
Purpose and Goals of the NCSX Conference Call on Modular Coil Analyses

February 25, 2004

10:00 EST

Agenda

- **Phil Heitzenroeder – Introduction**
 - Background
 - Purpose of the Conference Call
 - Goals
 - **David Williamson - Discussion of Analyses**
 - From the Preliminary and Baseline Design Reviews
 - Required for the Final Design Review
 - Discussion of Material Properties Used and Required
 - **Jim Chrzanowski – Cable Properties Testing**
 - discussion of the test specimens and testing methodology planned on the “final” coil cable.
 - **Open Discussions**
 - Comments on the Analyses
 - Comments on the proposed Cable Testing / Properties Determination
 - **Develop a Plan of Action**
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Background

The PBR Design and Analysis Presentation concluded:

“Analysis shows design to be adequate for reference operating scenarios

- ❑ *Coil cools from 40-deg temperature rise after pulse in 15-min with no ratcheting*
- ❑ *Deflection of coil structure due to EM loads is <0.04-in, stress minimal (FS=2)*
- ❑ *Winding stress depends on properties, initial strain due to cure and thermal shrinkage*
- ❑ *Initial analysis shows stress up to 16-ksi, FS=1.3*
- ❑ *Further non-linear analysis is planned during final design”*

But...

- **Calculations were based on estimated or preliminary properties for the materials.**
- **Fatigue calculations were not performed.**

For the FDR, in the analysis area we need to demonstrate that the static, fatigue, and thermal analyses results meet NCSX’s design criteria;

- This requires defensible materials properties!
 - ❑ E for the impregnated cable. *This is the most important parameter, and the one for which we still have many questions.* An ANSYS cable model would predict an E in the range of 4 x higher than the preliminary test results.
 - ❑ α for the stainless steel casting and cable. *Not a problem; just need more data.*
 - ❑ Shrinkage coefficient for the epoxy/glass.
 - Tests indicate 1.48% , but expected “gaps” opening between test windings and the coil forms are not observed!
 - This is important because it makes a big difference in how the winding is initially supported by the winding form.
- ❑ K for the impregnated cable. We’re probably OK with available data on Cu and epoxy.

Purpose of this Call

- To discuss the analysis history and future plans.
 - To discuss the materials properties used to date, data concerns, and plans for additional materials test.
 - *Most importantly, to get your suggestions concerning the analysis, materials data, and testing.*
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Meeting Goal

To develop plans for:

- Independent checking of thermal, static and fatigue analyses (parallel calculations?).
 - Possible joint analyses activities (model development?)
 - Materials testing consultation, possible assistance in actual test performance, and consultation on the data analysis
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