# The Fermilab Cryomodule Plan

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#### Fermilab

## A tribute to Indian Science Program





# **High Gradient Cavity Activities**



- Cavity inventory:
  - Fermilab in collaboration with Jlab, Cornell and ANL has 6 high gradient cavities already processed.
    - The average gradient of these cavities is 34 MV/m.
  - Fermilab has 26 (ILC length, 9-cell) cavities on order. 20 from ACCEL and 6 from AES (FY07-08).
  - Fermilab has purchased additional 10 cavities (FY08) from US vendor(s) and plans to continue purchase of additional in 10 FY09 and beyond
- In FY08, we have continued to process 9-cell cavities and develop new venders.
- We plan of about 60 processing and testing cycles for FY09 in support of S0 (40 R&D) and CM (20) fabrication.

### **1.3 GHz, 9-cell VTS Test Results**





# **High Gradient Cryomodule Plans**



- Fermilab has ordered all the parts for the CM2 except He vessel.
  - This will be Type-III+ Cryomodule. Goal is to make a S1 Cryomodule.
  - We are going to use already existing 5 high gradient cavities (~34 MV/m) plus 3 from the batch we will process in 08 and early 09.
  - Cold Mass and Blade Tuners are being fabricated under Fermilab-INFN MOU
- Two (9-cell, 1.3 GHz) cavities will be dressed and Horizontally tested by Spring 09. Rest to follow.
- Plan is to Build CM2 in FY09.
- Build CM3 in FY10.
  - We already have the cavities.

# S1 Global



- US will provide 2 cavities for the S1 Global program.
  - These will be from the current batch of ILC cavities to meet the schedule.
    - Standard TESLA Shape cavity just the symmetric end tubes.
- Fermilab could make it available to KEK without processing late CY08.
- These 2 processed, tested and dresses US cavities would be available by end of CY09.
  - Dressing of these cavities will be done only after the CM2 cavities.
  - The schedule is getting delayed due to 3.9 GHz HTS.
  - It may be Spring of CY10 due to very limited funding in FY09.

# **Cryomodule and RF Unit Test**



- ILCTA\_NML will test 2 Cryomodule with beam in the present building configuration.
  - Hooks will be in place for ILC beam test later if desired.
- Status
  - DESY Cryomodule CM1 is ready.
    - We are preparing the safety and other necessary document to start cool down at ILCTA\_NML at Fermilab.
  - A 10 MW Klystron is under test at SLAC. (US-Japan Collaboration)
  - Modulator (Fermiab) and RF distributions (SLAC) are under fabrication and test.
- Proposed Plan
  - Cool down the Capture cavity 2 and CM1 in CY09.
    - RF power FY09 using the 5 MW Klystron
  - High Gradient (>30 MV/m) CM2 should be deliver to ILCTA\_NML by end of CY09

### New Phase-1 Layout of ILCTA\_NML





### New Overall Layout of ILCTA\_NML





## **CM1 getting Ready forTest**









#### **TTC Meeting-IUAC Delhi**

10/23/2008

### **Current Picture of NML**





## **Next Few Year Plans**



- Continue Working Towards Phase-1 Goals
  - Complete Infrastructure to Cooldown, RF Power, and operate Capture Cavity-2 (CC2)
    - Vacuum, RF, Cryo, Interlocks, LLRF, Controls, etc.
  - Move CC2 to NML when infrastructure is ready
  - Commission Cryogenic System using CC2 and begin operation of CC2
  - Complete RF Infrastructure for Cryomodule-1 (CM1) RF Power System (5 MW) and Distribution (SLAC)
  - Move CM1 to NML and Install (Done)
  - Prepare Cryogenic Infrastructure for CM1
- Complete Phase-1 Goals
  - Cryogenic and RF system for CM1 Operational
  - Cooldown and RF Test CM1 (FY09)
- Begin Work Towards Phase-2
  - Begin Procurement of Injector (gun, magnets, etc.) and Test Beamline (dumps, magnets, etc.)
  - Delivery and Installation of CM2

#### 1.3 GHz Cryomodules

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# Summary



- US cavity fabrication and processing program is producing high gardient 1.3 GHz, 9-cell cavities.
  - The average gradient of 5 CM2 cavities is 34 MV/m.
  - We have several cavities in the processing and testing pipeline.
- Fermilab continues fabrication of 1.3 GHz Cryomodule.
  - The goal for CM2 is to satisfy S1 (31.5 MV/m) goal.
- Fermilab continues to develop infrastructure to test 2 Cryomodule with electron beam using A0 Photo Injector by end of CY10.