US LHC Accelerator Research Program

bnl - fnal - lbnl - slac

US Participation in the LHC Hardware Commissioning

Michael Lamm for the HC subgroup

17 June 2004

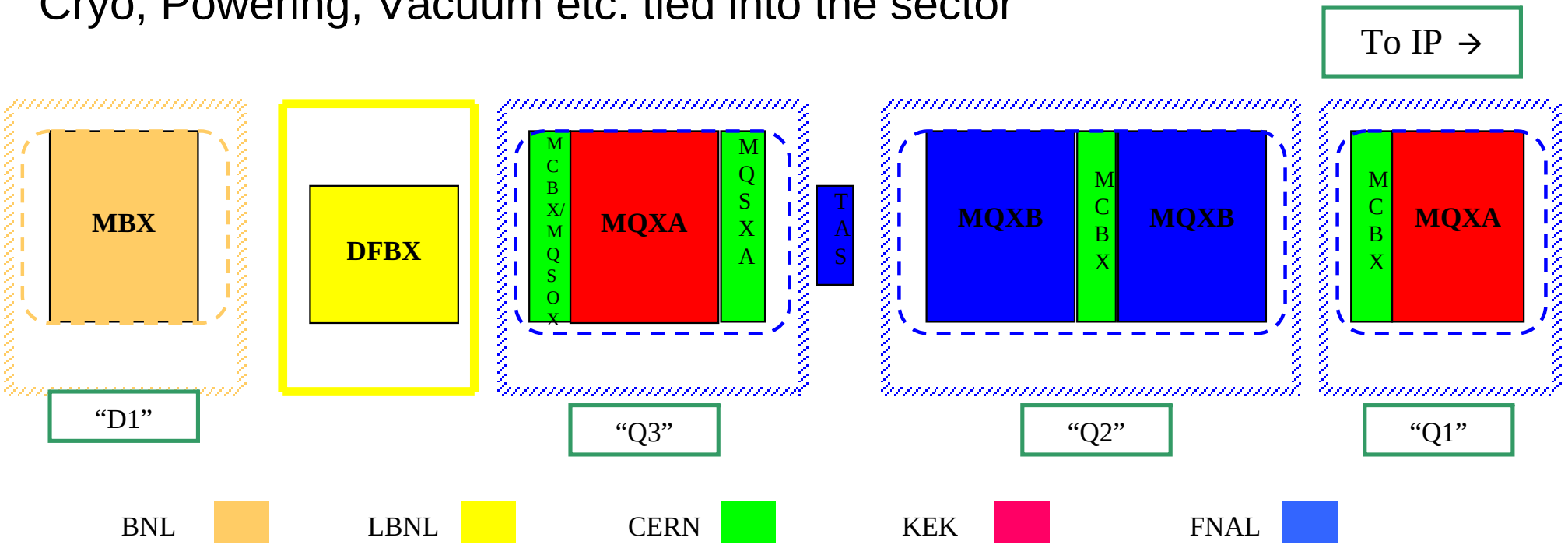
The Hardware Commissioning Task

- What is the Hardware Commissioning Task?
  - Assist in installation of equipment delivered under the construction Project.
  - Actively participate in system commissioning (cryogenic,vacuum,powering etc.)

- Why is it important?
  - Assure that our equipment is installed properly
  - Bring LHC physics to US HEP
  - Once-in-a-decade experience
  - CERN needs our help
  - International Cooperation

Major US Contributions to the LHC in the IR Inner Triplets

Cryo, Powering, Vacuum etc. tied into the sector



Other important Contributions

- Hadron and neutral absorber for high luminosity region(LBNL)
- Other separation dipoles (BNL)

Hardware Commissioning Since First LAPAC

- 2002 HC part of LARP baseline
- Summer 2003: HC part of approved LARP
  - Effort ~ 2 FTE/year
- Sept 2003 Port Jefferson LARP meeting
  - Establish LARP HC subgroup:
    Peter Wanderer(BNL), Mike Lamm(FNAL), Joseph Rasson(LBNL)
- November 2003: Discussion with CERN about Structure of US participation
  - Defining job types, length of stays, role in commission
  - Make presentation at HCWG
- February 2004: Refine participation, begin to recruit LARP participants, budget for 2004-6

CERN Installation and Hardware Commissioning Milestones

- Schedule available on:
  Web:http://lhc-new-homepage.web.cern.ch/lhc-new-homepage
- Major revision is in the works:
  - Compressed installation and commissioning with beam in 2007
- Milestones:
  - Hardware Fitup: Summer/Fall 2004
  - First Inner Triplet Installation (Spring 2005)
  - Begin Hardware Commissioning (Fall 2005)
  - Sector Test (Spring 2006?)
  - Finish Commissioning (Spring 2007)
  - First Circulating Beam (Summer/Fall 2007)

CERN Installation and Commissioning Org

- In the construction Project our responsibility ends with acceptance of deliverables.
- LARP HC participation is through the CERN Organization
- Installation:
  - Installation is the responsibility of the CERN project engineer Ranko Ostojic
  - Installation effort organized through Jean-Philippe Tock of CERN AT/CRI
- Hardware Commissioning:
  - Coordinated by Roberto Saban through the hardware commissioning working group (HC WG)
  - Minutes of HC WG available on the web

How LARP Personnel Would Fit Into LHC (1)

- Types of People Needed
  - Mechanical Engineer for Installation
    - Experts on mechanical interconnects
    - Vacuum Loading,mechanical support etc.
    - Short duration stays critical period FY05
  - Cryogenic Engineer for Installation and Commissioning
    - Expert on Feedbox, Magnet cryo, System cryo, Cryogenic operations, HTS leads
    - Longer duration stays critical period Fall FY06
  - Magnet Physicist
    - Expert on electrical interconnect, powering, quench protection
    - Longer duration stays, critical period Fall FY06

How LARP Personnel Would Fit Into LHC (2)

- Duration of Stays
  - Short duration (2 weeks to 2 months) during fitup and installation
  - Longer duration (up to a year) during commissioning
- Person would be part of installation or commissioning team made of persons from various groups
  - Installation organized by Ranko Ostojic (CERN owner of Hardware)
  - Commissioning organized by Roberto Saban
- It is agree by both CERN and LARP that people staying for extended periods of time would be expected to take real responsibilities for Installation and Commissioning
- Scope of LARP is focused on US deliverables. Time permitting it is logical for long duration people to include other hardware which directly affects US LHC deliverables. e.g. Global cryogenic system or commissioning IR beyond Inner Triplet

LARP Hardware Commissioning in FY04

- 0.5 FTE spread over three laboratories
- Activities include
  - Planning for FY05-8
    - Defining participation
  - Deliverable activity past CERN acceptance
    - Participation in Surface Fit Ups
      - TAS
      - Inner Triplet fitup slides to FY05

Effort by Task/Fiscal Year

“Above Ground” Mechanical Fitup

- Inner Triplet (D1,DFBX,Q3-Q1) Does not include TAS fitup
- Time Frame: October-November 2004
- Purpose of Test
  - Assemble all pieces for one complete IR
  - Mechanical fitup of interconnects
    - Pipes adjustments to install length, dry fit
    - Vacuum tests
    - Shields, interconnect kits
  - Magnets on alignment jacks
  - Electrical continuity
  - Exercise alignment (SSW?)
  - Build DFBX Cable trays as per final installation
- Level of Effort
  - FNAL 2 FTE-Months Eng. 2 weeks physicist
  - LBNL 2 FTE-Months Eng.
  - BNL 1 FTE-Month

Effort by Task/Fiscal Year

Installation

- Time Frame: First IR May-July 2005, Continuous throughout FY2006
- Purpose of Test
  - Assure that US components are installed properly
    - Check installation procedures
    - Participate in first electrical connections
    - Review electrical and alignment data

- Level of Effort FY05
  - FNAL 2 FTE-Months Eng. 2 weeks physicist
  - LBNL 1.5 FTE-Months Eng.
  - BNL 1 FTE-Month Eng/Physicist
- Level of Effort FY06 is about the same
  - Less effort/IR but more IR's

Effort by Task/Fiscal Year

Commissioning

- Time Frame: Fall 2005 through Spring 2007
- Purpose of Test
  - Once installation complete, all aspects of bringing system to full operation. Injection test in Spring 2006
- Level of Effort (mostly starts in FY06)
  - Two full time FTE's stationed at CERN through First 2 IR commissioning and Injector tests.
  - Other effort from all labs
    - FNAL 1 FTE-Months Eng.
    - LBNL 2 FTE-Months Eng.
    - BNL 1 FTE-Month

Effort by Task/Fiscal Year

Oversight

- Time Frame: Fall 2005 through Spring 2007
- Level of Effort
  - Less than .1 FTE/institution

Recent Changes in Effort/Cost

- Original Plan Calls for 2 FTEs in FY05, 6, 7, 1 FTE in FY08
- Slide in Commissioning towards FY06 argues for delay in "resident participation"
- Attempt at figuring in Real Cost of Travel and Living Expenses included

Major Cost is Living Expense in Geneva

- Close consultation with Fermilab CMS, which has already had to face living details for US personnel at CERN
- CMS has written guideless for living at CERN

  General Principal: employee financially neutral from experience
- Two types of participants: Short term and Long term
  - Short term < 6 months
    - Pay per diem, provide housing, car expenses
  - Long term >6 months
    - Provide COLA (exchange rate and “Big Mac” Coefficient)
- Major Issues
  - Variability of COLA
  - Health Insurance
  - Status at CERN (project or scientific associate status)

Proposed FTE and Manpower

		FNAL	BNL	LBNL	Total	Yearly Total
FY05	FTE	0.88	0.24	0.31	1.42	1.42
FY06	FTE	2.28	0.24	0.35	2.87	2.87
Institution total		3.15	0.48	0.66	4.29	

		FNAL	BNL	LBNL	Total	Yearly Total
FY05	Salary	$135.4K	$56.5K	$73.6K	$265.6K	$390.0K
	M&S	$75.7K	$18.8K	$29.9K	$124.4K	
FY06	Salary	$367.1K	$60.9K	$87.3K	$515.3K	$710.7K
	M&S	$140.0K	$19.8K	$35.6K	$195.4K	
Institution total		$718.3K	$156.0K	$226.5K	$1100.7K	

*FY06 based on two resident persons from Fermilab, breakdown of labor will be reviewed in early FY05

Conclusion

- This is an important program for LARP
  - We can make an impact on the LHC
  - Enthusiastic support from CERN
  - Will be one of the first LARP participations, need to do it right…
- We have presented our best estimate of required costs for full participation
  - Plan for success
- Major uncertainties:
  1. CERN schedule which is beyond our control
  2. Cost of living in Geneva
  3. Lining up the appropriate people at the right time within the caveats of 1 & 2