



# **NCSX Requirements Update**

**Wayne Reiersen**  
**NCSX Project Meeting**  
**PPPL**  
**March 30-31, 1999**

**NCSX**

# Topics

- **Documentation**
- **Shell time constant**

# Requirements documentation

- **Physics and system-level engineering requirements will be documented in a single document -- the General Requirements Document (GRD)**
- **The basis for the physics requirements in the GRD will be documented and defended at the PVR**
- **MZ is responsible for assuring that the physics requirements are properly addressed in the GRD**
- **WR is responsible for engineering requirements and overall document maintenance**
- **An Access database program developed by TRW for tracking requirements (EDITS) is being evaluated for use on NCSX**

# Time constant of shell

- **Previous guidance has been to keep the eddy current time constants low (order 10ms)**
  - **Fundamental concern appears to be field errors from eddy currents in shell**
- **This drives us to conducting shells with many insulating breaks or a non-conducting shell**
- **Fiber-reinforced plastic shells tend to have low strength, a CTE that is twice that of copper, and poor machinability**
- **Bronze shells have good strength, are easy to cast, easy to machine, have CTEs that match well with copper, and fairly high electrical resistivity (10x copper) and *are the preferred solution***

# Plan needed to establish time constant limits

- **Georgiyevskiy has employed a technique using harmonic analysis of error fields from perturbations to estimate island widths**
- **Good correspondence was observed between island width estimates from harmonic analysis and measurements off Poincare plots**
- **The following plan is proposed:**
  - **Build a SPARK model of the VV and shell**
  - **Vary the shell thickness and number of insulating breaks**
  - **Drive eddy currents in the VV and shell with filament models of the TF, PF, and HF coils**
  - **Calculate error fields on plasma surface**
  - **Perform harmonic analysis of error fields from VV and shell, estimate island widths**