

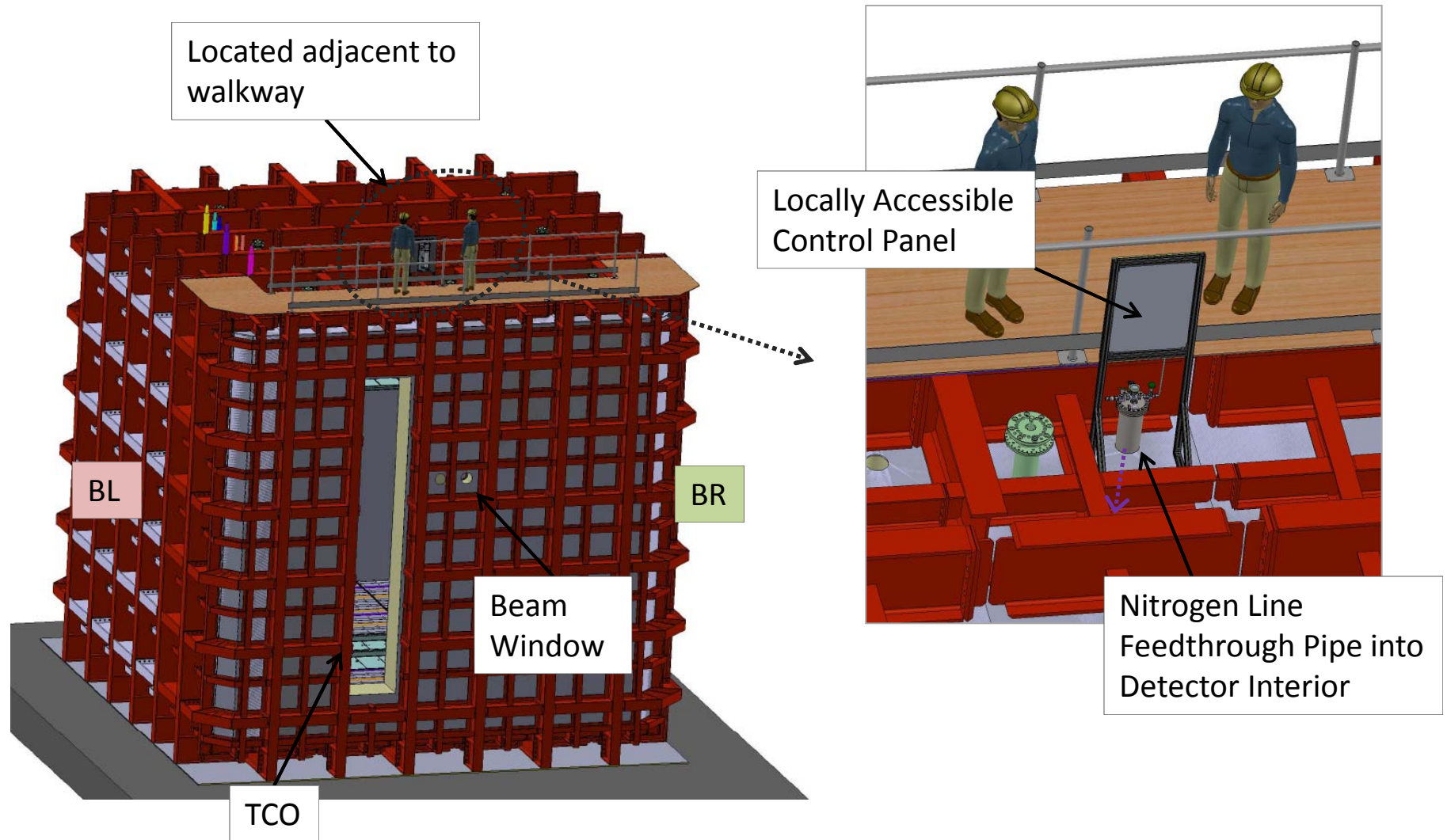
ProtoDUNE Single Phase Beam Plug Nitrogen Gas System Installation

Tim Loew
Lawrence Berkeley Lab
January 12, 2017

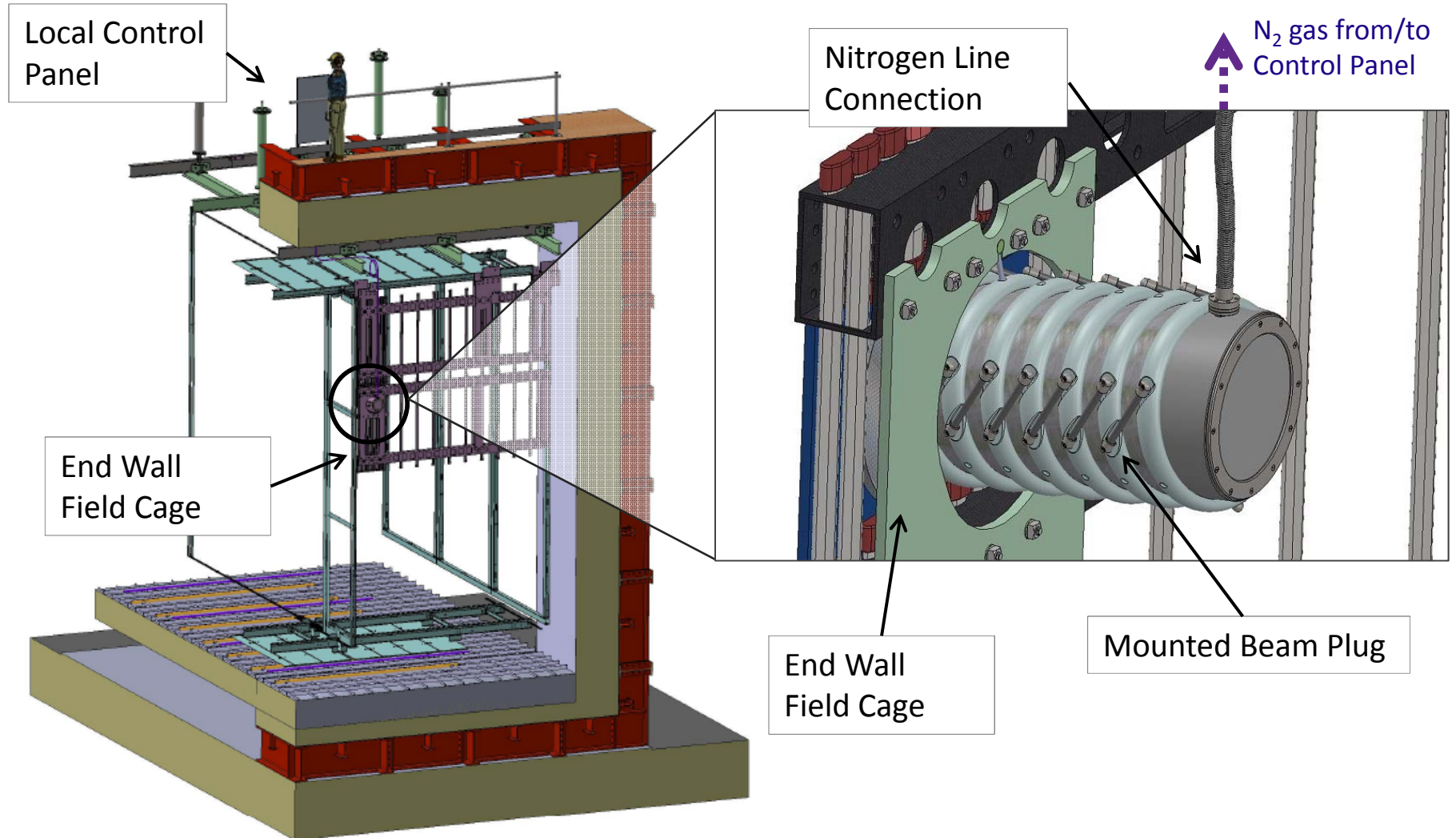
Introduction

- Gas System Overview and Installation Timeline
- Phase I
 - Install and secure external gas system components to roof and secure through feedthrough.
- Phase II
 - Mount Beam Plug into End Wall Field Cage and Install in Cryostat.
- Phase III
 - Uncoil and connect external gas line to Beam Plug mounted inside the Cryostat.

Beam Plug Nitrogen System (External)

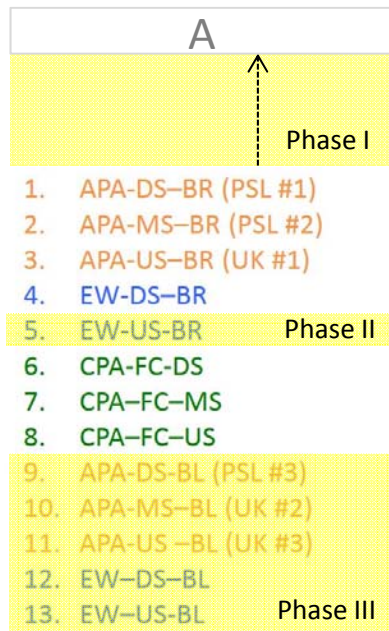


Beam Plug Nitrogen System (Internal)

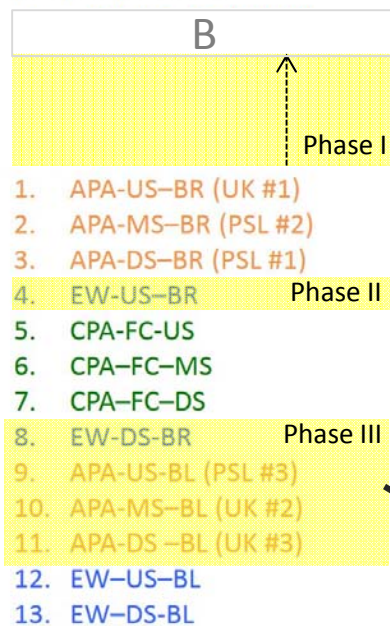


Phase I-III Installation Sequences

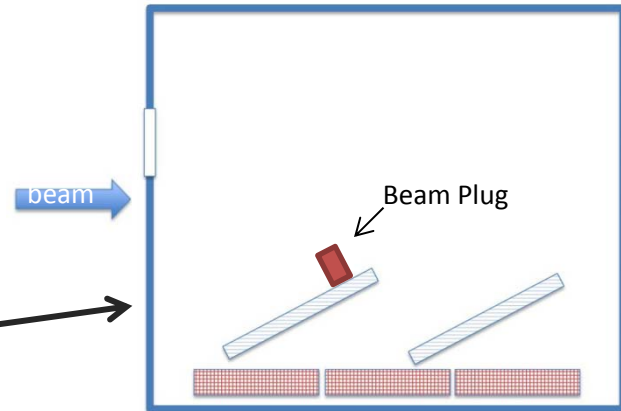
Order of **insertion** into cryostat through TCO :



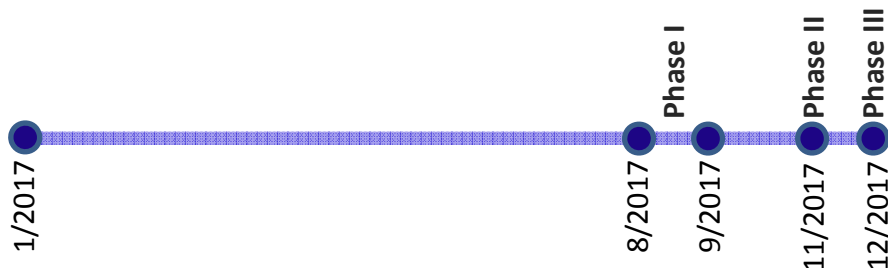
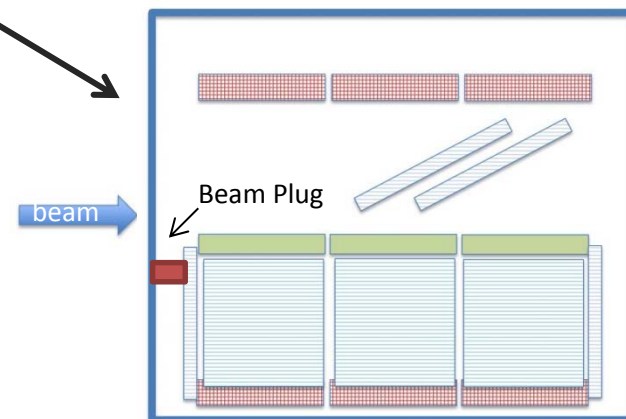
Order of **installation** into proper position :



Phase II (Prior To Step 5A)

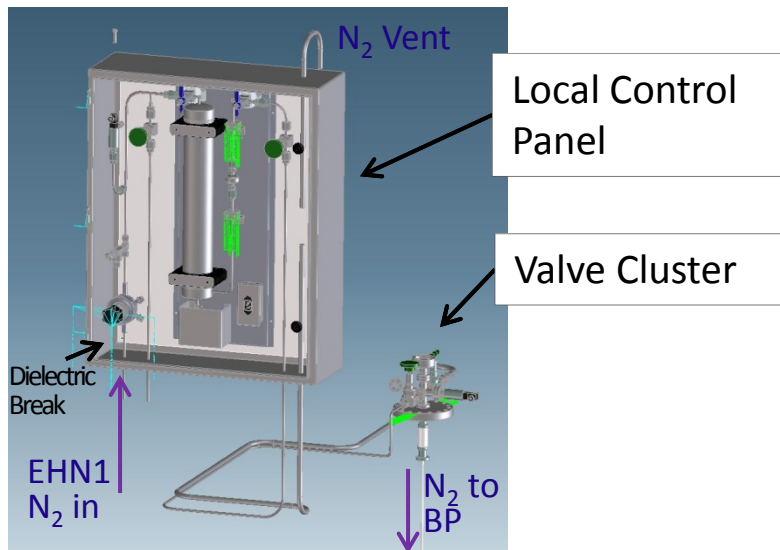
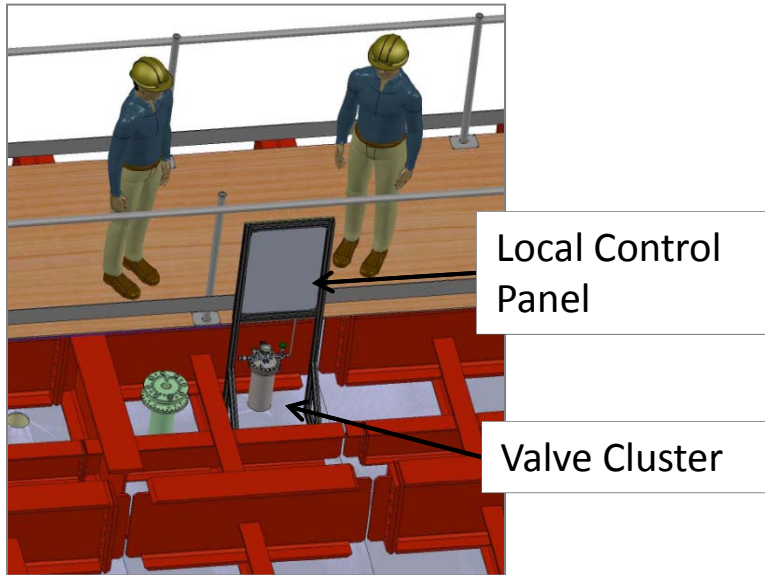


Phase III (Prior To Step 12B)



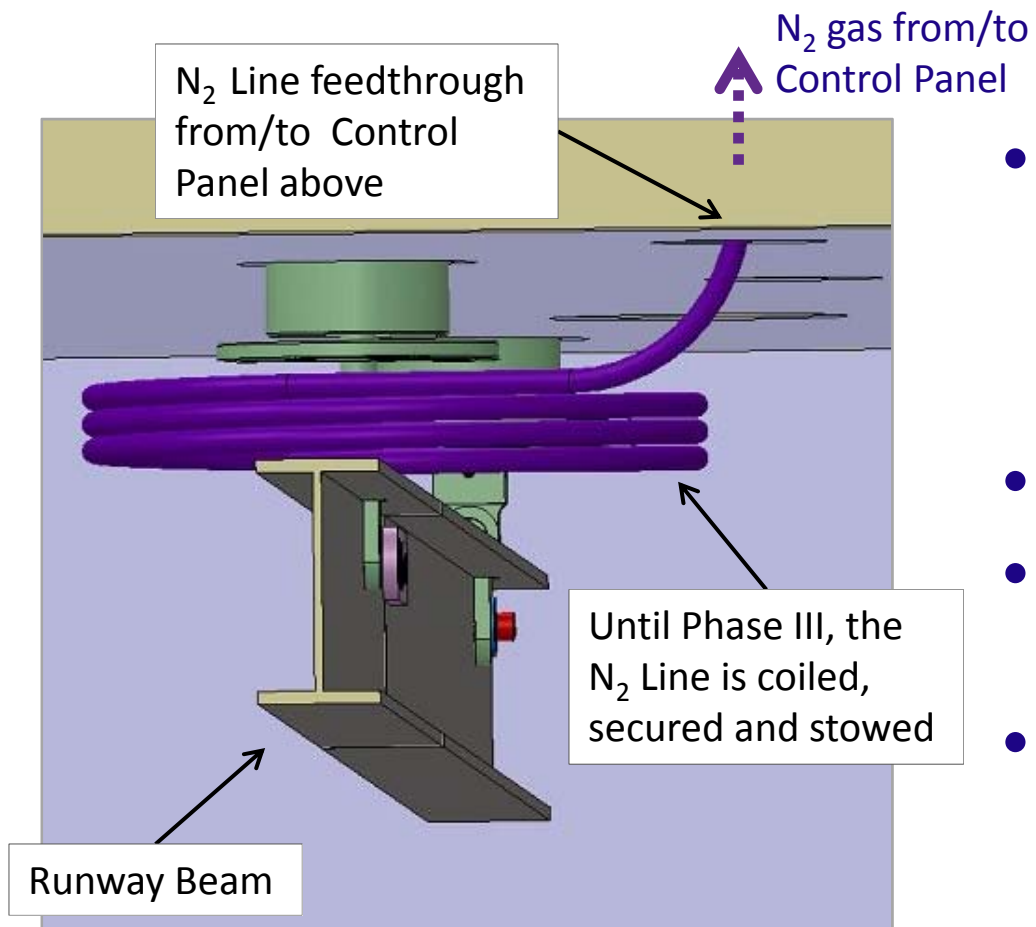
Graphics Source: Gina Rameika. Note: Phase timing shown approximate.

Phase I (Exterior): August/September 2017



- Install external Nitrogen Gas System components and Local Control Panel on roof.
- Secure Nitrogen Line through the Feedthrough Pipe flange.
- EHN1 Services Needed:
 - AC Power
 - House Nitrogen Line with a single custom fit section. No purity requirements. Low moisture content preferred.
- Slow Control Sensors (mV readout):
 - Temperature RTD (2X)
 - Pressure (2X)

Phase I (Interior): August/September 2017



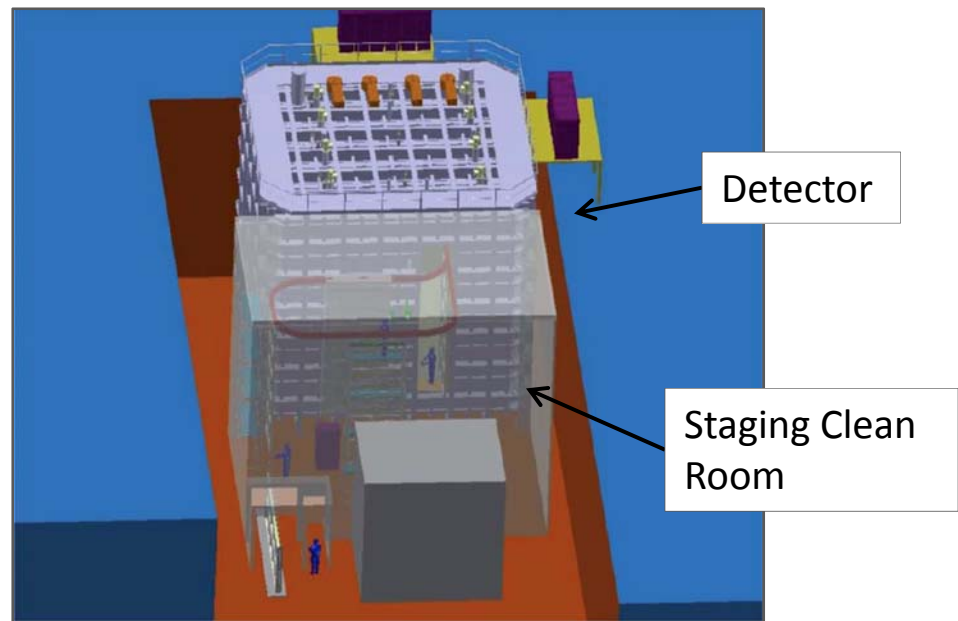
- Nitrogen Line temporarily coiled and supported by a Runway Beam until Beam C is in its final configuration.
- Nitrogen Line leak tested.
- Clean Electrical Grounding with Dielectric Break verified.
- System installation and testing duration: 1-2 weeks

Phase II: November/December 2017

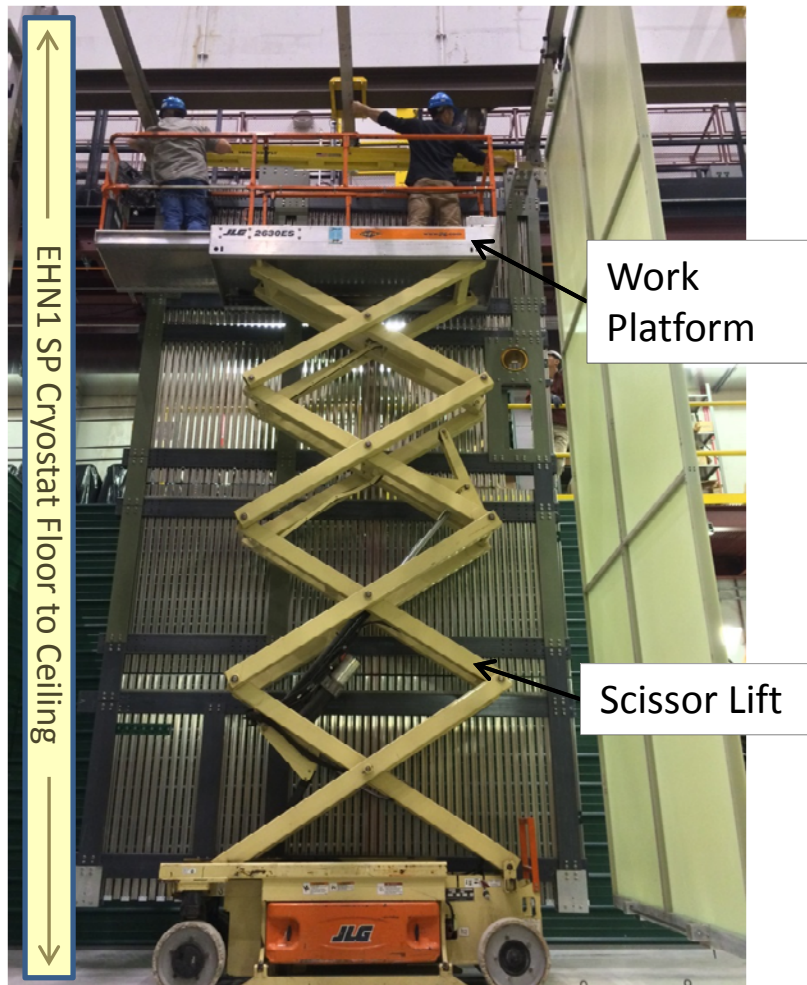


End Wall Field Cage with Beam Plug Mockup at Ash River Trial Assembly

- Beam Plug installed into End Wall Field Cage in Clean Room outside of cryostat.
- Beam Plug and End Wall Field Cage inserted into Detector together during Step 5A (*slide 5*).



Phase III: December 2017



Scissor Lift at Ash River Trial Assembly

- Beam Plug and End Wall Field Cage in position inside the detector.
- Scissor Lift is used to access Beam Plug location before north drift End Wall Field Cages are in their final configuration.

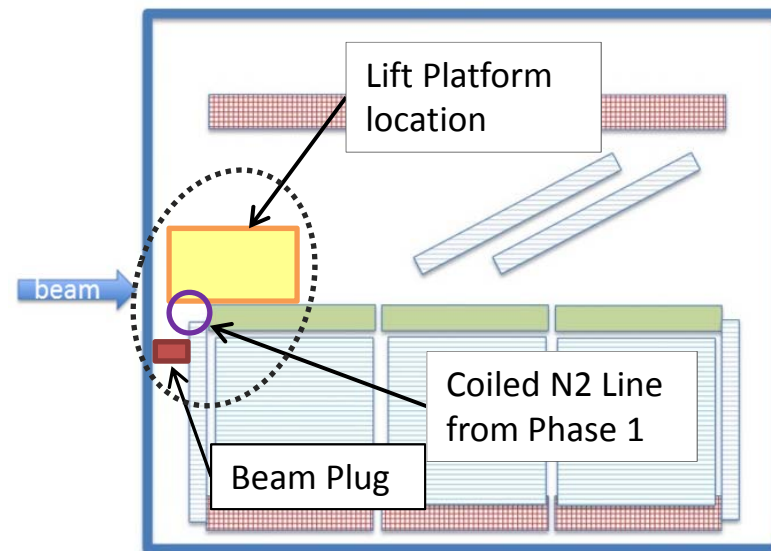
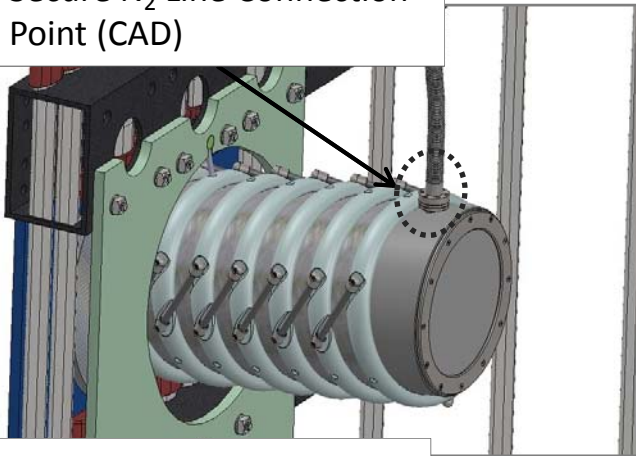


Image: Gina Rameika

Phase III: December 2017

Secure N₂ Line Connection Point (CAD)

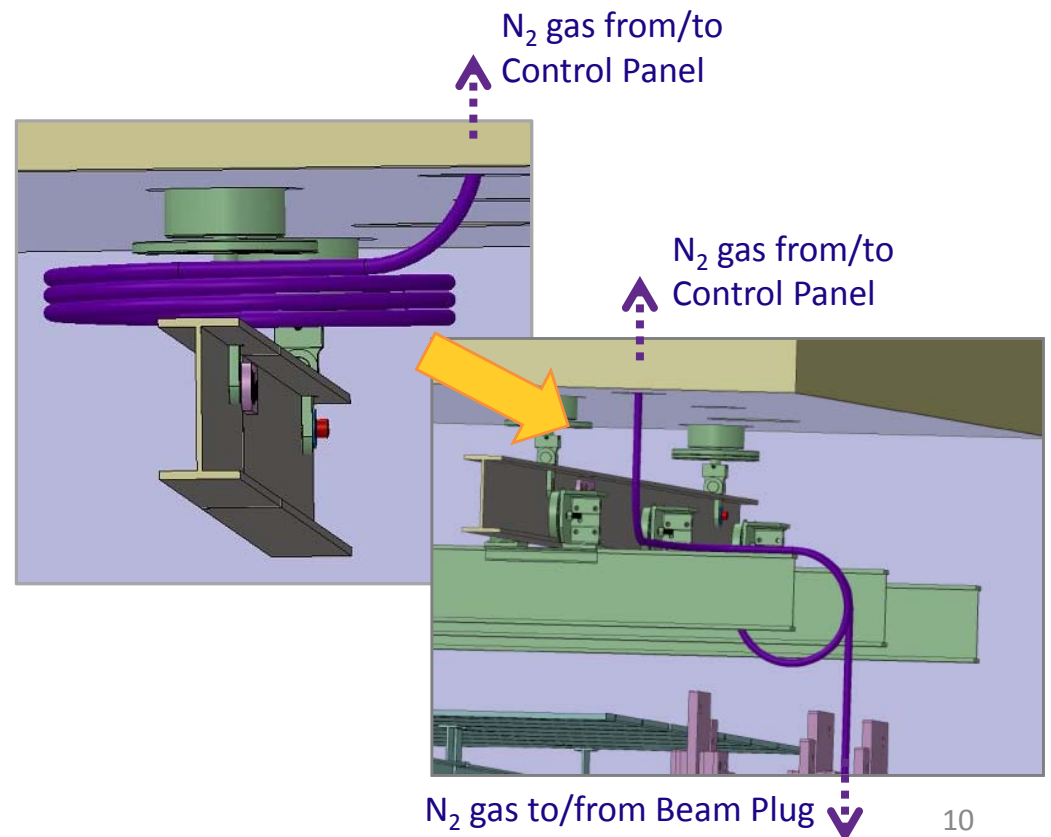


Secure N₂ Line Connection Point (mockup)



Phase III-type of view from Ash River.
(Will be within arms reach at EHN1.)

- Nitrogen Line is uncoiled and connected to the Beam Plug via metal seal Conflat flange.



Conclusion

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