ILCTA_NML Progress at Fermilab

Jerry Leibfritz

August 16, 2007

NML Project Overview

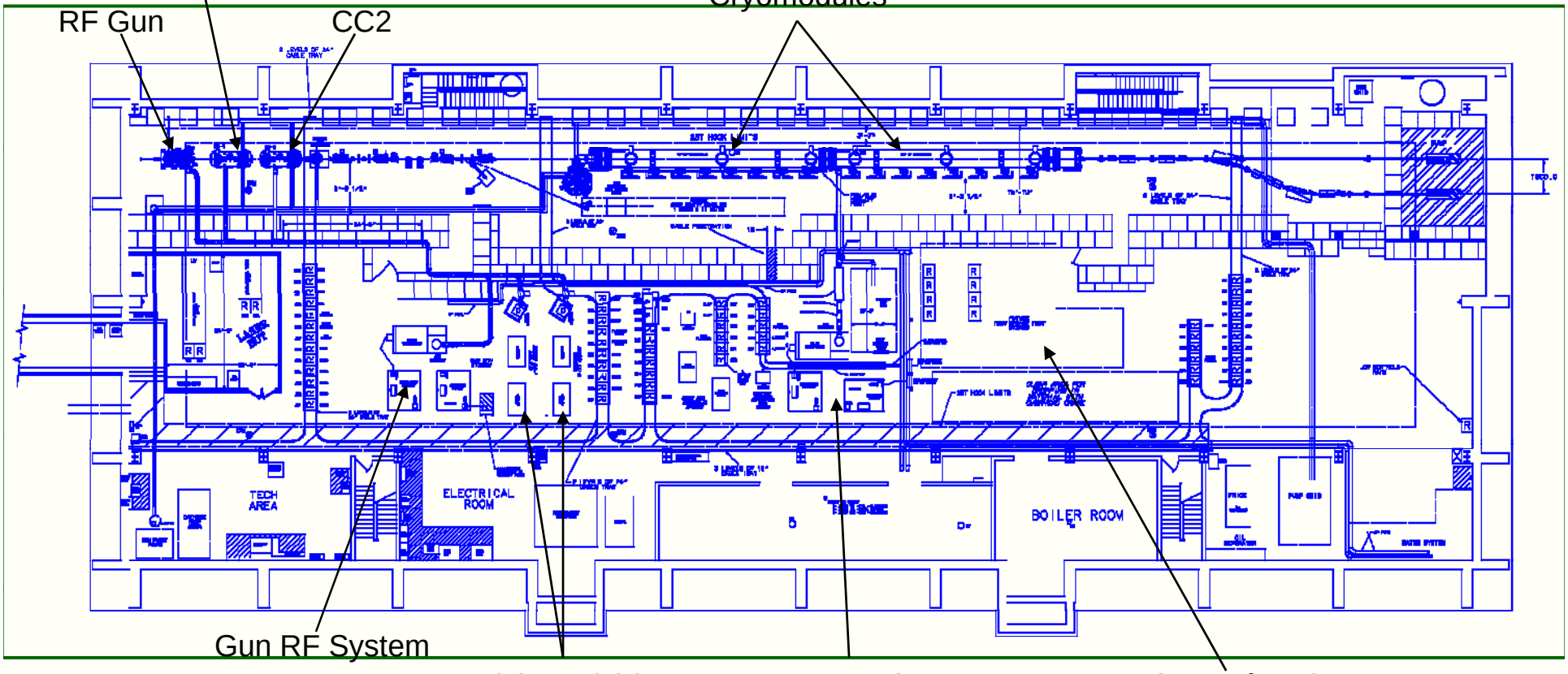
- **Overall Plan**
  - **Build an ILC RF Unit Test Facility at New Muon Lab Building (NML)**
    - One ILC RF Unit (3 Cryomodules)
    - 10-MW RF System
    - ILC-like Beam (3.2 nC/bunch @3 MHz, Up to 3000 bunches @ 5Hz, 300-μm rms bunch length)
- **Phase-1 (FY07 - FY08)**
  - **Prepare Facility for Testing of First Cryomodule (CM1) and Capture Cavity II (CCII) without Beam**
    - Infrastructure
    - RF Power
    - Cryogenics (Refrigerator #1)
- **Phase-2 & 3 (FY08 - FY10)**
  - **Install Injector, CM2 and CM3, Test with Beam**
    - New RF Gun
    - Move A0 Photo-Injector to NML and Install Test Beamlines
    - Extend Building to fit Third Cryomodule
    - Croyogenics (Refrigerator #2 and New Cryoplant-300W)
    - Upgrade RF System to 10 MW

Schedule Milestones

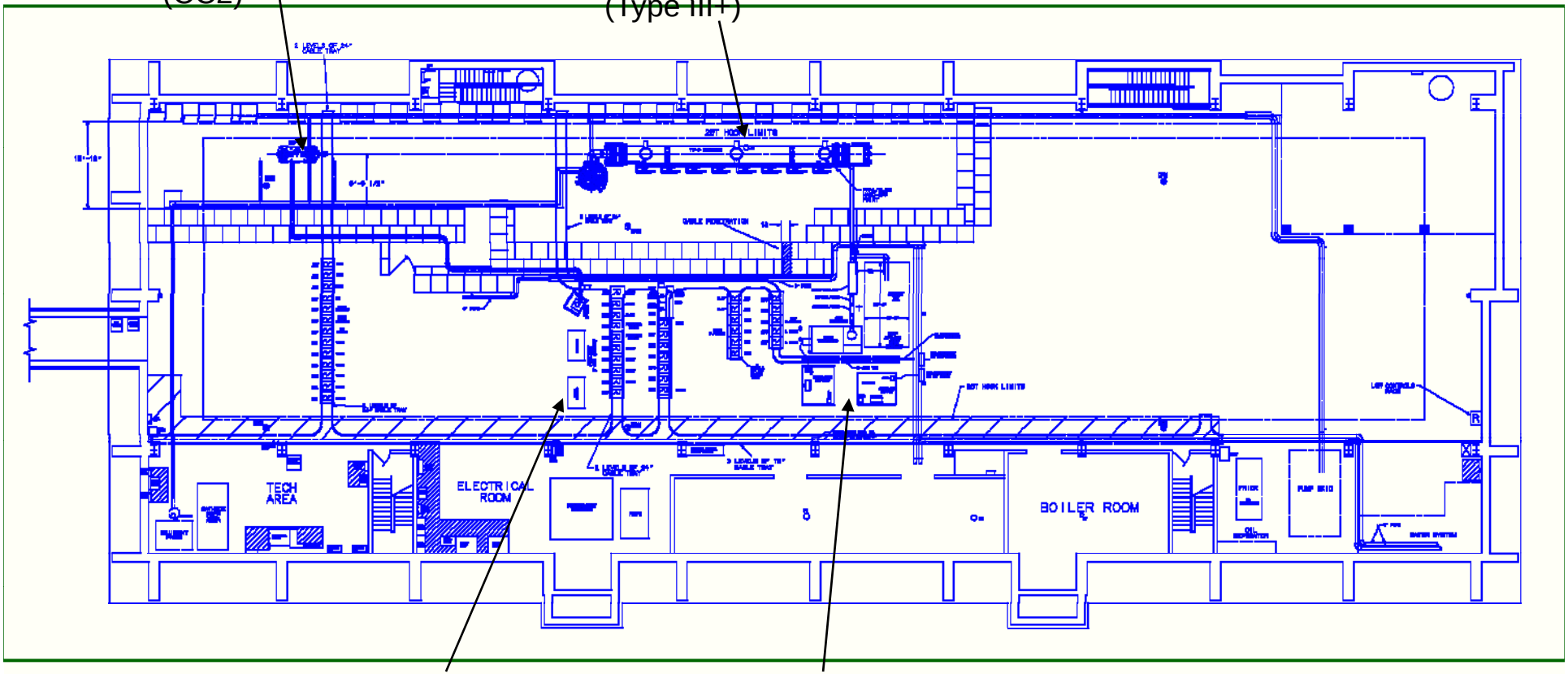
• Refrigerator #1 Operational	(7/07)
• Begin Civil Design of Building Extenstion	(8/07)
• Install RF Systems (5MW & CC2)	(9/07)
• Move CCII to NML	(11/07)
• 1st Cryomodule Delivery to NML (Type III+)	(11/07)
• Begin 1st Cryomodule RF Test (Warm)	(2/08)
• Begin Move of A0 Injector to NML	(2/08)
• Cryo System Components in Place	(5/08)
• Begin Cooldown of 1st Cryomodule	(7/08)
• Refrigerator #2 Operational	(7/08)
• Begin Construction of Building Extension	(7/08)
• 2nd Cryomodule Delivery to NML (Type III+)	(10/08)
• First Beam	(12/08)
• Order Cryoplant	(12/08)
• 3rd Cryomodule Delivery to NML (Type IV)	(~4/09)

Exterior of NML

Overall Layout of NML



Phase-1 Layout of NML



NML Building Infrastructure - FY07

- **Removal of CCM**
  - Completed Removal of Chicago Cyclotron Magnet (CCM)
  - Filled in CCM Pit (~10' deep) with Concrete
- **Prepared Building Infrastructure**
  - AC Power Distribution/Network Cabling
  - Relocated Piping, Cable Tray, Duct Work
  - Cleaned out Building, Epoxy Coated Floor
  - Began Preparation of Control Room (new ceiling, paint, carpet, furniture)
  - New AC Units in Office Area, Repaired Sewer Line, Replaced Boiler

ILC Test Area at NML

NML During Removal of Chicago Cyclotron Magnet(CCM) (September, 2006)

NML Facility after CCM Removal and Floor Painting (February, 2007)

NML Test Facility Infrastructure - FY07

- **Test Facility Infrastructure**
  - Construction of Cave for Phase-1 (~3/4 of Full cave) (90% complete)
  - Installed Electrical Racks and Cable Tray
  - Design of Waveguide Layout/Penetrations Complete
  - Beam Absorber/Dump Analysis complete
- **Alignment**
  - Installed Deep Rod Monuments (DRM's)
  - Established Alignment Network
  - Installed Water Level System

Current Picture of NML Facility

View From North

NML Cryogenic System - FY07

- **Cryogenic System**
  - **Installed Gas Storage Tanks**
  - **Refrigerator #1 (60W@1.8K)**
    - **Complete & Ready to Operate**
  - **Distribution System**
    - **Feed Can, Feed Cap, End Cap out for Bid**
    - **Pipe Installation (40% complete)**
    - **End Cap Support Girder Design in Progress**
  - **Added Positive Isolation Back into System**
    - **Separate Injector Components from Cryomodules**

NML RF System - FY07

- **RF System**
  - **5 MW for CM1**
    - Klystron, Modulator, Pulse Transformer Ready to Install (waiting for cave construction to finish)
  - **300 KW for CCII**
    - Ready to Install (waiting for cave construction to finish)
  - **5 MW for Gun**
    - Klystron, Pulse Transformer, Modulator Parts ordered
  - **Distribution**
    - Waveguide, Distribution Components Ordered
    - CM1 Distribution Coming from SLAC

NML Injector/Accel./Test Beamline - FY07

- **Injector**
  - RF Gun Design is Progressing (Cavity-DESY, Cathode System-INFN)
  - Requisitions Written for Gun Solenoids and Power Supplies
  - Specification for New Injector Magnets being Reviewed
  - Injector Lattice being Finalized
  - Specification for Laser Hut/Climate Controlled Instrument Room being Reviewed
- **Accelerator**
  - Cryo. Girder/CM Support Being Designed
  - First Cryomodule Assembly Began - 7/23/07 (Delivery 11/07)
  - Design Work has Begun on HOM Absorber
- **Test Beamline**
  - Lattice is being Finalized
  - Specifications for Magnets being Reviewed
  - Beam Absorber/Dump Analysis Complete

NML Auxillary Systems - FY07

- **Vacuum System**
  - Components Ordered for (2) Vacuum Carts
    - Leak Detectors, RGA's, Pumps, Gages, Controls
  - Equipment for Insulating, Beamline, and Warm Coupler Vacuum Systems being Specified
  - Warm Beam Valves for CM1 Ordered
  - Design of CM1 Vacuum Spools from Cold Beam Valve to Warm Beam Valve is Complete
- **Water Cooling System**
  - System Design Complete
  - Have New Pumps and Heat Exchanger
  - Piping Installation (70% complete)
  - Temporary Skid Moved to NML (for Phase-1)
- **Safety Systems**
  - Radiation, ODH, Safety Assessment, etc. Documentation Being Prepared

NML Controls/Instrumentation - FY07

- **Controls**
  - Control Room Furniture Installed
  - Wireless Network Installed Throughout Building
- **Instrumentation**
  - Wire Position Monitors for CM1
  - Faraday Cup Fabrication
  - RF Protection System

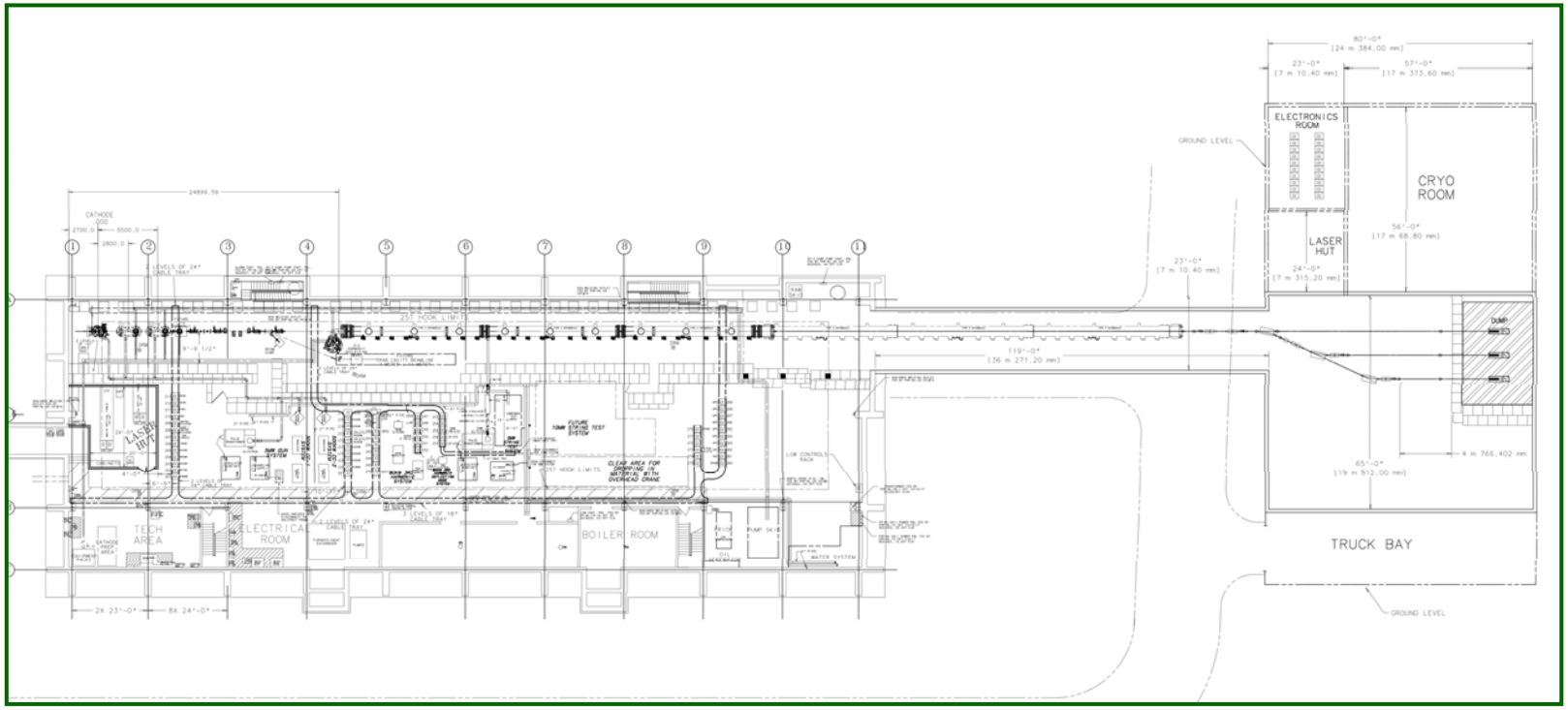
Before

After

Remaining Work for Phase-1

- **Finish Installation of:**
  - Cave (& Paint)
  - Cable Trays Over Cave
  - Cryogenic Distribution System for CCII & CM1
  - Control Room (computers, etc.)
  - Water Piping
- **Install**
  - RF Systems and RF Distribution for CCII and CM1
    - Waiting for Cave Completion (1-2 weeks away)
  - Water Cooling Skid
  - Safety, LLRF, and Control Systems
  - Pull Cables
  - Fabricate Cryo Support Girder
- **Move Capture Cavity II from Meson Detector Building (MDB)**

NML Conventional Facility Building Extension



- Began Design of NML Extension with CF&S Group (FESS)
- Room for 6 Cryomodules (2 RF Units)
- Expanded Diagnostic and AARD Test Area
- Cryoplant (300W)