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| **Issue addressed** | **Team** | **Description of Action** | **Questions to be Answered** | **Time Frame** | **Cost** |
| **Transportation** | | | | | | |
| Comparison of the differences in shipping systems between Eu-XFEL and LCLS-II (FNAL and JLab) | Tom Peterson (co-lead),  Olivier Napoly  (co-lead),  Yuri Orlov,  Tug Arkan,  Andrew Burrill,  Naeem Huque,  Brian Hartsell,  Chuck Grimm | * Create an overall timeline of the cryomodule design changes related to transportation and power couplers. (utilize information from the CD-1 review) * Working with the DESY team, do a detailed comparison of the two shipping frames/systems. | * What were the major design changes? * Reasons behind the changes? * Reviews and approvals? * Can we improve frame isolation? * Should we just copy the XFEL system? * Do we have the right springs? * Are the modified transport caps acceptable? |  |  |
| Independent Industrial Review of the Transportation System | Brian Hartsell (lead),  Brian Niesman, Terry Cross, Naeem Huque, SLAC Rep | * Working with industrial consultant review all aspects of CM transportation system. * Includes examining:   + frame   + springs   + type of trailer   + temperature control   + 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? |  |  |
| Collect and summarize relevant data and results from shipping tests | Andrew Burrell (lead),  Jamie Blowers, Jeremiah Holzbauer,  Chris Adolphsen, Naeem Huque, Laura Browne | * Understand shipping frame behavior and possible improvements. * Collect existing transport information (sufficiently summarized) and store in one location * Vendor (IDC) spring analysis | * Collect summary information from each test such that we identify any new concerns that still need to be addressed * Reconcile data analysis and engineering conclusions for all transportation tests. |  |  |
| Understand the J1.3-07 difference from other shipments | Ed Daly (lead), Naeem Huque, Brian Hartsell, Jeremiah Holzbauer, SLAC | * Examine J07. * Repeat a shipping test (?)   + Use same instrumentation as F1.3-05 tests. | * Why is the 15 Hz resonant frequency at the power coupler absent compared to Fermilab shipments? * Are coupler displacements similar those in F1.3-05 shipping test 2? |  |  |

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| **Cryomodule Design and Process** | | | | | | |
| Power coupler Design & Procurement Analysis | Andrew Burrill,  Karen Fant, Chris Adolphsen, Olivier Napoly (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.) * Compare manufacturing processes between Eu-XFEL & 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 F1.3-06 bellows. * Identify sample and testing conditions   + Frequencies   + Displacements   + Statistical confidence * Utilize 3rd party engineering firm | * Identify bellows reliability and design margins and determine if suitable for the transportation and operational requirements for LCLS-II * Committee agree to test plan |  |  |
| 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? |  |  |
| Stabilization of cold coupler bellows | Nikolay Solyak (lead),  Ken Premo, Mircea Stirbet, Josh Kaluzny, Yuriy Orlov, SLAC 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. |  |  |
| 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? |  |  |
| Identify the impacts, plans and logistics to perform warm part of the coupler installation at SLAC | Tom Peterson, Rob Coy,  Ken Premo,  JLab | * Develop a preliminary plan for the installation of warm part of coupler at SLAC. * Understand the cost and impact of removing the warm part of the couplers at Fermilab | * What are the changes to the existing plans for how CMs are received, tested and installed at SLAC? * What infrastructure is required? * What training is required? * What risks are associated with this change? * What are the mitigations? |  |  |
| Shipping instrumentation | Jeremiah Holzbauer (lead), Chris Adolphsen, Larry King, Naeem Huque | * Define and standardize instrumentation for future tests and road trips * Define and document specific locations and attachments | * What is the standard testing package of instrumentation * What is the set for shipping to SLAC * How do we collect, monitor, store, distribute and archive data |  |  |
| Update modal analysis for system | Vishy Ravindranath (lead)  Mark Ross,  Ken Premo,  Mircea Stirbet | * Include couplers and inter-cavity bellows in modal analysis | * Predict coupler displacement based on expected accelerations |  |  |
| Investigate alternative shipping methods | Geoff Pile (ANL)  Ed Daly (JLab)  Elvin Harms (FNAL) | Consider alternate shipping methods   * Air * Rail * Sea | * Develop shipping costs * Investigate potential peak G-loading * Compare and contrast the various methods |  |  |