



BNL -FNAL - LBNL - SLAC

Commissioning: Beam, IR and Hardware

Mike Syphers

Introduction / Short Review
IR/Hardware Commissioning Status
Beam Commissioning
Tasks, Budget, Time Line
Summary/Conclusions



Review from last time ...

- Reorganization: APC --> 'AP' and 'C'
 - Separating Accelerator Physics from Commissioning allowed for better concentration on these separate issues
- Present Commissioning tasks include
 - IR Commissioning (USLHC deliverables)
 - Hardware Commissioning (i.e., non-USLHC items; *prev. slide*)
 - Beam Commissioning
- IR and HW Commissioning employ many of same people, similar expertise; much overlap
 - Mike Lamm leads both IR and HW aspects
 - Elvin Harms leading Beam Commissioning; assists Lamm in Fermilab HW Comm (covers both AccDiv and TechDiv)
- FNAL Director agrees to support add'l 4-7 people for HW Comm
 - LBNL agrees to add'l 2-3
 - BNL will be 'case-by-case'
 - SLAC=0



LARP Commissioning

- IR Commissioning
- Hardware Commissioning
- Beam Commissioning



Interaction Region Installation Oversight

Installation Oversight

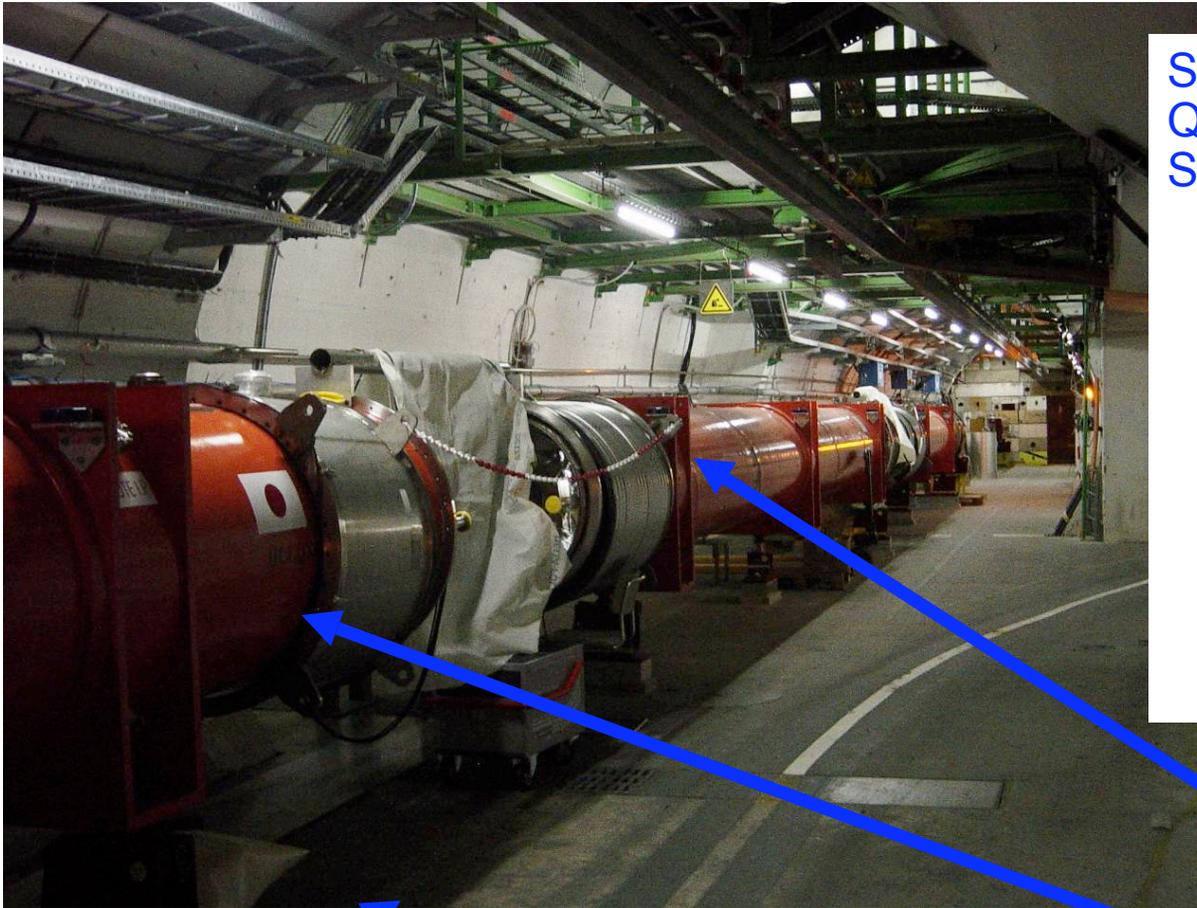
Since DOE Review Last Fall:

- First USLHC String (Q1-Q3/Feedbox/D1) transported to tunnel in November/December
- LARP Oversight and technology transfer for USLHC interconnects
 - 7 LARP personnel from three institutions during January/Feb 2006
- Weekly meetings to iron out installation issues





Installation of First IR Quads at IP-8 L



Status of Installation of Quads, Feedbox and D1 Separation Dipole:

- Place on Jack stands
- Alignment
- Electrical interconnect of buswork and instrumentation
- Welders qualified for welds
- Welding underway

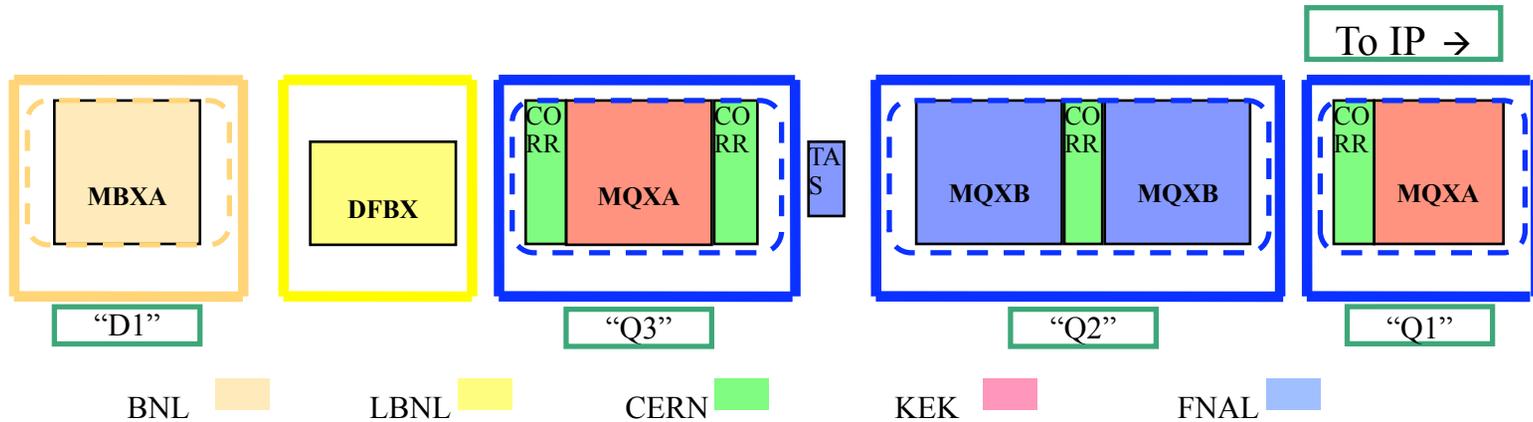
X Towards LHC-B IP

Q2

Q3



Components to be Commissioned in 5 IR's



Status of US Shipments to CERN

4/6/2006

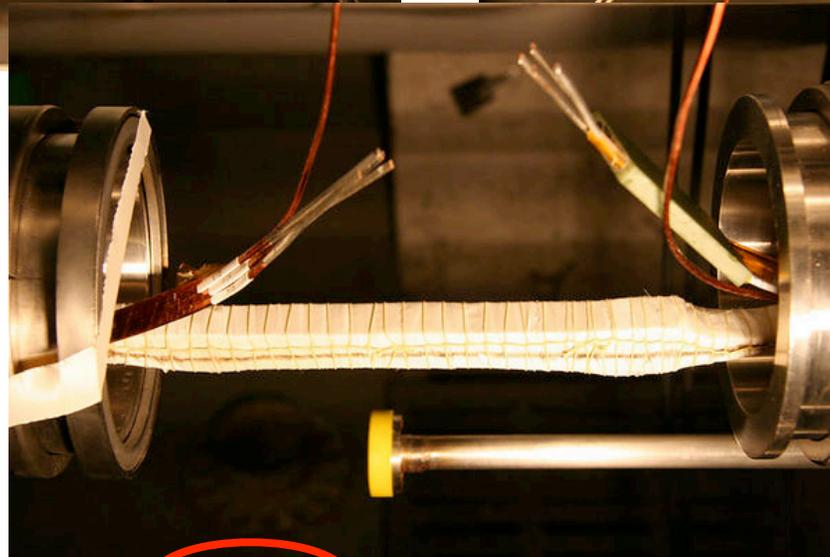
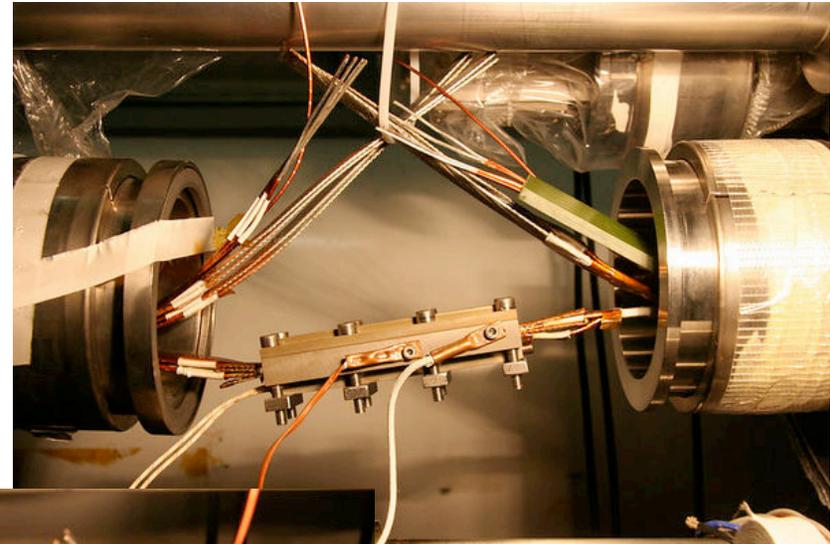
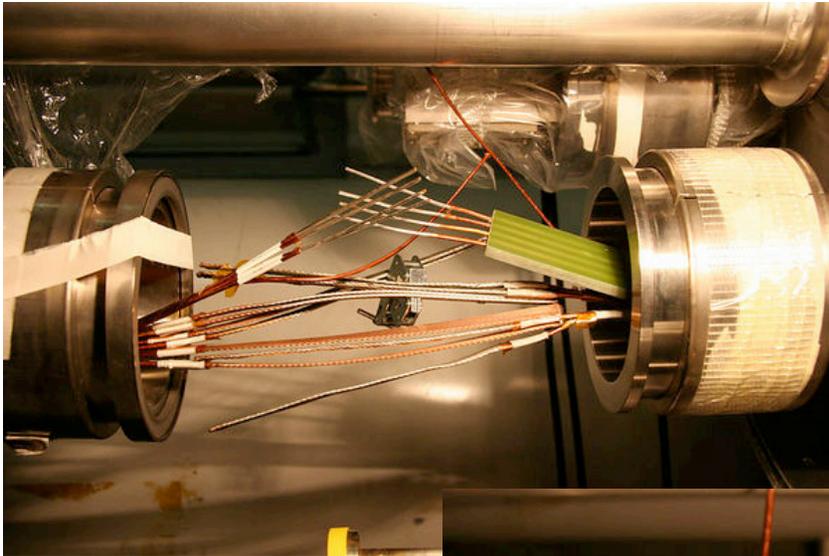
IR Region	CERN Start on Equipment Preparations	Q1	Status	Q2	Status	Q3	Status	DFBX	Status	D1	Status	D2	Status
IR8L	Aug-05	A01	at CERN	B04	at CERN	C03	at CERN	G	at CERN	D1L102	at CERN	D2L102	at CERN
IR8R	Aug-05	A04	at CERN	B05	at CERN	C04	at CERN	H	at CERN	D1L105	at CERN	D2L101	at CERN
IR1L	Nov-05	A02	at CERN	B03	at CERN	C05	at CERN	A	at CERN	none		D2L106	at CERN
IR5L	Dec-05	A06	at CERN	B08	at CERN	C06	at CERN	E	at CERN	none		D2L105	at CERN
IR5R	Apr-06	A05	at CERN	B09	at CERN	C07	at CERN	F	at CERN	none		D2L104	at CERN
IR2L	Jul-06	A07	at CERN	B06	at CERN	C08	14-Apr-06	C	at CERN	D1L103	at CERN	D2L107	at CERN
IR1R	Aug-06	A08	at CERN	B10	done	C09	15-May-06	B	at CERN	none		D2L109	at CERN
IR2R	Sep-06	A09	28-Apr-06	B07	30-Jun-06	C02	at CERN	D	at CERN	D1L104	at CERN	D2L108	at CERN
Spare		A03	at CERN	B01	at CERN	C01	at CERN	none		D1L101	at CERN	D2L103	at CERN

IR 4	D3	Status	D4	Status
IR4L	D3L101	at CERN	D4L101	at CERN
IR4R	D3L102	at CERN	D4L102	at CERN
Spare	D3L103	done	D4L103	at CERN

TAS and TAN absorber at CERN ready for installation

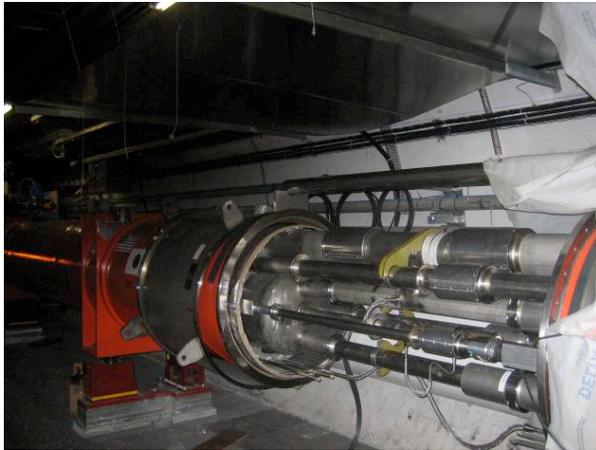


Main Bus Splicing Q1-Q2





Recent Pictures (taken by Peter Limon)



IR8L interconnects almost complete



IR8R Magnets Installed



IR Commissioning vs. Hardware Commissioning

- **“General” Commissioning**
- CERN report on deficiency in personnel for HC task
 - Requested assistance from outside. Needs: Quench protection, magnet powering, cryogenic operation and cryogenic controls
- Commissioning Task Force: looked at US participation in Beam and Hardware commissioning; Feb-July 2005
 - Conclusion on HC
 - Fermilab could contribute ~6 people from Accelerator and Technical Divisions
 - LBNL could contribute 1-2 people to work cryogenics and DFBX commissioning
- CERN to offer “project associate status” to long term commissioners



“General” Hardware Commissioning

- LARP Level 2 Commissioning

- Identify People

- Matched to CERN needs

- Interest in going

- Lab can spare them (lab won't fall apart without them)

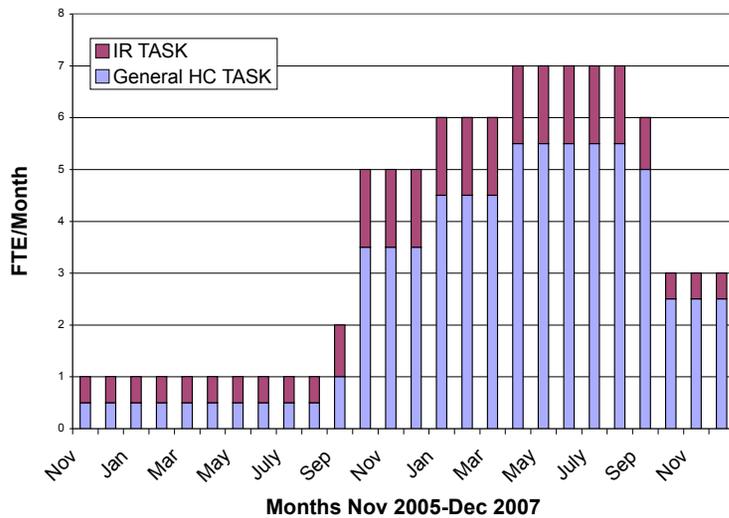
- Produced list of 6 Fermilab employees. Included those on IR commissioning

- LBNL has identified engineer for task with oversight from senior engineer Joseph Rasson

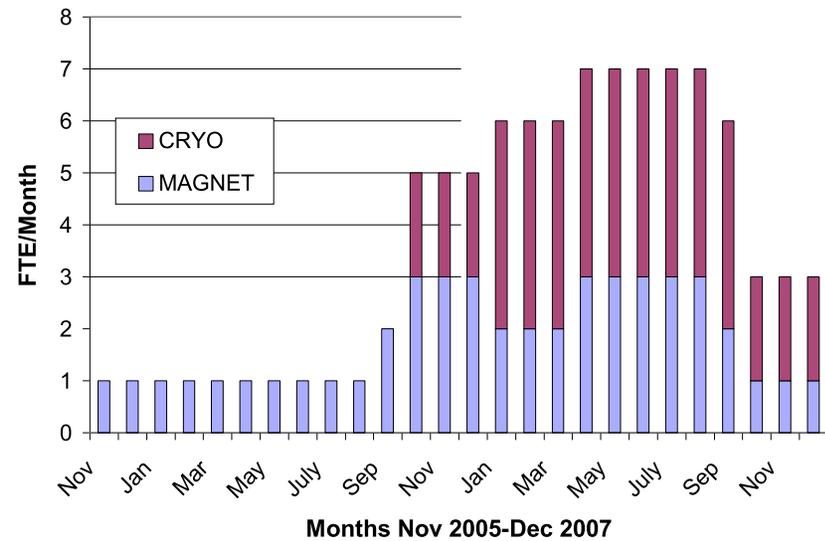


Profile by LARP HC Task, by CERN Task

IR vs. HW



Cryo vs. Magnet





Status of Hardware Commissioners

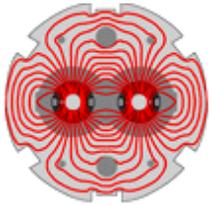
- 3-4 Hardware Commissioners scheduled for Fall 2006. LARP commissioners receive “Project Associate” status, join a CERN group (AT/ACR or AT/MEL) for nominally one year and contribute to the groups general HC responsibilities as well as US deliverables.
- Short term HC support from US experts as needed
- Peter Limon is stationed at CERN now
 - Liaison with LARP, LARP Safety Officer
 - Installation oversight
 - Assisting in Vacuum issues for Special Short Straight Sections (SSSS)



LARP

Comments on Hardware and Beam Commissioning...

- Looked at areas where US labs can participate in **Hardware Comm**
 - Produced list of possible candidates, compared w/ CERN's lists
 - People identified; several 'signed up'; FNAL + ~LBNL
 - Peter Limon at CERN now; at least two others from FNAL for long-term stays starting this year; others in the pipe-line; meets goals.
- **Beam Commissioning** has many interested parties
 - has been farther in future, effort now mounting to firm-up these names
 - though schedule seems to be slipping, still not so far away, either!
 - Toohig Fellows to play role here: R. Calaga set to go
 - enthusiasm is high, and starting to gain in recent months
- Negotiation process is extremely delicate; people want to go, but many conflicts -- job, family, time, etc.; not easy to get Labs to commit
 - Note: LARP 'part-time job' so far for most (~10% or less)
 - remote participation may involve many more people



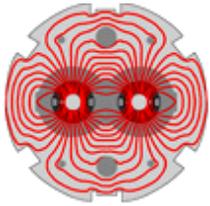
LARP

LARP Beam Commissioning



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- Recent presence at CERN (*slide*)
- Commissioning Structure Review
- Sector Test Opportunities (*slide*)
- Expression of Interest Form (*slide*)
- Budget (*slides*)
 - Spending was less than originally planned,
 - so, v2c re-tune sent funds to instrumentation
 - spending is on schedule for rest of FY, in particular with SPS and TI-8 events upcoming



Recent Presence at CERN



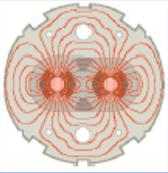
LARP

- **Several US visitors to CERN in Jan/ Feb 06**
 - **Nearly continuous presence for ~6 weeks**
 - **Chamonix workshop**
 - **Peggs, Syphers, Harms, (Shiltsev)**
 - **Software**
 - **Gysin, McCrory, Slaughter**
 - **Application development for Schottky task has begun**
 - **Beam Commissioning logistics**
 - **Team Account set up**
 - **Access, Training, etc.**
 - **CCC opening**
 - **Get to know LHC beam principals**
- **Reciprocal visits to FNAL in February**
 - **Jacquet, Normann, Suykerbuyk**

*from
Elvin Harms*

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LTC Dec 14th 05 : LHC commissioning organisation

from Roger Bailey

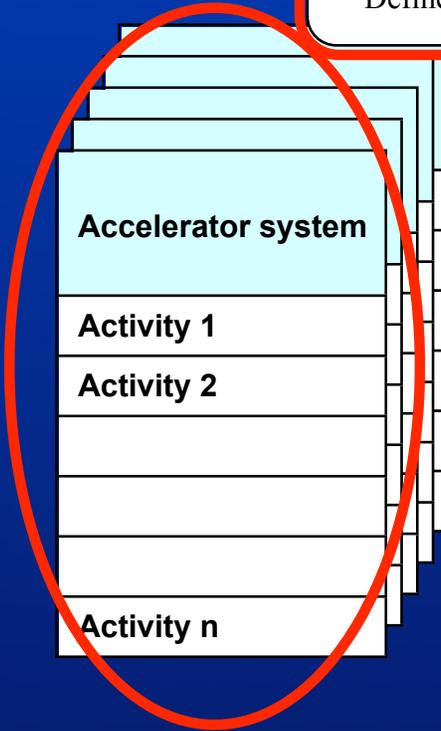
R.Bailey
M.Lamont
O.Bruning
P.Collier

Machine Coordinator
Weekly responsibility
3 needed

G.Arduini
R.Assmann
M.Giovanozzi
S.Fartoukh
J.Uythoven
J.Wenninger
F.Zimmermann
A.Butterworth

Accelerator Systems
As required
Defined responsibilities

Commissioner
Scheduled shifts years 1,2
Pool of at least 7 needed



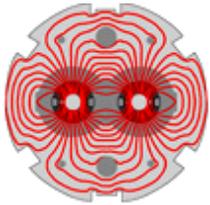
S.Redaeli	01.06
M.Gruwe	01.06
EIC3	07.06
EIC4	07.06
EIC5	01.07
EIC6	01.07
EIC7	01.07

EIC
Scheduled shifts long term
7 needed

Operator
Scheduled shifts long term
7 needed

M.Albert
G.Crockford
R.Giachino
G.H.Hemelseot
D.Jacquet
L.Normann
F.Pirotte
R.Suykerbuyk
E.Veyrunes

??

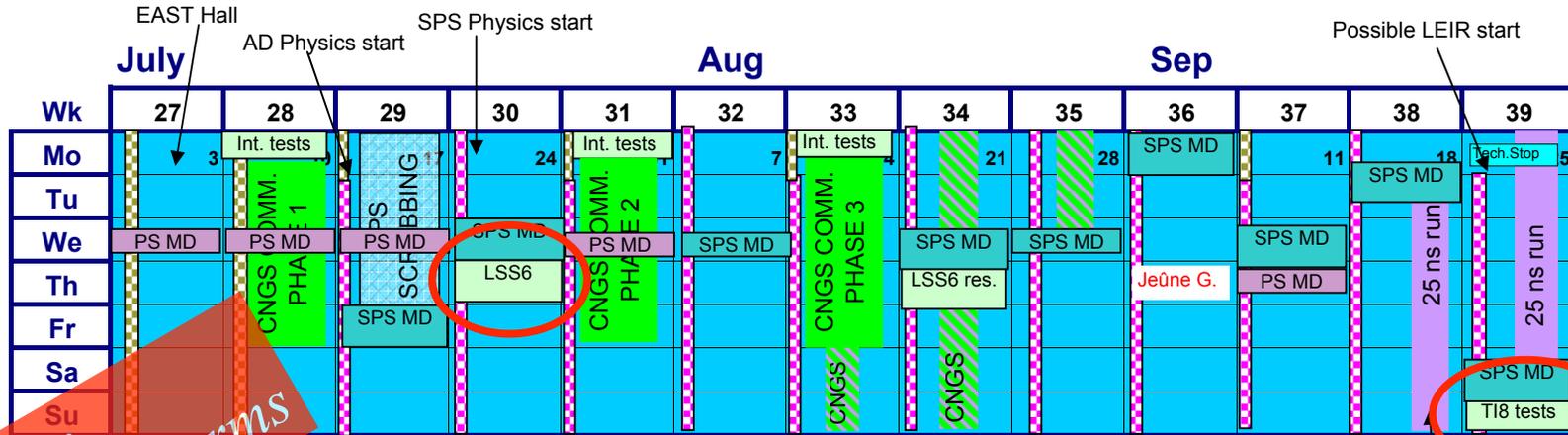


Upcoming Participation – SPS Schedule

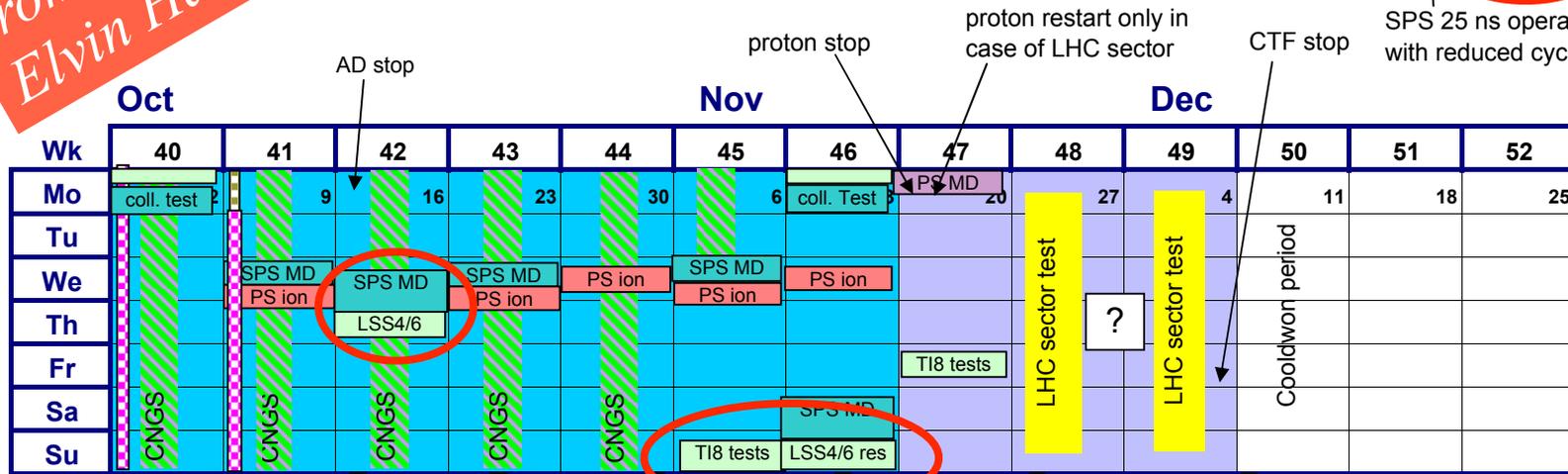


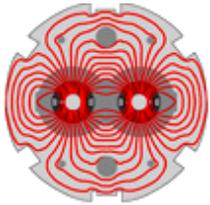
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from Elvin Harms





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Beam Commissioning: Expression of Interest



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- **Beam Commissioning 'Expression of Interest' form available on-line**
- **Go to <http://uslarp.org> for the form (near the bottom of the web page)**
 - **Test marketed to Fermilab/LARP – 11 responses**
 - **Full roll-out this meeting**
 - **Please respond by 1 June 2006**

note: not JUST for
long-term CERN visits

*from
Elvin Harms,
LARP Collaboration
Meeting, Apr06*



Commissioning Expression of Interest Form

LHC Accelerator Research Program (LARP) 05/05/2006 03:05 PM

LHC Accelerator Research Program (LARP)

LARP/LHC Beam Commissioning

Expression of Interest

AD Meetings

LARP Meetings

Document DB

USLARP Home

AD/LARP Home

The LHC Accelerator Research Project (LARP) is a multi-laboratory effort to foster US involvement in the Large Hadron Collider project at CERN. LARP is committed to being a presence for LHC Beam Commissioning scheduled to begin in 2007. At this time effort is underway to define interests and capabilities of US accelerator experts and link them into the Commissioning organization for the LHC. Beam Commissioning work may involve travel to CERN and/or remote effort from the US. This document serves only as an expression of interest. Receipt of same in no way guarantees nor commits one to a role in this effort.

Kindly complete and return the form below to aid us in formulating the US LHC commissioning team.

You can download this PDF document, or submit this electronic form.

Your Name

Address

Phone

Email Address

Affiliation

Department/Organization

Current Position/Duties

Fraction of time available

Availability to visit CERN (Length of stay, begin date)

Past beam commissioning/Operational experience

Areas of interest

Unique abilities you can bring to this effort

<http://larp.fnal.gov/commissioningForm.html> Page 1 of 2

US LHC Accelerator Research Program

bnl - fnal - lbl - slac

LARP/LHC Beam Commissioning Expression of Interest

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Name

Address

Phone

Email

Affiliation

Department/Organization

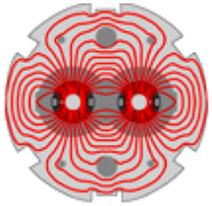
Current Position/Duties

So far, have received ~25 inquiries



Interfacing to LHC Controls

- US participation in commissioning the LHC will require knowledge and understanding of the LHC Controls System
 - Delivering an ‘instrument’ will require being able to interface it to the Controls System, perform diagnostics, etc.
 - Assisting in Commissioning (IR/HW/Beam!) will require ability to access accelerator data, perform analyses both locally (CCC) and from afar (in a CERN office; US office?)
- Commissioning tasks should include efforts to familiarize LARP personnel with LHC Controls
 - Need efficient mechanism for getting physicists started
- Fermilab is expected to have ‘remote access’ center (LHC@FNAL)
 - While not a LARP activity, *per se*, such a center will be very useful to all LARP participants
- At some small level, need to include this interfacing within the Commissioning task



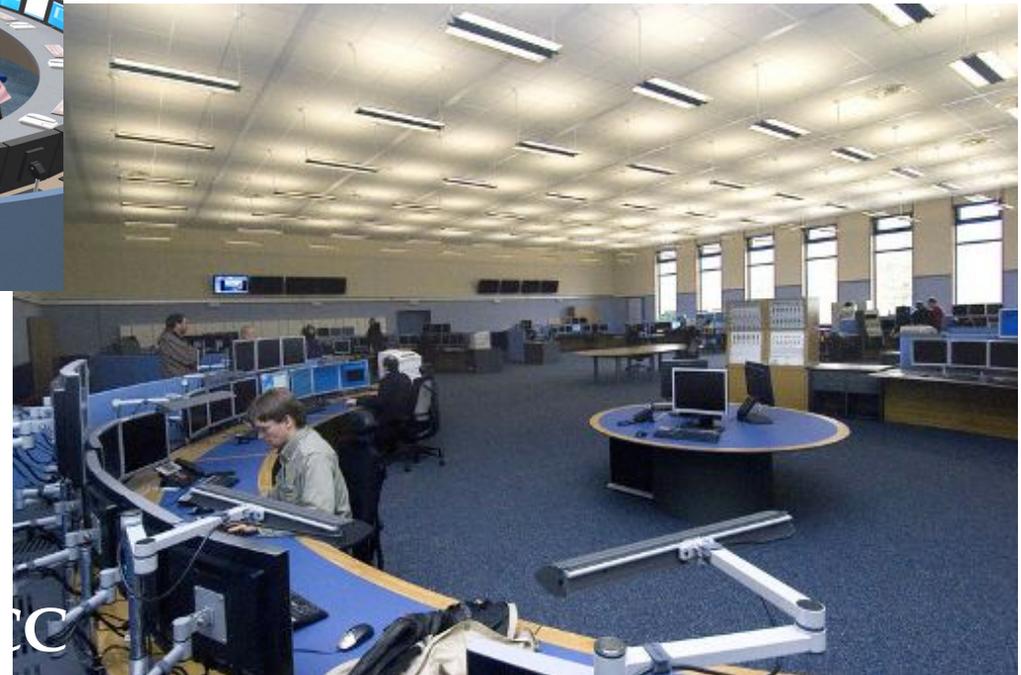
LARP

LHC@FNAL – LARP/LHC needs



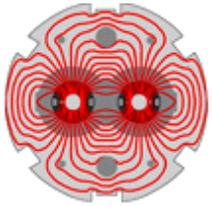
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*from
Elvin Harms*



Model the CCC at CERN

- speed assimilation prior to stays at CERN
- ease in remote participation in studies
- 'service after the sale'



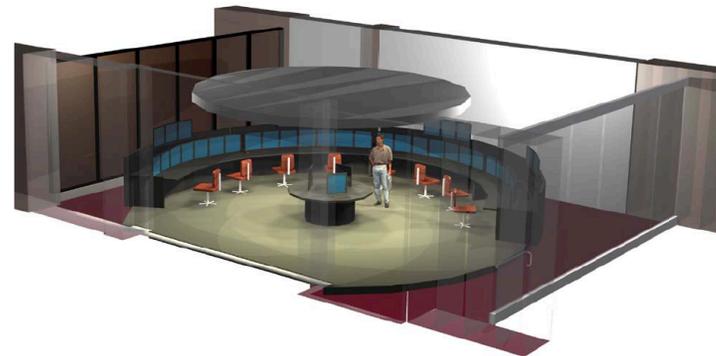
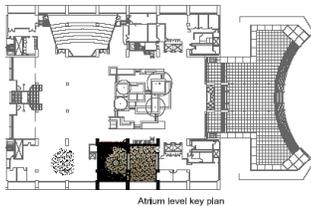
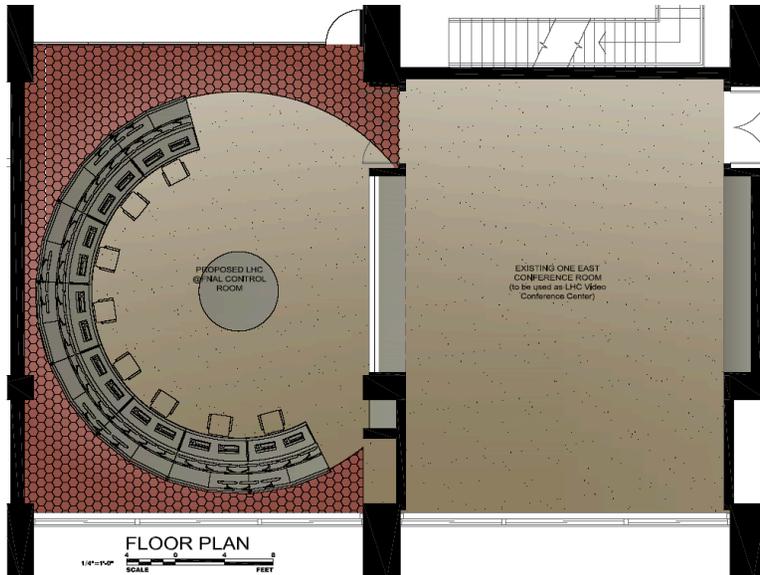
LARP

LHC@FNAL – renderings



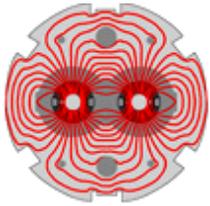
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*from
Elvin Harms*



LHC @ FNAL OPERATIONS CENTER

ATRIUM LEVEL PROPOSAL
April 25, 2006
FESS / Engineering



LARP

LHC@FNAL



BNL - FNAL - LBNL - SLAC

- **Joint CMS and accelerator activity**
 - for accelerator, LARP is main customer
- **~\$600K provided by FNAL directorate**
- **Look and feel of CERN's CCC**
- **Schedule is to 'complete' this Fall**
- **Number One challenge is to get securely connected to the CERN networks**
- **While center is @ FNAL, is intended to be used by all LARP collaborators**
 - need to further develop this aspect



Upcoming Commissioning Activities

- SpS Turn-on, Commissioning, Tasks
 - Collimation Studies
 - Beam-beam Wire Compensation Tests
 - Instrumentation tests
- Beam Line Tests
 - TI-8 Line
 - LSS4/6 Line
- Beta beating
 - No “beam tests” yet, but generating team to work with CERN in coordinated fashion -- first Accelerator System team w/ LARP



Commissioning Selection Committee (proposal)

- Need process for determining “*who goes*”
 - rank candidates -- skills, needs, availability, career potential, *etc.*
 - keep running list of candidate information
- Requires coordination between
 - U.S. Labs and CERN
 - Operations and Accelerator Physics
- **Proposal:**
 - form small Commissioning Selection Committee:
 - E. Harms (BC), W. Fischer (AP), A. Ratti (Instr), LARP, coordinating with...
 - R. Bailey (OP) and O. Bruning (AP), CERN,
 - with oversight from the LARP Commissioning Oversight Committee
 - M. Syphers (FNAL), M. Zisman (LBNL), (W. Fischer, BNL), J. Kerby (FNAL)
- Likely Scenario: get 50 “applicants,” 25 serious; 21 actually go, 7 per year for 3 years -- meets LARP’s goal



Commissioning Candidates Database

Aaaaa family	Bbbbb given	email	Lab	Profession	Area	Prob. Of Availability	Duration	CERN grp	Start date	Mentor / supervisor	Topics
Annala	Gerald	annala@FNAL.GOV	FNAL								
Bai	Mei	mbai@bnl.gov	BNL								
Beche	Jean-Francois	JFBeche@lbl.gov	LBNL								
Berg	Scott	jsberg@bnl.gov	BNL								
Broemmesiek	Daniel	broemmel@FNAL.GOV	FNAL								
Burov	Alexey	burov@FNAL.GOV	FNAL								
Cai	YunHai	yunhai@slac.stanford.edu	SLAC								
Calaga	Rama	rcalaga@bnl.gov	BNL	Phys PhD	Beam	100		18 AB/OP	Jul-06	Wenninger	Beta beat,
Cameron	Peter	cameron@bnl.gov	BNL								
Capista	Dave	capista@FNAL.GOV	FNAL								
Church	Michael	church@FNAL.GOV	FNAL								
De Santis	Stefano	sdesantis@lbl.gov	LBNL								
Drees	Angelika	drees@bnl.gov	BNL								
Fischer	Wolfram	wolfram.fischer@bnl.gov	BNL								
Furman	Miguel	mafurman@lbl.gov	LBNL								
Gattuso	Consolato	gattuso@FNAL.GOV	FNAL								
Harms	Elvin	harms@fnal.gov	FNAL								
Jansson	Andreas	jansson@fnal.gov	FNAL								
Johnson	David	dej@FNAL.GOV	FNAL								
Johnstone	John	jjohnstone@fnal.gov	FNAL								
Koba	Kiyomi	kiyomi@FNAL.GOV	FNAL								
Koizumi	Gordon	koizumi@FNAL.GOV	FNAL								
Luo	Yun	yluo@bnl.gov	BNL								
Markiewicz	Tom	twmark@slac.stanford.edu	SLAC								
Martens	Mike	martens@fnal.gov	FNAL								
McCrory	Elliott	mccrory@fnal.gov	FNAL								
Mcginnis	Dave	mcginnis@FNAL.GOV	FNAL								
Michelotti	Leo	michelotti@FNAL.GOV	FNAL								
Miyamoto	Ryoichi	ryoichi@fnal.gov	Austin								
Mokhov	Nikolai	mokhov@fnal.gov	FNAL								
Monville	Maura	mvi@ornl.gov	FNAL								
Moore	Ron	ronmoore@FNAL.GOV	FNAL								
Nagaitsev	Sergei	nsergei@FNAL.GOV	FNAL								
Nicklaus	Dennis	nicklaus@FNAL.GOV	FNAL								
Ostiguy	Francois	ostiguy@FNAL.GOV	FNAL								
Pasquinelli	Ralph	pasquin@fnal.gov	FNAL								
Peggs	Steve	peggs@bnl.gov	BNL	Phys PhD	Beam	50		12 AB/OP	Jan-08	Bailey	?
Pilat	Fulvia	pilat@bnl.gov	BNL								
Popovic	Milorad	popovic@FNAL.GOV	FNAL								
Prebys	Eric	prebys@FNAL.GOV	FNAL								
Qiang	Ji	jqiang@lbl.gov	LBNL								
Ratti	Alex	aratti@lbl.gov	LBNL								
Sen	Tanaji	tsen@fnal.gov	FNAL								
Seryi	Andrei	seryi@slac.stanford.edu	SLAC								
Shiltsev	Vladimir	shiltsev@fnal.gov	FNAL								
Simos	Nick	simos@bnl.gov	BNL								
Still	Dean	still@fnal.gov	FNAL								
Syphers	Mike	syphers@fnal.gov	FNAL	Phys PhD	Beam	85		12 AB/OP	Jul-08	Bailey	optics, orbit, ...
Tan	Cheng-Yang	cytan@fnal.gov	FNAL								
Tepikian	Steve	tepikian@bnl.gov	BNL								
Thurman-Keup	Randy	keup@FNAL.GOV	FNAL								
Trbojevic	Dejan	dejan@bnl.gov	BNL								
Vay	Jean-Luc	jlvey@lbl.gov	LBNL								
Warner	Arden	warner@fnal.gov	FNAL								
Webber	Bob	webber@fnal.gov	FNAL								
White	Sebastian	swhite@bnl.gov	BNL								
Zhang	Xiaolong	zhangxl@FNAL.GOV	FNAL								

Example Only



Commissioning Budget -- FY06

- FY06 request was met...
 - Originally: IR -- 540K, Beam -- 400K --> 940K
- Funds re-distributed, re-negotiated:
 - Hardware Commissioning WBS formed (1.2.1.3)
 - Labs agreeing to support salaries, while LARP supports travel, relo, etc.
 - Start of long-term trips delayed; actual costs of shorter trips realized; some funds re-allocated toward instrumentation
 - Final ‘tuned’ budget = 879K; expected to be spent

LARP FY2006 budget v2c

Mar 31, 2006			Total	Labor+MTSC				Labor				MTSC			
WBS				BNL	FNAL	LBNL	SLAC	BNL	FNAL	LBNL	SLAC	BNL	FNAL	LBNL	SLAC
US LHC Accelerator Research Program			11000	3264	3300	4086	350	2240	2346	2539	240	1024	761	1186	90
1	Accelerator Systems	Shiltsev	3684	875	1200	1309	300	607	927	962	240	268	273	347	60
1.1	Instrumentation	Ratti	1635	450	250	935	0								
1.1.1	Phase I														
1.1.1.1	Tune feedback	Cameron	430	405	25			375	17			30	8		
1.1.1.2	Luminometer	Ratti	960	25		935		20		667		5		268	
1.1.1.4	Schottky monitor	Jansson	245	20	225			20	180			0	45		
1.2	Commissioning	Syphers	879	65	670	144	0								
1.2.1	Phase I														
1.2.1.1	Beam Commissioning	Harms	335	35	300			20	200			15	100		
1.2.1.2	Interaction Region Commissioning	Lamm	501	30	335	136		22	245	96		8	90	40	
1.2.1.3	Hardware Commissioning	Lamm	43		35	8			25				10	8	

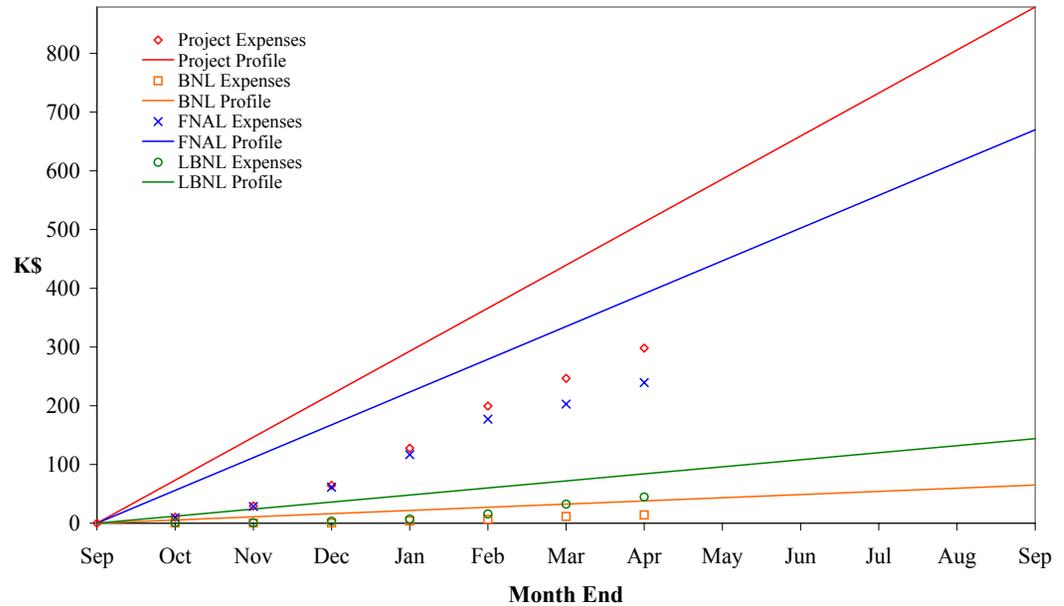


LARP

Commissioning -- FY06 Spending

- Under-spending at all labs -- 68% of projection
- esp. @ LBNL, BNL, though FNAL has larger budget
- SpS tests, TI tests, and other trips coming up...
- ... but schedule slip may affect spending profile further

W.B.S. 1.2 COMMISSIONING \$879k FY06 Funding



FY2006 LARP Budget	FY06 Funding Allocation					FY Expenses through April 30, 2006					Funding Balance as of April 30, 2006				
	BNL	FNAL	LBNL	SLAC	Total	BNL	FNAL	LBNL	SLAC	Total	BNL	FNAL	LBNL	SLAC	Total
FY2006 Budget	3,264.0	3,300.0	4,086.0	350.0	11,000.0										
FY2005 Carry Forward	27.7	4.3	42.7	63.4	138.1						27.7				
US LHC Accelerator Research Program	3,291.7	3,304.3	4,128.7	413.4	11,138.1	1700.3	1395.6	2168.5	66.1	5331	1,591.4	1,904.4	1,909.5	283.9	5,889.2
Commissioning	65	670	144	0	879	14.1	239.4	44.6	0.0	298	51	431	91	0	573
Phase I															
Beam Commissioning	35	300	0	0	335	0.3	50.8	0.0	0.0	51	34.7	249.2	0.0	0.0	284
Interaction Region Commissioning	30	335	136	0	501	13.7	188.0	44.6	0.0	246	16.3	147.0	91.4	0.0	255
Hardware Commissioning		35	8				0.6					34.4			34



Commissioning -- Final Remarks

- **IR Commissioning** well underway; LARP personnel have played crucial role
- **Hardware Commissioning** (~1-yr-long visits) being supported *via* LARP
 - CERN offering Project Associate positions; LARP handles travel, relo, ...
 - P. Limon at CERN for 6 mos., 6-12 to go; partially funded by LARP
 - Future HW Commissioners identified
 - FNAL: 7 there/going/approved; LBNL: 1-2 approved, negotiating plan
 - delicate negotiating process, as involves bosses, families, bureaucracy, ...
- **Beam Commissioning** so far consisting of short visits and communication
 - Sending people for SpS commissioning, beam transfer lines, Sector Test, ..
 - start-up, tests slipping? *Sector Test gone?*
 - Interest in BC continues to increase; EOI has helped
 - Need to firm up selection mechanism in next few months
 - Attempting to gather more LARP members, esp. from other Labs
 - Fermilab developing 'guidelines' for travel/relo (in conj. w/ CMS); attempting to 'translate' to other labs -- LBNL is present 'test bed'