HINS PMG Meeting

Bob Webber

April 5, 2007

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Meson Facility Status and Issues

HINS R&D Program Facilities

To address accelerator physics questions for a new concept, low-energy superconducting Linac

we will construct and test key components and integrate them into a demonstration accelerator in Meson Detector Building

- **Pulsed 2.5 MW, 325 MHz klystron RF power source**
- **325 MHz high power RF component test facility for studying RF power control devices**
- **Test stand for 325 MHz RT cavities and a test cryostat for 325 MHz SC spoke cavities**
- **Ion source and RFQ as a 2.5 MeV beam source**
- **10 MeV Room Temperature Linac**
- **Three 325 MHz SC spoke cavity cryomodules**
- **All accelerator sections to be operated with beam up to 60 MeV to verify and quantify performance**

This all adds up to building and operating a first-of-its-kind superconducting 60 MeV H- linac

Recent Success !!!

From HINS logbook, yesterday, Wednesday, April 4
Full peak klystron output power achieved at short pulse

Date Created: Wednesday, April 4, 2007 4:22:20 PM CDT
Date Saved: Wednesday, April 4, 2007 4:22:20 PM CDT
Category - Topic - sequence number: 325_MHz_RF/Klystron - Log - 69
Operator(s): Peter Prieto
Keyword(s): :
Click here to download a copy of file

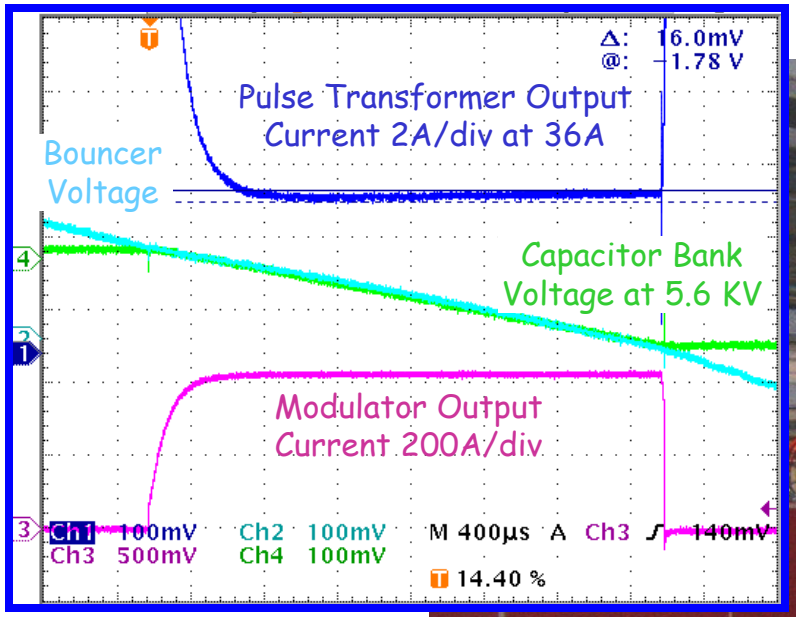
Klystron average RF power reached 2.6 MW with 17.7 Watt input power.
The RF pulse length was 100 usec at 1 pps.

Attached File: klypower.xls

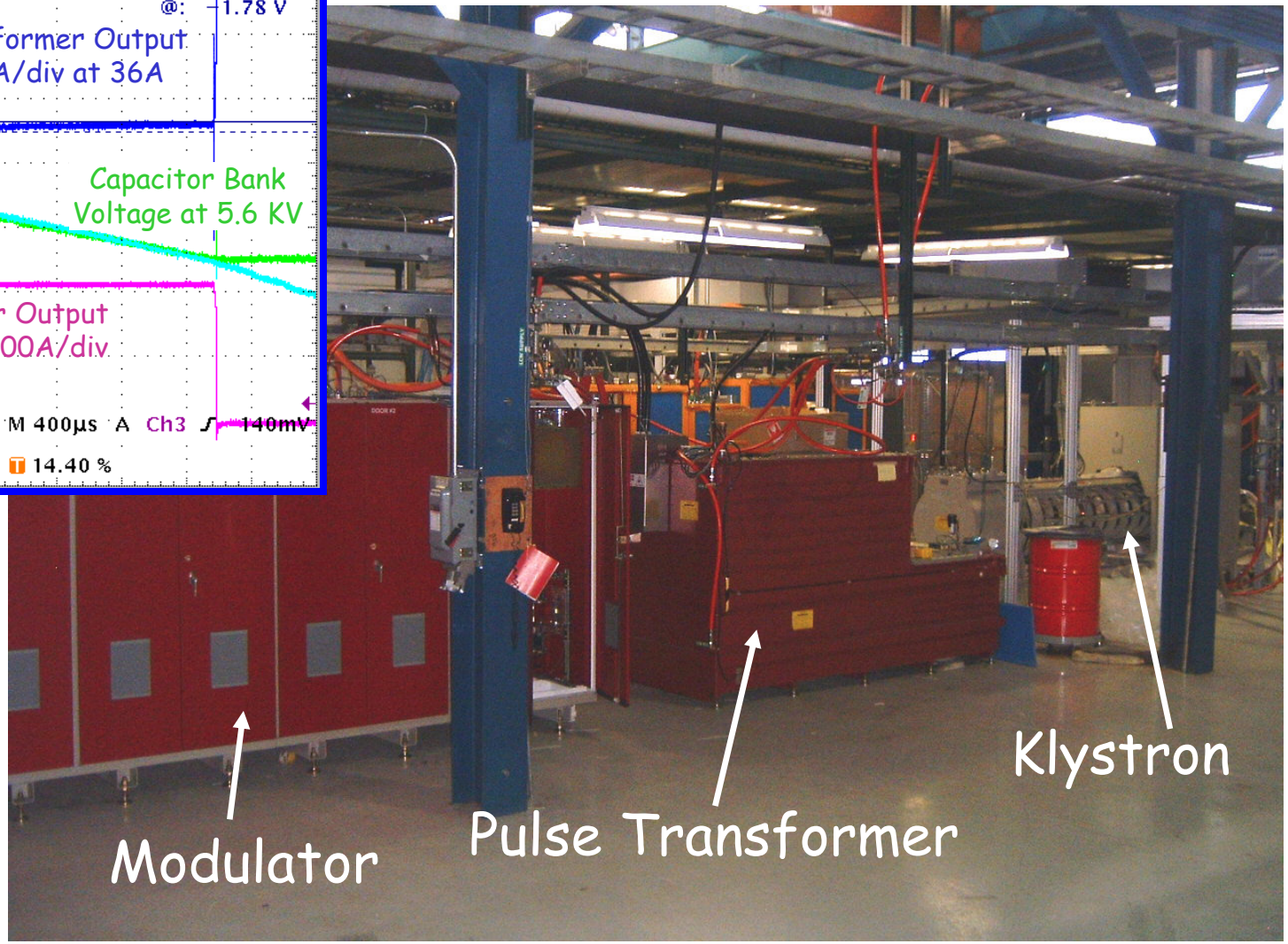
Klystron Commissioning Team

Klystron and Waveguide Installation

Modulator and Pulse Transformer



Modulator Signals at 5.6 KV into Resistive Load February 2, 2007



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RF Component Test Area Cage

HINS 2007 Goals in MDB

- **Complete 325 MHz RF power system commissioning including RF component cage area and cavity test cave**
  - Will be done by end of April
- **Begin RF component testing in RF test area**
  - To commence in May
- **Full power tests of first room-temp cavity**
  - To commence in May or June
- **Design and construct fenced ion source / RFQ area**
- **Relocate 50 KeV proton source from MS-6 to MDB and commission**
  - By mid-summer (before start of accelerator shutdown?)
- **Install cryogenic transfer lines into cavity test cave**
- **Design and install infrastructure (RF distr., water, vacuum, etc) to accept RFQ**
  - By mid-summer, i.e. before end of summer accelerator shutdown
- **Install RFQ and commission**
  - Install in September and operate at full RF power by mid-October 2007
- **2.5 MeV beam operations by end of 2007**

Tasks Required for Near-Term Objectives

- **Water**
  - Install new pump on existing skid
  - Install water to ion source/RFQ
  - Develop design specs for new skid with higher flow capacity
- **Mechanical**
  - Install coax transmission lines to cavity test cave
  - Construct ion source/RFQ area fencing
  - Support ion source installation in MDB
  - Design/Install RF distribution components to RFQ
- **Vacuum**
  - Establish vacuum system for room temp cavity testing in cave
  - Design/install vacuum system (with Piekarz et al.) for ion source/RFQ
- **EE**
  - Deliver ~ 6 regulated power supplies for ferrite vector modulators (testing and RFQ)
  - Engineering for global solenoid, steering, and FVM power system design
  - Charging supply

Tasks Required for Near-Term Objectives

- **Controls**
  - Provide interface with" ILC Controls" so we aim for common methods
  - Continued/enhanced daily controls support
  - EPICs database management and entry
  - EPICS applications
  - New timing system rate generator hardware
- **RF**
  - Provide/commission initial LLRF system
- **Cryo**
  - Support TD with test cryostat cryogenics system issues
  - Install cryo transfer lines into cavity test cave
  - Support TD with accelerator spoke cavity cryostat and interface design to understand Linac enclosure cryo physical requirements/features
- **Instrumentation**
  - Supply Semenov digitizer boards

HINS 2008-9 R&D Objectives

- **Superconducting cavity test cryostat installation and operation**
- **Linac cave design, construction, and utilities**
- **Demonstration of independent RF amplitude & phase control of multiple Room Temperature cavities on single klystron**
- **Room temperature Linac installation**
- **10 MeV operation**
- **Ready to install SC cavity cryostat(s) and high energy beam transport in Linac cave in 2010**

Tasks Required for 2008-9 Objectives

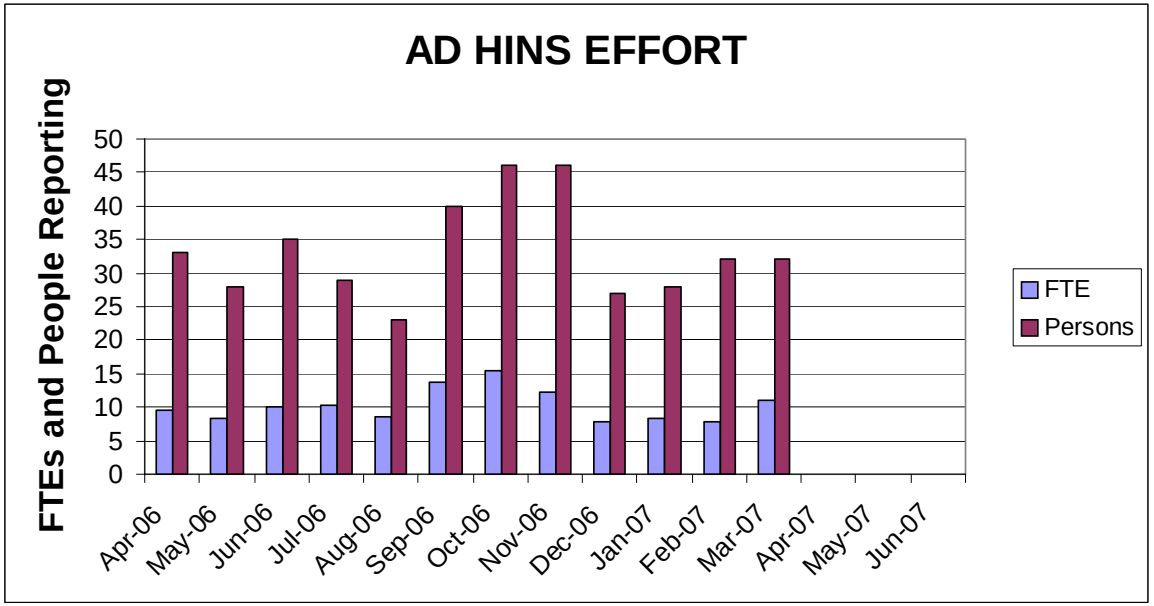
- **Water**
  - Install new skid
  - Install water to Linac cave
- **Mechanical**
  - Install coax transmission lines to room temp section of Linac cave
  - Install room temp Linac beam line and components
- **Vacuum**
  - Install vacuum system for room temp Linac
- **EE**
  - Complete engineering design for global solenoid, steering, and FVM power system
  - Deliver ~ 40 power supplies for ferrite vector modulators
  - Install/commission power system for room temperature Linac components
  - Deliver final klystron charging supply
  - Vacuum controls

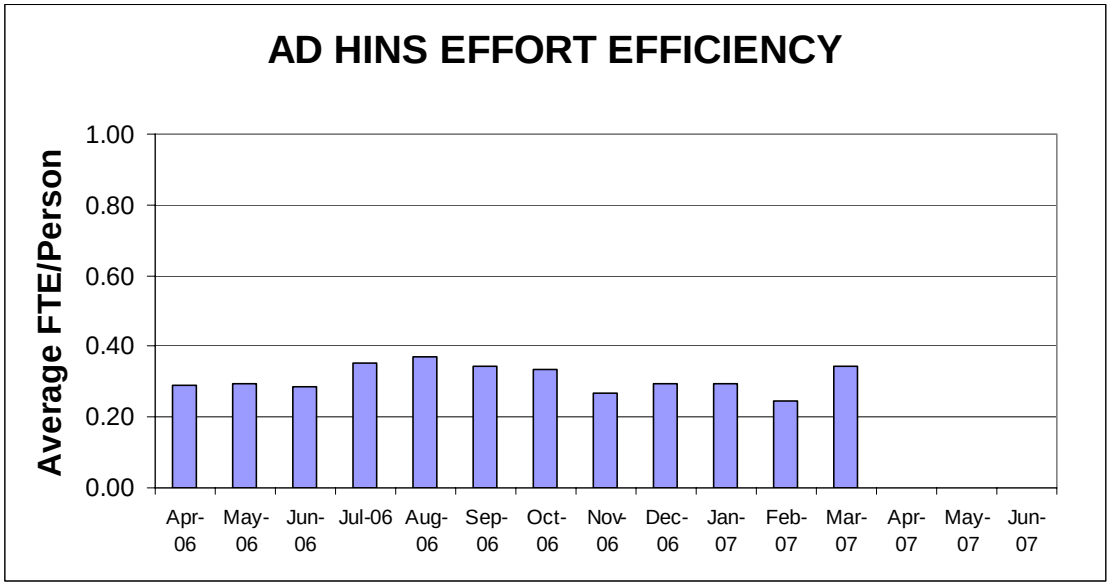
Tasks Required for 2008-9 Objectives

- **Controls**
  - Provide interface with" ILC Controls" so we aim for common methods
  - Continued/enhanced daily controls support
  - EPICs database management and entry
  - EPICS applications
  - Hardware support
- **RF**
  - Provide/commission multi-cavity LLRF system
- **Cryo**
  - Support TD with test cryostat cryogenics system issues
  - Install cryo transfer lines into cavity test cave
  - Support TD with accelerator spoke cavity cryostat and interface design to understand Linac enclosure cryo physical requirements/features
  - Completer Linac cave cryo system design
- **Instrumentation**
  - Specification/design/engineering/procurement of room temp Linac beam instrumentation
  - Suppy/install room temp Linac beam instrumentation

AD Involvement with Meson Facility

Accelerator Division Effort on HINS





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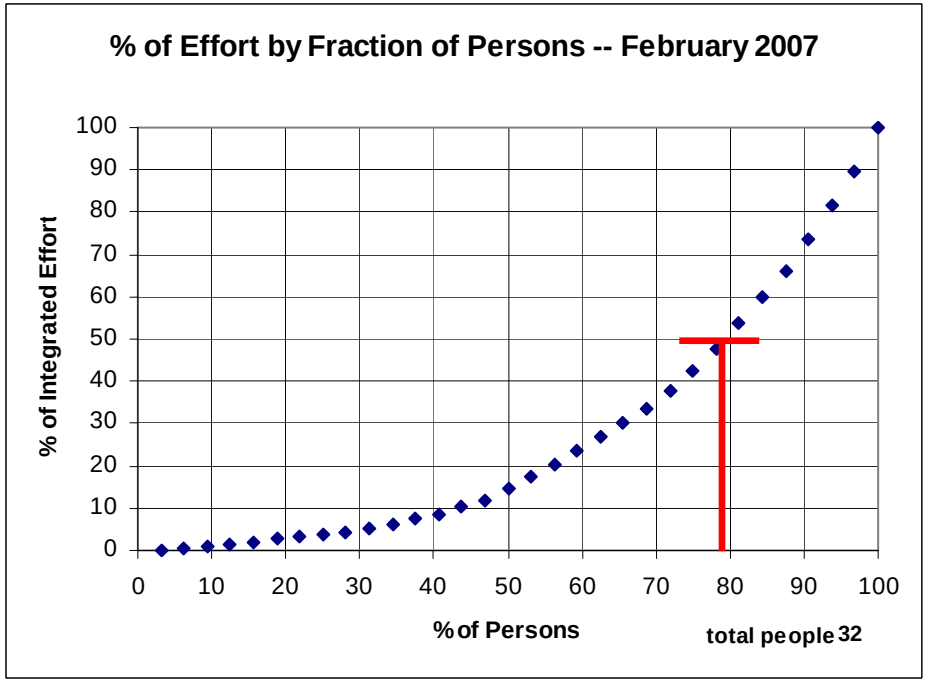
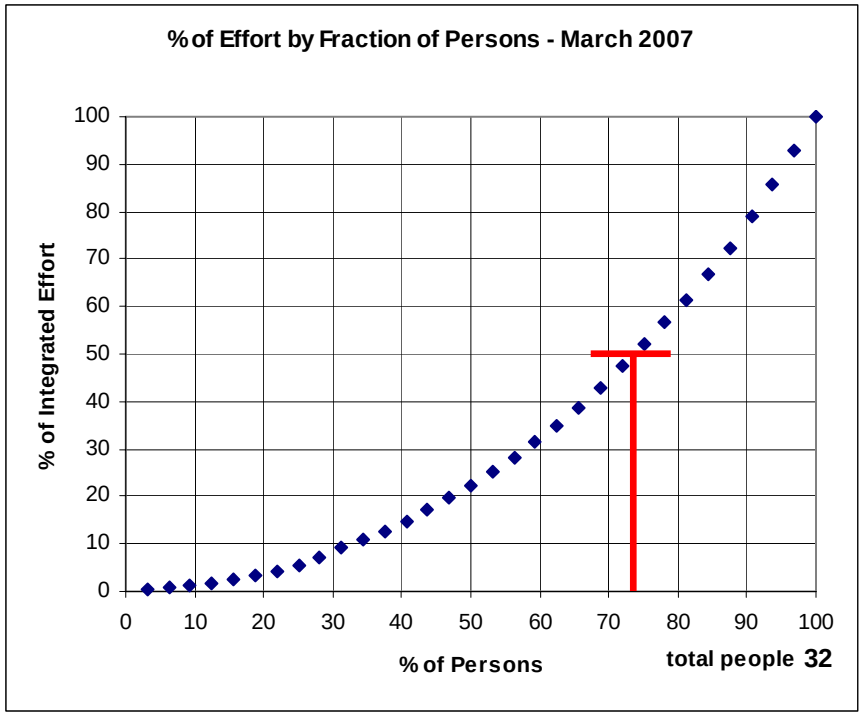
February and March AD HINS Effort





Recent Meeting with AD Dept. Heads

- **Summary of immediate needs, identified before and as result of the meeting, to accomplish 60 MeV HINS at MDB in 2010:**
  - More Mech Support help, Terry Anderson to update estimate of the effort needed to meet 07 and 08-09 HINS objectives
  - More of someone like Jerry Leibfritz in project engineering role to develop the physical "big picture" (even part time would help, e.g. share with NML) (Liebfritz not available)
  - Project-dedicated person from Controls (large-part-time)
  - Cryo person (large-part-time) to pay attention/participate with TD design for design of cryo systems to support spoke cavity cryostats and focusing solenoids in MDB
  - Steady attention (at a fixed level) from B.Chase/LLRF group to the MDB RF commissioning, system design/modeling issues, etc
  - EE support attention to help develop spec for FVM bias power supplies and for system design of power supply/distribution for FVMs and beam line superconducting solenoid magnets.
- **Especially need full-time/large part-time people for systems design issues**
- **Department Heads all agreed they would like restatement of priorities from the Lab/Divison management to understand how they might redistribute their workforce if expected to increase HINS support.**

Positive Results from Meeting

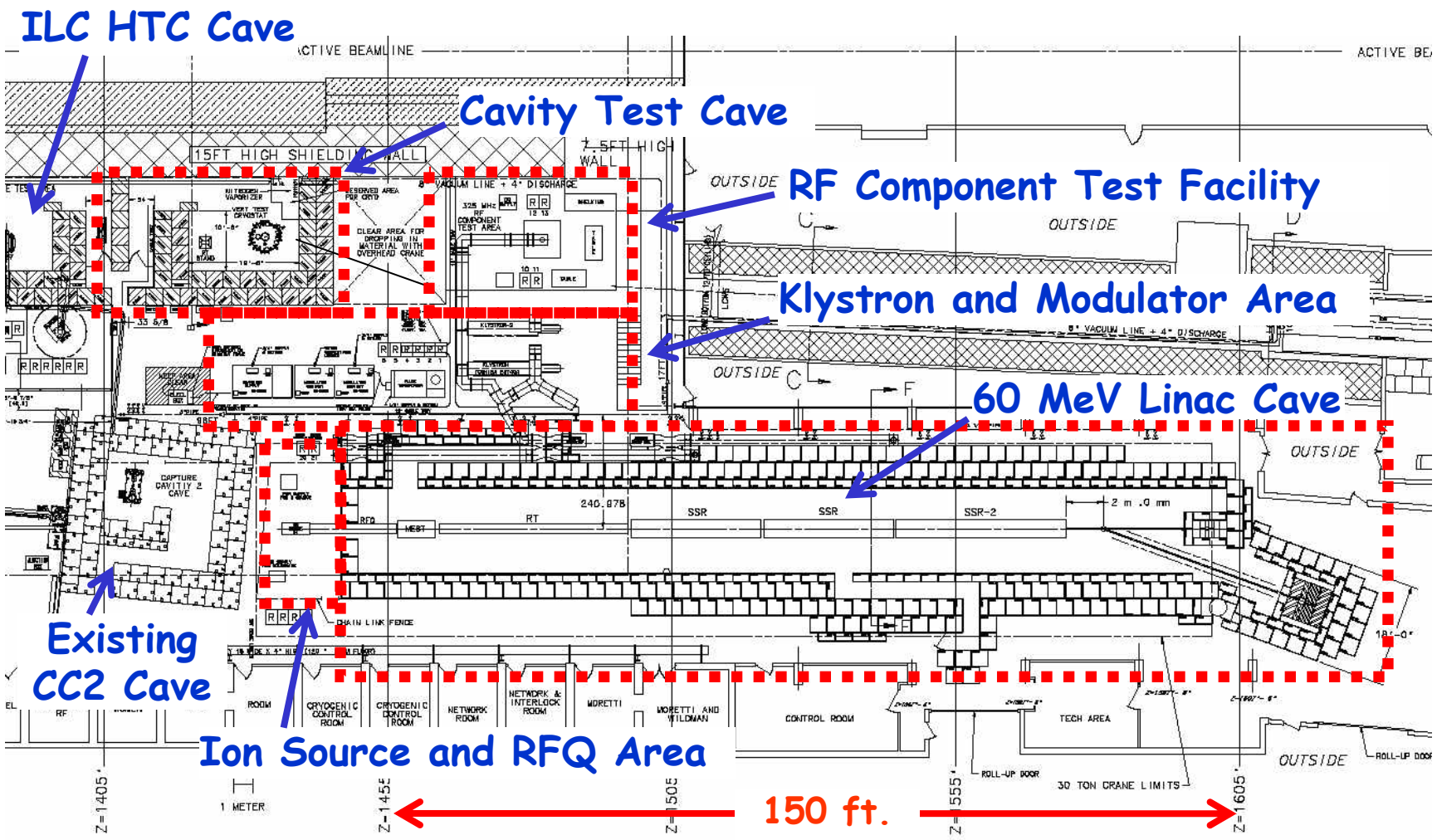
- **ME Support agreed to put in the effort to scope out the magnitude of our needs**
- **Dan Wolff is investigating focusing solenoid power system requirements (incl. quench protection)**
- **Dan also has started series of meetings on IQM power supply requirements and design**

Other Discussions from AD Dept. Heads Meeting

- **It was noted that even ILC appears only 5th on AD priority list**
- **Mechanical engineering already at a deficit to support Nova/ANU engineering demands and NML expectations are growing**
- **AD LLRF group has unique expertise that already receives more demands than they can support (even with present help from CD)**
- **Jay Theilacker**
  - Concerned about the magnitude of the HINS Meson Linac cryo design job, especially in light of other large cryo design demands including NML
  - Noted that the HINS Linac will require full capacity of Meson Cryo plant while ILC is suggesting expanding their activities there
  - Suggested that, since HINS will consume all available Meson cryo anyway, much could be saved by removing the CC2 cave from MDB picture

Compatibility of HINS and ILC Facilities in Meson

HINS Floor Plan in Meson Detector Building



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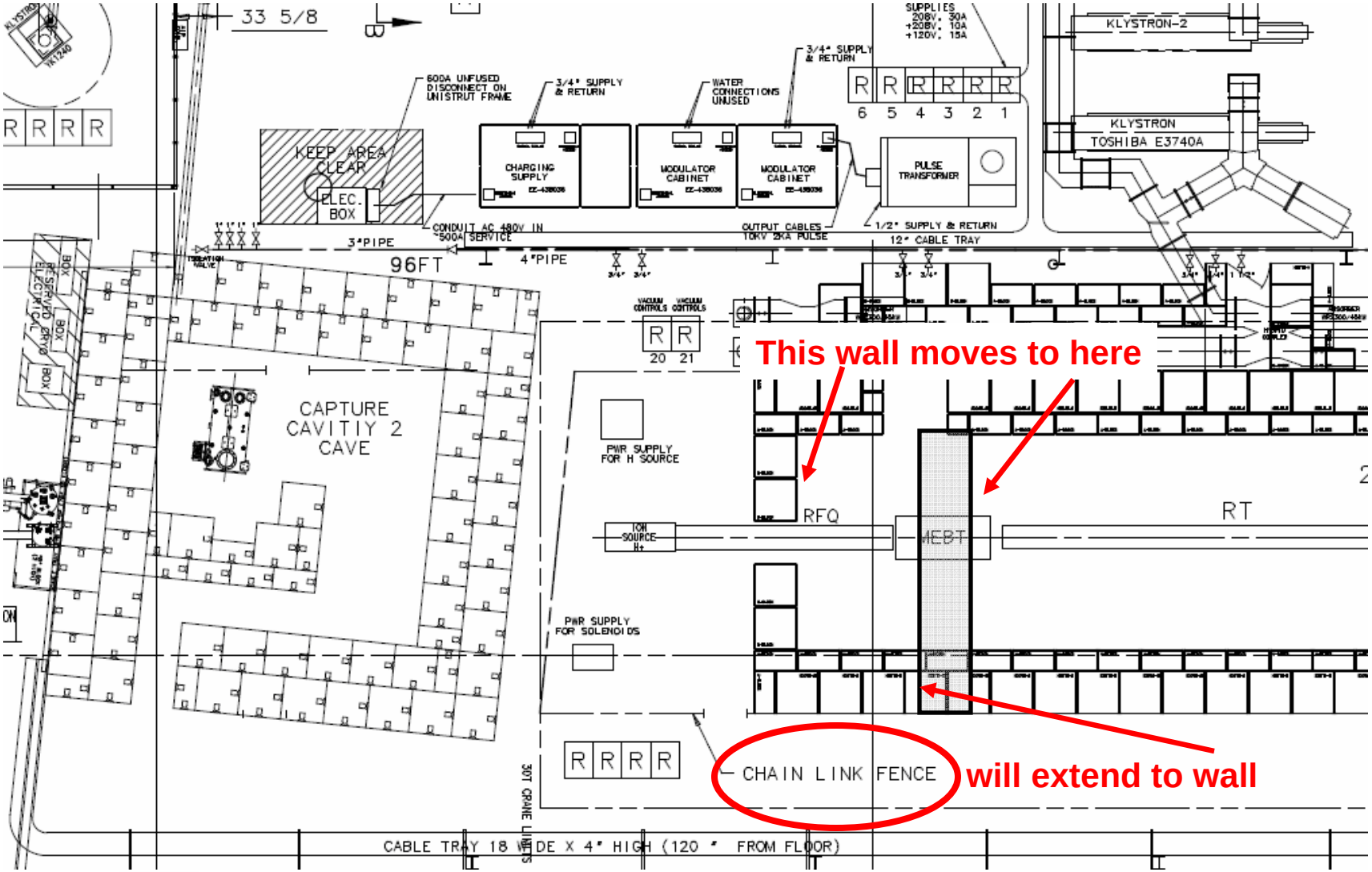
Floor Plan Near CC2 Cave



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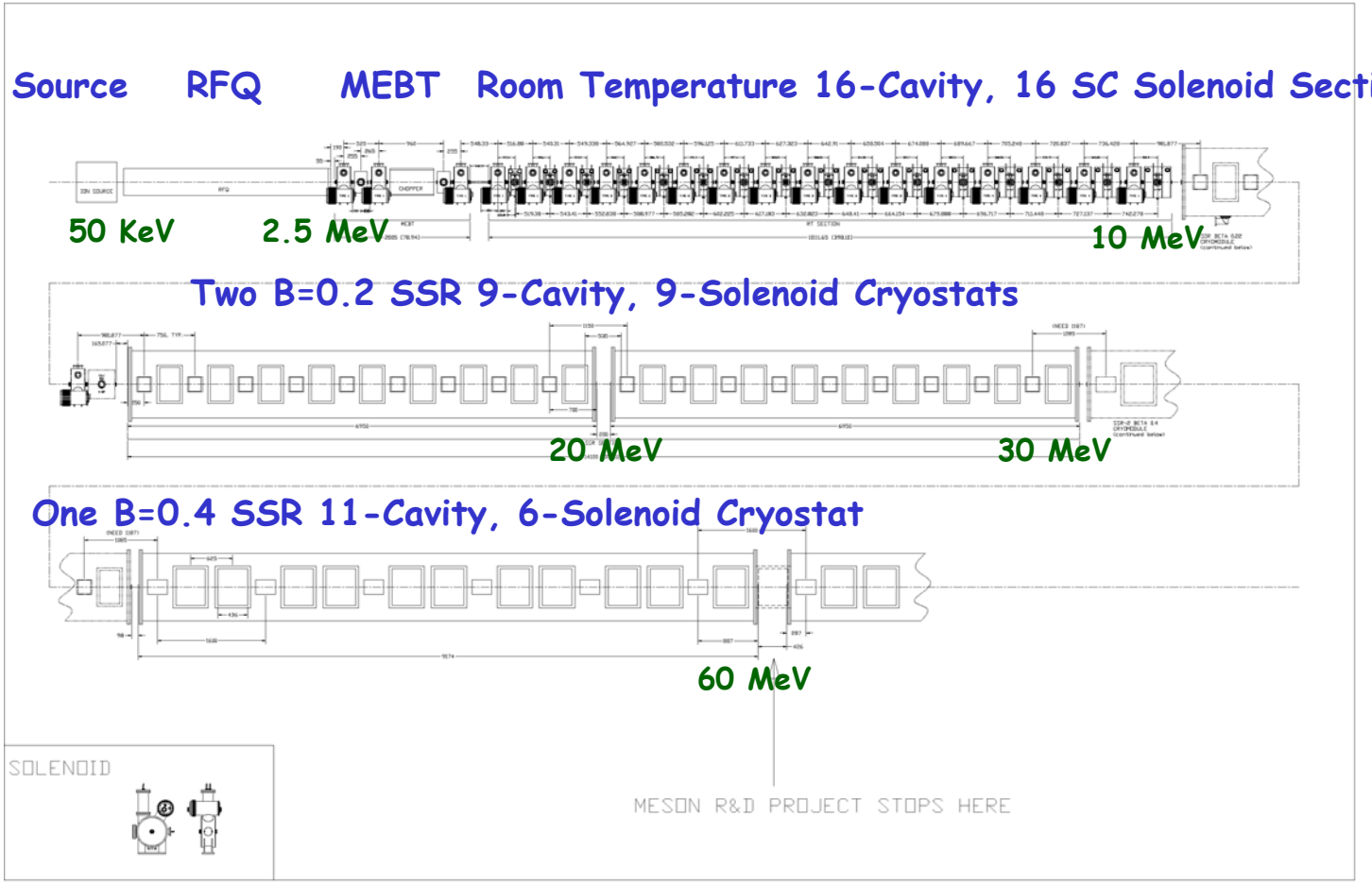
backups

Layout Through Second β=.4 Cryostat

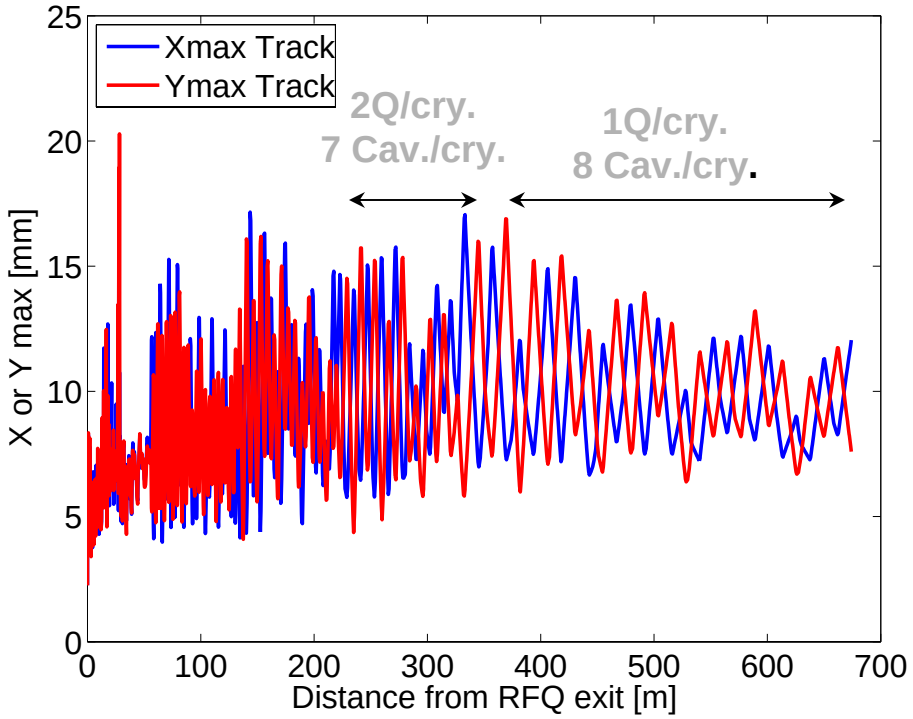


HINS with Standard / 8 ILC units in BETA=1 section (TRACK simulations, 45 mA, 200kp)

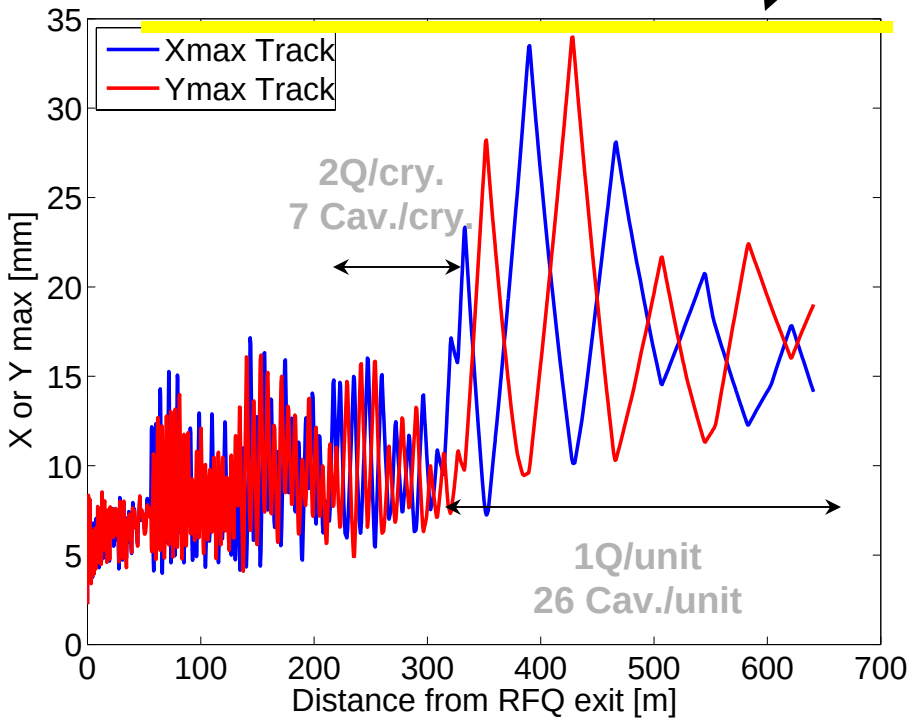
Max envelope

cavities edges

standard



8 ILC units



Status

- **2.5 MW, 325 MHz modulator/klystron system installed and now being commissioned**
- **Commissioning of RF component area and cavity test cave will immediately follow**
- **Ion source work is proceeding on 50 KeV injector and both H+ and H- sources,**
- **RFQ is in fabrication, expected end of summer**
- **First Room Temperature spoke cavity is complete except for power coupler (ceramic/brazing issues), expected to be ready for power testing in few weeks**

HINS R&D Schedule Goals

- **2.5 MeV beam tests**
  - By end of 2007
- **Superconducting cavity test cryostat installation**
  - Early 2008
- **First SC spoke cavity power tests in test cryostat**
  - Spring 2008
- **Linac cave construction and utilities installation**
  - Starting October 2007
- **Demonstration of independent RF amplitude & phase control of multiple Room Temperature cavities on single klystron**
  - October 2008

HINS 2007 Plans in Meson

- **325 MHz RF power system commissioning including RF component cage area and cavity test cave now thru April**
- **Begin component testing in RF test area in May**
- **First room-temp cavity full power tests in May/June**
- **Installation of fencing around ion source area and build low-energy wall of Linac cave in MDB**
- **Move ion source/injector from MDB and commission**
- **Design and install infrastructure (RF distribution, water, vacuum, etc) to accept RFQ in September**
- **Install cryo transfer lines into cavity test cave**
- **Commission RFQ with RF power**
- **2.5 MeV beam operations by end of 2007**