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# **Alignment Activities at the Fermi National Accelerator Laboratory**

Horst Friedrichs

Fermi National Accelerator Laboratory

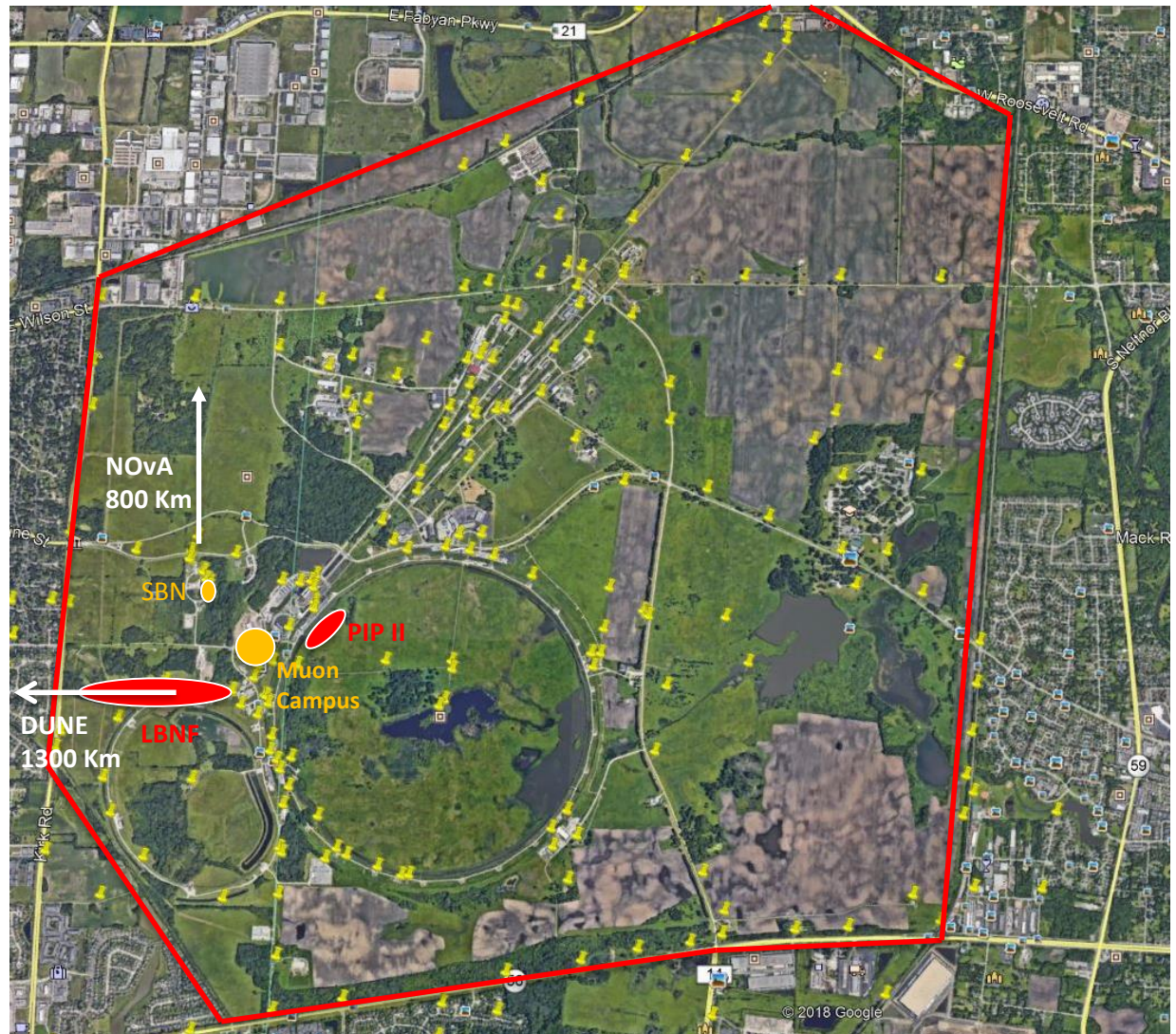
IWAA 2018 at FNAL, Batavia, October 08 – 12, 2018

# Alignment Activities at the Fermi National Accelerator Laboratory

## Fermilab areal view (25 Km<sup>2</sup>)

Position & vertical  
control network of  
Monuments & BMs

Most recent and  
future project sites

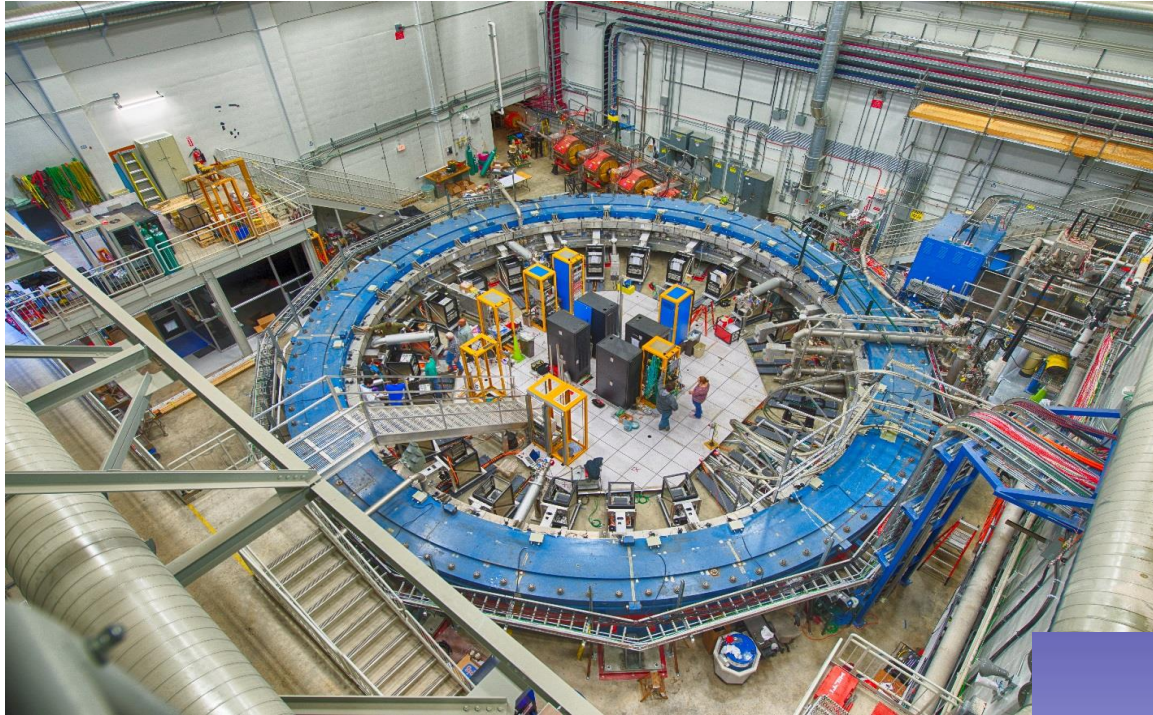




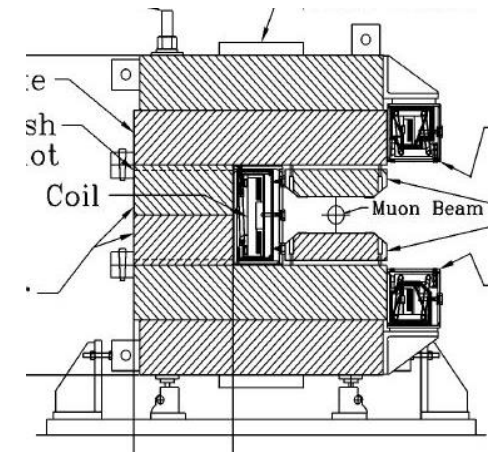
# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ Muon Campus (g-2)

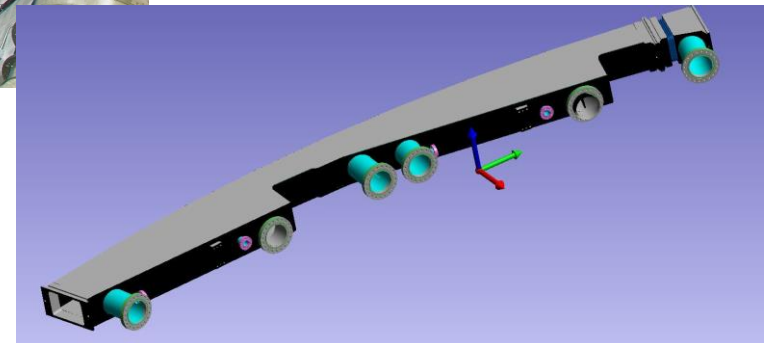
H. Friedsam / J. Kyle



14 m dia. g-2 storage ring constructed from 12 x 30° yoke segments



Ring cross section

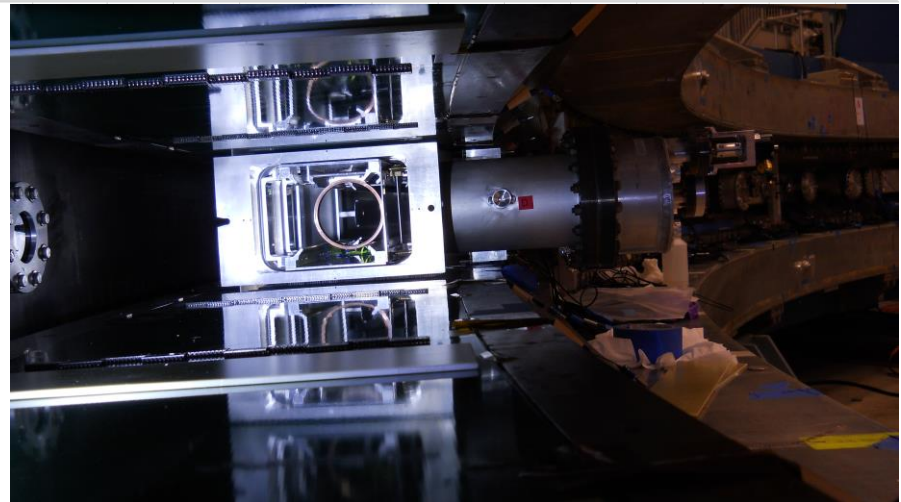
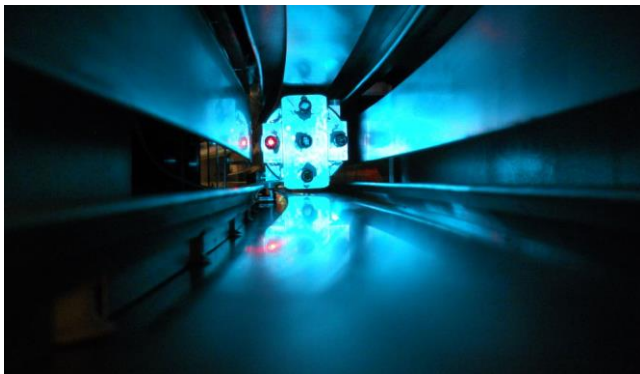
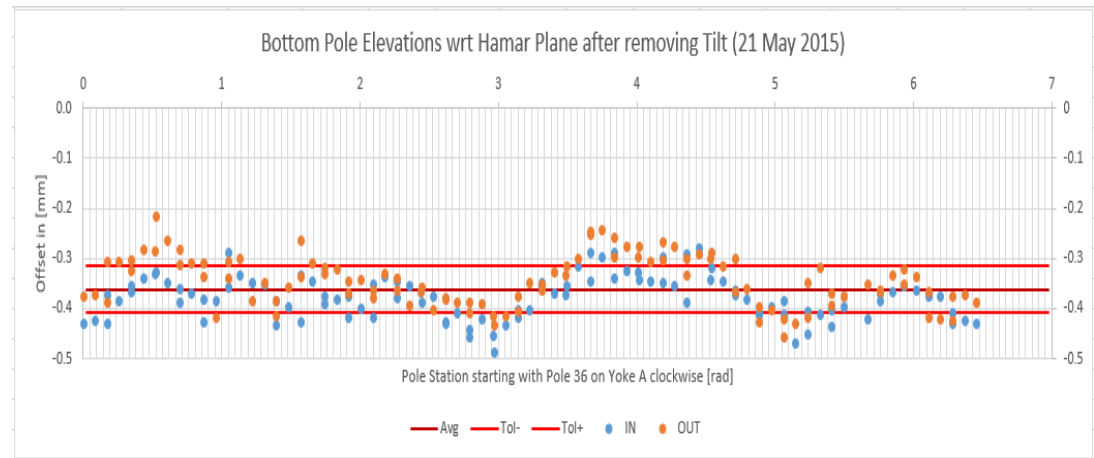


# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ Muon Campus (g-2)

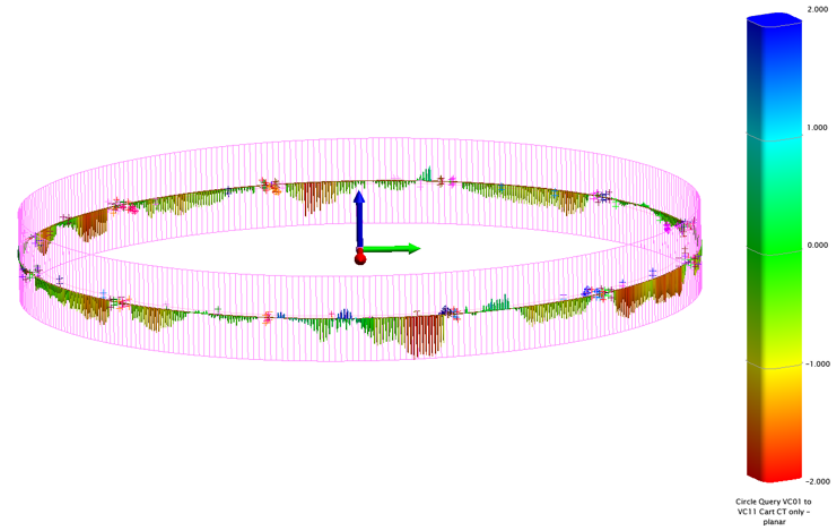
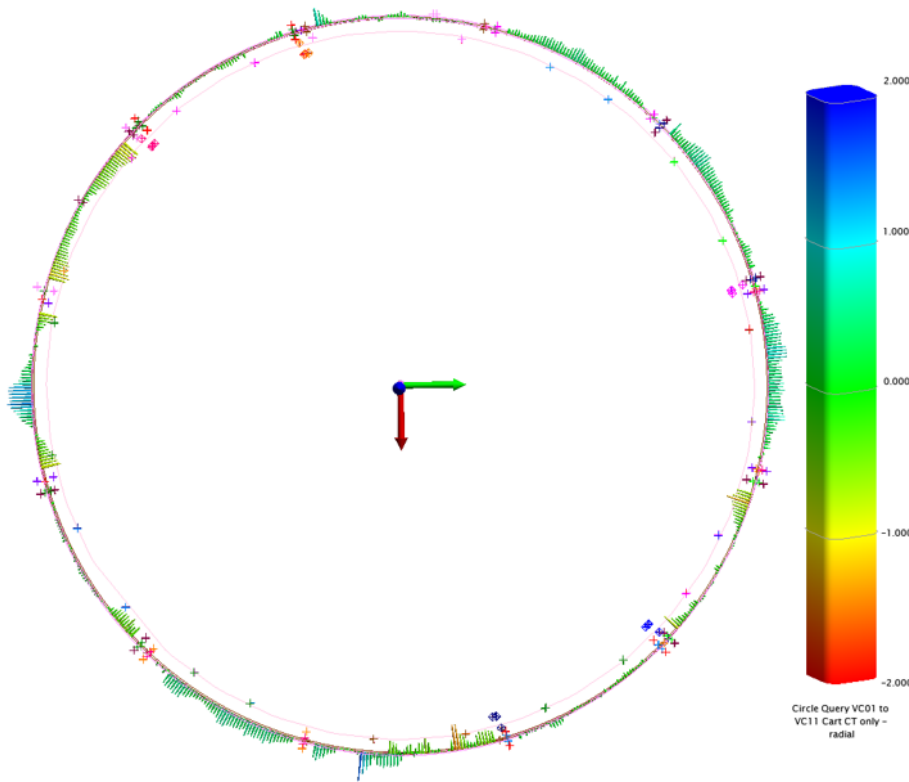


HAMAR Rotating Laser Level ( $\pm 2.5\mu\text{rad}$ )



# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ Muon Campus (g-2)



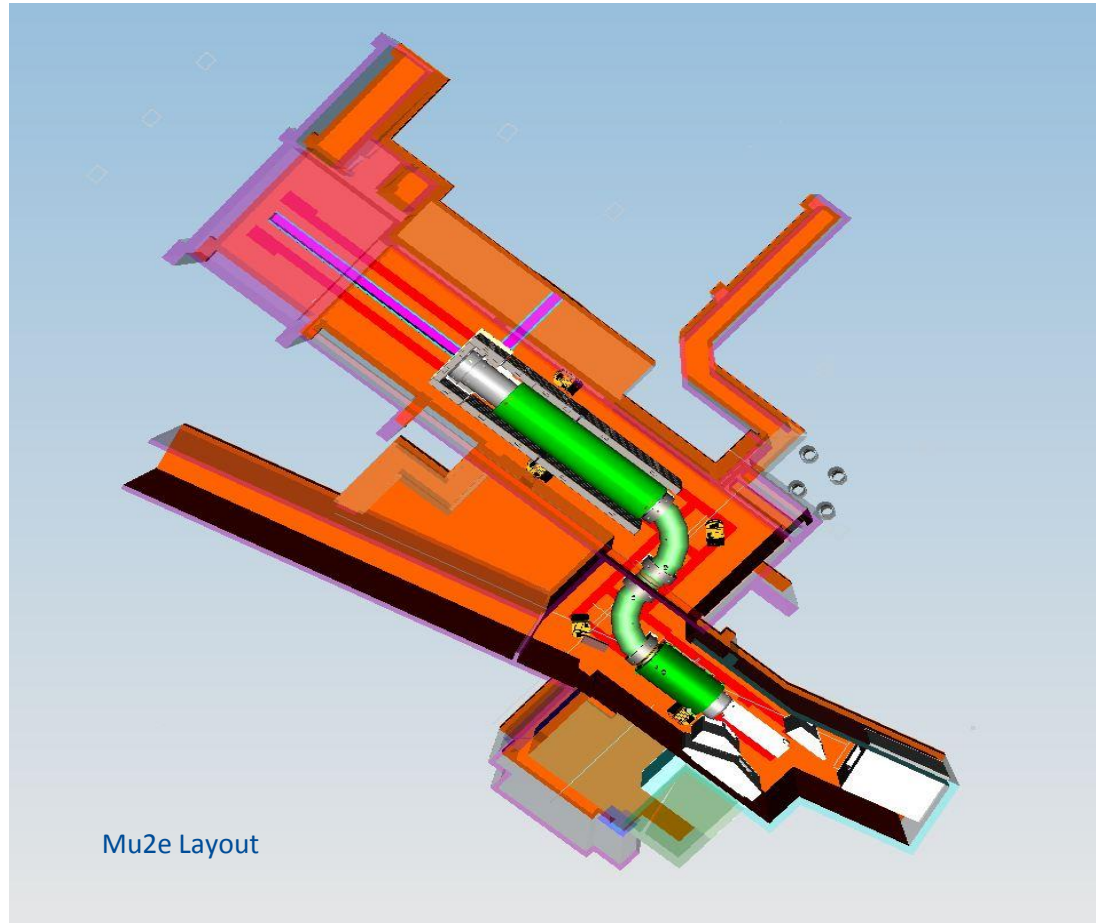
Vertical and radial deviations of the NMR probe trolley wrt ideal beam orbit (scale  $\pm 2$  mm – expected tolerance  $\pm 0.3$  mm )



# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ Muon Campus (Mu2e)

J. Barker / J. Kyle



# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ Muon Campus (Mu2e)



Production Target



Proto-type TS segment



DS magnetic Field Mapper

# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ Short Baseline Neutrino Project (SBN) Dr. B. Oshinowo



SBN Far  
Detector

MicroBOONE  
Detector

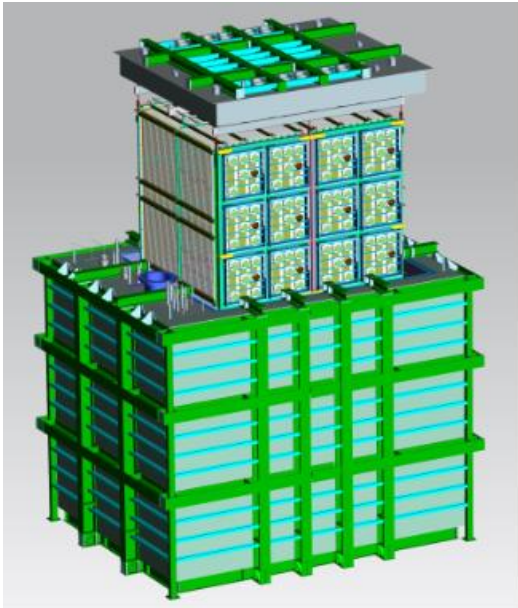
SBN Near  
Detector



# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ SBN Project

SBN Near Detector



The MicroBooNE cryostat.

SBN MicroBOONE Detector

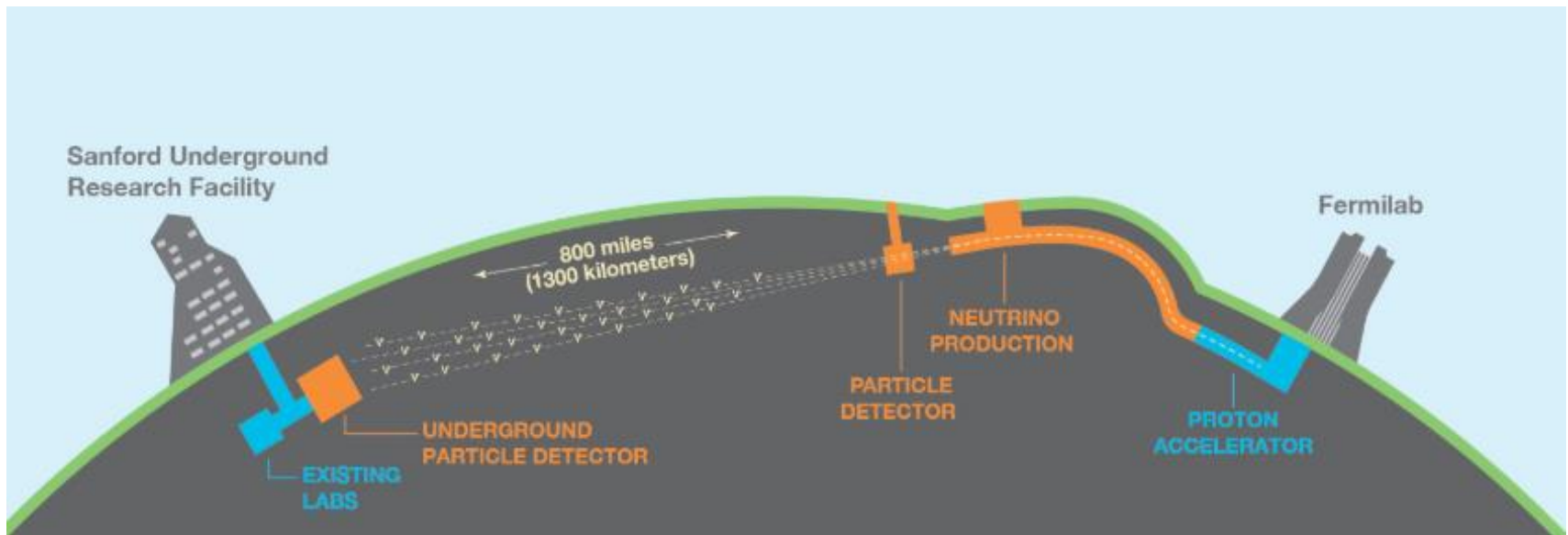
SBN Far Detector ICARUS



# Alignment Activities at the Fermi National Accelerator Laboratory

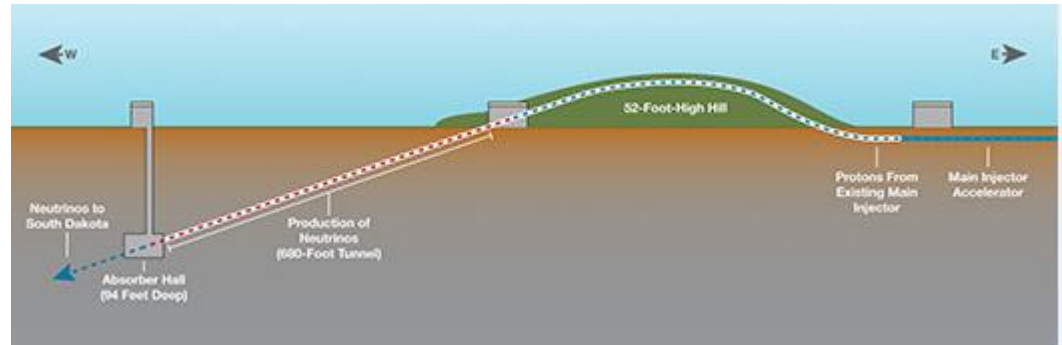
## ➤ Dune / LBNF Projects

Dr. V. Bocean

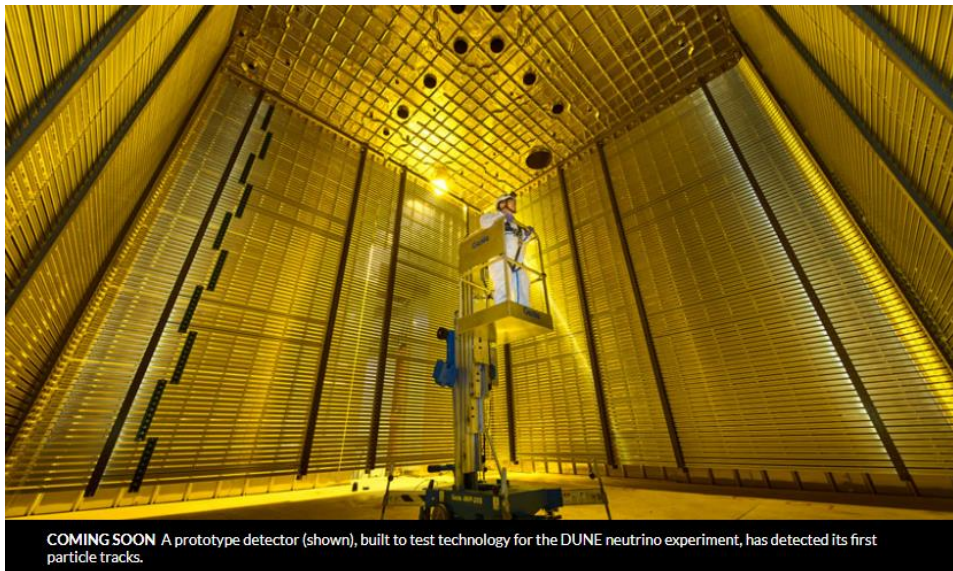


# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ Dune / LBNF Projects



Proto DUNE liquid Argon cryo-vessel at CERN



Proposed LBNF beam line



# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ DUNE / LBNF Projects



All smiles before going 1.6 Km below ground  
and before claustrophobia sets in

# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ DUNE / LBNF Projects



# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ Proton Improvement Project II (PIP II)



Architectural concept of the 300 m long Super Conducting RF PIP II Linac  
PIP II increases power on target to 2.4 MW ➔ Remote handling of survey equipment necessary

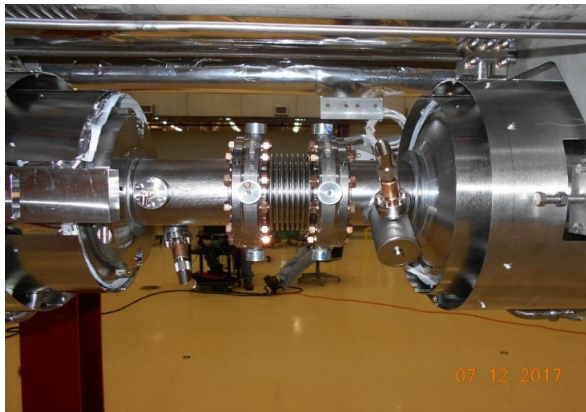


# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ Linac Coherent Light Source LCLS II      Dr. V. Bocean / G. Gassner

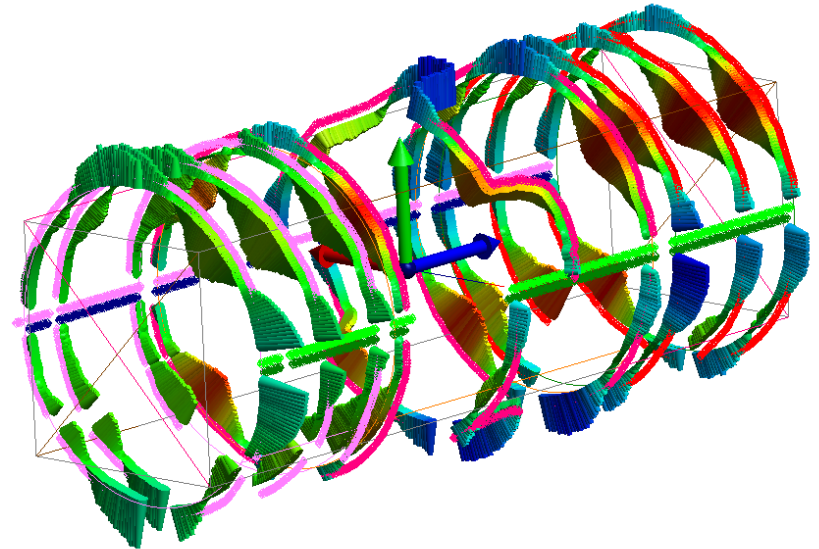
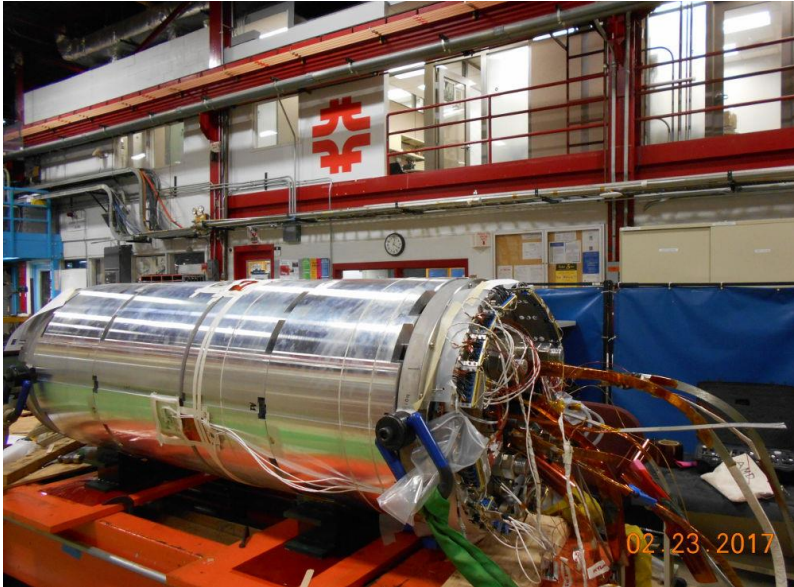


In collaboration with JLAB and SLAC, Fermilab is producing half of the SRF required cryo-modules



# Alignment Activities at the Fermi National Accelerator Laboratory

## ➤ High Luminosity HL-LHC upgrade J. Kyle / Dr. H. Durand



# Alignment Activities at the Fermi National Accelerator Laboratory

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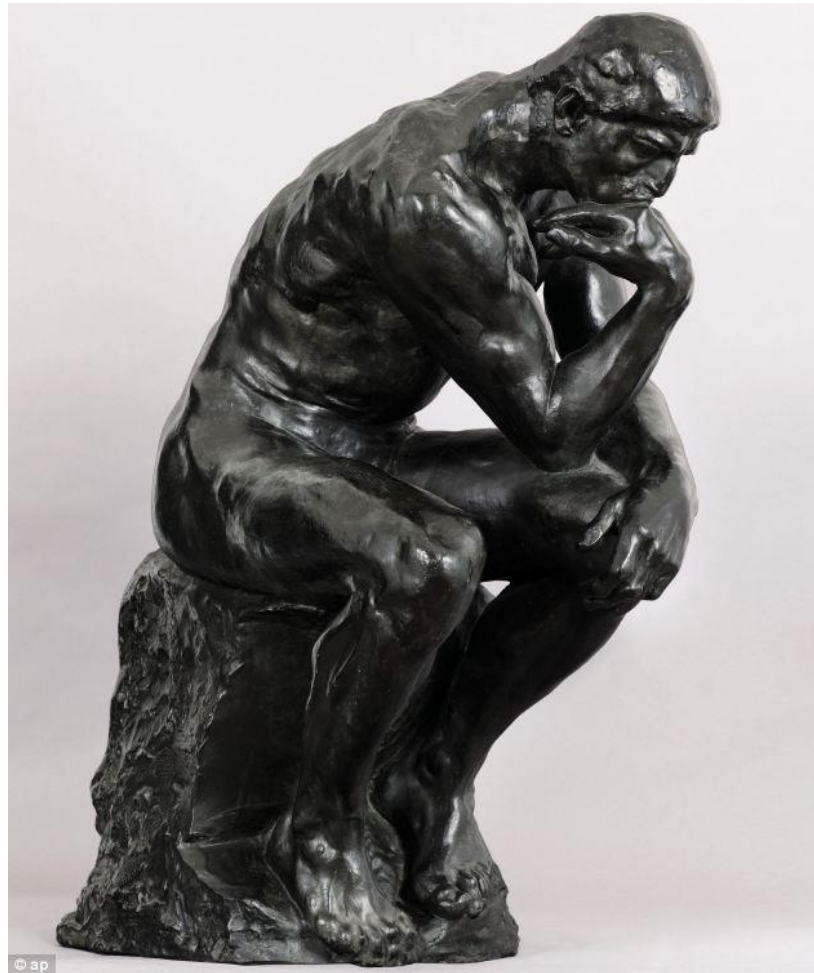
## ➤ Summary and future challenges

- Many different projects have been initiated at FNAL and are progressing in parallel thus taxing the AMD resources
- All of these projects require new laboratory infrastructure
- The laboratory funding has changed to a project driven structure determined by line items in the annual congressional appropriations bills
- The AMD seems no longer be part of the project planning or is being subsumed under installation activities and with that we are no longer in control of our own destiny



# Alignment Activities at the Fermi National Accelerator Laboratory

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*Quo vadis AMD ?*