F1.3-05 Daily Report 2018-08-01

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

The committee consists of:

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

Other attendees today:

* John Galayda (SLAC)
* Rich Stanek (Fermilab)
* Jeremiah Holzbauer (Fermilab)
* Brian Hartsell (Fermilab)
* Hanley Lee (DOE SLAC site office)
* Norbert Holtkamp (SLAC)
* Josh Kaluzny (Fermilab)
* The committee, other visitors, and Fermilab staff viewed F1.3-05 following the finding of the leak late yesterday at the inner coupler bellows for cavity 1. The initial investigation procedure, which considered only disassembly and measurements up to finding the leak, has been completed. The leak location was verified by means of listening to the response of the leak noise to a coupler tuning adjustment.
* Jeremiah Holzbauer and Chris Adolphsen presented a first look at F1.3-05 transportation data from last Wednesday, July 25. Their presentations area posted at our Indico page for investigation documentation. <https://indico.fnal.gov/event/17822/>
* The preliminary indications are no excessive shocks for the cryomodule but significant (several mm amplitude) 15 Hz oscillations in the Z (beam axis) direction of the power coupler mid section (between bellows, so exercising bellows laterally).
* The committee then focused on planning the various follow-up activities for the next few days and weeks. This consists of preparation for a DOE OPA review at the end of August and establishing the various parallel investigative paths for finding a safe method of cryomodule transportation to SLAC.

The timeline up to the review is as follows:

Now – Find all string leaks, remove bellows from coupler 1 and begin analysis, identify bellows failure. Decide next use of F05.

Aug 8 – draft investigation plans – threads of investigation are identified. Leads are identified and confirmed. Each lead has a plan.

Aug 14 -- Detailed investigation plans

Aug 21 -- post review documentation

Aug 28-29 – DOE OPA review (Fermilab) Charge will be shared.

Monday, Wednesday, Friday we will continue with remote connection meetings.

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

(draft concept below, some of these tasks overlap but involve different focus, not confirmed with all the suggested names yet)

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| **Issue addressed** | **Team** | **Description of Action** | **Questions to be Answered**  | **Time Frame** | **Cost** |
| Differences in shipping results between Eu-XFEL and LCLS-II (FNAL and JLab)  | Participants: Tom Peterson (co-lead), Yuri Orlov, Tug Arkan, Marc Ross (co-lead), Andrew Burrill, Naeem Huque | Create an overall timeline of the cryomodule design changes. Start from information used in the CD-1 review. Drill down to RF coupler and transportation.  | What were the major design changes, reasons behind the changes, reviews and approvals?  |  |  |
| Power coupler Design & Procurement Analysis | Karen Fant, Chris Adolphsen, Andrew Burrill (Lead)  | Understand power coupler differences. Review design specifications and change history. Review supplier manufacturing processes (CPI and RI) & relevant QA information. (No RI coupler yet in CM transport.) Make a manufacturing comparison between Eu-XFEL couplers and LCLS-II couplers. -   | What were: 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?  |  |  |
| Understand bellows capabilities and limitations | Mark Ross (Lead), Sushil Sharma (BNL), Joe Matalevich, Tom Page  | Bellows mechanical testing. X-ray samples of unused bellows and F06 bellows.  |  Identify samples and testing conditions. Displacements, frequency, cycles, statistical confidence, etc.Committee agree to test plan Utilize 3rd party Engineering firm  |  |  |
| Transportation Acceleration data analysis & interpretation |  | Understand shipping frame behavior and possible improvements.  | Reconcile data analysis and engineering conclusions for all prior transportation tests. Vendor (IDC) spring analysis |  |  |
| Responses to the June 12 review  |  | Document responses to the June 12 review |  |  |  |
| J07 Difference from other shipments | JLab | Examine J07. Repeat a shipping test (?) Use exactly the same instrumentation as F05 tests.  | Why is the 15 Hz resonant frequency at the power coupler absent compared to Fermilab shipments |  |  |
| Stabilization of cold coupler bellows | Nikolay Solyak (lead), Ken Premo, Mircea Stirbet, Josh Kaluzny, Yuriy Orlov, SLAC technical rep | Analyze and test possible configurations where cold coupler bellows are stabilized. Includes the test of pulling the warm couplers and stabilizing bellows with Berry bolts. | Is there a way to stabilize the bellows without pulling the warm couplers?Do the Berry bolts stabilize the cold bellows enough for shipping?Do both bench test (vibration) and a full CM road test.  |  |  |
| Transportation System Industrial Input | Brian Hartsell (lead), Brian Niesman, Terry Cross, Naeem Huque, SLAC technical rep  | Working with industrial consultant review all aspects of CM transportation system. Includes examining the frame, springs, type of trailer, temperature control, and cold mass restraint.  | Can we improve frame isolation? Is a different trailer type better (style or suspension changes)? Can we add temperature control to minimize differential thermal contraction?Can they help define a route and methodology to ship to SLAC?Is there interest in performing shipping under contract? |  |  |
| Comparison of the XFEL vs. LCLS-II shipping systems (with help from DESY) | Naeem Huque (lead) Brian Hartsell, Olivier Napoly, Chuck Grimm, SLAC technical rep | Working with the DESY team, do a detailed comparison of the two shipping frames/systems. | Can we improve frame isolation? Should we just copy the XFEL system?Do we have the right springs?Are the modified transport caps acceptable? |  |  |
| Stabilization of cavity string | Josh Kaluzny (lead), Tom Peterson, Ed Daly, Yuriy Orlov | Look for ways to stabilize the cavity string with respect to vacuum vessel or other parts of the cold mass | Can we stabilize the cavity string and decrease displacements during transport?Is there a way to stabilize the 50K shroud to another part of the upper cold mass?Where could you grab the cavity string and tie it off in order to stabilize it? |  |  |
| Compare JLab vs. FNAL assembly and alignment | Tug Arkan (lead), Virgil Bocean, Bob Legg, JLab alignment rep, Damon Bice, Danny Forehand | Compare the assembly steps and alignment procedures such that there is an understanding of whether or not the cold coupler bellows is left in the same state during transport | Are there differences in the way CMs are assembled/aligned that lead to differing offsets in the cold coupler bellows?Does the fact that JLab assembles with string under vacuum lead to better alignment of the coupler with respect to vacuum vessel?Can we perform a tolerance stack up or examination to understand maximum bellows offset? |  |  |
| Collect and summarize relevant data and results from shipping tests | Andrew Burrell (lead), Jamie Blowers, Jeremiah Holzbauer, Chris Adolphsen, Naeem Huque, Laura Browne | Collect existing transport information (sufficiently summarized) and store in one location | Collect summary information from each test such that we identify any new concerns that still need to be addressed |  |  |
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