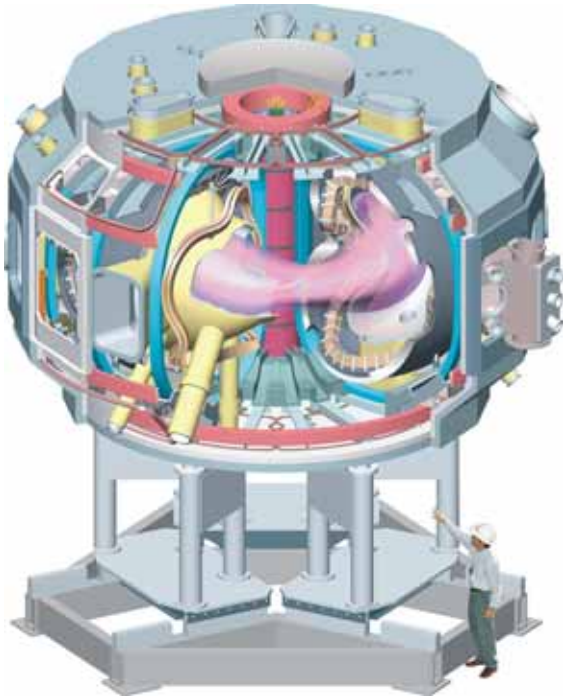
Design Integration Overview

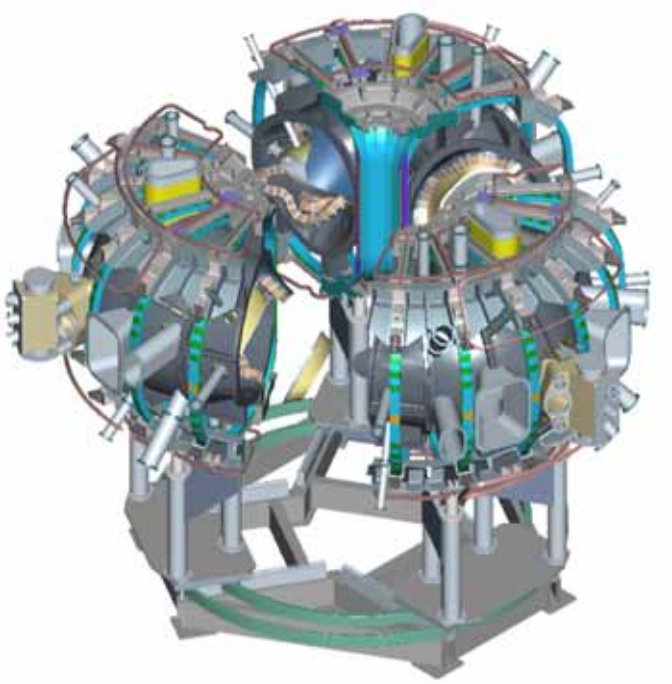


Mike Cole/Tom Brown

Oct 6, 2008

Outline

- Design Integration Objectives
- Division of Responsibilities
- Examples
  - Interference Checking
  - Machine Assembly
  - Facility Interfaces
- Summary



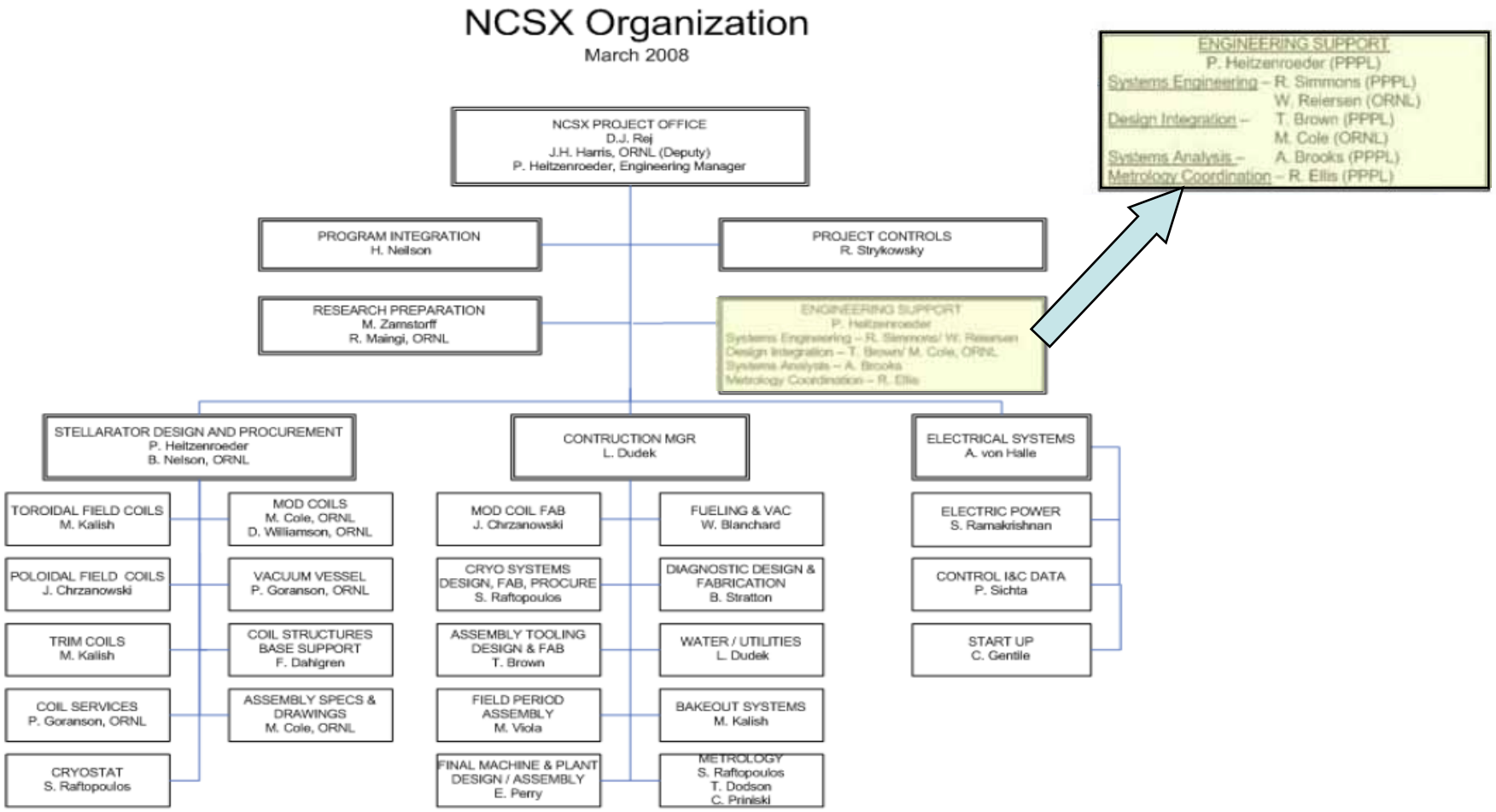
Design Integration Objectives

Responsibilities include:

- Work with WBS managers to develop initial concepts (layout of the machine).
- Investigate interface issues related to space allocation around the machine
- Check PDR/FDR design concepts as designs are finalized i.e. interference issues, assembly issues….
- Investigate out of tolerance dimensions from vendors to determine design impact
- Administering the CAD database of project models and drawings. Reviewing and promoting CAD models and drawings. Establishing Intralink procedures and privileges
- Providing support to the metrology and dimensional control efforts by analyzing metrology data in conjunction with CAD models of the parts and assemblies

Importance of Design Integration

NCSX

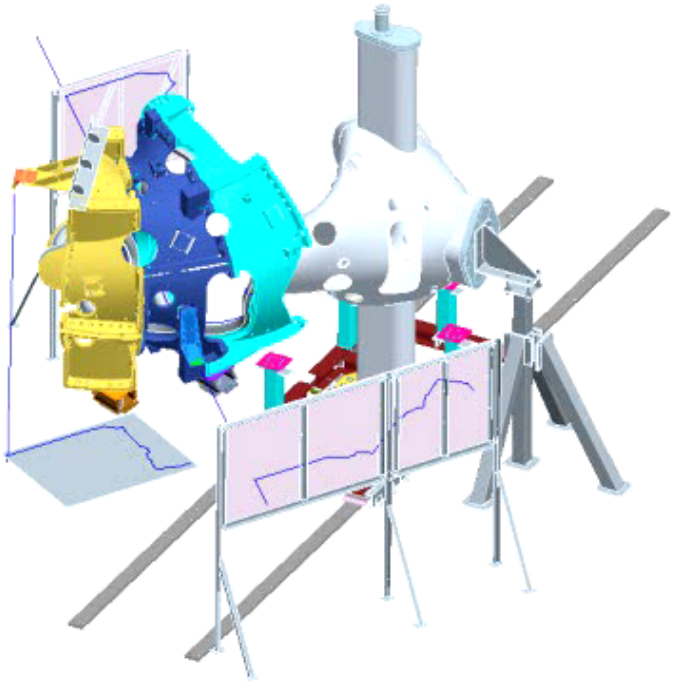


Division of responsibilities

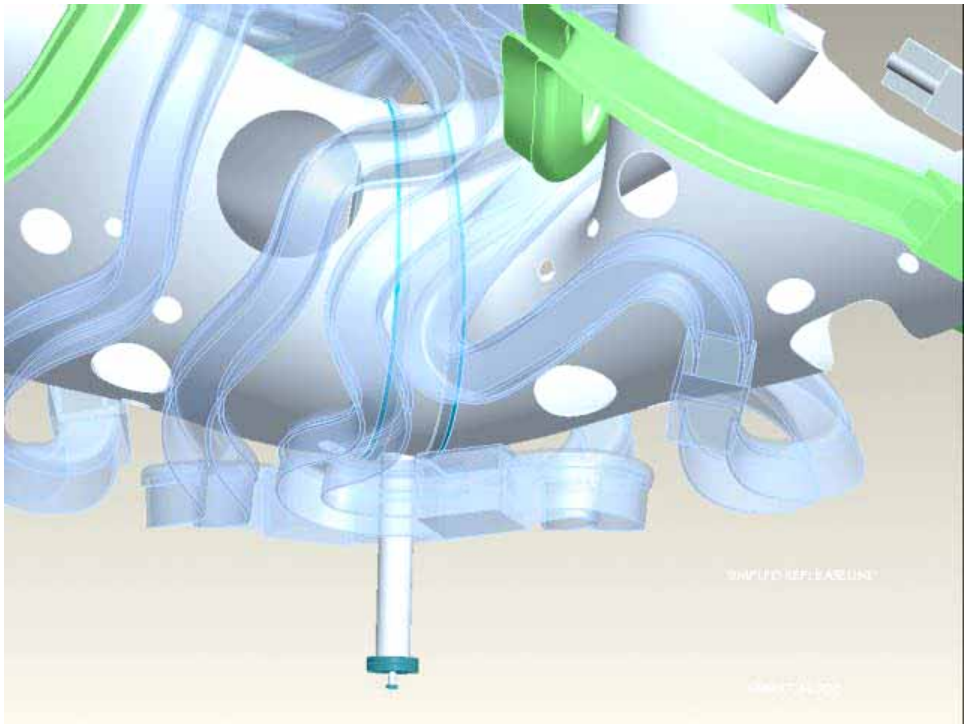
- Tom took the lead role in design integration
  - Our roles changed during different stages of the project
    - In support of ORNL in developing the device core component details M.Cole
    - Development of the test cell general arrangement, and T. Brown
    - The machine assembly design and assembly sequence plan T. Brown
  - The WBS structure helped us divide work into logical assignments.
- GOOD COMMUNICATION!
  - Working at two different locations was a challenge but we talked daily, freely shared information and reports, and emailed frequently
  - Worked to develop the data management system for Pro E files so that we shared common file location. Everyone who was involved in the CAD group at PPPL or Oak Ridge had free access to all design files
    - Solved problems of working on the same file by having cad users lock files when they had them checked out
    - Good internet connections between institutions were very good. Download times were reasonable
    - PPPL's development of the "Engineering" Web site was an excellent method for sharing information.
    - Large file transfers have been accomplished using ftp sites at PPPL and ORNL

Assembly simulation clearance studies

Station 3 assembly

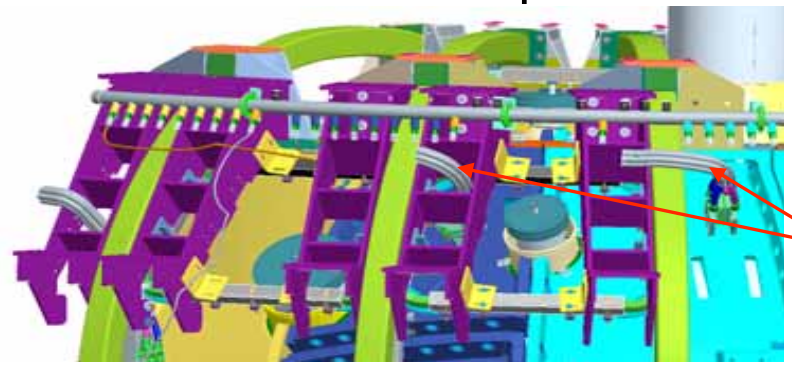


Final machine assembly



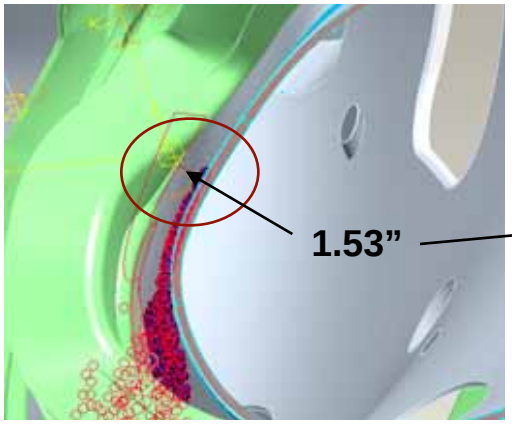
Continue to review interfaces and support the metrology and dimensional control efforts

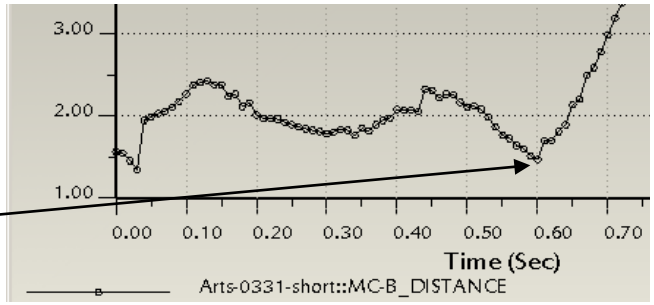
- Continue to review component interfaces



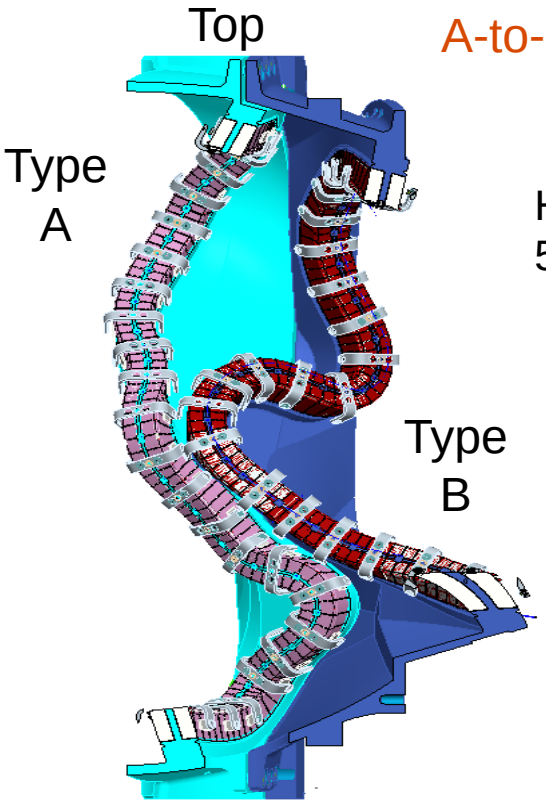
Added lead stems to improve assembly features and schedule

- analyzing metrology data in conjunction with CAD models of the parts and assemblies

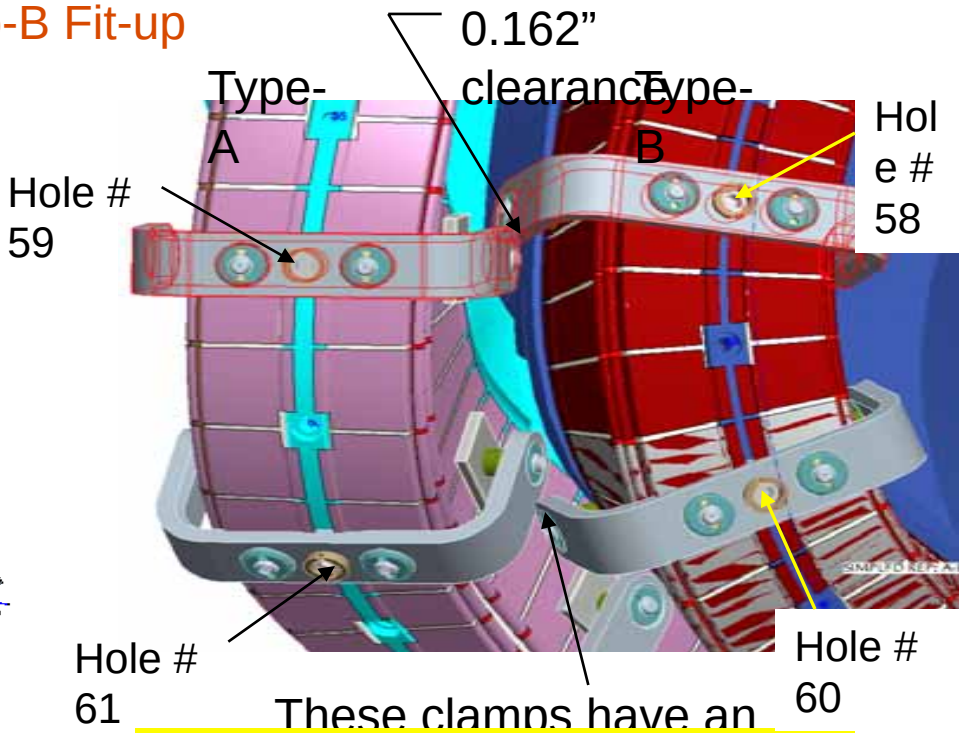




Ex - Interference Checking

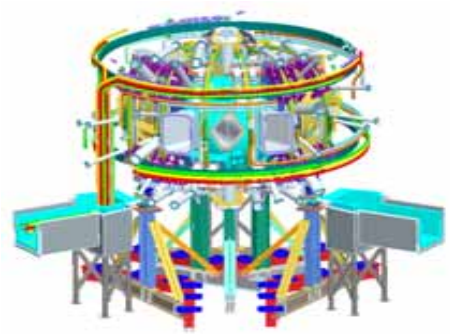


A-to-B Fit-up

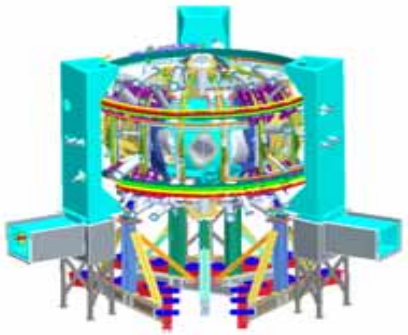


Clamps on A and B where there is interference or close contact is indicated. Clamp measured needed.

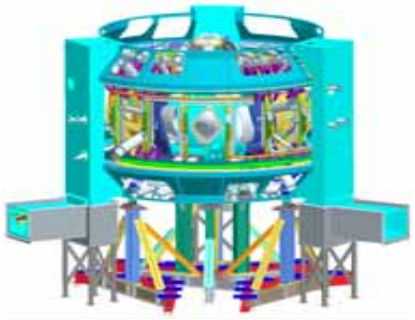
Ex – Machine Assy



1. Lead routing into base of chase

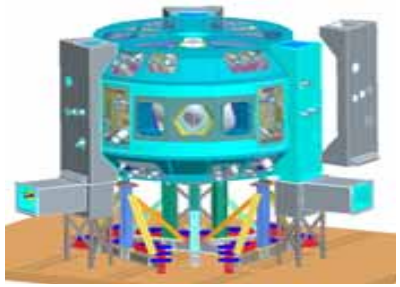


2. Interior lead chase installed

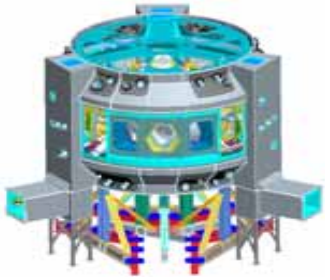


3. Interior angle sections installed

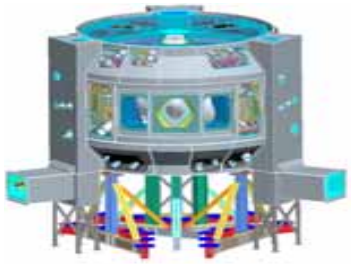
4. Interior mid-sections and upper/lower flat sections installed



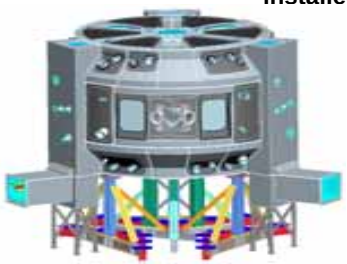
5. Exterior lead chase installed



6. Exterior angle sections installed

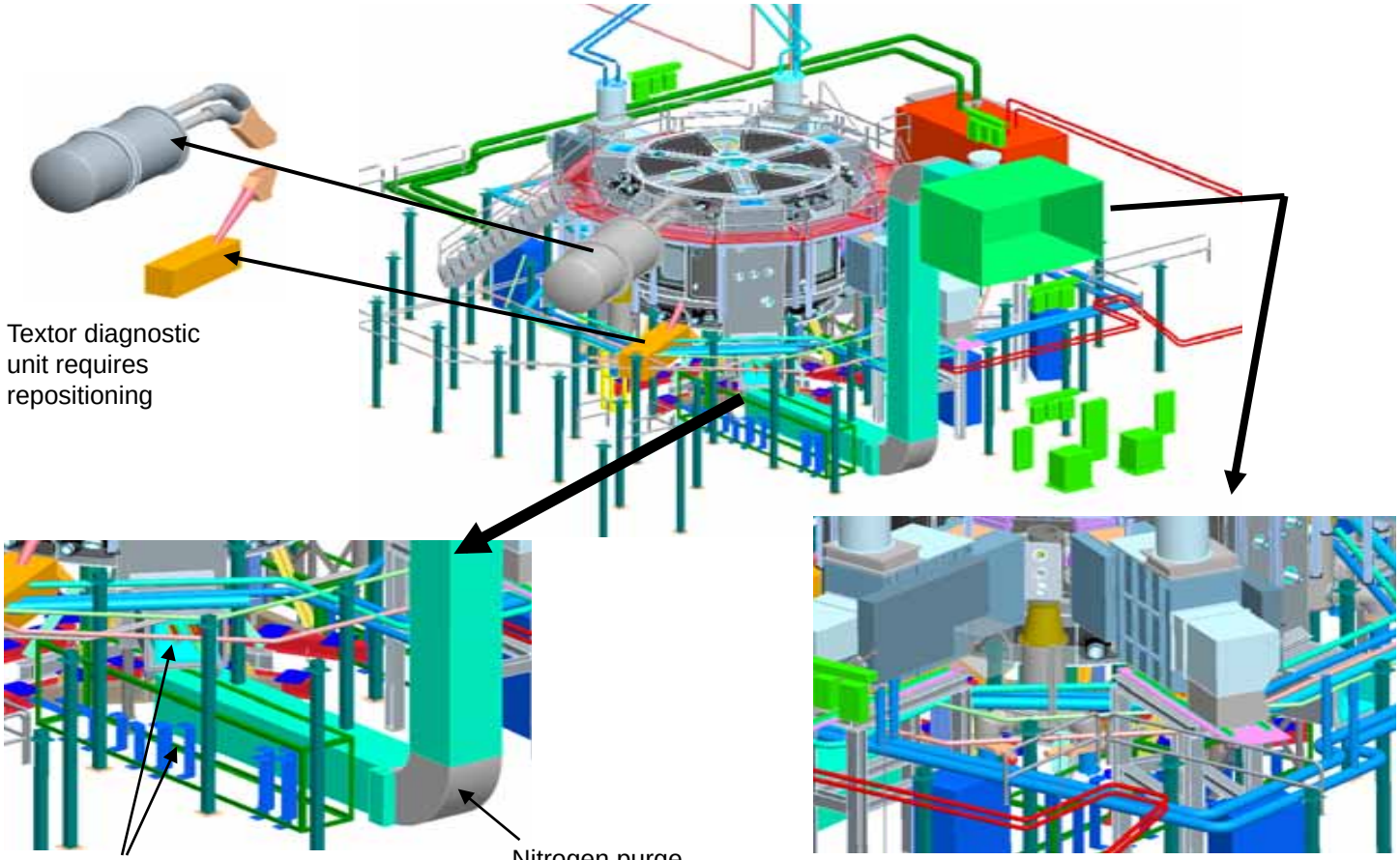


7. Exterior mid-sections sections installed

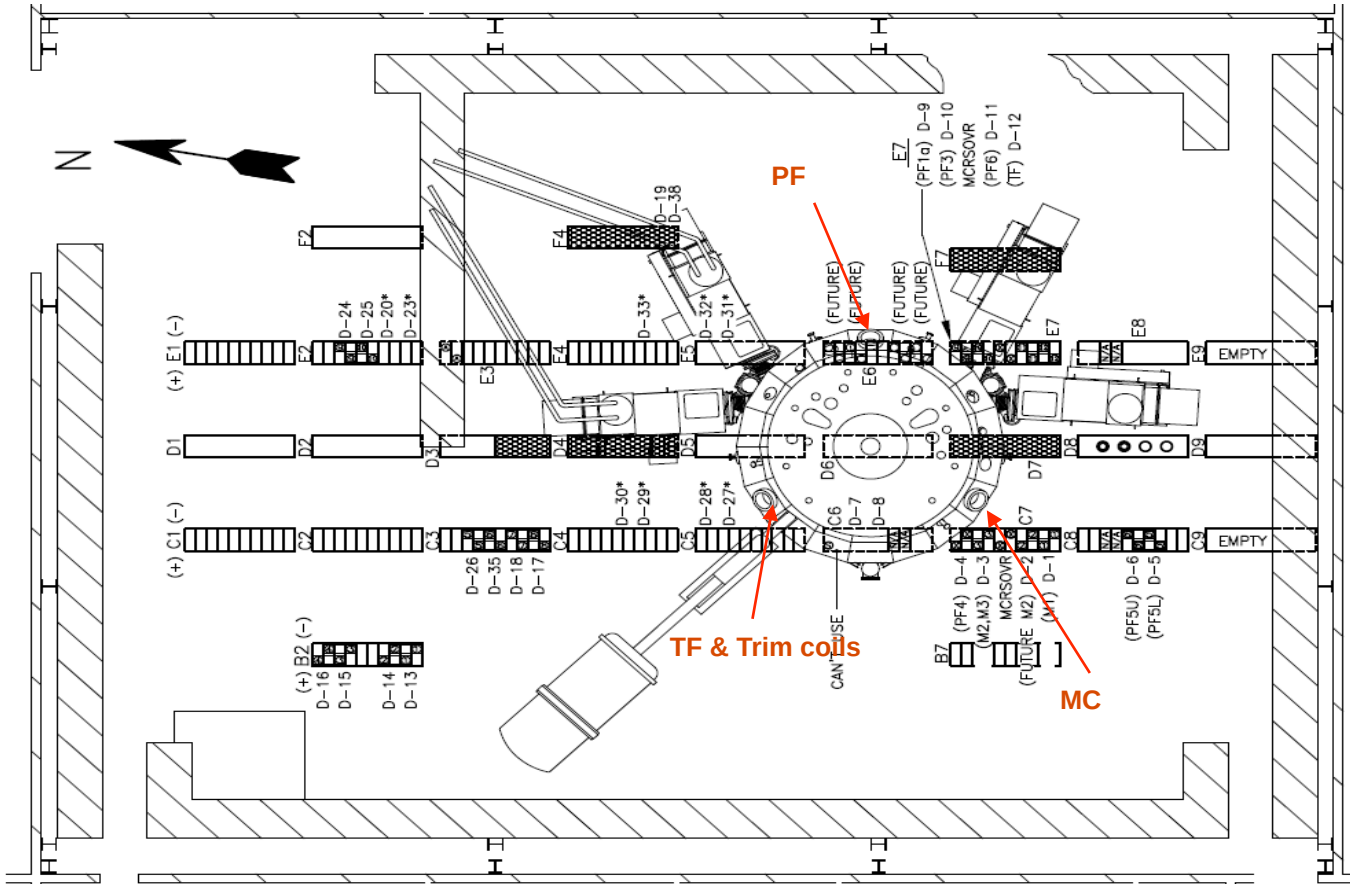


8. Exterior upper/ lower flat sections and port covers installed

Ex - Machine Assembly/Facility



Ex – Facility interface



Summary

- What worked with Design Integration
  - The project identified the importance of design integration as shown on the organization chart.
  - Individuals for accomplishing the design integration effort were assigned
  - 3d cad tools were a significant tool used to achieve design integration objectives
  - Initial objectives were successful during early stages of design
- What did not work
  - The individuals assigned to perform the design integration objectives were assigned other task that prevented them from meeting the design integration objectives.
  - More people should have been assigned design integration task early in the project schedule
  - With time, the design integration people become the most familiar with all aspects of the machine. They become very valuable based on the knowledge of the machine. When problems develop and a solution has to be found quickly they are often chosen to work on critical problems. Reassigning these individuals is very tempting but it must be done very carefully. These are often the ones that will prevent a problem from becoming critical.