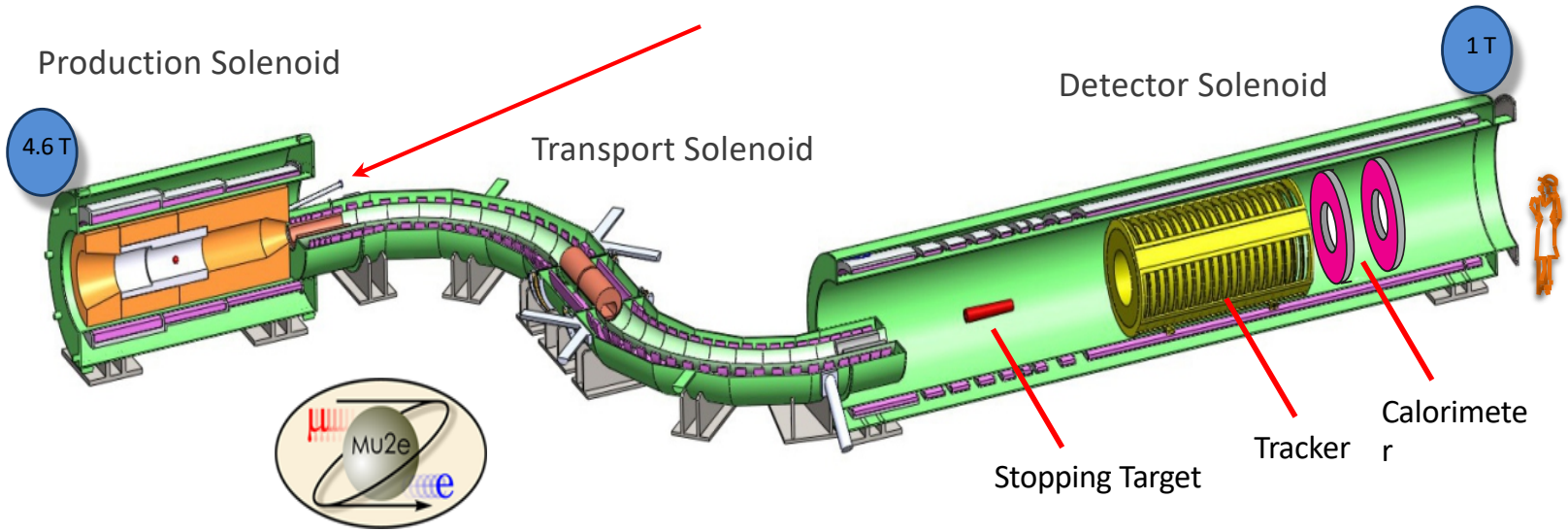


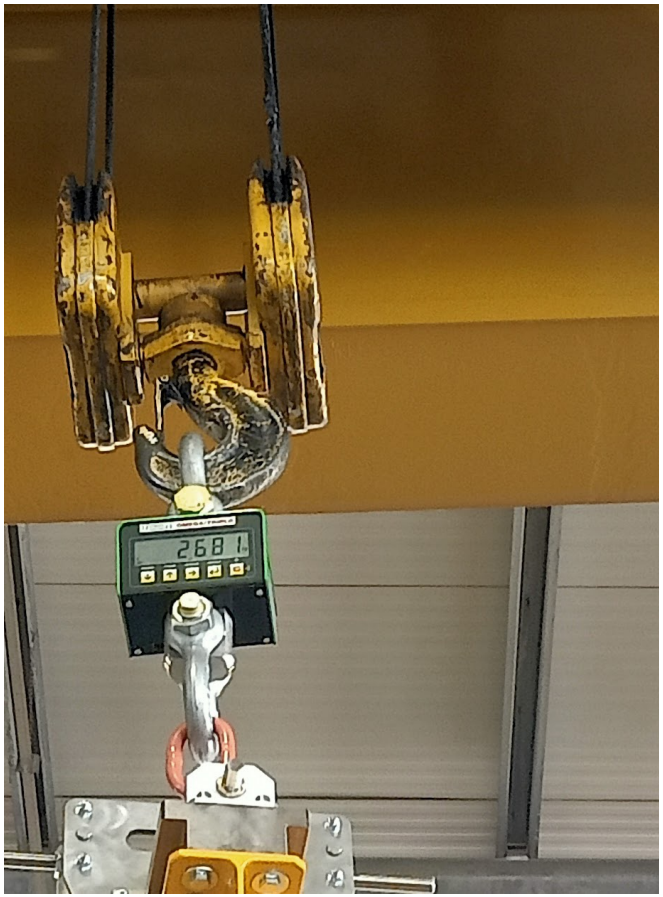
Moving the Calo out of Sidet

Coll. Meeting June 2025

fabio

Transporting the calo to Mu2e building

- the calorimeter disks assembly is complete
- the lifting and transport procedure is assessed
- Lifting fixture and transport stand have been built
- Lifting Fixture and transport stand at Sidet
- Working with Min Jeong Kim(Integ. lead) to coordinate the Critical Lift and Move procedure review.
- Collecting all the documentation
- Planning the move for the 26/27 of june



Load test

- Load test carried out at Cerasa Mechanics
- Documented

Critical lift and transport review

- The calorimeter is a unique, unreplaceable, delicate, costly device. Therefore we consider the move as CRITICAL
- Well-progressed for review of critical lift and transport

- Collecting all documentation to be provided
- Alessandro Saputi is preparing the technical files

- People involved:

  - Min Jeong Kim
  - Alessandro Saputi (L3 +Calo Engineer)
  - Sai Manohari Kancharla (Mech Eng) more on Access Platform?
  - F. Happacher (L2- deputy, L3)
  - George Ginther (Integration)
  - Jeremiah Holzbauer
  - John A. Trebe
  - Adam Wixon.
  - Brian Niesman
  - Critical lift technical Panel

Review planning

https://docs.google.com/spreadsheets/d/11GjstmIfth6cRUm09W4dPJVuuKWEfjo8QGLZ3wF8f2U/edit?usp=sharing

Task	Owner	Status	Start date	End date	Deliverable	Notes
Finalizing design documents on Lifting Fixture and Transport Stand (Technical Notes, Drawings, etc.)	Alessandro Saputi	In progress	m/d/yyyy	9/24/2024	File	FESHM 10110: Below-the-hook Lifting Devices
Finalizing Critical Lift Plan	Alessandro Saputi	In progress	m/d/yyyy	9/27/2024	File	FESHM 10200: Lift Plans
(Organizing) Review on Lifting Fixture, Transport Stand, and Critical Lift Plan (by MSS Lifting & Material Handling Panel)	Min Jeong Kim	Not started	9/23/2024	10/11/2024	File	FESHM 10110: Below-the-hook Lifting Devices, FESHM 10200: Lift Plans
Preparation for Transportation Plan (with other documentation required by FESHM 10210) and Hazard Analysis (HA) on IMPACT	Min Jeong Kim	Not started	9/23/2024	10/11/2024	File	Transportation Plan, PtD, TFMEA
Detail the transport plan and obtain agreement between stakeholders	Fabio Happacher	Not started	m/d/yyyy	10/11/2024	File	Notes
Preparation for Transport Readiness Review (Review charges, identification of reviewers, etc.)		Not started	11/4/2024	11/8/2024	File	Notes
Distribution of review materials to review committee (One week advance)		Not started	11/11/2024	11/15/2024	File	Notes
Transport Readiness Review		Not started	11/18/2024	11/22/2024	File	Notes
Completing construction of Lifting Fixture and Transport Stand	Alessandro Saputi	Not started	m/d/yyyy	m/d/yyyy	File	3-4 weeks
Delivery of Lifting Fixture and Transport Stand	Fabio Happacher	Not started	m/d/yyyy	m/d/yyyy	File	1 week
Lifting Fixture visual inspection and test operation (Final approval by panel; Lifting fixture added in database for regular maintenance)	Min Jeong Kim	Not started	m/d/yyyy	m/d/yyyy	File	Notes
Identification of resources to execute the plan	Tom Diehl	In progress	m/d/yyyy	11/29/2024	File	Riggers: PPDir, Detector Operations & Support Division, R&D and Technical Support Department, Experiment Installation Group (Leader: T. Wicks); Truck Driver: Dispatch
Tour to the route/site with team (riggers, dispatch, roads & gravel, etc.)	Min Jeong Kim	Not started	m/d/yyyy	m/d/yyyy	File	Notes
Dry runs (It looks OK without it considering the requirements by detector design/construction)		Not started	m/d/yyyy	m/d/yyyy	File	Notes
Actual Transport (Calorimeter DIsk 1) Installed on the detector rails if time is allowed.		Not started	m/d/yyyy	1/2/2025	File	Notes
Actual Transport (Calorimeter DIsk 0)		Not started	m/d/yyyy	1/13/2025	File	Notes
Calorimeter installation on the detector rails		Not started	m/d/yyyy	m/d/yyyy	File	Notes
Alignment (Requirement Criteria?)		Not started	m/d/yyyy	m/d/yyyy	File	Do we need to invovle Alignment & Metrology Department? If so, what time frame?

Documentation

We got all the certification, manual, material certification and load tests from the manufacturing company. Min Jeong has everything.

Alessandro has completed his technical files. (I saw them!) He just needs to cross reference them with the documentation from Cerasa and then send it to MinJeong.

Transportation Failure Mode and Effect Analysis (**TFMEA**), Prevention through Design (**PtD**)

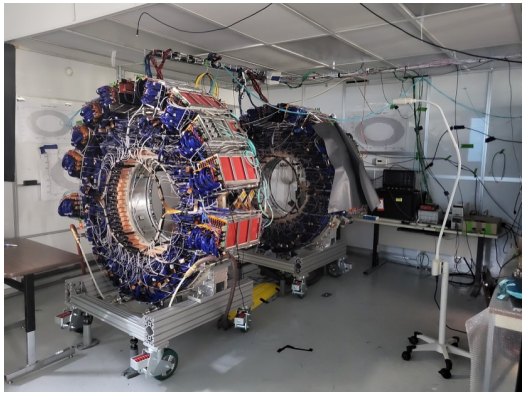
Some in DocDB

- Calculations and ASME certifications Cerasa Mechanics
  Mu2e-doc-52897, version 1
- Handling Manual Cerasa Mechanics
  Mu2e-doc-52900, version 1
- Mu2e calo - Lifting and Transport plan.pdf
  Mu2e-doc-52909, version 1
- Lifting Device for Mu2e Calorimeter Installation (Mu2e-EMC-LD) – Technical Drawings. A. Saputi
  Mu2e-doc-52903, version 1
- Transport Stand for Mu2e Calorimeter Installation (Mu2e-EMC-TS) - Technical Drawings. . A. Saputi
  Mu2e-doc-52906, version 1

Last 2 documents to be uploaded soon

Shipment At Sidet

- Min Jeong and John opened the crate and checked that the lifting fixture an transport stand made it safely to fermilab
- Took everything out and arrange it in LabA
- The lifting fixture is not fully assembled. We need to install the CoG mechanism and the orizontal Bars that are assembled during the actual Calo Loading procedure



Calorimeter Transportation Planning

EN 16010: Document for Work Package #48004 on Integration Management Planning and Control Tool (IMPACT)

As of June 2, 2025

Object to Move: Mu2e Calorimeter Disk (Two Disks labeled as "Disk 0" and "Disk 1" - transport procedure is equal to both disks)

The calorimeter is a unique, irreplaceable, delicate and costly device. Therefore, the lift and tranport of calorimeter is defined as "Critical".

The calorimeter is a very delicate object (see Figure 1). The main risks that detector experts envision are related to vibrations that could propagate to the crystals and to the connections of electronics and optical fibers.

Starting Location: SiDet - Lab A, Clean Room

Final Destination: MC-2 Building, Detector Hall

Transport Date 1: tentatively on June 20, 2025 (for Disk 1)

Transport Date 2: tentatively on July 25, 2025 (for Disk 0)

Work Planner: Min Jeong Kim

POCs [Designated Task Leaders]: Min Jeong Kim (Fermilab), Fabio Happacher (LNF)

Qualified Crane Operator(s): John Trebe, Tommy Olszanowski, Thomas Wicks

Worker(s): John Trebe, Tommy Olszanowski, Matthew Brock, Daniel Pearce

Truck Driver: Mark Hauser

Facility Manager(s): Humberto Gonzalez [SiDet - Lab A], Luis Martinez [MC-2]

Division Safety Officer (DSO): Lisa Reger

Authorizing Supervisor(s): Gregory Rakness, George Ginther

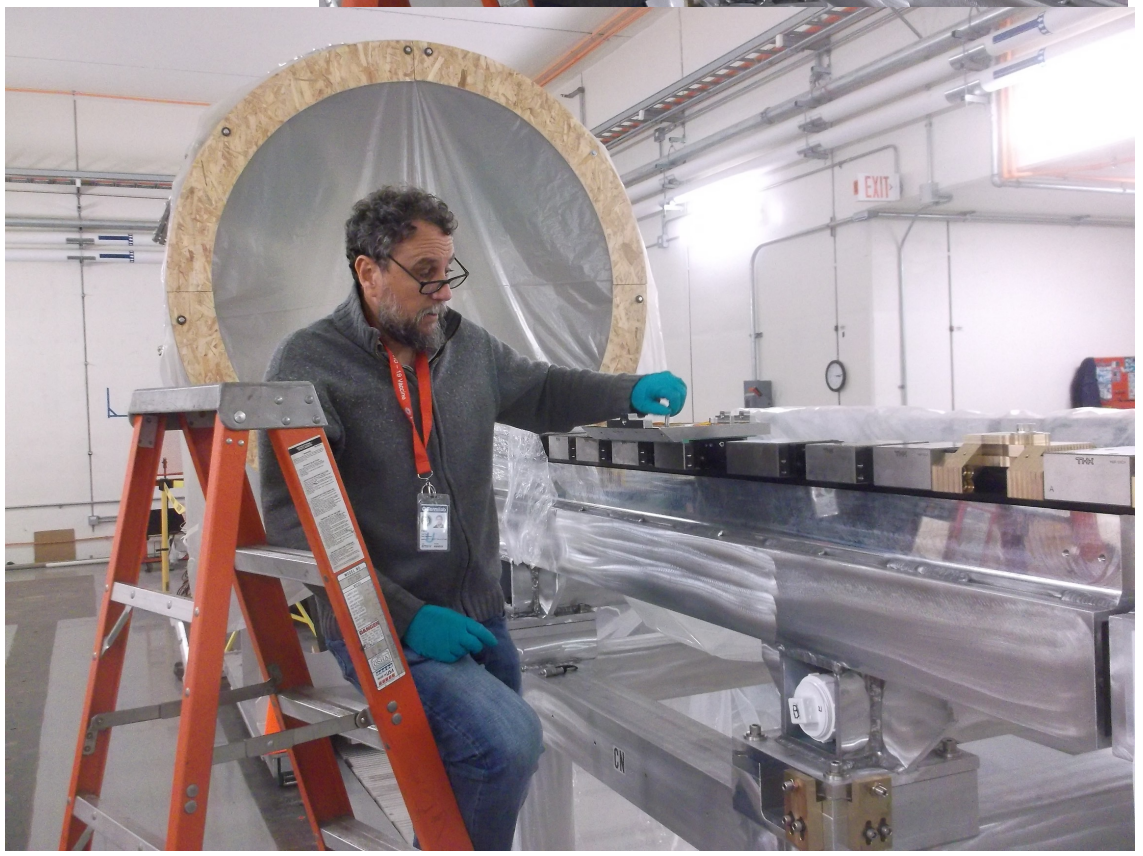
Disk 0	Disk 1	Step Identifier	Task	Separate Procedures to Call in or Brief Instructions Provided	
		Part A	**Preparation and Loading in SiDet - Lab A**		
☐	☐	A-1	Check if the calorimeter disk is ready for transport (by LNF POC).	Is there any checklist to use? (detector protection)	
☐	☐	A-2	Confirm if the calorimeter disk is secured tight to the assmebly stand before moving.	An interface plate per each side (Left/Right); the plate is bolted to the bottom of the disk (structural Al ring) as well as to the Assembly Stand 80/20 profile (using 8X M10 bolts).	Figure 2
☐	☐	A-3	Bring in the truck to the loading dock and install the transport stand on the truck deck. Tighten its feet (mounting plates equipped with dampers) to the truck using shackles (with swivel feature) and ratchet straps to secure.	Vibration Dampers: Paulstradyn, Model 820-533717 (very efficient for high frequencies; bolted to the mounting plate). Low frequencies are not a concern for a low speed air-drive move.	How to lift the transport stand? Would come as it is fully assembled? Are shackles/straps good enough to secure the transport stand on the truck deck?
☐	☐	A-4	Roll out smoothly the calorimeter disk on the wheels of assmebly stand from the cleanroom to the loading dock.	The first disk to be transported being currently parked inner side of clean room (far away from the door), in case the force (beyond a couple of human pushing) to be applied to initiate a move, we will utilize Johnson Bar or Steering Wheel Bar that can be more suitable for that small space of clean room). We may consider to use a forklift to gain an initial thrust (in a worst case scenario).	Where is the mark for the truck (We marked an extreme outermost position towards the door where the truck deck can be centered for the crane to have enough clearance to load.)

Calorimeter Transportation Planning

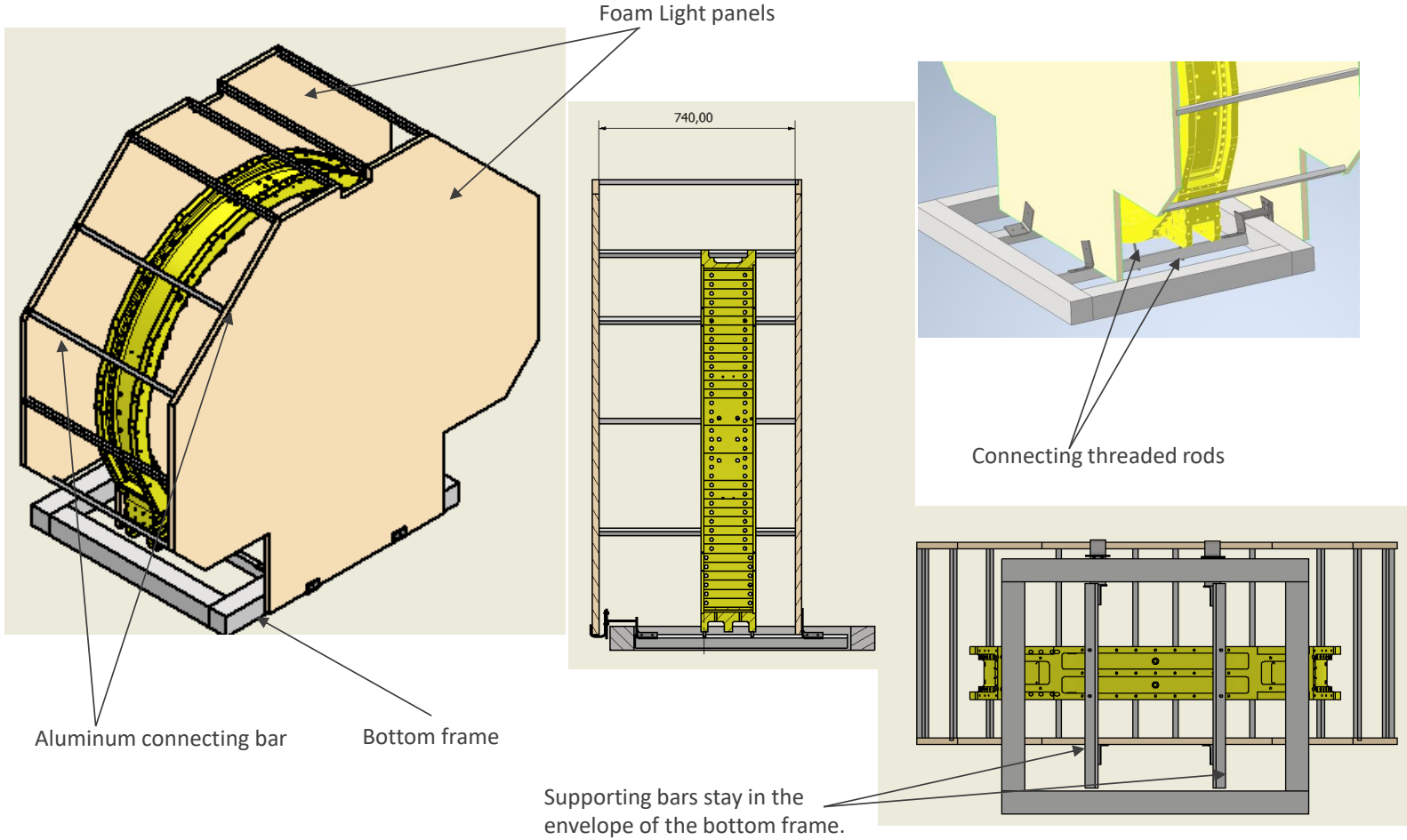
☐	☐	A-5	Load the calorimeter disk (together with assembly stand) to the truck using the lifting fixture and critical lift plan/permit (EN 14309 2025-43966) - Case 1.	The lifing operations (considered as the moment when the maximum accelerations may be applied to the object) are required to be performed as smooth as possible to reduce stress on the detector supporting structure. The crane must be operated carefully at minimum possible speed. Monitor the balance while lifting the load. Follow the procedure of adjusting the center of weight if necessary (iterative).	Identified a open deck truck to use and checked the access of the truck to the loading dock (Confirm the crane headroom with final lifting configuration; measure the height of roll-up door for clearance check).
☐	☐	A-6	Lay down the entire assembly on the transport stand. The transport stand has a features to center and to secure the entire assembly on its position, which are metalic stoppers constraining the height if the lifting fixture on the transport stand.	The lifting fixture is sitting on the transport stand, and the calorimeter disk on the assembly stand is hanging without any additional contact to the transport stand. The system of lifting fixture and transport stand combined togehter is designed to avoid any stress transfer to the calorimeter.	
☐	☐	A-7	Tighten the lifting fixture to the transport stand using tie rods. In this way, the detector assmbly is securely loaded and decoupled as much as possible from the truck vibrations.		
☐	☐	A-8	Disconnect slings connecting to the crane and leave on the top of the lifting fixture.		
		Part B	**Transport**		
☐	☐	B-1	Prerequisite: Road survey done in advance.	If necessary, the Roads and Grounds will be contacted to fix potholes and road roughness.	Mark Hauser, the truck driver, is going to perform a test drive without load and report back - it's a very familiar route to him, but to check the road damage with severe weather conditions during winter.
☐	☐	B-2	The truck will proceed at the lowest speed possible (3-5 miles/hour) to ensure a smooth drive and will be followed by crews overseeing the path.		About 4 feet/sec (specified in LNF document) equals ~2.73 miles/hour.
		Part C	**Unloading in MC-2**		
☐	☐	C-1	Prerequisite: Installation of calorimeter feet (2 feet per a disk) on the detector train rails done in advance.	The feet are equipped with bearing blocks	
☐	☐	C-2	Open the roll-up door. The truck can enter in the loading dock in reverse gear.		
☐	☐	C-3	Connect and secure the sling attached at the lifting fixture to the MC-2 building crane.		
☐	☐	C-4	Untie the tie rods between the lifting fixture and the transport stand.		
☐	☐	C-5	Unload the calorimeter disk (together with assembly stand) using the lifting fixture and critical lift plan/permit (EN 14309 2025-43966) - Case 2.	Case 2 (preferred): Move the calorimeter disk directly to the rails and perform the functionality check in this configuration; Case 3: Move the calorimeter disk to a temporary location to perform a functionality check and install it on the detector train rails later (need cribbing to reattach the four wheels of assembly stand and to remove the lifting fixture).	The assmebly stand can't support the weight of both the calorimeter disk and the lifting fixture.
☐	☐	C-6			
☐	☐				
☐	☐				
☐	☐				
☐	☐				

Transport preparation

- We are collecting the final parts needed for Calorimeter move and installation
- McMaster order for screws, pins, straps,etc
- pre - assembled the Feet at Sidet
- With George we Checked the feet mounting on detector train



Transportation calorimeter housing.



Next 2 weeks

- We plan to be at Fermilab next week (june 15)
  - Feet installation
  - Lifting Fixture assembly
  - Transport stand assembly - dampeners and feet
  - Calorimeter drainage
  - Calorimeter transport cover assembly
  - Final discussions and plannig with Min Jeong