

**NCSX**

**WBS 1 Torus systems  
Design Progress and Status**

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NCSX Project Meeting  
PPPL  
March 31, 1999

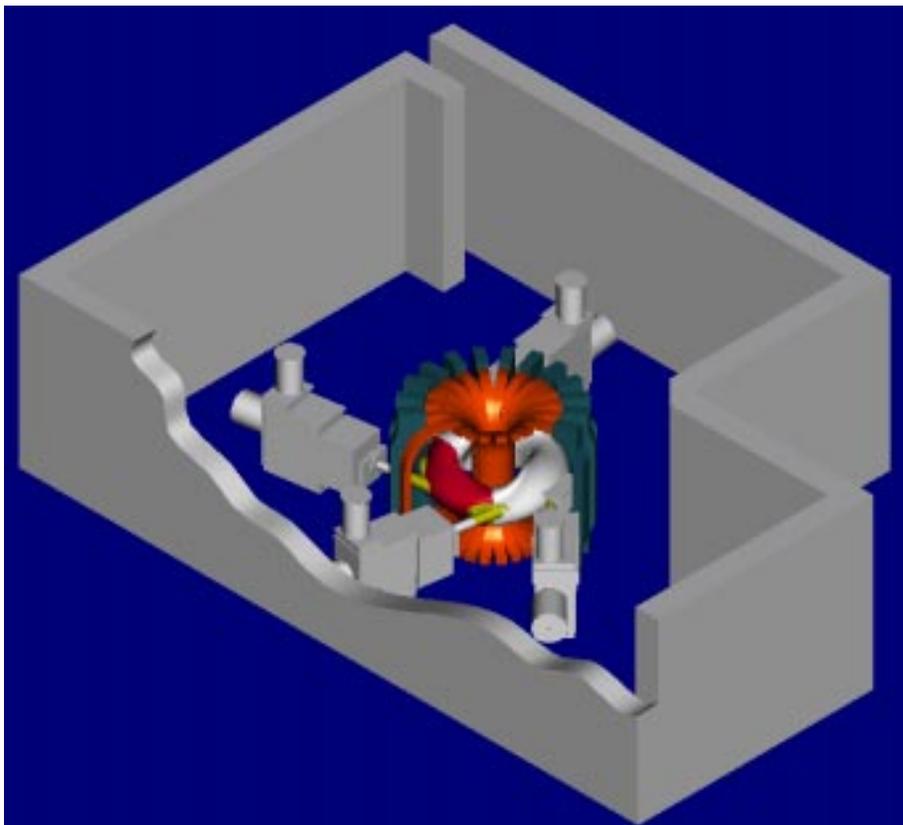
# Outline of Presentations

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- WBS 1 Overview and status Nelson
- Non-Axisymmetric Coil and Structure Design Williamson  
*Design Parameters, Design configuration, Status and Issues*
- Vacuum Liner Goranson  
*Requirements and Design Criteria, Fabrication Options, Status and Issues*
- Design Integration Cole  
*Port and Neutral Beam Injection layouts*
- Issue recap and summary Nelson

# NCSX in PBX facility

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## Baseline parameters for design study

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- Pre-assembled, “drop in “ stellarator core, consisting of vacuum vessel, saddle coils, and saddle coil structure

Option 2C - Re-use PBX TF, PF coils and structure

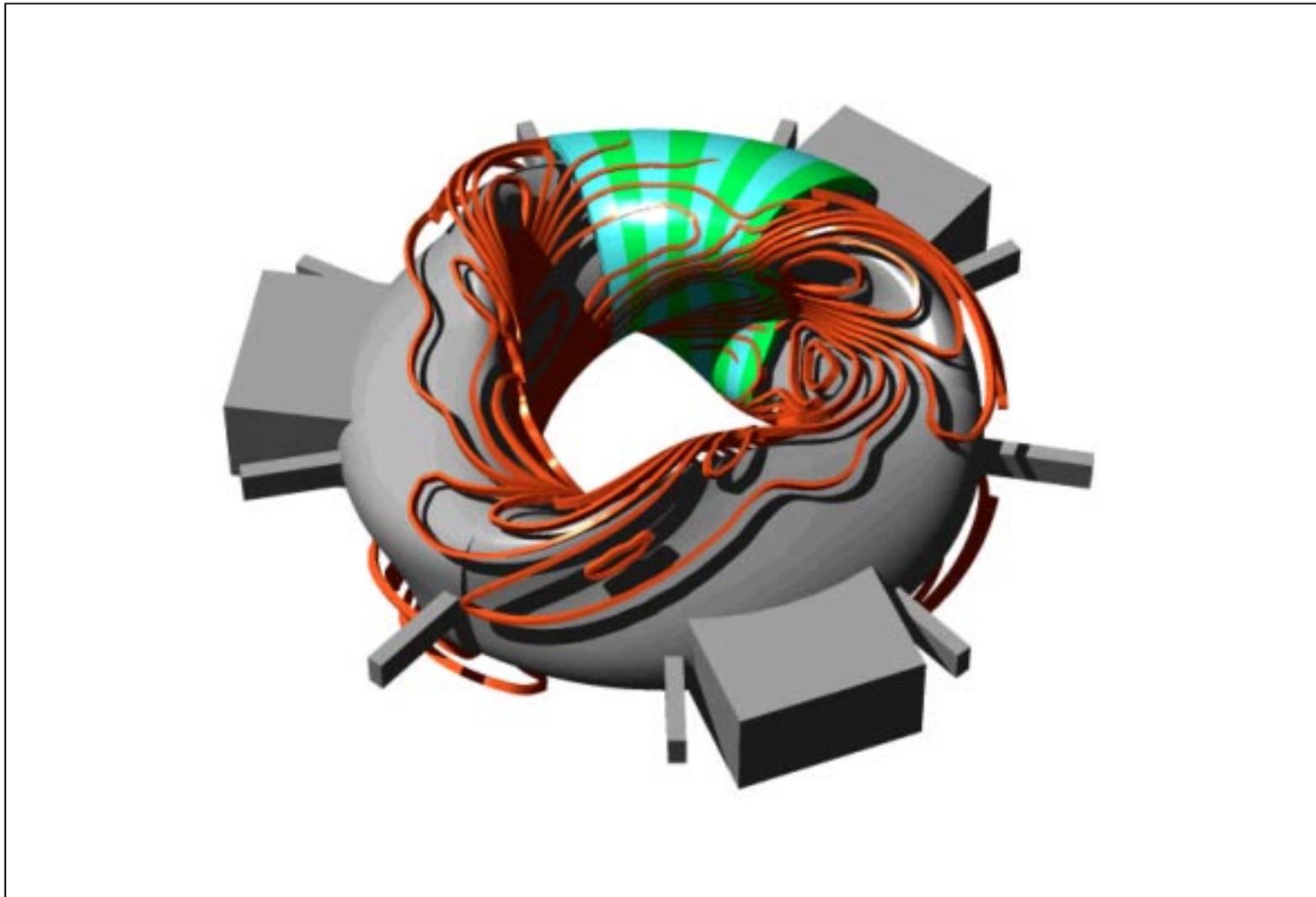
- C10 plasma with SAD18.5\_16 coil set, LN cooled

16 x 70 mm winding size,  $\sim 17,500 \text{ A/cm}^2$  current density at 2 Tesla field on axis  
23 mm minimum spacing between saddle coil windings  
10 turns per saddle coil

- Vacuum vessel is stand-alone, structural vessel that can be baked to 350C

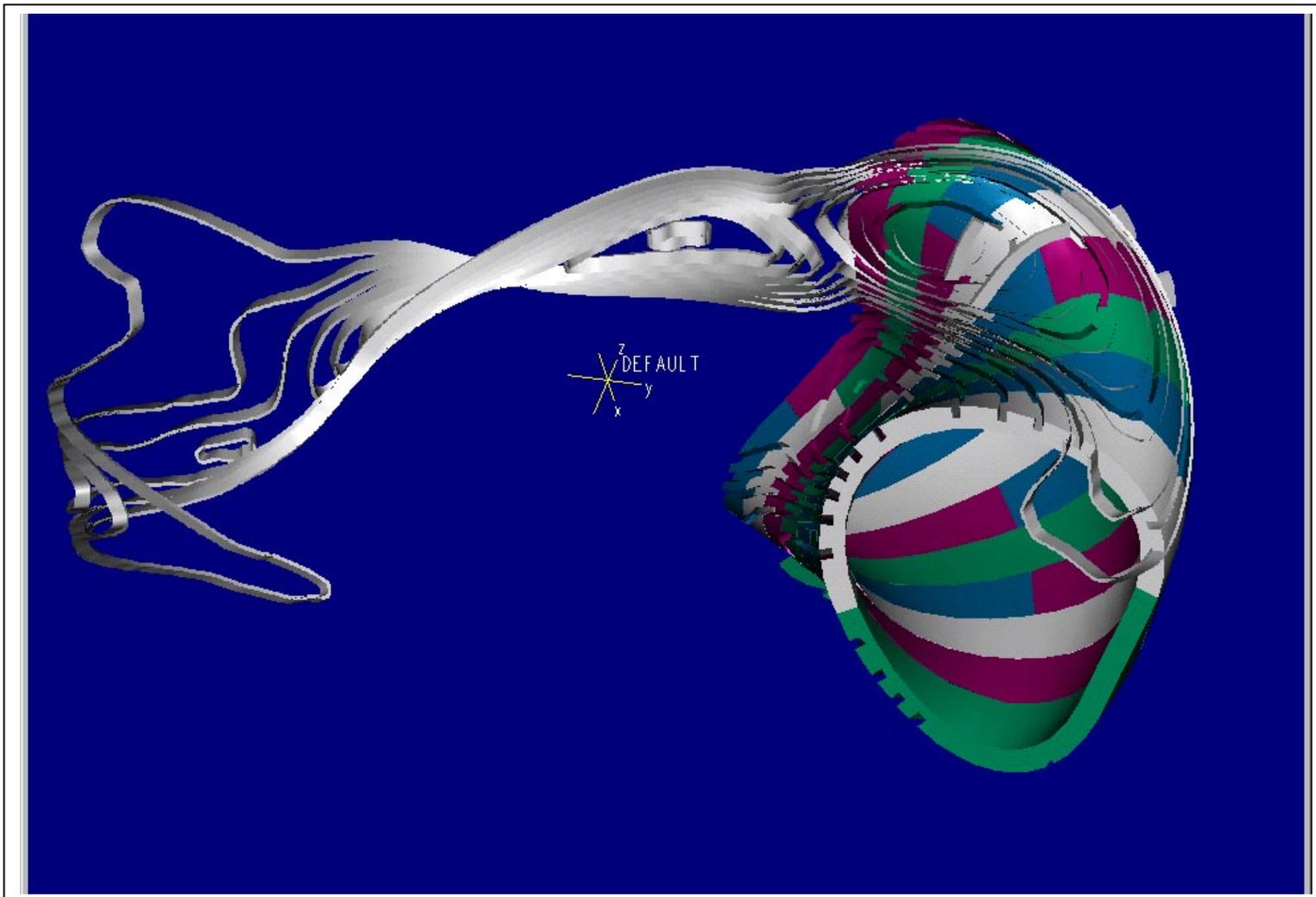
## Winding set , SAD185-8 with vacuum vessel and partial shell

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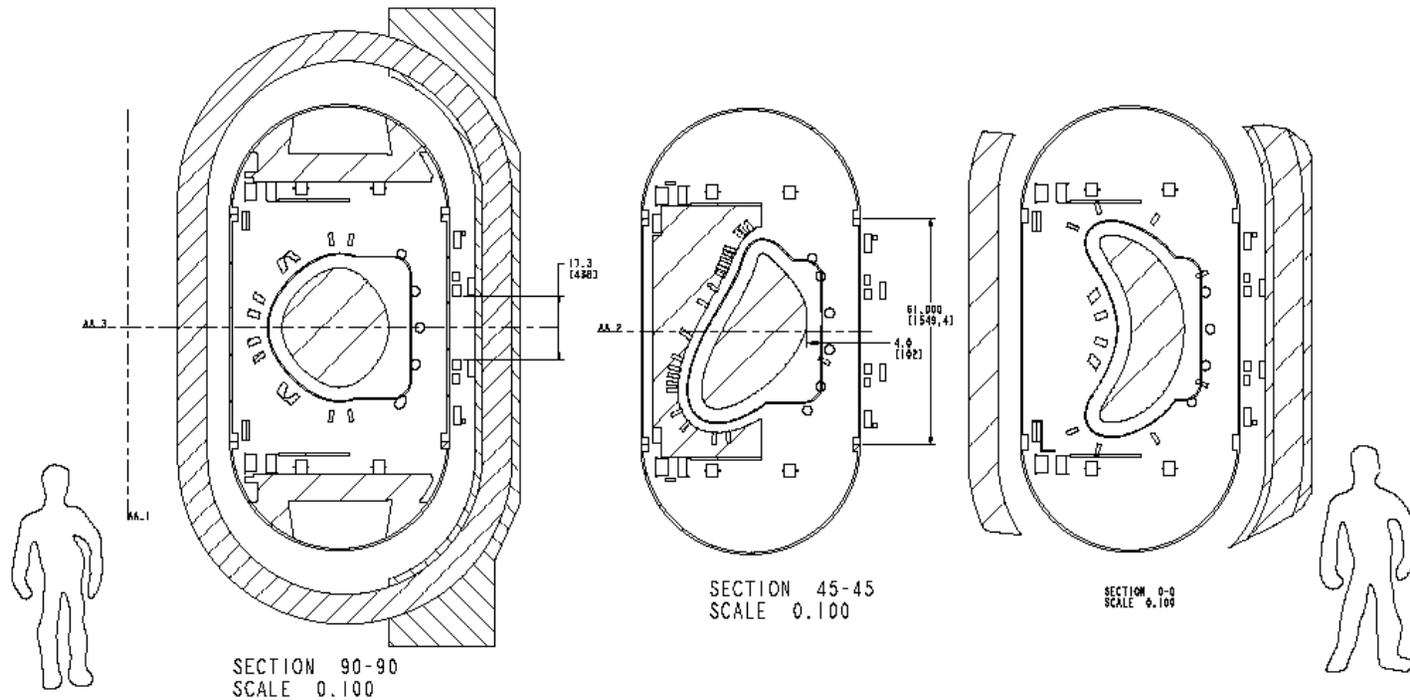
# Winding set , one field period, SAD185-16 with partial shell

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# Sections through machine for D9E in PBX

NOTE: Design based on cell end surface data \*d6e-2\*



ELEVATION VIEWS

(SECTION CUT)

## WBS-1 Goals for March 30 to May 5

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- Continue to refine design criteria and requirements
- Develop radial build parameters
- Select saddle coil and shell structure configuration
  1. Develop shell design based on bronze castings, 8 segments per period
  2. Contact vendors concerning fabrication / winding / structure concept
  3. Begin to execute R&D plan
- Continue to identify and resolve vacuum vessel issues
  1. Contact potential fabricators about break bending vs other forming techniques
  2. Explore permeability issue
  3. Develop thermal insulation scheme and document first order thermal analysis
  4. Begin to execute R&D plan
- Continue to develop and benchmark tools for analysis and for iterating 3-D coil designs between physics and engineering

## Progress since March 30 meeting

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Progress has been made in several areas since March 30 meeting

- Selected the baseline design configuration and fabrication concept
  - Segmented bronze casting with machined grooves for shell fabrication
  - Break-bending of flat developments for vacuum vessel fabrication
- Reviewed baseline radial build
- Performed first order thermal analysis of vessel and shell
- Performed independent field and force calculation for saddle coils (HM Fan)
- Began to execute R&D plan
- Continued design integration task with NBI-aiming studies using 18 and 20 TF coils