F1.3-05 Daily Report 2018-07-31

Second day of our review committee meetings on site at Fermilab.

The committee consists of:

* Tom Peterson (SLAC) [tjpete@slac.stanford.edu](mailto:tjpete@slac.stanford.edu)
* Rich Poliak (SLAC, with support from Marc Clay and Marc Weibel, also SLAC QA) [rpoliak@slac.stanford.edu](mailto:rpoliak@slac.stanford.edu)
* Joe Matalevich (Jefferson Lab) [josephm@jlab.org](mailto:josephm@jlab.org)
* Greg Hays (SLAC) [haysgr@slac.stanford.edu](mailto:haysgr@slac.stanford.edu)
* Tom Page (Fermilab) [tpage@fnal.gov](mailto:tpage@fnal.gov)
* Olivier Napoly (Saclay and Fermilab) [napoly@fnal.gov](mailto:napoly@fnal.gov)

Other attendees today:

* John Galayda (SLAC)
* Rich Stanek (Fermilab)
* Jeremiah Holzbauer (Fermilab)
* Brian Hartsell (Fermilab)
* Joe Preble (Jefferson Lab)
* Josh Kaluzny (Fermilab)

The committee, Joe Preble, John Galayda, and Fermilab staff viewed F1.3-05 after removal from the transportation fixture and setting on concrete blocks. We followed the planned investigation and disassembly procedure up to the final alignment check prior to leak searching the cavity vacuum.

Set up and began populating Indico page for investigation documentation. <https://indico.fnal.gov/event/17822/>

(Alignment yesterday was top posts only, verbal report no change.)

Removed shipping caps. DS cold gate valve 0.4 mm change X, preliminary. Rest as before and as expected.

Removed restraints. No change. No wear marks under restraints.

Coupler pumping line and couplers all good vacuum.

DS cold gate valve on CM is stuck open. Will just now (3:30 PM CDT) pump on beamline vacuum space.

Wednesday.

* Review data from the F1.3-05 transportation test, downloaded today and being collected and analyzed now. 9:00 AM CDT
* Review of system resonant frequencies
* Committee member assignment (see draft assignments below)
* Plan for follow-up meetings

**Specific Sub-Team Charges supporting the LCLS II CM Transportation Investigation Team**

(draft concept below, not confirmed with all the suggested names yet)

Create an overall Timeline of the Cryomodule design changes

Goal: understand differences in shipping results

* Participants: **Tom Peterson (co-lead)**, Yuri Orlov, Tug Arkan, **Marc Ross** **(co-lead)**, Andrew Burrill
* Start from information used in the CD-1 review
* Major design changes, reasons behind the changes, reviews and approvals
* Drill downs related to Power Coupler & Transportation

Power coupler Design & Procurement Analysis

Goal: understand power coupler differences

* Participants: Karen Fant, Chris Adolphsen, **Andrew Burrill (Lead)**
* Design specifications and change history
* Supplier manufacturing processes (CPI and RI) & relevant QA information
* Manufacturing process changes, materials procurements (i.e. batches of components, serial # locations and history, etc.)
* Bellows supplier & manufacturing processes & relevant QA information
* Bellows electroplating processes & relevant QA information
* Manufacturing comparison between Eu-XFEL couplers and LCLS-II couplers.

Bellows reliability testing:

Goal: understand bellows capabilities

* Participants: **Mark Ross (Lead)**, Sushil Sharma (BNL), Tom Peterson
* Identify samples and testing conditions
  + Displacements, frequency, cycles, statistical confidence, etc.
  + Committee agree to test plan
* Utilize 3rd party Engineering firm (who selects?)

Transportation Acceleration data analysis & interpretation:

* Participants: Naeem Huque, Jeremiah Holzbauer, Chris Adolphsen, **Mark Ross (Lead)**
* Reconcile data analysis and engineering conclusions for all prior transportation tests
* Vendor (IDC) spring analysis

Steps for start of disassembly (draft from Brian Hartsell, reviewed and edited by Brian, Tom Peterson, Joshua Kaluzny, Rich Poliak)

27 July 2018

* Grayed out here is done.
* Have process engineering on hand with cameras documenting all steps and their before/after state. They do a good job of this. (Yes, we are doing this.)
  + Start today, document the cryomodule on the trailer. Photograph springs, tie-downs, shims. Done
  + Check
    - Remaining bolt torques on plates holding cryomodule to frame (in progress)
    - Strap tightness (done, all tight)
    - Wear marks (examined, none visible)
    - Spring displacements
* Monday. Then, after the above are done. Monday, after walkthrough.
* Remove ‘upper truss’
* Remove bolts holding cryomodule to frame
* Attach lifting fixture and move cryomodule to blocks
* Remove top hats
  + Insert borescope through KF flange and look at cap clearance
* Visual inspection and photographs of the cryomodule supports and the surfaces they touch on the vessel.
* Alignment set up *(in progress 2:30 PM, Monday)*
  + Alignment shoots ‘as found’ state with caps installed
  + During this process, document ‘as founds’ as much as we can with the borescope through open tuner access ports.
  + Electrical checks.
  + RF measurements.
* Measure Belleville washer gap one more time before removal
* Remove caps with synchronized quarter turns of the spindle ‘nut’ for lack of a better term
  + Check Belleville washer stack for correct positioning
* Alignment shoots ‘as found’ state with caps removed (only movement 0.4 mm in X at DS gate valve)
  + At this point, we have access to end vibration/shock monitors:
    - GP1s on gate valves
    - Slam sticks on gate valves
* Coupler vacuum needs to be checked, including opening up the right angle valves to the coupler pumping line. (Coupler vacuum good)
* Borescope work on the cryomodule through all tuner access ports:
  + Open all tuner access ports
  + Document loose/missing/found hardware
  + Check coupler G10
  + Check coupler bellows
  + Check BPM (doesn’t necessarily need the borescope)
* Final alignment check with post tie-downs removed (no change)
* After we have ‘as found’ images of the coupler 4 area on the borescope, we can remove the instrumentation there:
  + Slam sticks on the cavity flange and the 50K shroud
  + Displacement potentiometer across cold bellows
* Get another set of images of the coupler 4 area with the borescope.
* Document any open area with camera shots from all angles:
  + Ends
  + Top hats
  + Tuner access ports
  + Couplers
* Pump on beamline vacuum. I think we can assume this was a dirty leak and we need to use a regular leak detector (instead of a clean mass flow cart), although not an oil backed rougher leak detector. (Leak heard at cavity 1.)
  + Use the ‘stethoscope’ method that was used to find CM06 coupler leaks. See if we can narrow down a location.
  + Follow this trail as needed, pictures documenting steps along the way.
* As we approach determining the leak location, we will pause and decide next steps.

