UPDATE ON β LIMITS FOR ARIES-CS

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ARIES-CS Project Meeting

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Planned Procedure for ARIES-CS Design

September Town Meeting Consensus: (order of importance)

- Ignore local stability criteria (Do This)
- Ignore local stability criteria (Do This)
- Check flux surface quality (PIES) (Do this)
- Check low order edge rationals (Do this)
- Check linear global stability (Monitor for community buy in)
- Nonlinear predictions (Research project)

Proposed Stability Analysis: January 2005 To December 2005

MAJOR TASK	SUBTASK	STATUS	COMMENTS
Evaluate the applicability of equilibrium and stability on β limits in stellarators	Review recent findings on applicability of MHD stability β limit predictions in large stellarator experiments	***Completed July 2005***	*Review recent experimental literature concerning interpretation of β limits in large stellarator experiments*
	Define a reasonable, defensible approach to incorporate an appropriate role for MHD stability limits in the design of ARIES-CS	***Completed September 2005***	*Requested for September Team meeting in absence of full understanding of relevance of ideal limits*
	Compare linear stability predictions and continue investigating applicability of MHD stability β limit predictions in stellarators	***Initiated***	*Input to NSTAB for DIII-D cases is a first step to understanding difference between linear and nonlinear predictions*
	Investigate sponge model for stellarator equilibrium β limit	***Initiated***	*Continuing development of model*
	Investigate role of flux surface quality in setting the β limit	***Proposed***	*Requires models and measures of surface quality*

Major Outstanding Tasks: January 2005 To December 2005

MAJOR TASK	SUBTASK	STATUS	COMMENTS
Monitor development of tools needed for ARIES-CS design	Continue monitoring progress of ideal and resistive MHD tool development	***Continuing***	*This is ongoing from previous years*
Investigate impact of variations from the baseline Scaled NCSX and MHH2 configurations on system performance	Apply the equilibrium and stability tools to evaluate sensitivity to minor variations in the geometry	***Initiated***	*Base NCSX and MHH2 configurations were evaluated previously*
	Apply the equilibrium and stability tools to evaluate sensitivity to the ι and pressure profiles	***Proposed***	*Required tools are set up to perform more systematic studies*
	Identify the key issues that affect the β limit	***Proposed***	*Expectation from tokamak experience is that ι and pressure will be key parameters*

Proposed Stability Analysis For Remainder of ARIES-CS Project: January 2006 To December 2006

Major Priority: Complete outstanding technical tasks in line with September 2005 Town Meeting consensus:

MAJOR TASK	SUBTASK	STATUS	COMMENTS
Investigate impact of variations from the baseline Scaled NCSX and MHH2 configurations on system performance	Apply the equilibrium and stability tools to evaluate sensitivity to minor variations in the geometry	***Initiated***	*Base NCSX and MHH2 configurations were evaluated previously*
	Apply the equilibrium and stability tools to evaluate sensitivity to the ι and pressure profiles	***Proposed***	*Required tools are set up to perform more systematic studies*
	Identify the key issues that affect the β limit	***Proposed***	*Expectation from tokamak experience is that ι and pressure will be key parameters*

- **Check sensitivity of NCSX 'ARE' case to:**
  - Edge rationals by modifying ι profile
  - Edge pressure by flattening profile at edge
  - Boundary shape
- **Check sensitivity of MHH2 16 coil case**