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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?
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| 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?
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| 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.
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| 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?
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| 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
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| 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?
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| 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.
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| 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?
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| 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?
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| 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
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| 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
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| 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
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