

NCSX Field Period Assembly (FPA) Closeout Notes

MODELS – DRAWINGS – ANALYSES – TESTING – INTERFACES – SPECIFICATIONS

All provided by engineering/ORNL support. ORNL provided the specification to go along with the models, drawings and design.

SCOPE

We began FPA activities in 2006.

Station 1 was defined as VVSA assembly; Station 2 was Modular coil 3-pack assembly; Station 3 was assembling 3-packs over the vacuum vessel; and station 5 was assembling TF coils over Field periods and port installation onto vacuum vessels.

STATUS, REMAINING WORK AND COSTS

Station 1 activities are complete except for the few leaking cooling tubes and wrapping the port extensions with heaters and insulation. ORNL was embarking on developing a system for insulating the ports because the Pyrogel is very friable and is terrible to work with. The bad cooling tubes have been replaced and left unconnected. The riser tubes remain to be welded onto the flex tubing and are obvious. The diagnostic loops and thermocouples have all been tested and characterized.

Station 2 assembly tasks have been perfected. ABC1 and ABC2 are complete. The biggest hurdles were switching from TIG to MIG for distortion control. TIG is still used on the root of the J-groove style welds. The shear plate design is now stable. Shear plates need to be custom machined (typically 3 – 4) to match to the raw casting surfaces. The Station 2 actual times are nearly identical to my estimates. The costs should include supporting shop time though. We had a machinist and a tech nearly full time to support the FPA assembly activities. Metrology was the elephant in the room. It was a huge part of the cost and often became unpredictably nonfunctional for a week or 2 at a time. Extra time needs to be included for the downtime OR at least 3 parallel operations should be arranged to allow for skipping around.

Special notes: We increased the size of the rods attaching surrogate shim plates to bolted ones.

Station 3 was set up and functioned well. As with Station 2 there was about 6 weeks of setup time. However in the future it will take about 2-3 weeks to set up a stand and the screens. This activity was considered high risk but was in fact simple.

Station 5 is estimated and sufficient time is believed to be included for setup and development. Handling of the ports for installation still needs to be worked out but should not be difficult. 10K should be set aside for that tooling.

Before resuming assembly, we took lots of photos which could be reviewed and my 3:15 daily meeting notes would provide valuable insight. Review all lift procedures NCSX-999; NCSX-1000 and NCSX-1002.

The final status of the coils is attached. The spreadsheet provides the current coil status and which fit-ups the pre-measurements that remain.

Metrology data can be found at:

http://ncsx.pppl.gov/NCSX_Engineering/Metrology/index_Metrology1.htm

Coil	Wound/ VPI Comp	¹ Coil Post- VPI Items	² Initial Elect. Testing	Ground Poloidal Break	Final Clamps (incl short clamps)	T-Couples Installed (coil area)	Insul Installed	Bushing Fab	Premeasure Metrology	Location	New Holes	Grind/Mill (Nut Clearance)	Grinding (Overcast)	Comments
A-1	X	X	X	X	X	X	X	X	X	CFW		X	X	FPA
A-2	X	X	X	X	X	X	X	X	X	NCSX TC		X	X	3 PACK
A-3	X	X	X	X	X	X	X	X	X	NCSX TC		X	X	3 PACK
A-4	X	X	X	X	X	X	X		X	NCSX TC		X	X	3 PACK
A-5	X	X	X	X	X	X	X	X	X	CFW		X	X	3 PACK
A-6	X	X	X	X	X	X	X	X		CFW		X	X	3 PACK
B-1	X	X	X	X	X	X	X	X	X	CFW		X	X	FPA
B-2	X	X	X	X	X	X	X	X	X	NCSX TC		X	X	3 PACK
B-3	X	X	X	X	X	X	X	X	X	NCSX TC		X	X	3 PACK
B-4	X	X	X	X	X	X	X	X	X	NCSX TC		X	X	3 PACK
B-5	X	X	X	X	X	X	X			CFW		X	X	3 PACK
B-6	X	X	X	X	X	X	X			CFW		X	X	3 PACK
C-1	X	X	X	X	X	X	X	X	X	CFW	X	X	X	FPA
C-2	X	X	X	X	X	X	X	X	X	NCSX TC	X	X	X	3 PACK
C-3	X	X	X	X	X	X	X	X	X	NCSX TC	X	X	X	3 PACK
C-4	X	X	X	X	X	X	X			NCSX TC	X	X	X	3 PACK
C-5	X	X	X	X	X	X	X	X	X	CFW	X	X	X	3 PACK
C-6	X	X	X	X	X	X	X			CFW	X	X	X	3 PACK
	X	Done												Updated:
	IP	In Progress												10/15/2008 14:00:00 PM

¹ Diag box, loops, lock clamps etc.

² Includes hipot to 7.5 kV

Gross Fit	Completed (SAT)
C5-C1	10/26/2007
B1-C1	1/8/2008
A1-B1	11/27/2008
A1-A2	12/3/2007
A2-B2	2/5/2008
B2-C2	2/19/2008
C2-C3	1/15/2008
B3-C3	3/14/2008
A3-B3	3/11/2008
A3-A4	3/12/2008
A4-B4	4/14/2008
B4-C4	5/25/2008
C4-C6	
B5-C6	9/25/2008
A5-B5	9/23/2008
A5-A6	
A6-B6	10/13/2008
B6-C5	10/14/2008