



Module Development and Test Plans

Tom Peterson
Fermilab



Module Production Timeline

- ILC-1 (Module 9 in DESY's numbering scheme)
 - **TTF III+ “kit” from DESY**
 - **Parts delivery Oct 06**
- ILC-2 (assembled in US from parts procured in US and Europe)
 - **TTF III+**
 - **Parts available summer 07**
- ILC-3 (assembled in US from parts procured mostly in US)
 - **Type IV**
 - **2008**



Cryomodule Assembly Facility (CAF) Infrastructure Setup Status (from Tug Arkan)

- Cavity String Assembly Clean Room was certified on the last week of April 2006. Construction punch-lists were created and vendor is currently working to finalize them. Expected completion: End of May 2006.
- Brian Smith spent 2 weeks at DESY to witness the cavity string assembly for Module #6. He is currently working to setup inside of the clean room infrastructure for string assembly work.
- Rail system is being aligned outside of the clean room under the Cold Mass Assembly area.
- Cold Mass Assembly Screw Jack Lifting Fixture will be installed starting this week.
- We still plan to install Big Bertha fixture at CAF-ICB when the building is ready.
- DESY will send to Fermilab 2 dressed, horizontal tested cavities. These are 2 spares for Module #6 that were not used. We can use these 2 cavities to shake down the clean room infrastructure, FNAL horizontal test infrastructure and most important to practice the string assembly procedures that we learned at Hall 3.



CAF



1 June 2006

R&D Board Meeting

4



Clean Room at CAF





Type IV cryomodule design

- Create a complete documentation package in 2007 for type IV module fabrication
 - 3-D model
 - 2-D drawings for fabrication of parts and assembly
 - Include real magnet and BPM design
- Start with module without magnet
 - We have no magnet design yet
 - We need module design without a magnet, anyway
 - Nevertheless, the quad/corrector/BPM design is at the heart of the module and is needed soon



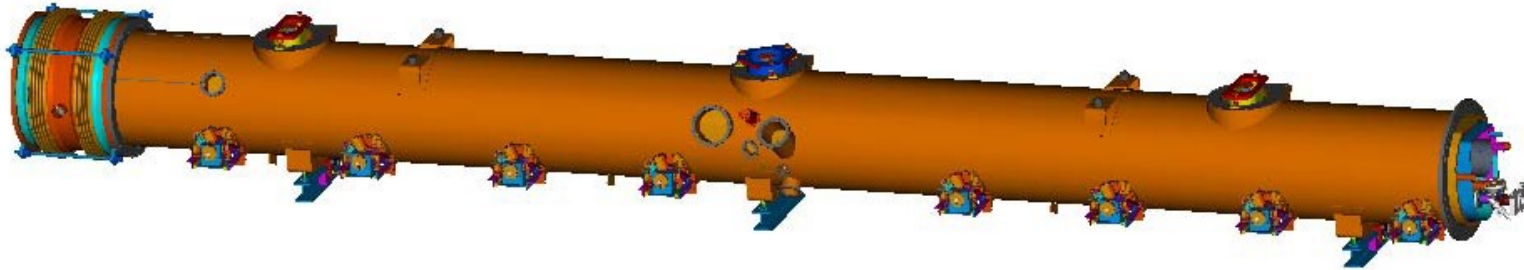
Cryomodule Development Status

- Don Mitchell and Tug Arkan are currently at DESY to watch the Module #6 Cold Mass assembly at Hall 3.
- Yuri Orlov, Chuck Grimm, and contract designers are working on T4CM drawings based on the most straightforward update from Type III.
 - **Before Don left for DESY, as of May 12, he assembled an incomplete set of T4CM drawings and conceptual drawings as a way of providing a start for our cost estimating activities.**
 - **Jpeg captures from the model file are on the next two slides**
- Contract negotiations with AES still underway for cryomodule cost estimate
- Fermilab in-house group also working on cryomodule cost estimate
- Fermilab will assemble two Type III+ cryomodules
 - **First from a complete “kit” from DESY and Zanon**
 - **Second from cavity procurement plus Zanon cryostat procurement -- this procurement is starting**



Type IV cryomodule side view--

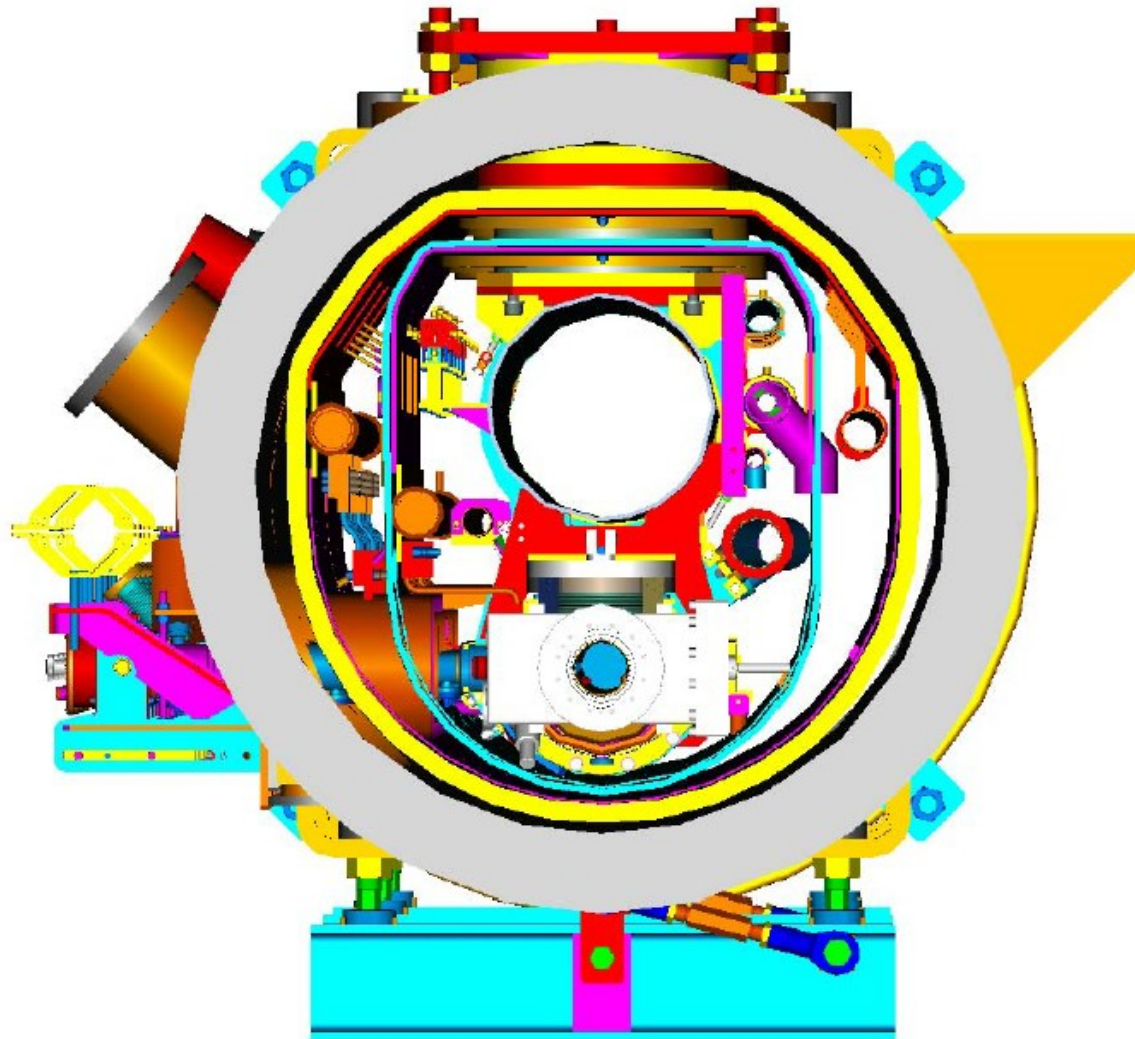
12 May 06 CAD model from Don Mitchell



- “Type IV” design is right now really just a rearranged type III (old current lead ports, not even III+).
- Salman Tariq has done nice design work on cavity interconnect flanges and piezo tuner mechanics
- Mike McGee is working on a CAD model for vibrational analysis of the module structure



Type IV cryomodule end view --
12 May 06 CAD model from Don Mitchell





Type IV international collaboration

- The type IV cryomodule design effort includes international collaborators
- Efforts will be coordinated among the groups
 - **Some specific plans for dividing the work are in place**
 - **Design efforts are still just starting due to other demands on people's time**
 - **Participants include CERN, DESY, Fermilab, INFN, KEK, SLAC**

Task 16: Module test plans

- What must be done on a module test stand, and what instrumentation and features are required?
 - **Thermal measurements**
 - **Alignment verification, etc.**
- What earlier (before final cold test) tests of the module and module components should be done for QA, QC, and understanding module performance?
- Tie-in to module test stand design

Task 17: Module instrumentation

- What special instrumentation is required to be built into the module for understanding performance both on the test stand and in the test linac?
 - **Additional temperature sensors**
 - **Wire position monitor or another system (such as optical windows) to verify cavity positional stability with thermal cycles**
 - **Etc.**



Module Test Goals

- DESY Kit (ILC-1) and ILC-2
 - Very high priority -- gain assembly experience, cool down and operate modules with RF!
 - Also clearly vital -- alignment tests, particularly following cold-warm cycling, for comparison with Type IV data
 - Thermal studies for purpose of commissioning instru.
- ILC-3 (type IV)
 - Tests aimed at type IV design issues and beyond type IV, such as beam tube seal assembly, vibrational stiffness, evaluate cost reduction features, static heat loads
 - Key element of testing -- alignment stability with thermal cycles -- is this really better than type III?
 - Thermal studies -- would like to evaluate static heat



More Module Test Issues

- Questions from Lutz
 - **What could be learned from re-assembled modules (using the same cavities over and over again)?**
 - Some answers: assembly experience, tests of cryostat assembly procedure and design modifications
 - **What are tests that are clearly module related (as opposed to horizontal or vertical cavity tests)?**
 - Cryostat issues. Any cavity interaction issues?
 - **Which are the tests where high-performance cavities are needed?**
- Finally, tests with beam



ILCTA-New Muon Lab Timeline

- Interim refrigeration system March, 2007
 - **“Satellite” refrigerator in stand-alone mode**
 - **Enough cooling power for several modules (~40 - 50 W at 2 K)**
- Still need cryogenic distribution (transfer lines and end boxes) design and procurement
 - **Modified DESY TTF and/or XFEL designs**
 - **Modifications will take some design effort**
 - **Significant procurement -- mid 07 if start now**
- Not to mention the RF and other infrastructure -- much work to be done



Priorities

Plans for module testing are not getting much attention yet. In fact, type IV design effort has not had much attention yet.

1. ILC RDR and cost estimate (major effort)
2. 3.9 GHZ cryomodule for DESY
Which includes requirement for horizontal test cryostat in which cavities will be tested
3. Vertical dewar for “tight loop” processing and R&D testing
4. Type IV cryomodule design
5. Plans for ILCTA-New Muon Lab