

ProtoDUNE Beam Window Cryostat Penetration Locations

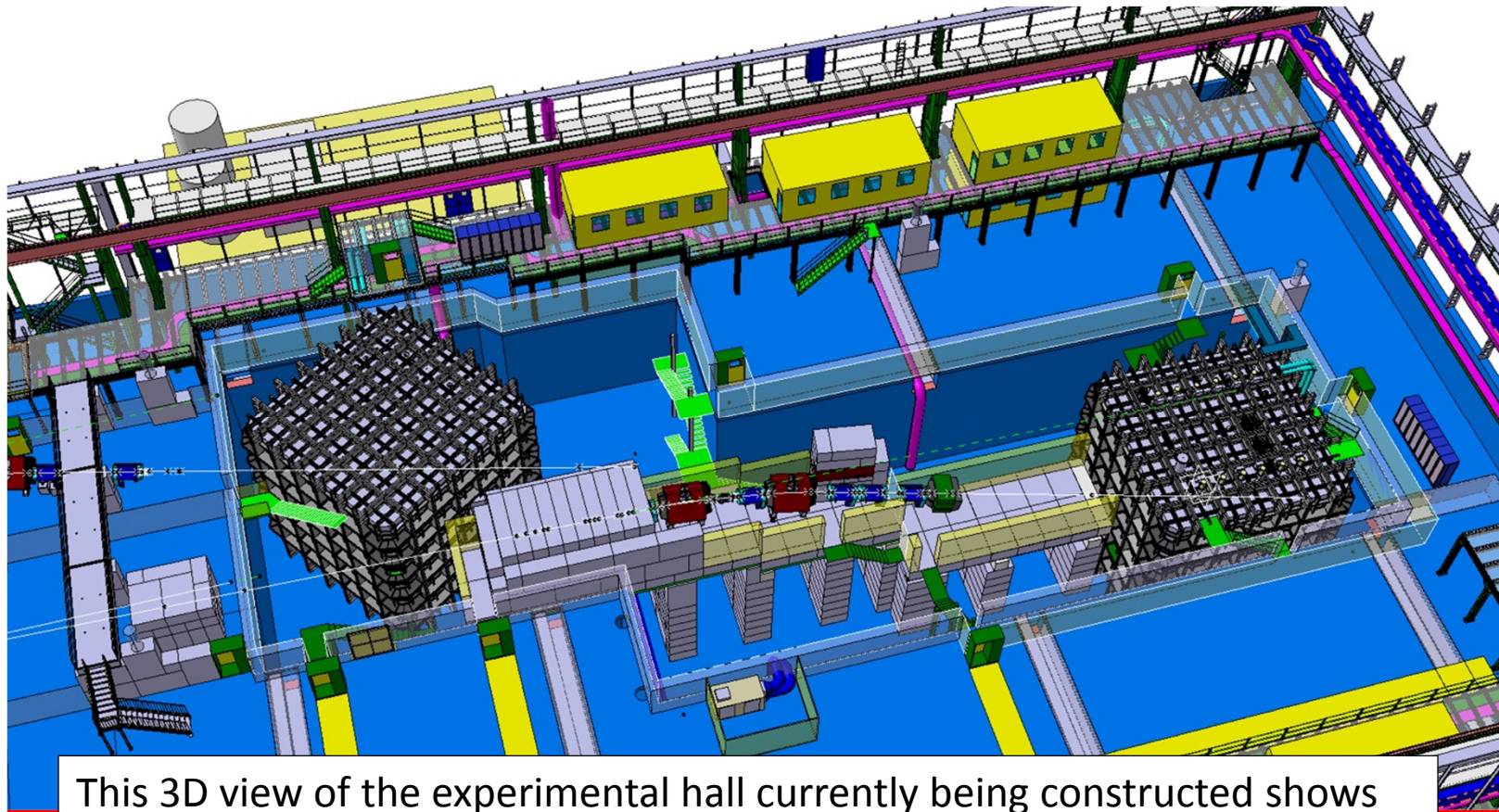
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Overview

- The ProtoDUNE cryostat has an array of penetrations for feedthroughs, instrumentation, etc. Three of these penetrations are designated for beam windows.
- The location and orientation of each window is constrained by the upstream beamline, the detector's outer support structure, and the adjacent 180 kV field cage.
- The process described in these slides is being undertaken to determine the best window placement and to document the process that led to it.

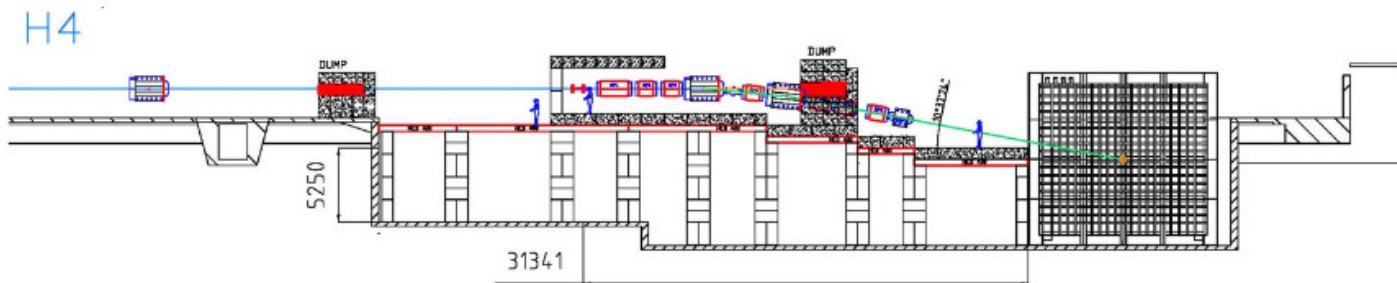
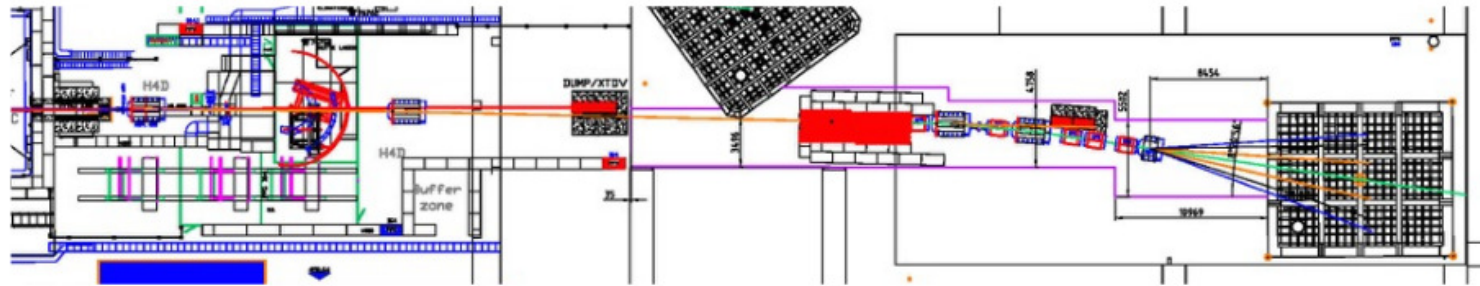
EHN1 Experimental Hall



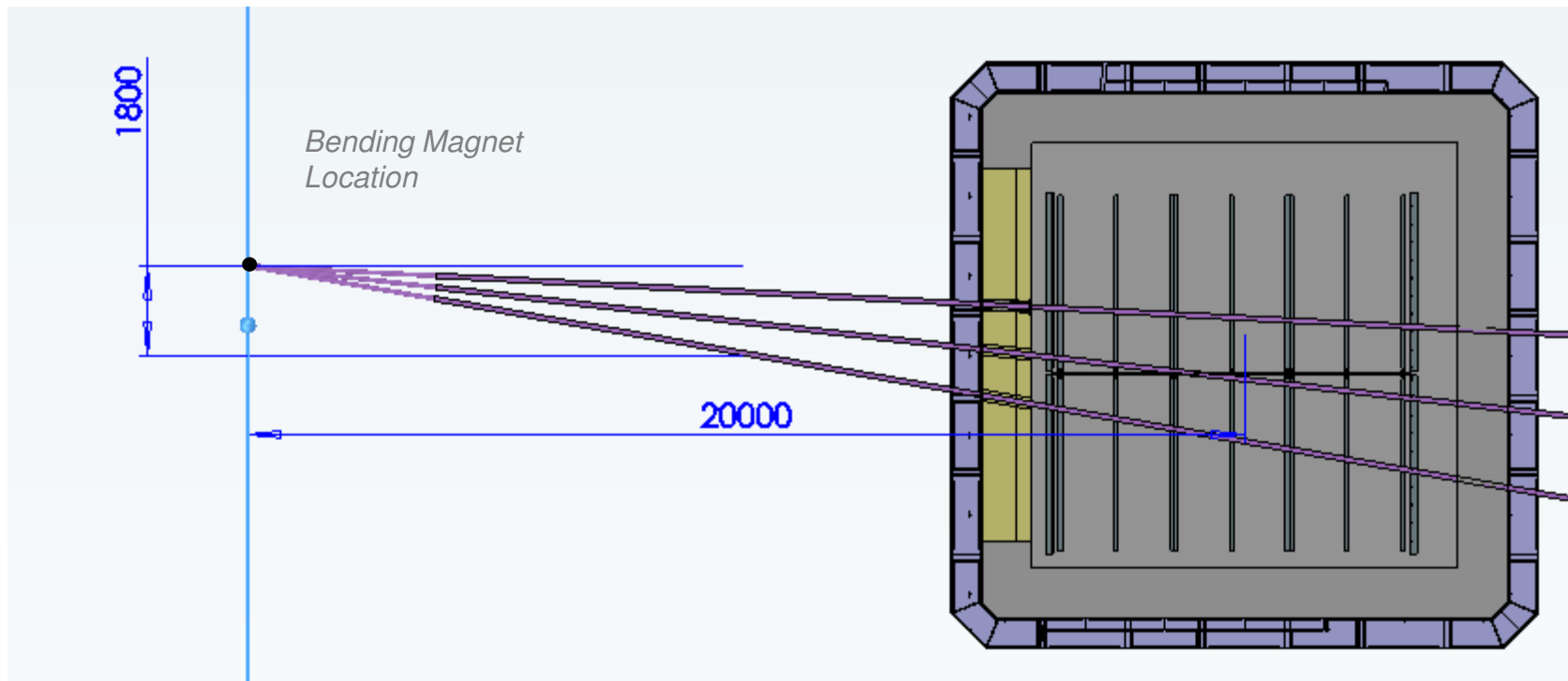
This 3D view of the experimental hall currently being constructed shows the H4-VLExt beamline to the protoDUNE detector.

EHN1 Experimental Hall

Beam layout - H4-VLEext

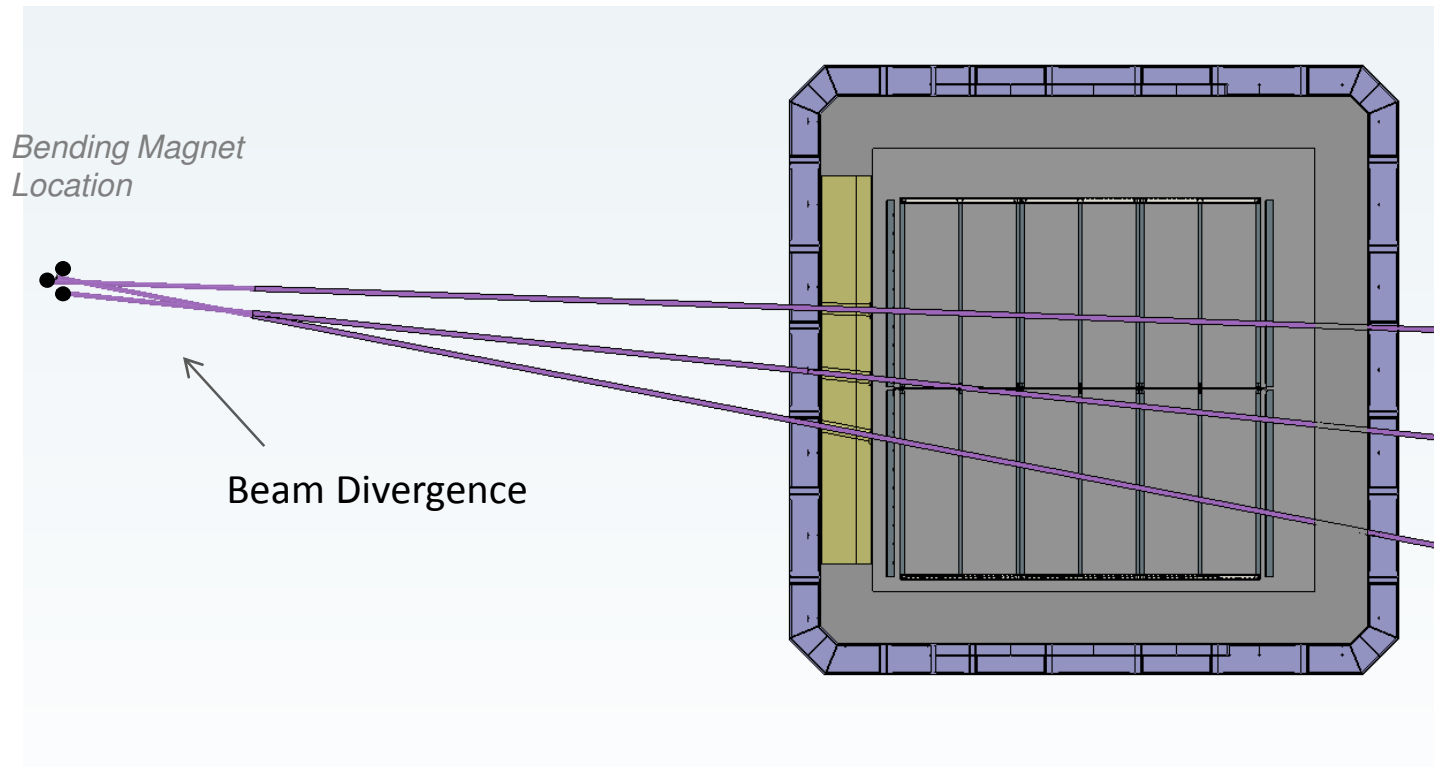


Step #1: Set Beamline Position First



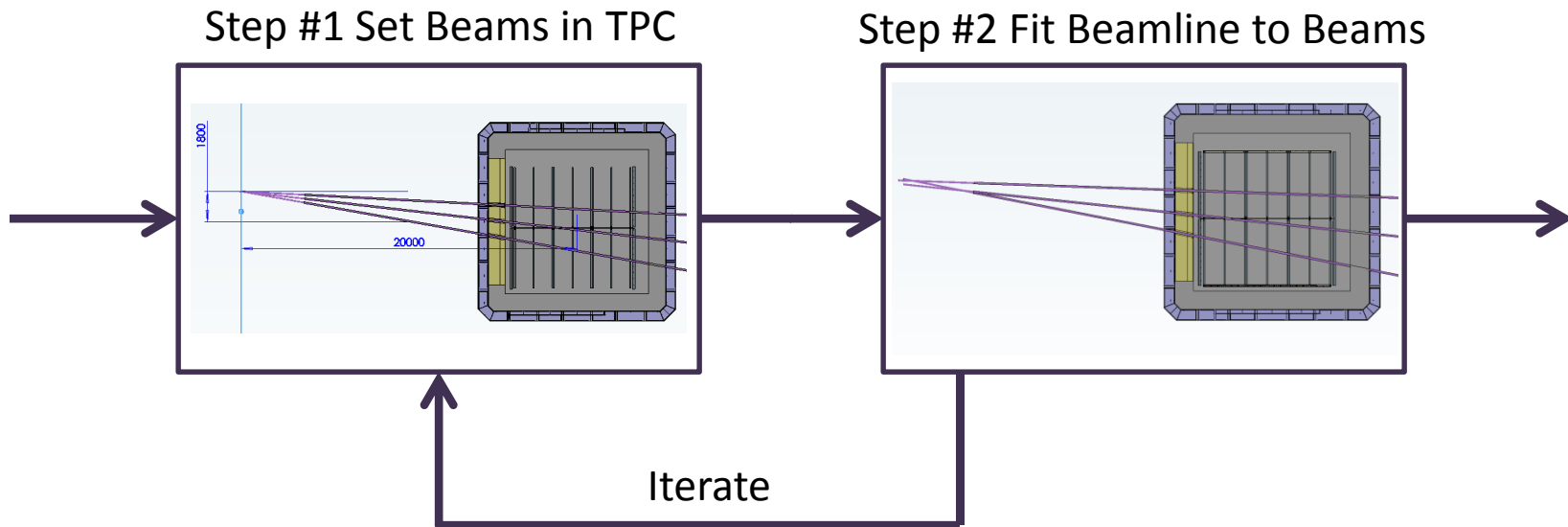
First, set the beamline elements, then determine where the beam can go. All beams diverge out from bending magnet, but may be constrained against ideal transit through TPC active volume.

Step #2: Set Beam Positions



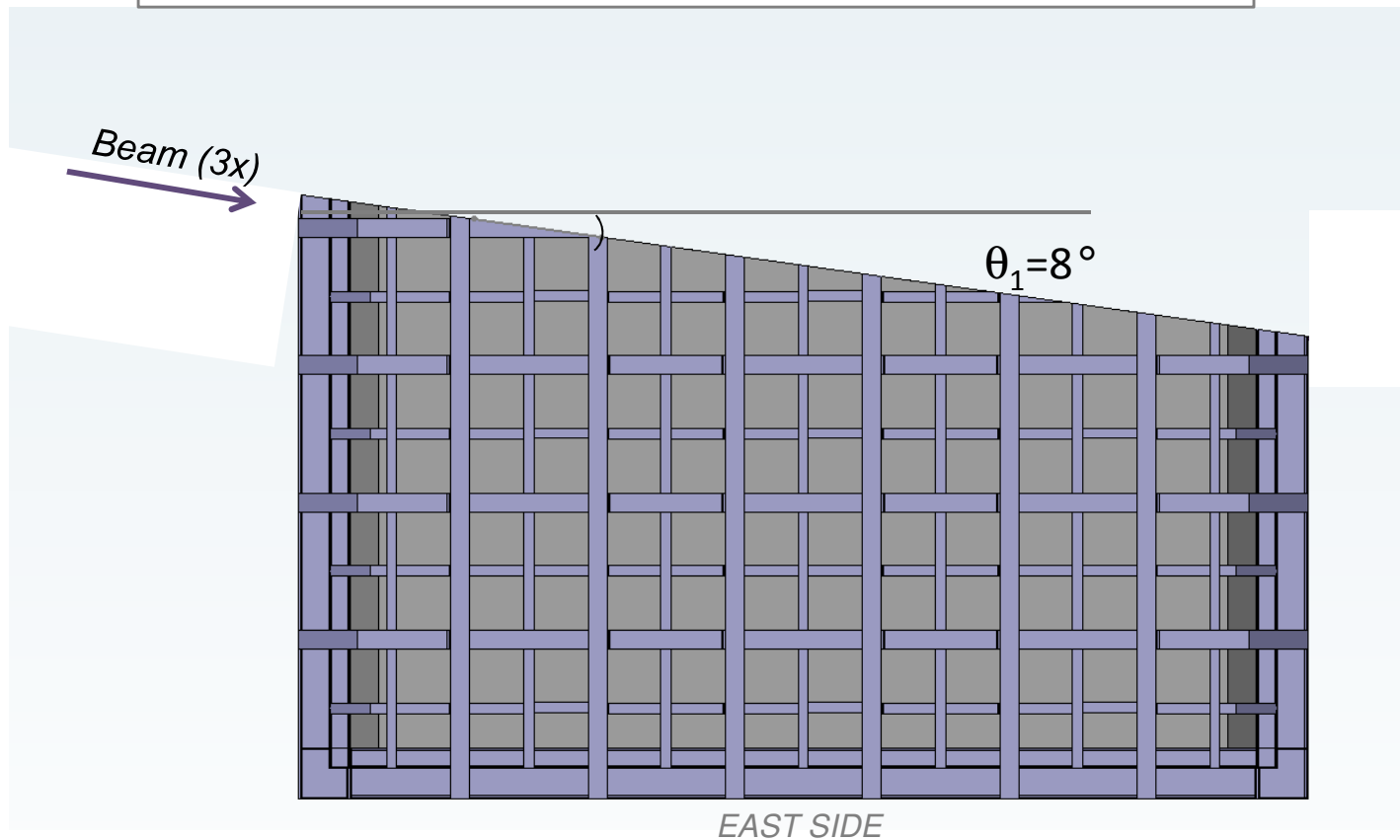
Second, set the ideal beam trajectories directly with respect to TPC elements. These beams may not trace back to the bending magnet, as can be seen by the divergence above.

Step #3: Iterate to Best Solution



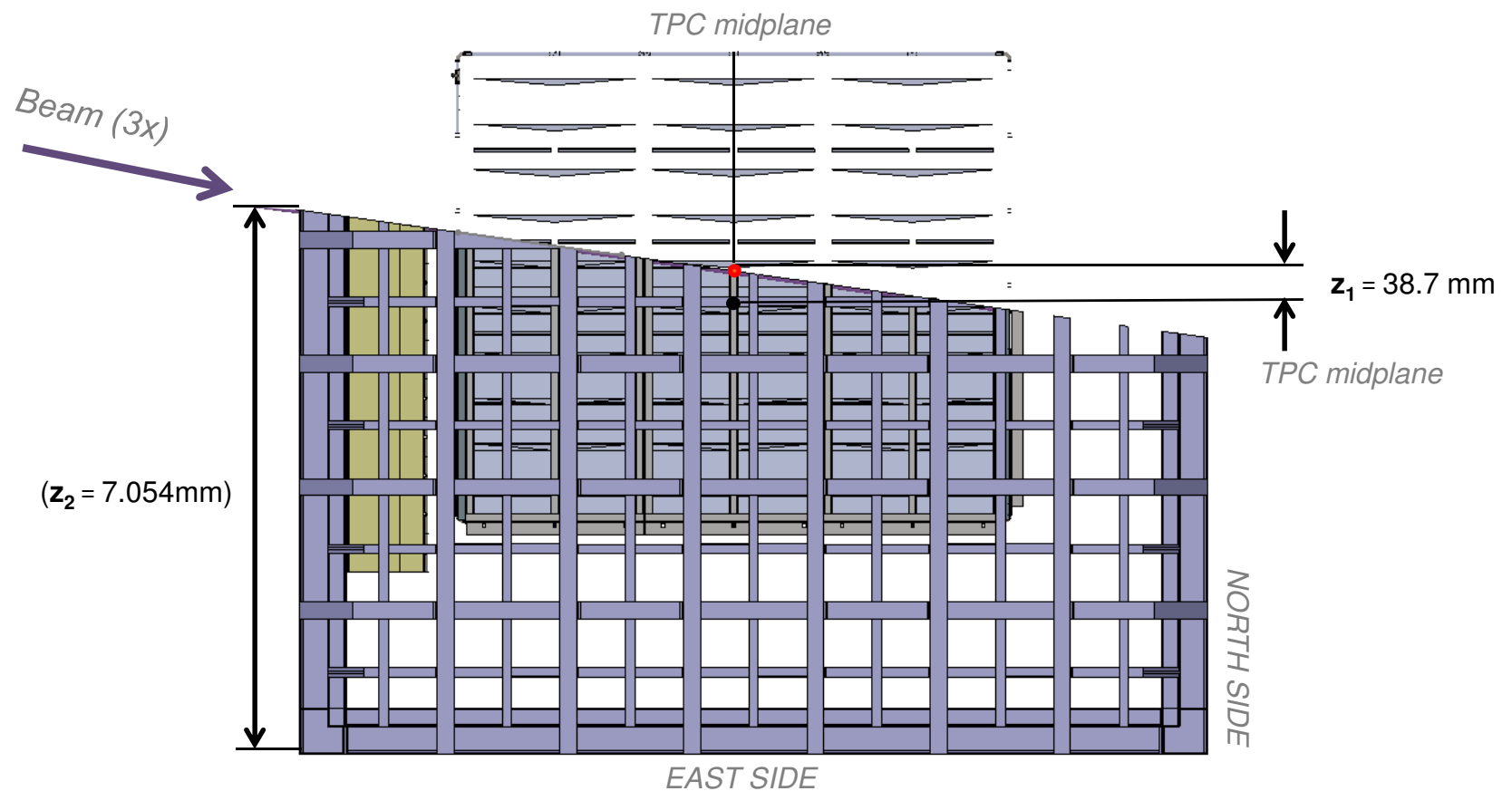
Beam Declination Angle θ_1

θ_1 Should be in the range between 6° - 8°

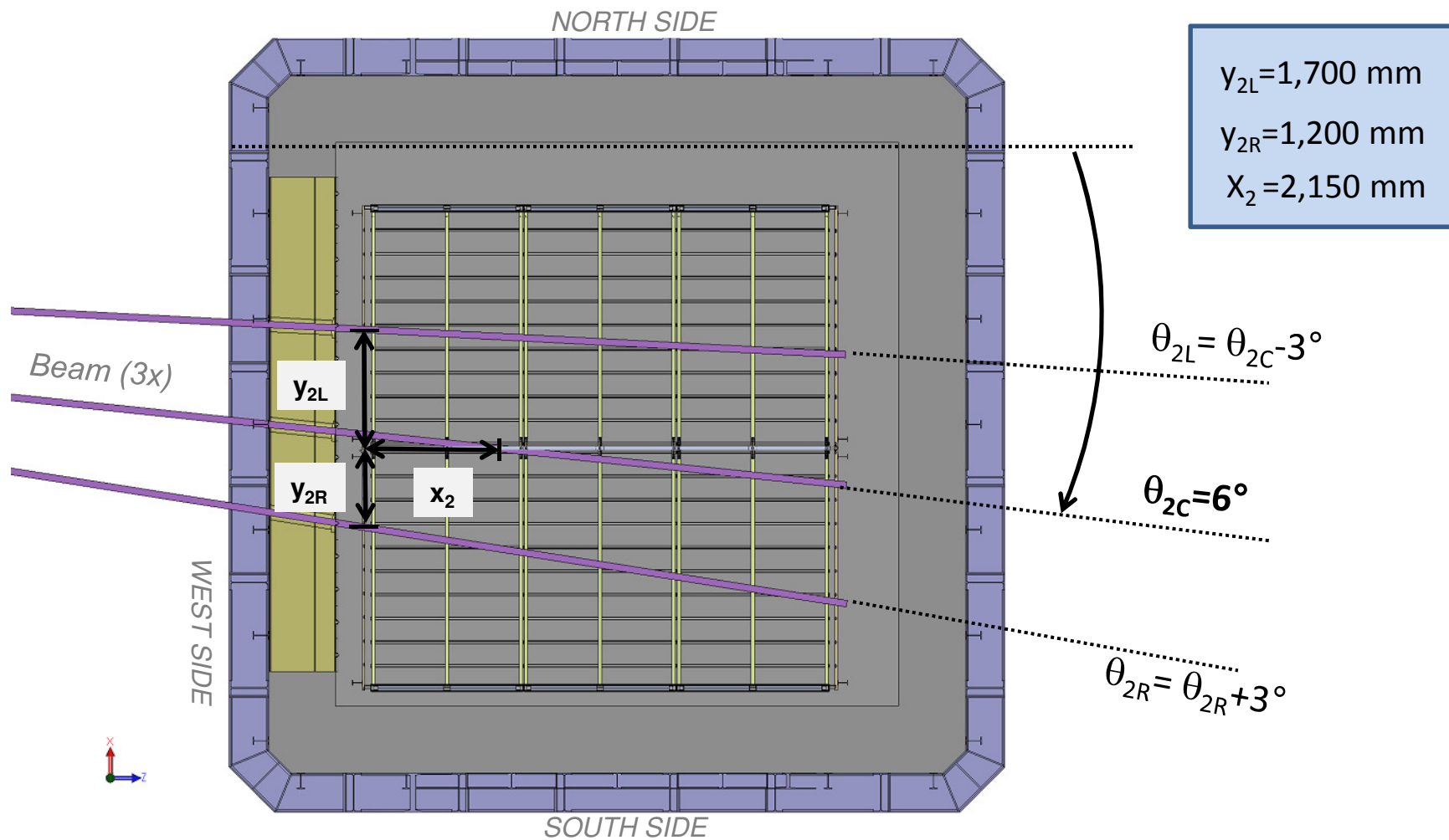


Heights Where Beam Crosses Above TPC

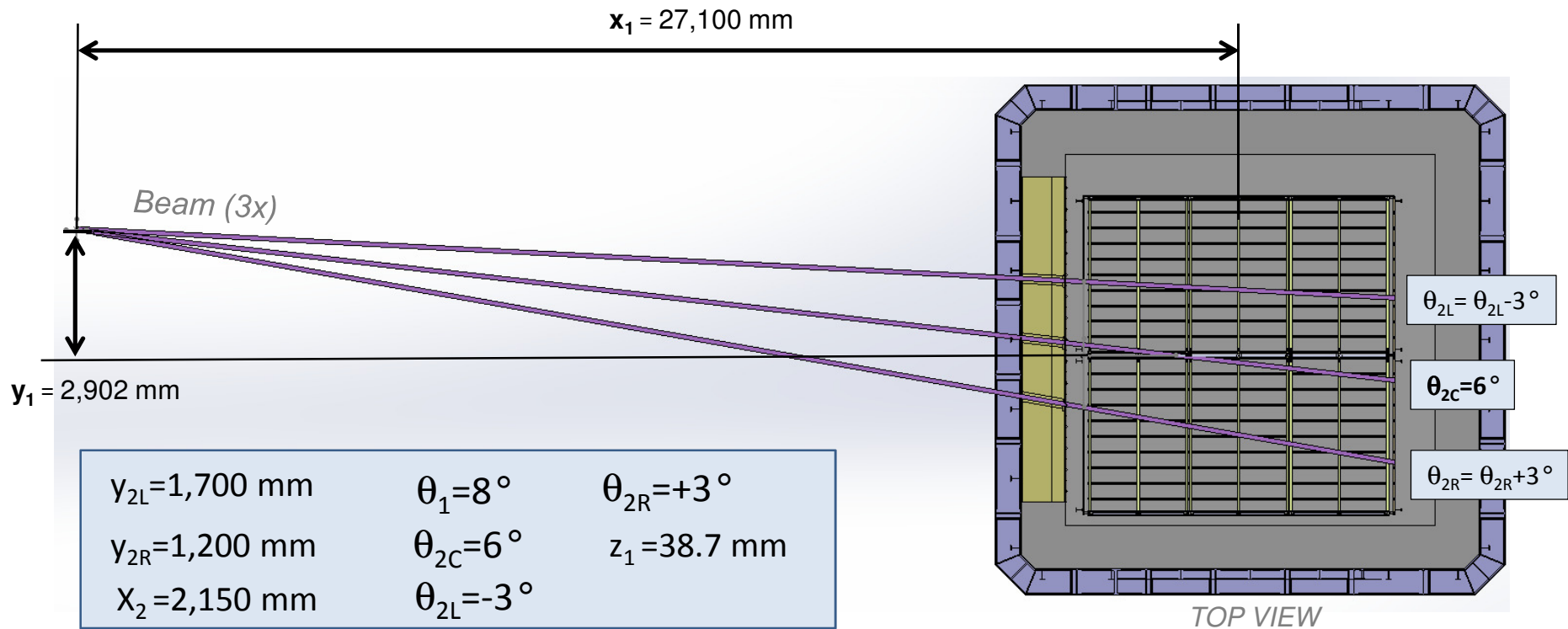
\mathbf{z}_1 is a set parameter along with θ_1 . \mathbf{z}_2 is derived.



Beam Offsets at FC/CPA Crossing

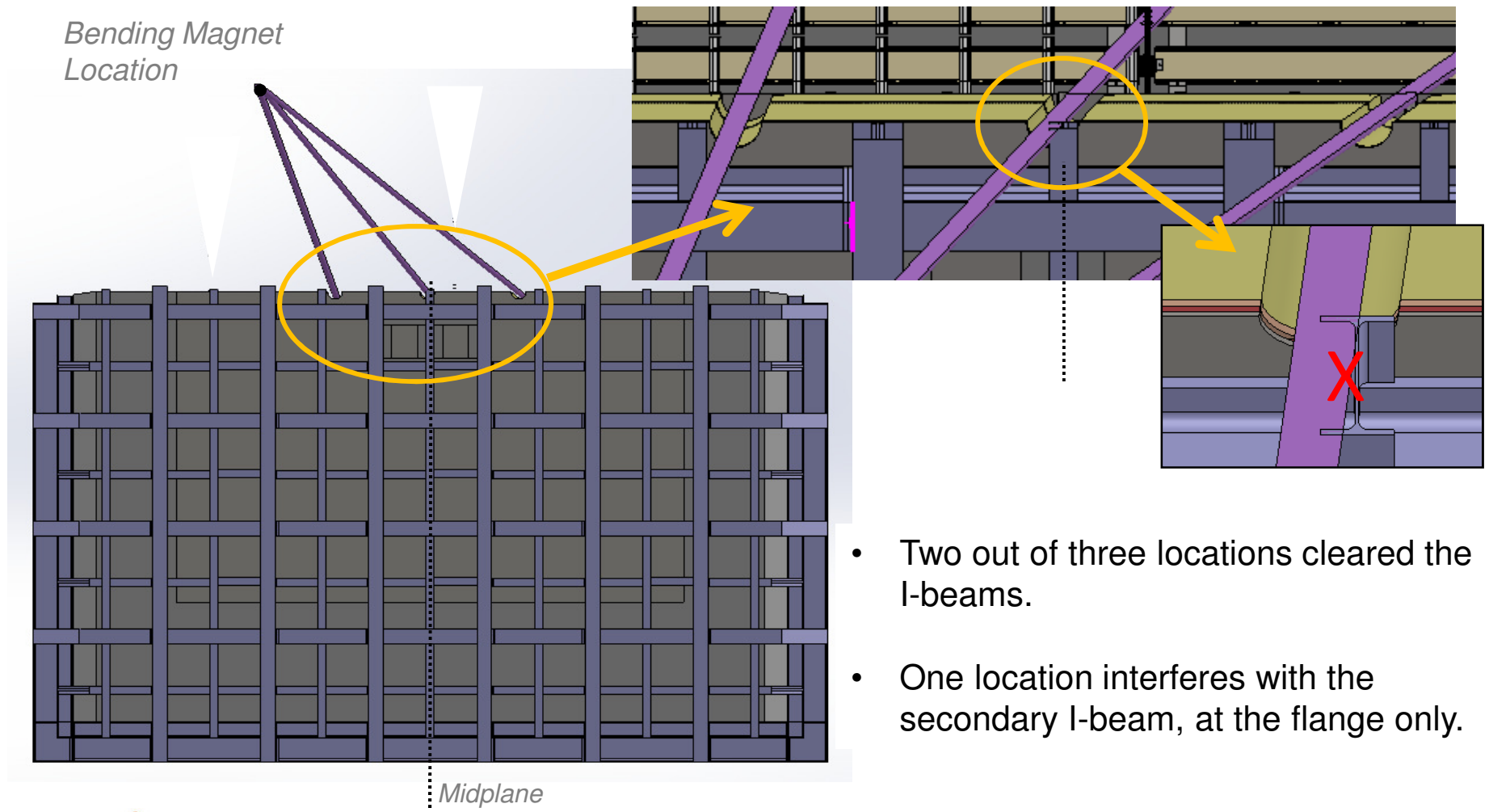


Beams Defined at FC/CPA Converge with These Values



This is one possible set of eight values. These values are within range for the beam, plus the beams converge. However, the convergence point is approximately 12 m further than the initially proposed beamline layout, and this may not be feasible. Further values need testing.

Beam Entry Points Interface with External Structure



- Two out of three locations cleared the I-beams.
- One location interferes with the secondary I-beam, at the flange only.