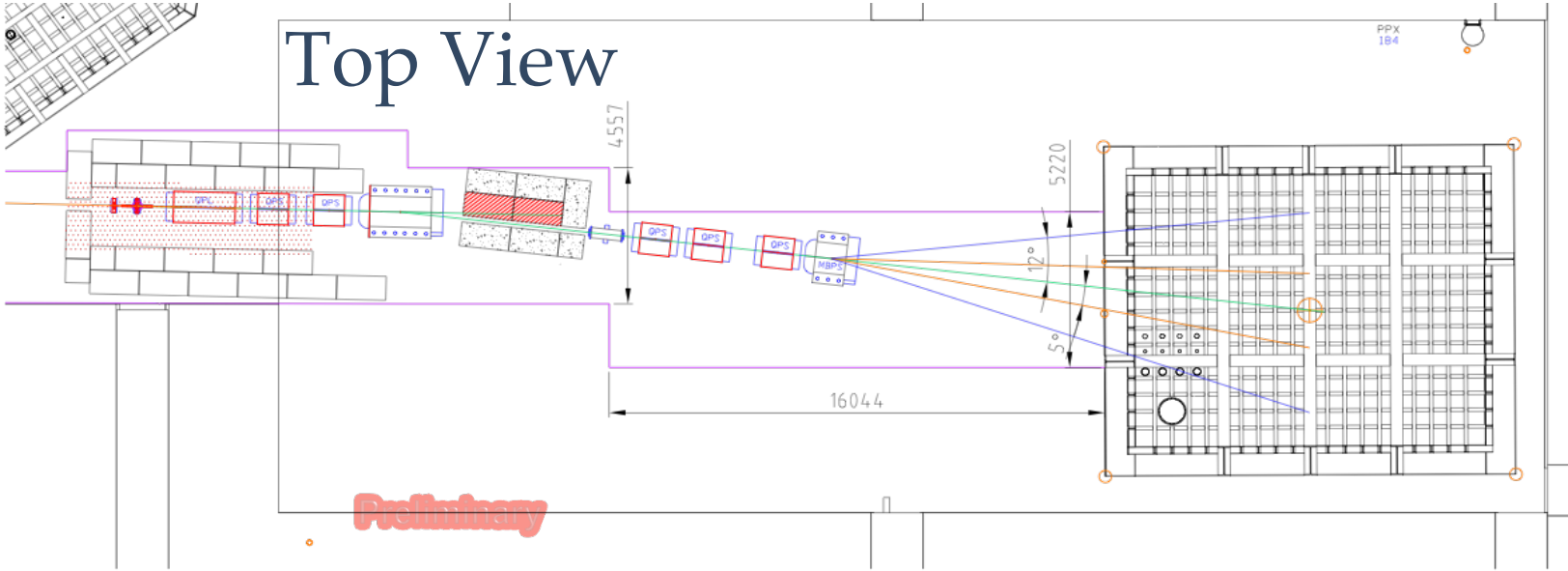
Parameter	Requirements
Particle Types	$e^{\pm}, \mu^{\pm}, \pi^{\pm}, K, p$
Momentum Range	0.2 - 10 GeV/c
Momentum Spread	$\Delta p/p < 5\%$ (limited by the aperture of the magnets)
Transverse Beam Size	RMS(x,y) $\approx 10$ cm (At the entrance face of the LAr cryostat)
Beam Divergence	tbd
Beam Angle (horizontal plane)	$\approx 10^{\circ}$ (w.r.t. the long axis of the cryostat)
Beam Dip Angle (vertical plane)	$\approx 6^{\circ}$ (downward from horizontal)
Beam Entrance Position	Multiple beam windows
Rates	200 Hz (maximum)

- Current beam line design caps the max momentum to 7 GeV/c to maximize rate at the lower momentum range
- Beam optics allow momentum as low as 0.2 GeV/c, but we are likely to start at 0.4 GeV/c

# EHN1 Extension - Beam layout

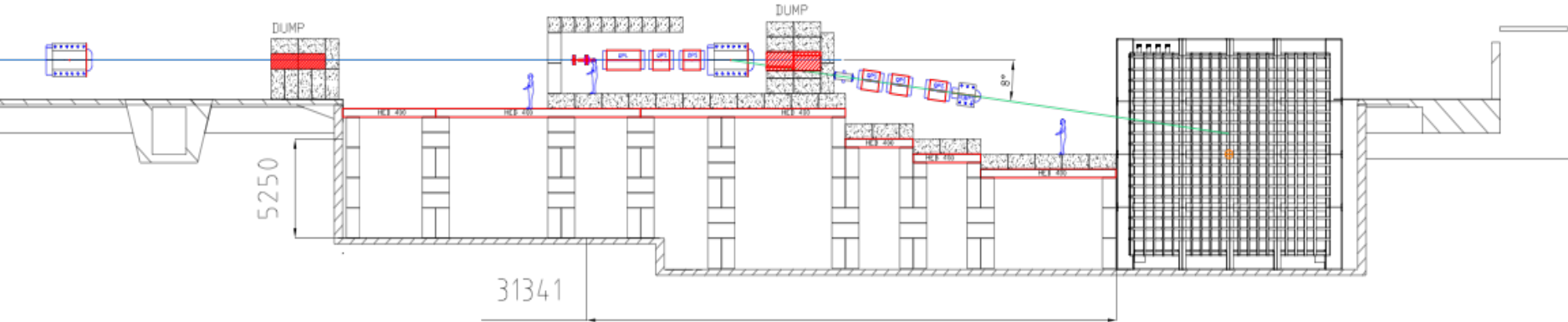


# H4-VLE beam to protoDUNE



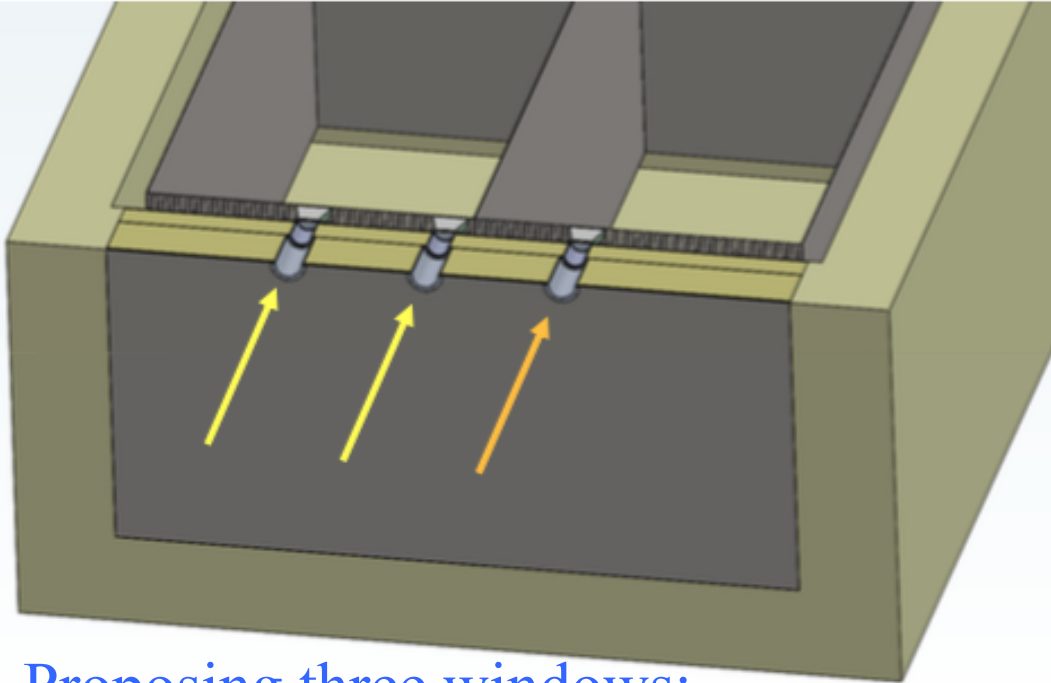
### Side View

H4-VLEext



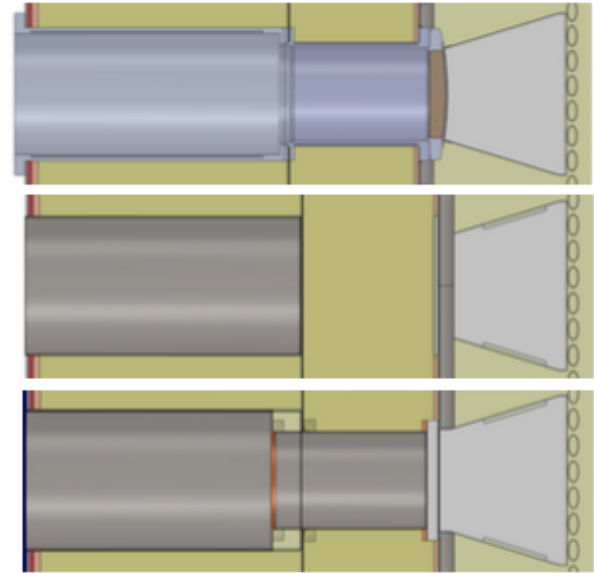
# Beam Windows

## protoDUNE LAr Cryostat

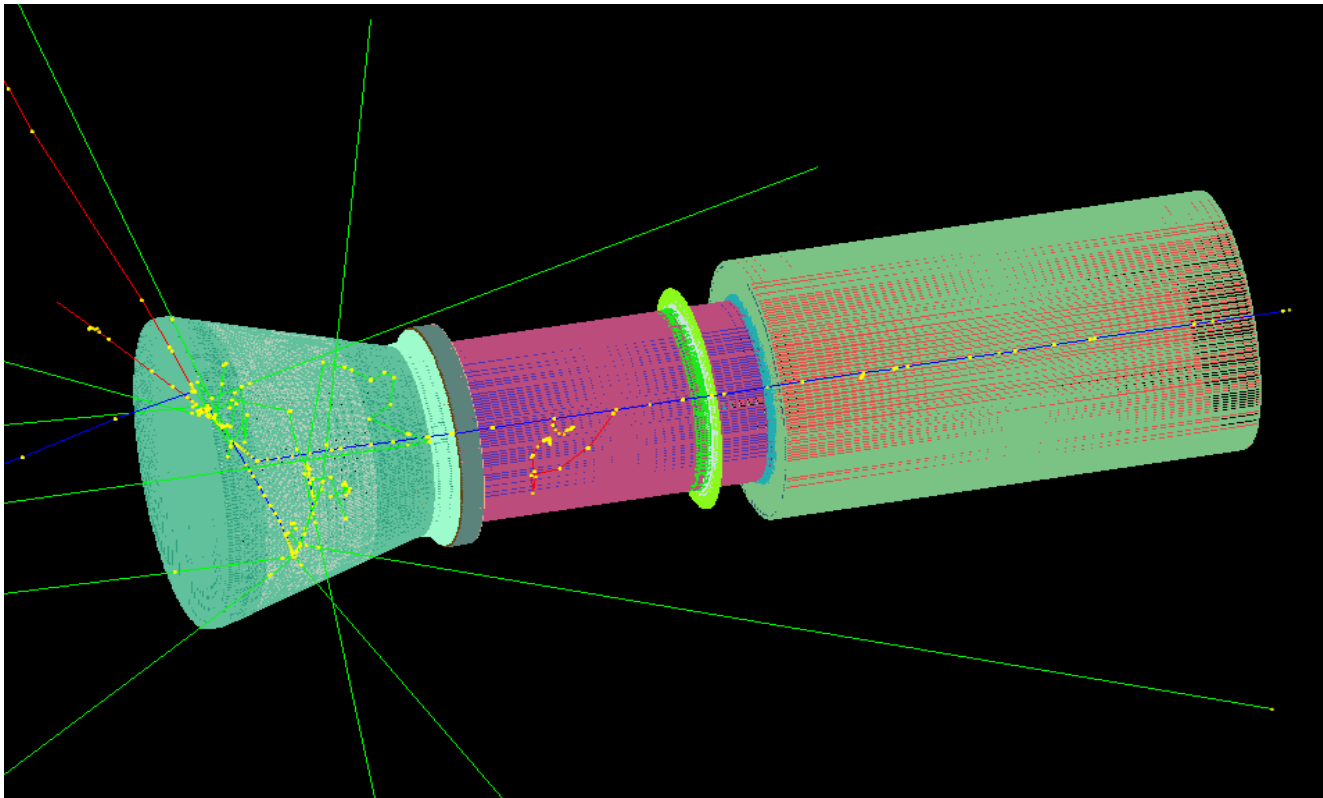


- Proposing three windows:
  - One for each drift volume
  - One mid-plane crosser
- Waiting for cryostat/TPC design to finalize to determine the final placement of the windows

## Three Window Designs



- Three window design options
- Different performance, cost, and risks
- Thermal/structural FEA study is ongoing



- Matt imported Tim's CAD model into GEANT4
- Converted some tessellated geometry into native G4 solids
- Study the physics performance of each window design options
- Will incorporate the window into Tyler and Martin's TPC model
- Plan to present the physics results in Donna and Jarek's subgroup meeting soon