



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

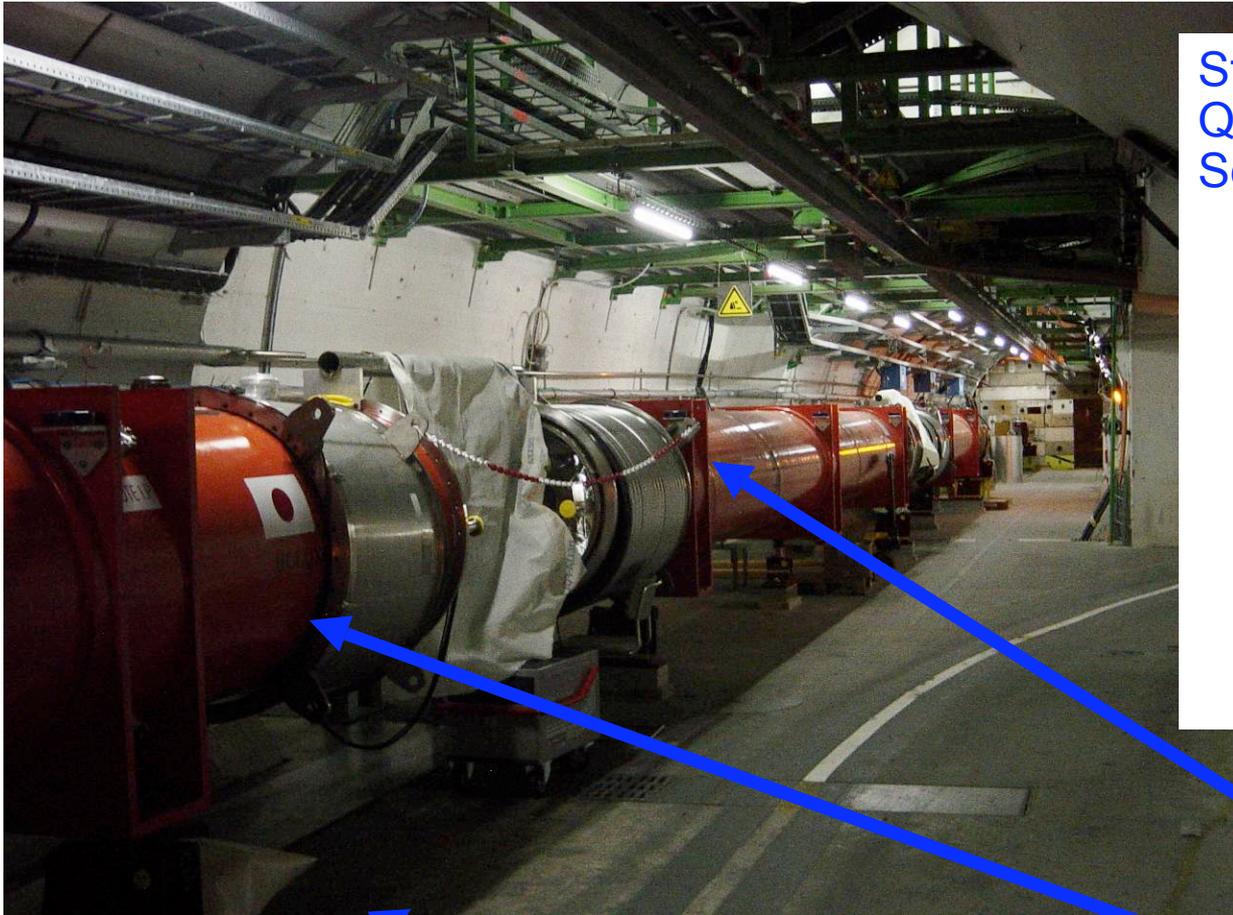
Since DOE Review Last Fall:

- 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

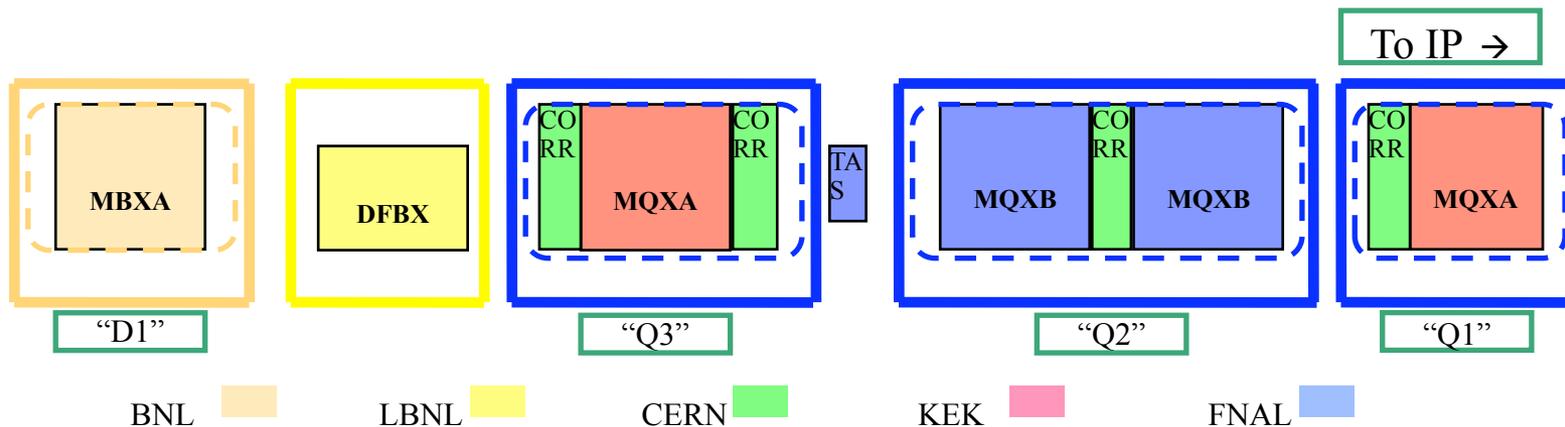
X Towards LHC-B IP

Q2

Q3



Components to be Commissioned in 5 IR's



Status of US Shipments to CERN

4/6/2006

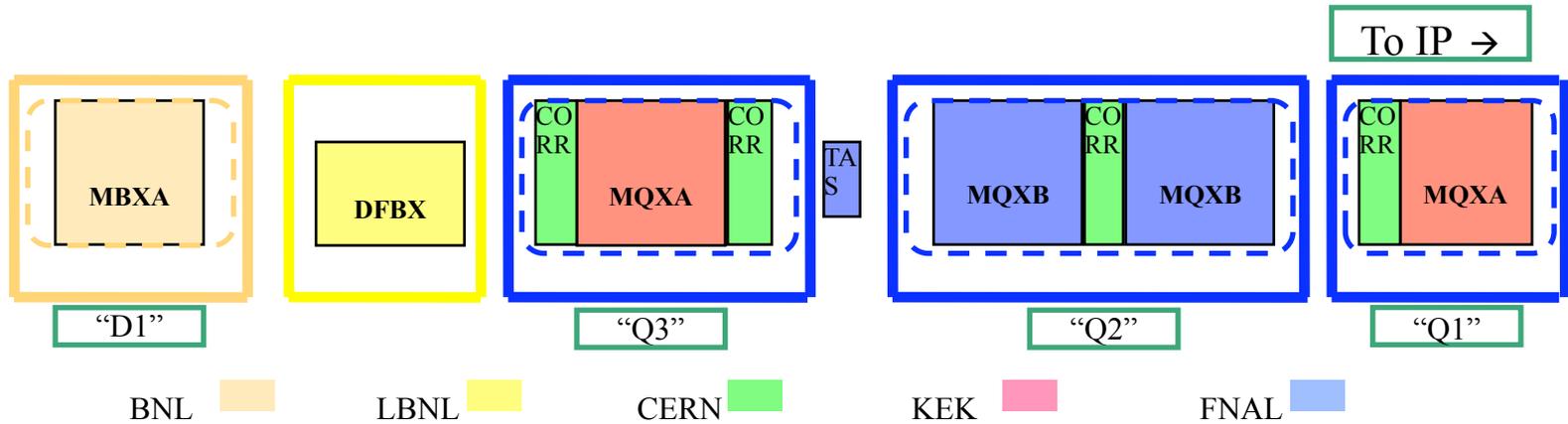
IR Region	CERN Start on Equipment Preparations	Q1	Status	Q2	Status	Q3	Status	DFBX	Status	D1	Status	D2	Status
IR8L	Aug-05	A01	at CERN	B04	at CERN	C03	at CERN	G	at CERN	D1L102	at CERN	D2L102	at CERN
IR8R	Aug-05	A04	at CERN	B05	at CERN	C04	at CERN	H	at CERN	D1L105	at CERN	D2L101	at CERN
IR1L	Nov-05	A02	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



Components to be Commissioned in 5 IR's



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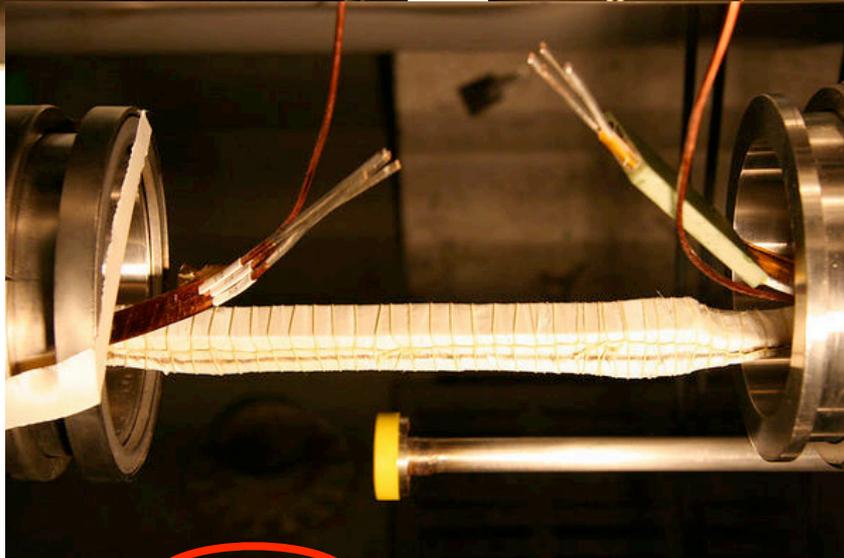
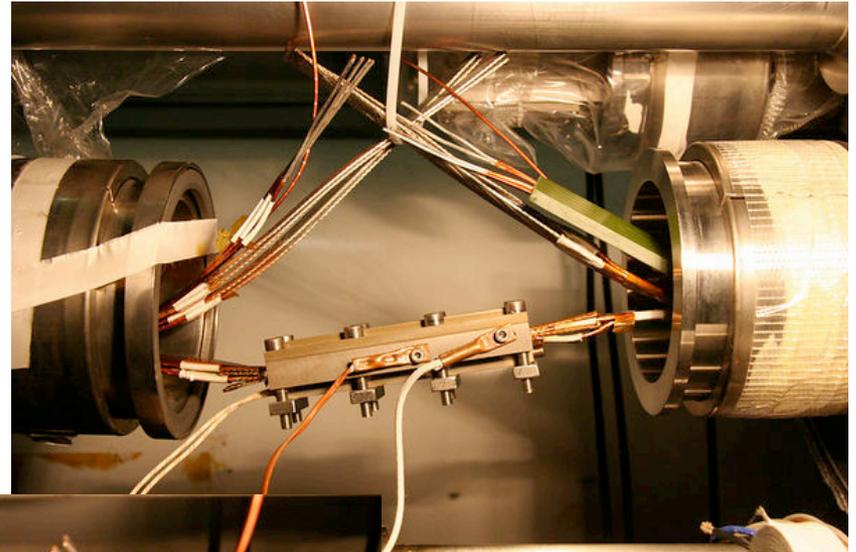
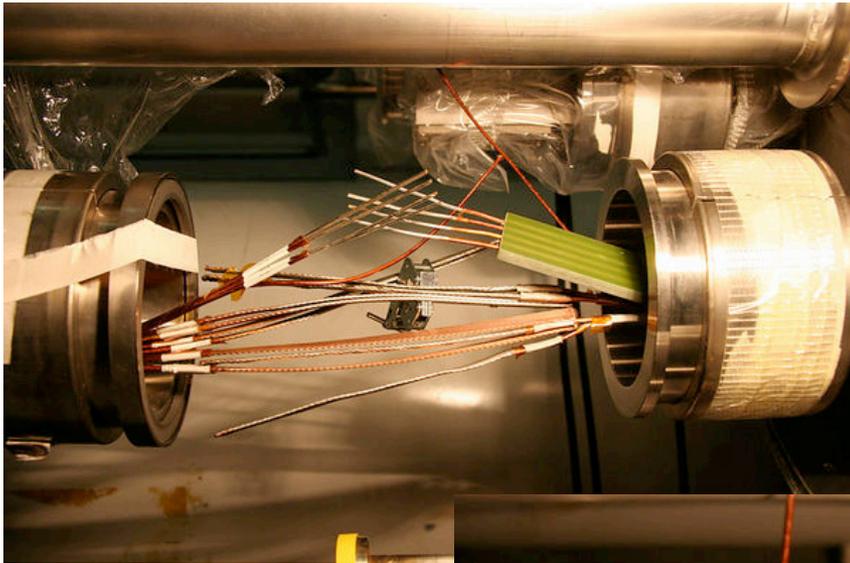
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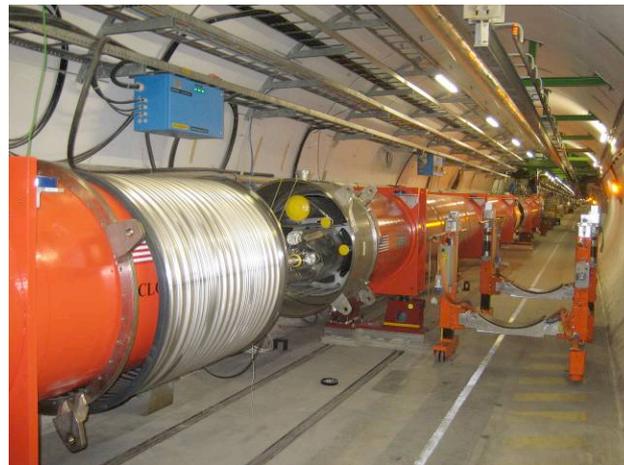


Main Bus Splicing Q1-Q2

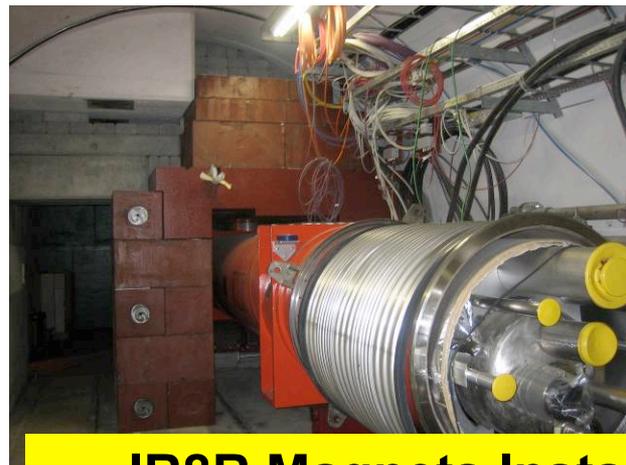




Recent Pictures (taken by Peter Limon)



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



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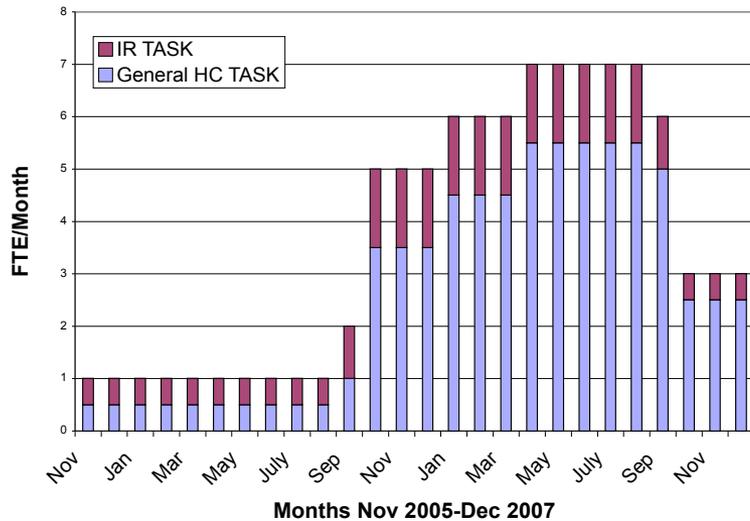
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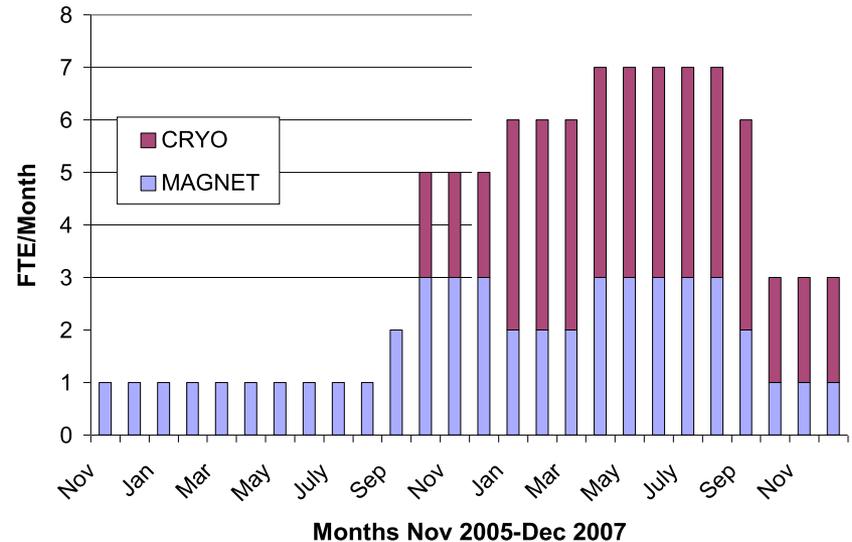


Profile by LARP HC Task, by CERN Task

IR vs. HW



Cryo vs. Magnet





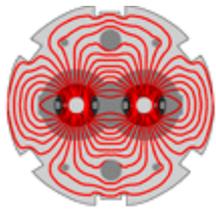
Status of Hardware Commissioners

- 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)



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



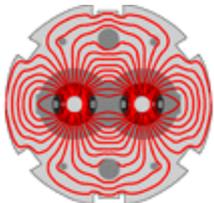
LARP Beam Commissioning



LARP

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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



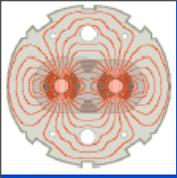
LARP

- 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

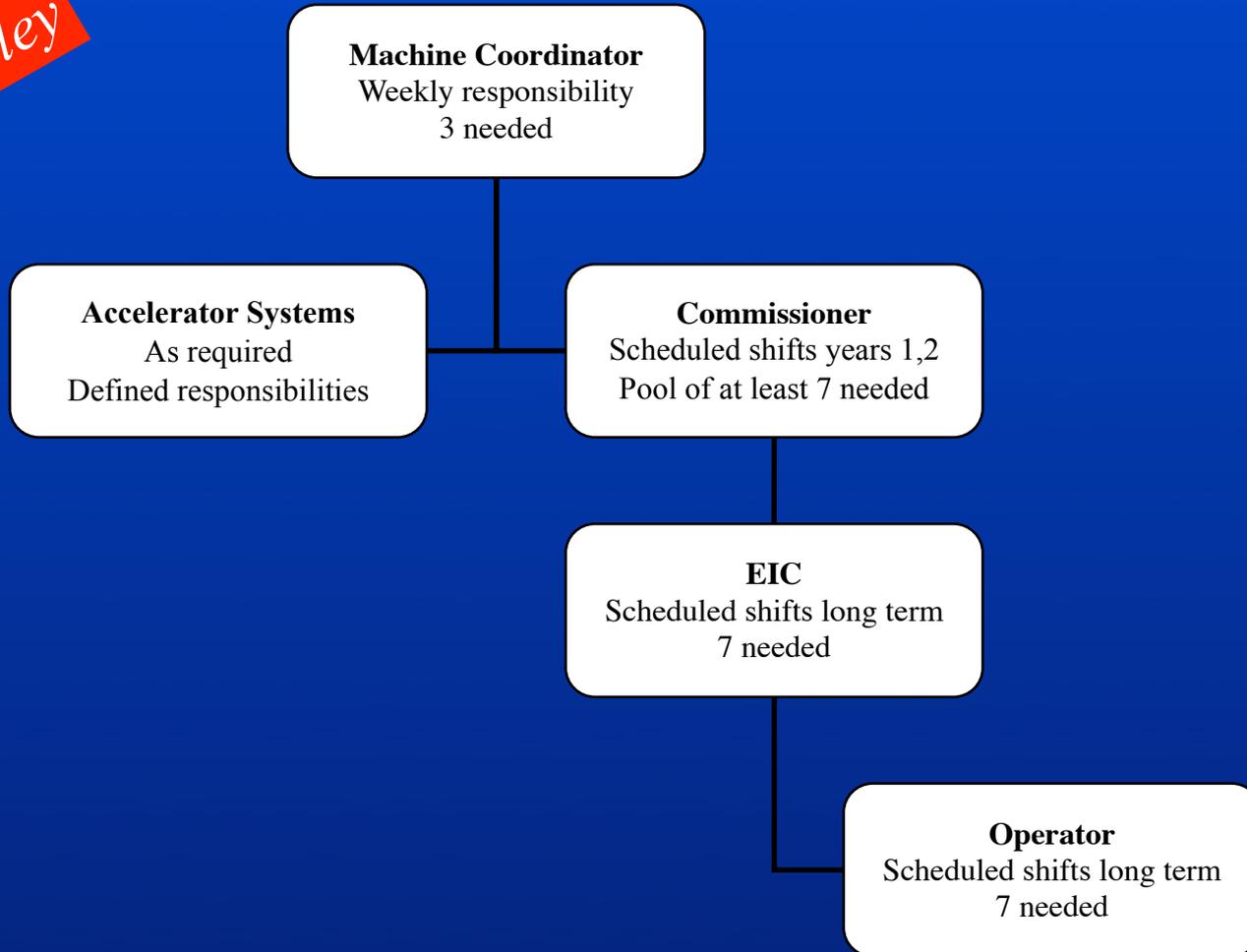
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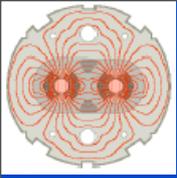




LTC Dec 14th 05 : LHC commissioning organisation

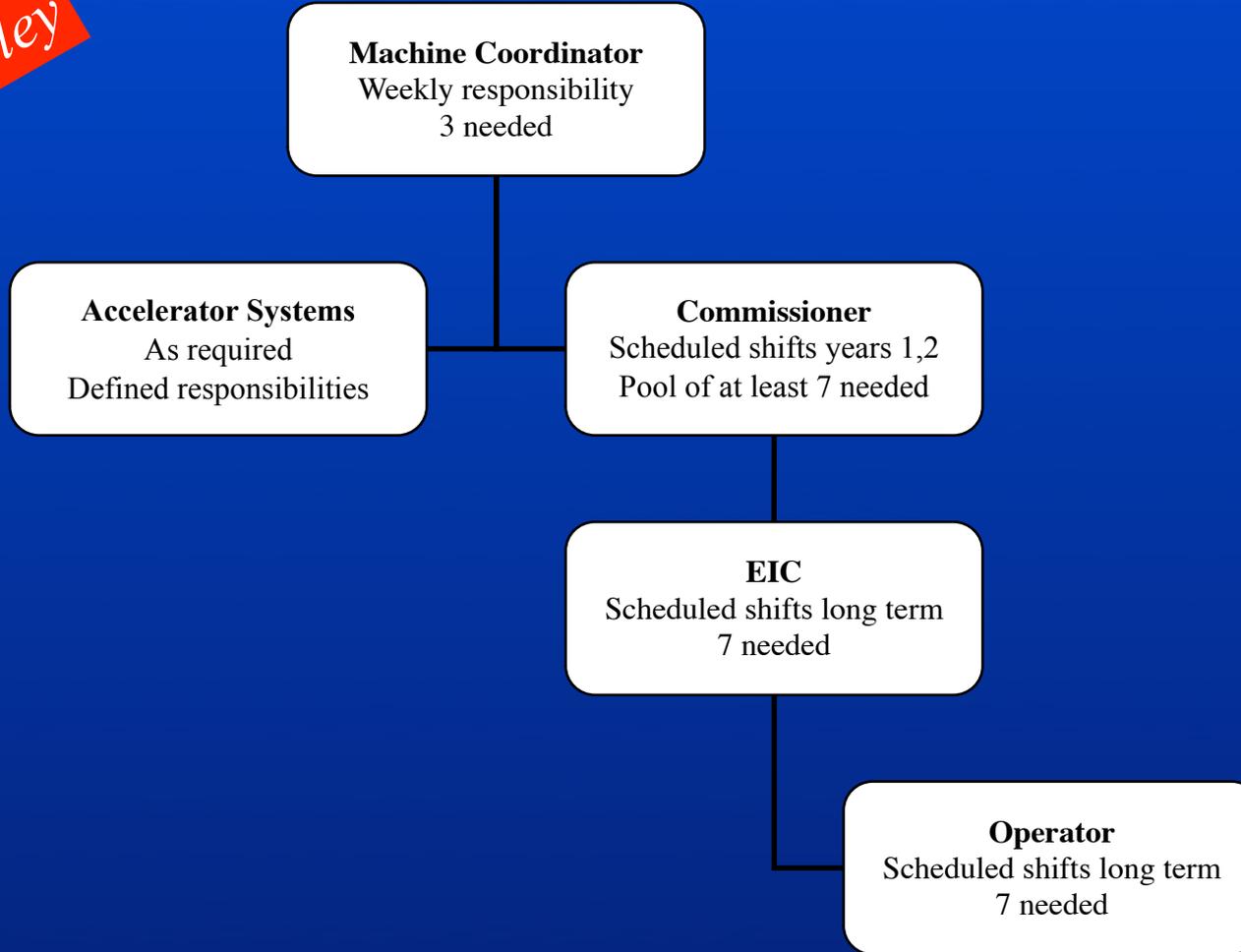
from Roger Bailey



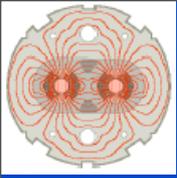


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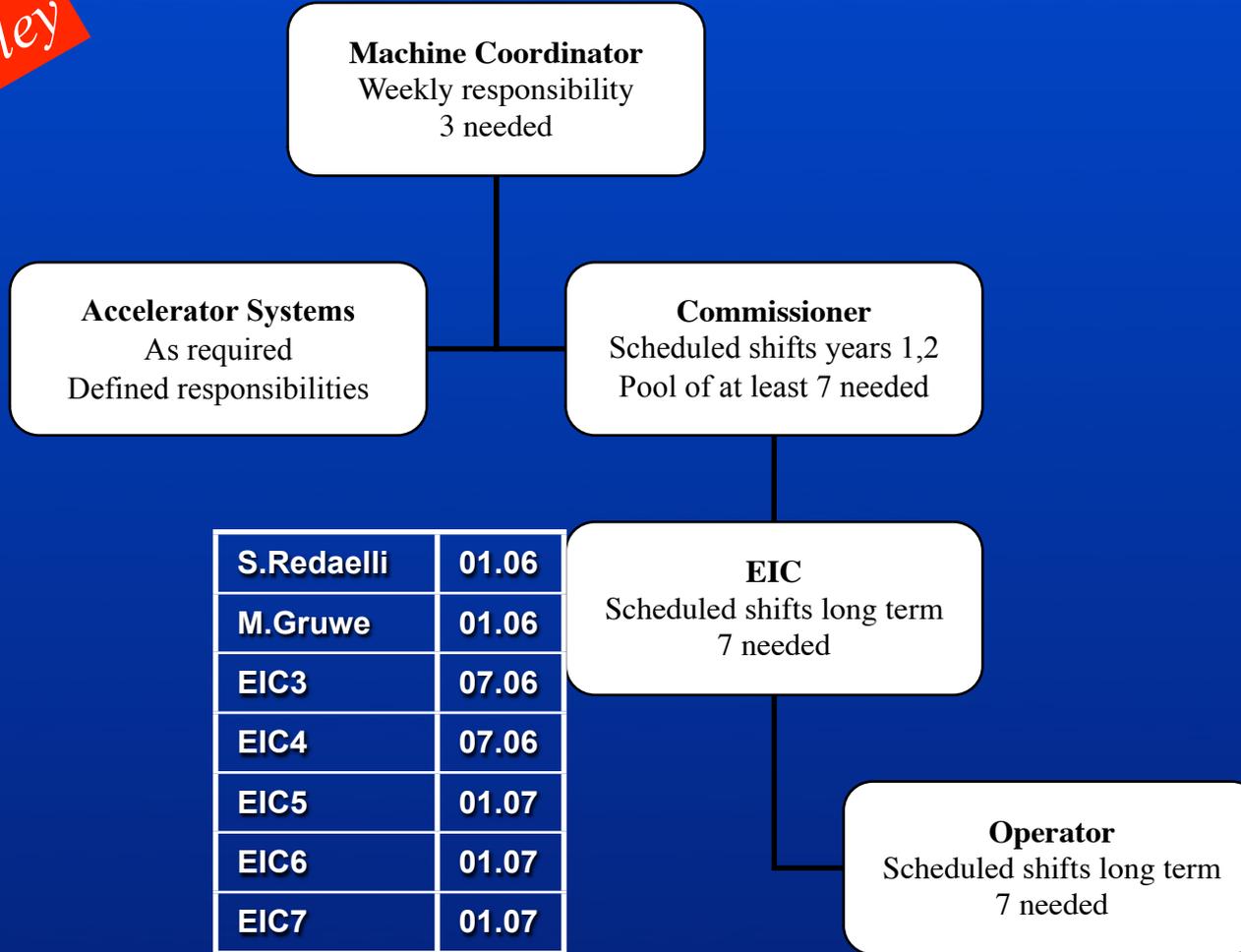


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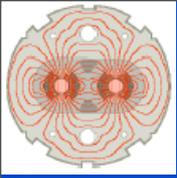
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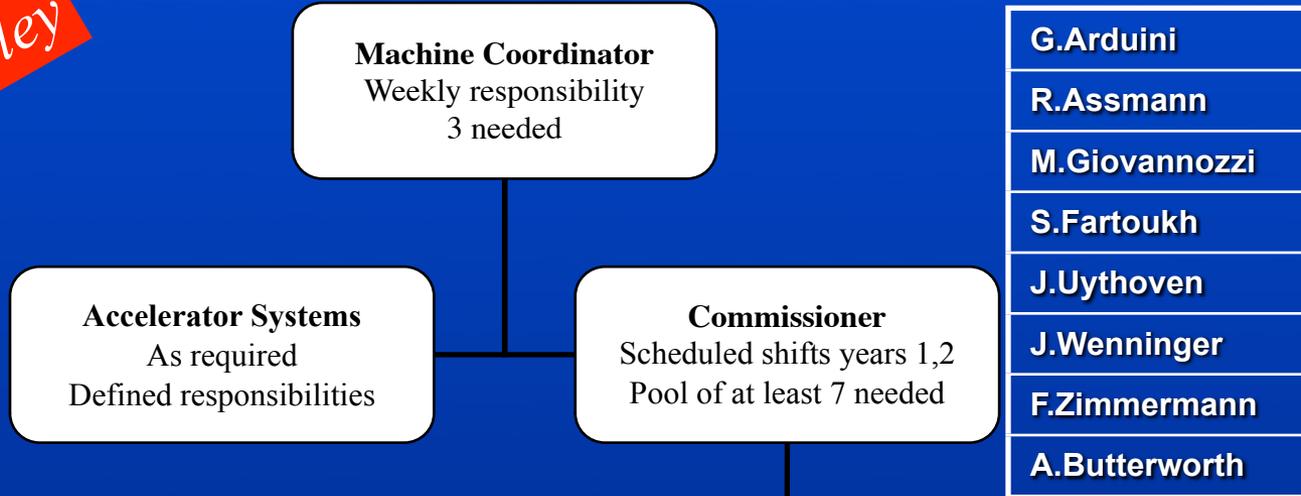
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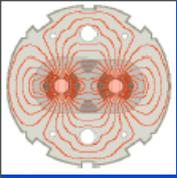
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EIC
Scheduled shifts long term
7 needed

Operator
Scheduled shifts long term
7 needed

M.Albert
G.Crockford
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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
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Accelerator Systems
As required
Defined responsibilities

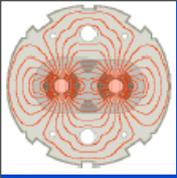
Commissioner
Scheduled shifts years 1,2
Pool of at least 7 needed

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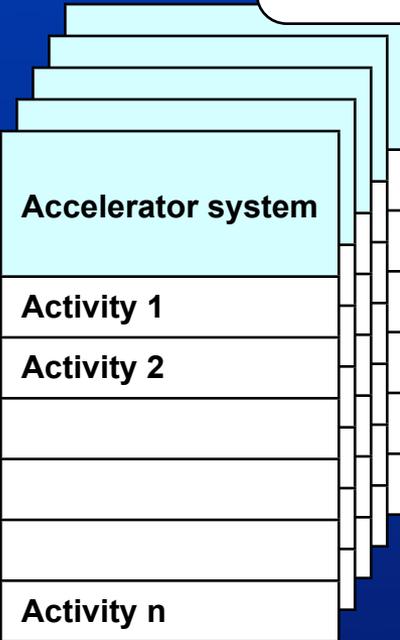
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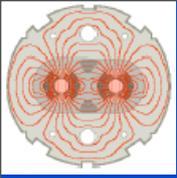


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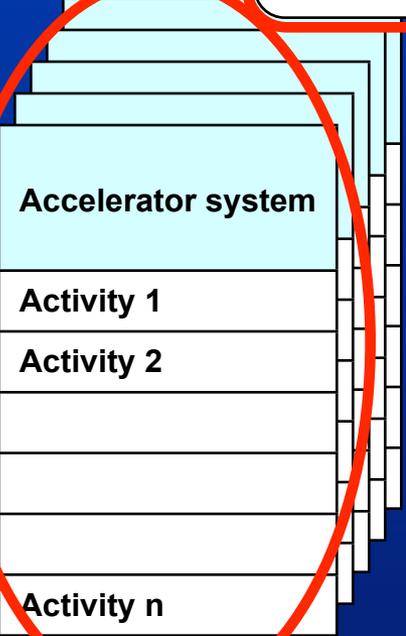
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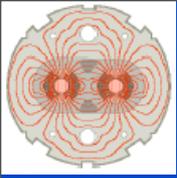
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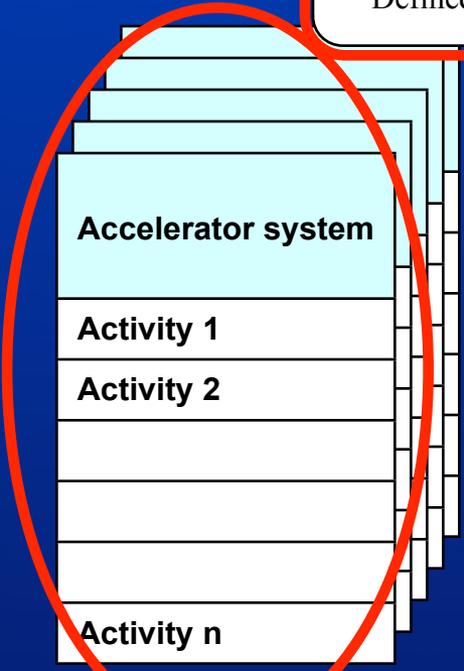
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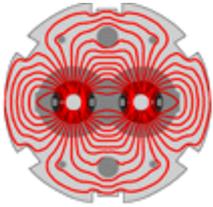
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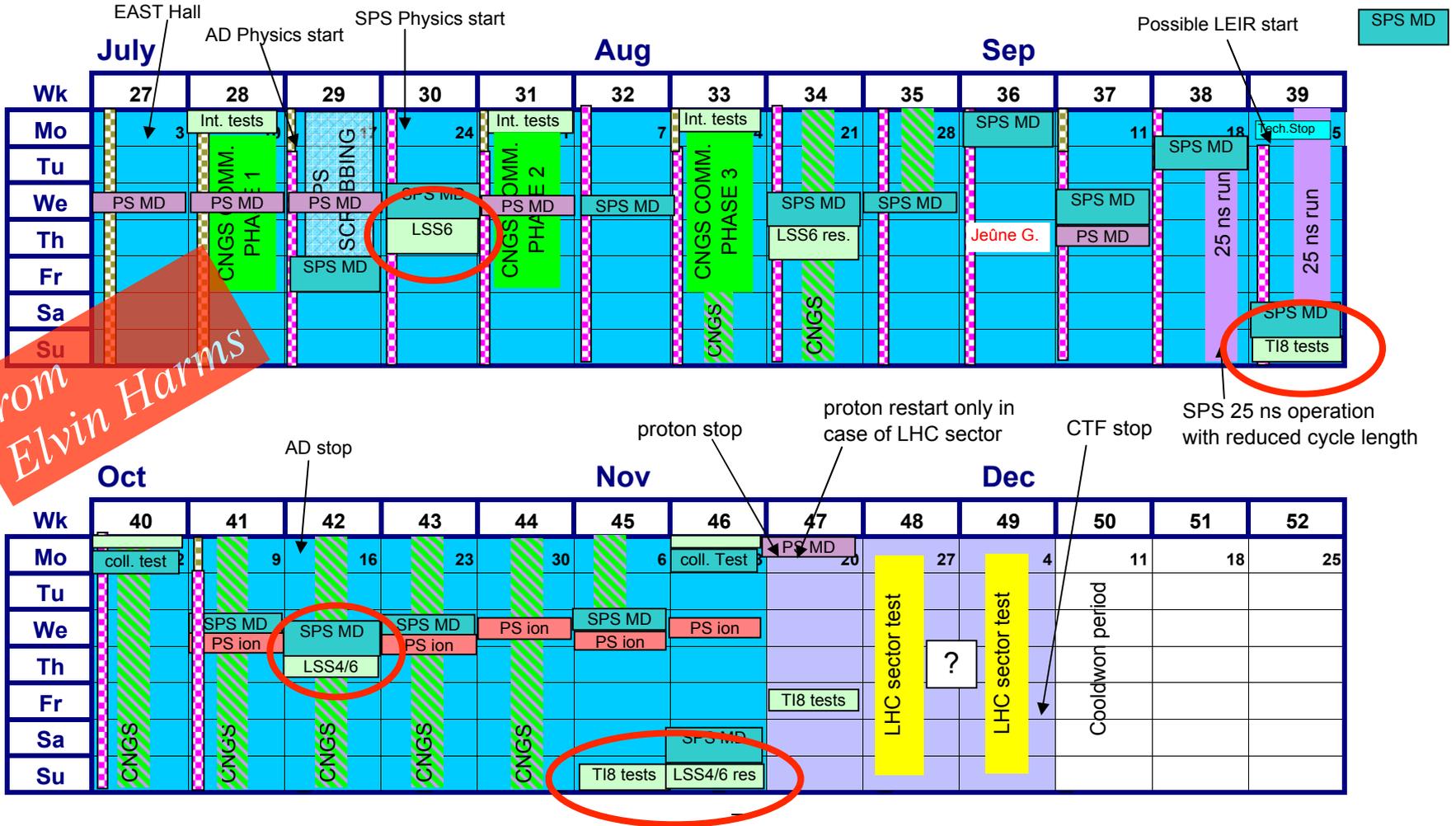


Upcoming Participation – SPS Schedule

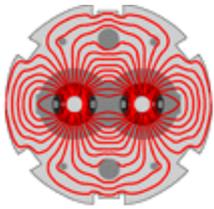


LARP

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from Elvin Harms



LARP

Beam Commissioning: Expression of Interest



BNL - FNAL - LBNL - SLAC

- **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	<input type="text"/>
Address	<input type="text"/>
Phone	<input type="text"/>
Email Address	<input type="text"/>
Affiliation	<input type="text"/>
Department/Organization	<input type="text"/>
Current Position/Duties	<input type="text"/>
Fraction of time available	<input type="text"/>
Availability to visit CERN (Length of stay, begin date)	<input type="text"/>
Past beam commissioning/Operational experience	<input type="text"/>
Areas of interest	<input type="text"/>
Unique abilities you can bring to this effort	<input type="text"/>

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

US LHC Accelerator Research Program
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LARP/LHC Beam Commissioning

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Address	<input type="text"/>
Phone	<input type="text"/>
Email	<input type="text"/>
Affiliation	<input type="text"/>
Department/Organization	<input type="text"/>
Current Position/Duties	<input type="text"/>



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
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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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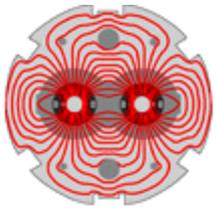
Current Position/Duties

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



LHC@FNAL – LARP/LHC needs

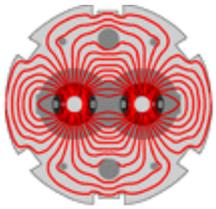


BNL - FNAL - LBNL - SLAC

LARP



*from
Elvin Harms*



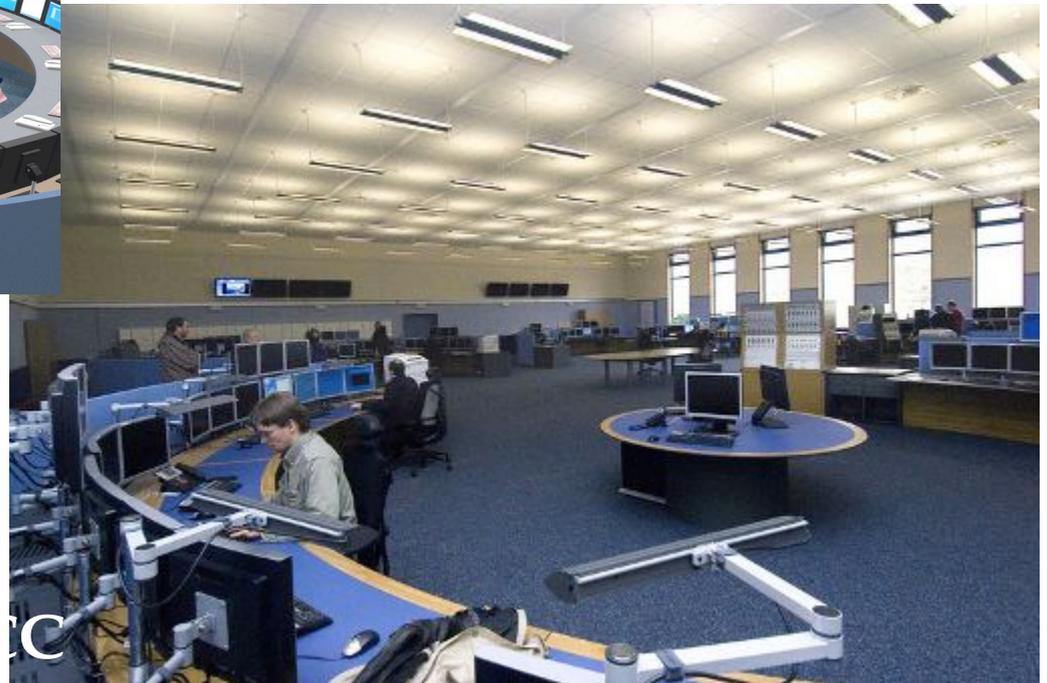
LHC@FNAL – LARP/LHC needs

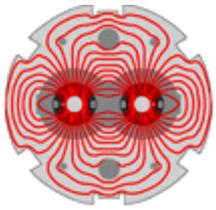


BNL - FNAL - LBNL - SLAC

LARP

*from
Elvin Harms*





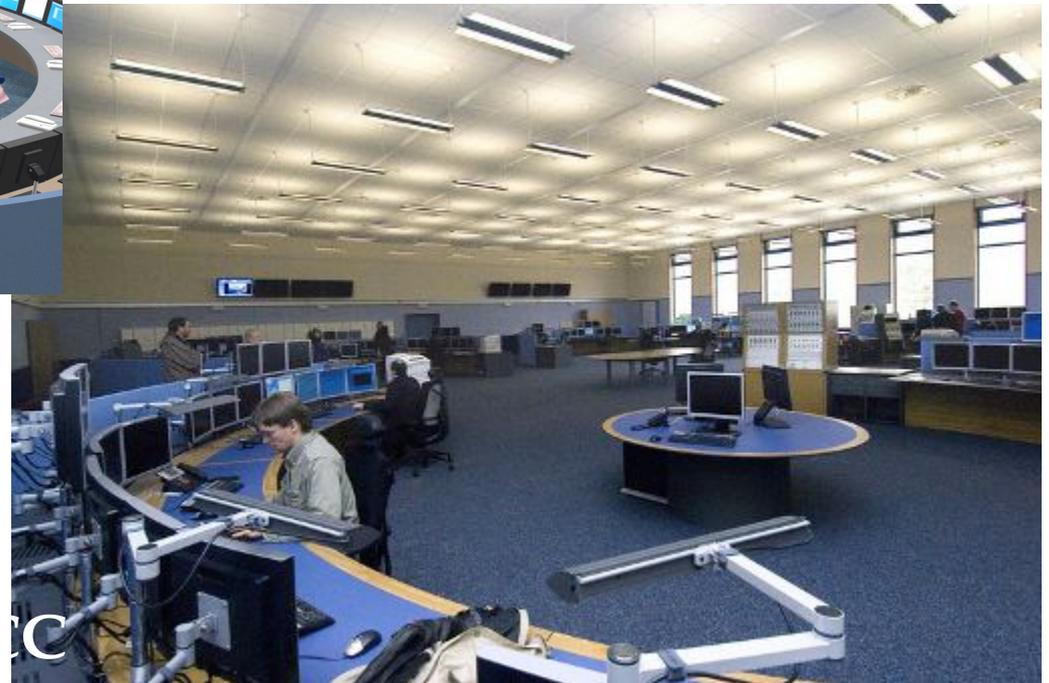
LHC@FNAL – LARP/LHC needs



BNL - FNAL - LBNL - SLAC

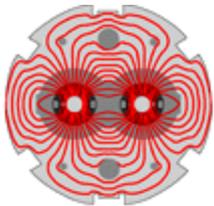
LARP

*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'



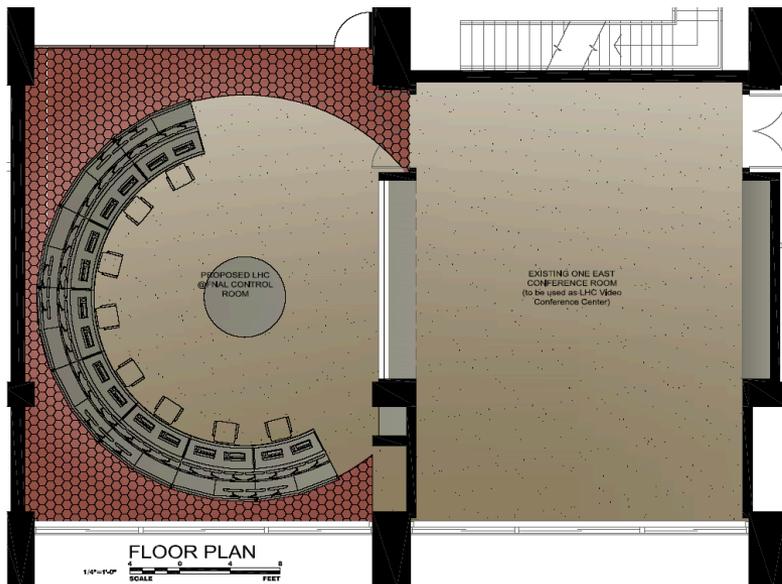
LARP

LHC@FNAL – renderings



BNL - FNAL - LBNL - SLAC

from Elvin Harms



View of proposed control room - looking east from Atrium

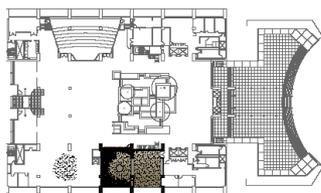
View of existing conditions



View with projection on wall



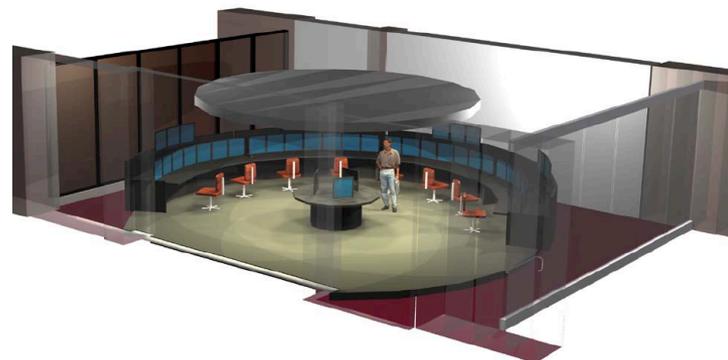
View with projection on glass



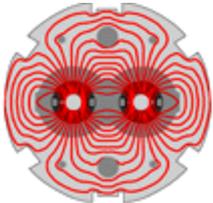
Atrium level key plan

LHC @ FNAL OPERATIONS CENTER

ATRIUM LEVEL PROPOSAL
April 25, 2006
FESS / Engineering



Isometric view of proposed control room



LHC@FNAL



LARP

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	Mentor / Start date	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								
McCrorry	Elliott	mccrorry@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	tepijian@bnl.gov	BNL								
Thurman-Keup	Randy	keup@FNAL.GOV	FNAL								
Trbojevic	Dejan	dejan@bnl.gov	BNL								
Vay	Jean-Luc	jlway@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

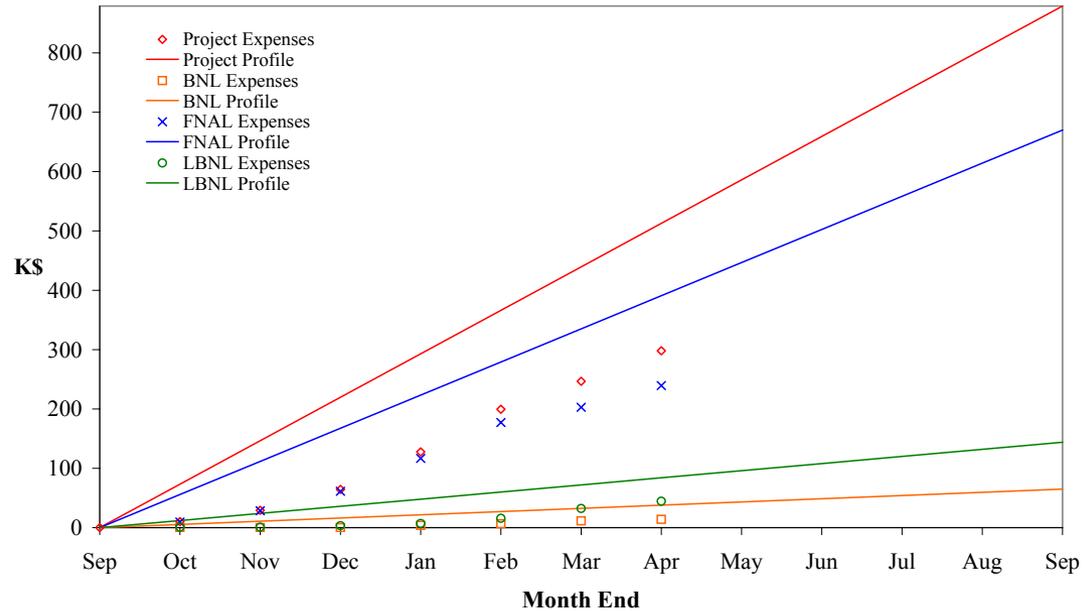
Mar 31, 2006			Total	Labor+MTSC				Labor				MTSC			
WBS				BNL	FNAL	LBNL	SLAC	BNL	FNAL	LBNL	SLAC	BNL	FNAL	LBNL	SLAC
US LHC Accelerator Research Program			11000	3264	3300	4086	350	2240	2346	2539	240	1024	761	1186	90
1	Accelerator Systems	Shiltsev	3684	875	1200	1309	300	607	927	962	240	268	273	347	60
1.1	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	



Commissioning -- FY06 Spending

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

- 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

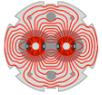


FY2006 LARP Budget	FY06 Funding Allocation					FY Expenses through April 30, 2006					Funding Balance as of April 30, 2006				
	BNL	FNAL	LBNL	SLAC	Total	BNL	FNAL	LBNL	SLAC	Total	BNL	FNAL	LBNL	SLAC	Total
FY2006 Budget	3,264.0	3,300.0	4,086.0	350.0	11,000.0										
FY2005 Carry Forward	27.7	4.3	42.7	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

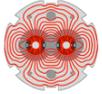


Commissioning -- Final Remarks

- **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'

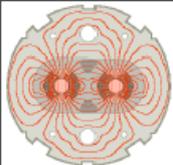


LARP



LARP

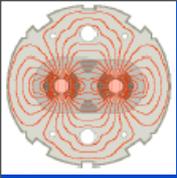
Back-up



Tests with beam

*from
Roger Bailey*

		Priority	Duration	Intensity	# shots	Intensity	Cycle	Comments
			h	p+		p+		
1	End T18, Injection Steering, commission BDI, timing	1	24	5E+09	500	2.5E+12	de-Gauss	TDI in - g LHCb
2	Trajectory acquisition commissioning, trajectory correction, threading, energy matching	1	24	5E+09	500	2.5E+12	de-Gauss	To IR7 beam dump
3	Linear Optics from kick/trajectory, coupling, BPM polarity checks, corrector polarity checks	1	12	1E+10	400	4.0E+12	de-Gauss	
4	Check BLM system	1	6	5E+09	100	5.0E+11	de-Gauss	First to TDI, then to IR7 dump
5	Aperture limits, acceptance	1	18	5E+09	1000	5.0E+12	de-Gauss	Oscillations, p bumps, BLMs, BCT
6	Momentum aperture	1	6	5E+09	100	5.0E+11	de-Gauss	Move energy of SPS beam
7	Commission multi-bunch injection ?	1	6	6E+10	50	3.0E+12	de-Gauss	BDI acquisition, MKI
8	Determination of quench level - calibrate BLMs	1	36	1E+11	20	2.0E+12	de-Gauss	Start with pilot and work slowly up
9	Commission normal cycle - recheck dispersion, optics, aperture	1	24	5E+09	300	1.5E+12	Nominal	Cycle & wait
10	Effects of magnetic cycle, variations during decay, reproducibility	1	24	1E+10	300	3.0E+12	Nominal	10 cycles
11	Energy offset versus time on FB	2	12	2E+10	100	2.0E+12	Nominal	Cycle & repeat
12	Field errors (high statistics)	2	12	2E+10	200	4.0E+12	Nominal	Collect data, off-line analysis
13	Transfer line collimation studies - TCDI	2	6	5E+09	800	4.0E+12	Nominal	TDI in - mainly on to TCDI
14	Injection protection studies - TDI	3	6	5E+09	800	4.0E+12	Nominal	On to TDI and IR7 dump
15	IR bumps, aperture, separation, crossing angle bumps [LHCb?]	3	6	5E+09	100	5.0E+11	Nominal	Careful in LHCb
TOTAL			222		5270	2.9E+13		On to TED
DAYS			9.3			6.5E+12		On to TDI
						4.0E+12		On to TCDI

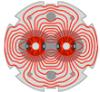


*from
Roger Bailey*

Accelerator physics – O.Bruning

Activity	Responsible	Other CERN	LARP
Optics	O.Bruning, S.Fartoukh M.Giovannozi, W.Herr T.Risselada Y.Papaphilippou		X
Aperture	B.Jeanneret, W.Herr F.Schmidt, F.Zimmermann Y.Papaphilippou		X
Impedance	F.Ruggiero E.Metral, F.Zimmermann		
Lattice correctors	S.Fartoukh, F.Schmidt Y.Papaphilippou		X
Triplet correctors	S.Fartoukh, F.Schmidt		X
Lifetimes	J.Jowett, F.Zimmermann		X
Separation / Crossing	W.Herr, F.Zimmermann Y.Papaphilippou		
Collisions	W.Herr, R.Assmann		
Luminosity	W.Herr, R.Assmann		X
Ions	J.Jowett, C.Carli S.Maury, S.Gilardoni H.Braun		

plus many other activities...



LARP

A first list ... (shhhh!)

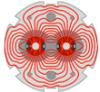
Note: all are not "1-year" prospects

Task	Priority	Person 1	Person 2	Person 3		
Control system						
Applications software						
Accelerator Technical services	1	Suzanne Panecek	Jean Slaughter	Ron Moore	Elliott McCrory	more
TI operations						
Electrical supply						
Cooling & Ventilation						
Vacuum						
Cryogenics	2	Arkadiy Klebaner	FNAL Cryo dept.			
Access						
Cold magnets	2	Mike Tartaglia	Mike Lamm	other FNAL/TD		
Warm magnets						
Magnet circuits and power converters	2					
Power Interlock System (PIC)						
Quench Protection and Energy Extraction (QPS)	2	Bob Flora				
SPS extraction, transfer, injection and first turn	2	Mike Syphers	Elvin Harms			
Multi turn losses and BIS dependability						
Protection devices other than collimators	2	Jerry Annala				
Collimation system and Halo cleaning	1	Dean Still				
Clean Beam Extraction						
Radio protection	3					
Beam Instrumentation						
Screens						
BCTs						
BPM, trajectory & orbit correction						
BLM						
PLL for Q, Q', coupling	1	CY Tan				
Profile monitors		Andreas Jansson				
Schottky	1	Ralph Pasquinelli	Andreas Jansson			
Luminosity monitors	1	Toohig Fellow Miguel Furman	Toohig Fellow			
Vacuum conditions during operation and electron cloud						
Reference magnet system						
RF systems and longitudinal beam dynamics						
Transverse feedback	2	CY Tan	Jim Steimel?			
Experimental solenoids and compensations						
Experimental equipment (Roman pots, velo)						
Beam in the injectors	2	Dave Capista	Dennis Nicklaus			
Ion beam in the injectors		Angelika Drees	BNL			
Orbit feedback system	1	Mike Martens	Mei Bai			
Filling efficiency and flat bottom conditions	1	Mike Martens				
Ramp and squeeze losses and overall quality	1	Ron Moore	Andreas Jansson			
Machine protection system	1	Jerry Annala	Dean Still			
Optics	2	Vahid Ranjbar	Mike Syphers	Andreas Jansson		
Mechanical aperture		Elvin Harms	Dennis Nicklaus			
Machine Impedance and collective instabilities	2	Toohig Fellow				
Dynamic aperture	2	Toohig Fellow	Mei Bai			
Lattice corrector settings	3	Mike Martens	Mike Syphers	Vahid Ranjbar		
Triplet corrector settings	3	Tanaji Sen	Mike Syphers			
Lifetimes	3	Ron Moore	Xiaolong Zhang			
Separation schemes	2					
Crossing angle schemes	2					
Collisions and luminosity steering	1	Elvin Harms	Jerry Annala			

Work in Progress!

Interested Personnel

Fermilab	LBNL	BNL
Andreas Jansson	J Rasson	Mei Bai
Bob Flora	Miguel Furman	Angelika Drees
Arkadiy Klebaner	(Jr Eng.)	
CY Tan		
Dave Capista		
Dave Johnson		
Dean Still		
Xiaolong Zhang		+ Toohig Fellows
Elliott McCrory		
Elvin Harms		
Jean Slaughter		
Jim Patrick		
Jerry Annala		
Jim Steimel?		
Mike Lamm		
Mike Martens		
Dennis Nicklaus		
Mike Syphers		
Ralph Pasquinelli		
Ron Moore		
Suzanne Panecek		
Tanaji Sen		
Toohig Fellow		
Vahid Ranjbar		
Mike Tartaglia		
(mag instru expert)		
(mag cryo expert)		



LARP

Score Sheet -- Long-Term Visits

Name	Lab	Approval	Comments
IR/HW Comm:			
1 Peter Limon	FNAL	+	Oversight, HW Comm; 50% LARP, 50% HW Comm
2 Roger Rabehl	FNAL	+	cryo; 50% LARP, 50% HW Comm
3 Sandor Feher	FNAL	+	magsys; 50% LARP, 50% HW Comm
4 Mike Tartaglia	FNAL	~	magnet systems
5 Bob Flora	FNAL	~	power supplies, quench protection
6 (TD Insru expert)	FNAL	~	mag instrumentation
7 (TD cryo expert)	FNAL	~	mag cryo
8 Suzanne Panecek	FNAL	~	controls interface
9 Arkadiy Klebaner	FNAL	-	cryo
10 Dennis Nicklaus	FNAL	-	controls interface
11 Jim Patrick	FNAL	-	controls interface
12 J Rasson	LBNL	-	magsys
13 (engineer)	LBNL	-	power supplies
14 (Jr Eng.)	LBNL	-	magsys

Beam Comm:			
1 Jerry Annala	FNAL		machine protection, luminosity steering
2 Dave Capista	FNAL		SpS, LHC injectors
3 Elvin Harms	FNAL		transfers, apertures, luminosity steering
4 Andreas Jansson	FNAL		Schottky, profile monitors
5 Dave Johnson	FNAL		SpS, LHC injectors
6 Mike Martens	FNAL		orbit feedback, lattice correction, etc.
7 Elliott McCrory	FNAL		controls interface, data analysis
8 Ron Moore	FNAL		ramp and squeeze, lifetimes, data analysis
9 Ralph Pasquinelli	FNAL		Schottky
10 Vahid Ranjbar	FNAL		instrumentation, optics, correctors
11 Jean Slaughter	FNAL		controls interface, data analysis
12 Jim Steimel	FNAL		beam feedback
13 Dean Still	FNAL		collimation
14 Mike Syphers	FNAL		beam transfers, optics, corrector settings
15 CY Tan	FNAL		Tune Tracker
16 Xiaolong Zhang	FNAL		beam lifetime issues
17 Mei Bai	BNL		orbit feedback, optics, corrector settings
18 Angelika Drees	BNL		collimation
19 Miguel Furman	LBNL		beam lifetime issues, eCloud
20 Rama Calaga	?		Toohig Fellow
21 <i>Future Toohig Fellows</i>	<i>all</i>		<i>all</i>

Work in Progress!

Note: all may not be "1-year" prospects



Prioritized List of Involvement -- HW/Beam

Priority 1

Task	Level of interest (1 = highest)	Person 1	Person 2	Person 3
Control system				
<i>Applications software</i>	1	X	X	X
Collimation system and Halo cleaning	1	X		
Beam Instrumentation				
<i>PLL for Q, Q', coupling</i>	1	X		
<i>Schottky</i>	1	X	X	
<i>Luminosity monitors</i>	1	X		
Orbit feedback system	1	X		
Filling efficiency and flat bottom conditions	1	X		
Ramp and squeeze losses and overall quality	1	X	X	
Machine protection system	1	X	X	
Collisions and luminosity steering	1	X	X	

Priority 2

Task	Level of interest (1 = highest)	Person 1	Person 2	Person 3
Cryogenics	2	X		
Cold magnets	2	X	X	
Magnet circuits and power converters	2			
Quench Protection and Energy Extraction (QPS)	2	X		
SPS extraction, transfer, injection and first turn	2	X	X	
Quench Protection and Energy Extraction (QPS)	2	X		
SPS extraction, transfer, injection and first turn	2	X	X	
Protection devices other than collimators	2	X		
Transverse feedback	2	X	X	
Beam in the injectors	2	X		
Optics	2	X	X	X
Machine Impedance and collective instabilities	2	X		
Dynamic aperture	2	X		
Separation schemes	2			
Crossing angle schemes	2			



Prioritized List of Involvement (cont'd)

Priority 3

Task	Level of interest (1 = highest)	Person 1	Person 2	Person 3
Radio protection	3			
Lattice corrector settings	3	x	x	x
Triplet corrector settings	3	x	x	
Lifetimes	3	x	x	
Experimental conditions	3			

no priority

Task	Level of interest (1 = highest)	Person 1	Person 2	Person 3
Beam Instrumentation				
<i>Profile monitors</i>		x		
Ion beam in the injectors		x	x	
Mechanical aperture		x		
Vacuum conditions during operation, e-cloud		x	x	



Prioritized List of Involvement (cont'd)

No discernible interest

Task	Level of interest (1 = highest)	Person 1	Person 2	Person 3
Vacuum				
Access				
Warm magnets				
Power Interlock System (PIC)				
Multi turn losses and BIS dependability				
Clean Beam Extraction				
Beam Instrumentation				
<i>Screens</i>				
<i>BCTs</i>				
<i>BPM, traject. & orb corr</i>				
<i>BLM</i>				
Reference magnet system				
RF systems and longitudinal beam dynamics				
Experimental solenoids and compensations				
Experimental equipment (Roman pots, velo)				
Ions				
Accelerator Technical services				
<i>TI operations</i>				
<i>Electrical supply</i>				
<i>Cooling & Ventilation</i>				



IR Commissioning Task Sheet

US LHC Accelerator Research Program
Task Sheet

Task Name: Interaction Region Commissioning **Date:** 21 Oct 05

Responsible Person: Michael Lamm, FNAL (lead), Peter Wanderer, BNL, Joseph Rasson (LBNL)

Budget for FY2006:

	BNL	FNAL	LBNL	Total
Labor	\$57.6K	\$300.0K	\$60.0K	\$411.0K
MSTC	\$22.4K	\$70.0K	\$30.0K	\$129.0K
total	\$80.0K	\$370.0K	\$90.0K	\$540.0K

MTSC is essentially all travel, with the exception of \$10K to cover expenses associated with the installation.

Milestones

- 1) January 2006. Finish installation procedures for US deliverables
- 2) February 2006. Provide installation oversight of US deliverables in first IR.
- 3) March 2006. Send first "long term" hardware commissioner
- 4) June 2006. Begin commissioning of first IR
- 5) Summer 2007. CERN's planned end date for hardware commissioning

Statement of work for current FY 06+:

Installation:

The latest schedule calls for the start of transport of US deliverables in October-November of 2005. Schedule for interconnection of elements is tentatively scheduled for January-February 2006. For this first interconnection, we plan to send people from all three laboratories to oversee the installation. These people will stay for 2-4 weeks, depending on their expertise. In the meantime, all laboratories are putting the finishing touches on the installation procedures and drawings, checking parts lists etc. Note that these procedures were written and validated through our successful participation in the March-April 2005 mechanical fitup at CERN.

After the first IR, installation will continue, first completing both sides of IR8. The LARP participation will be reduced to after the first installation, but we plan to have at

least installation expert at CERN for each US interconnection. Installation will continue into FY07.

Commissioning:

Based on our present understanding of the CERN commissioning schedule, the cool down of the first sector will be in June 2006. Our first long term commissioner, Sandor Feher, will begin his stay at CERN in March 2006. He will join the AT/MEL group with an emphasis on quench protection and powering of our US deliverable magnets. Roger Rabehl plans to go to CERN in June/July 2006, joining the AT/ACR group, which is responsible for the machine cryogenics. Roger will lead his expertise to the cooldown of the US deliverables.

Through these long term commissioners, LARP will play an active role throughout the entire LHC hardware commissioning, which is estimated to be completed in the summer of 2007.

Oversight:

A fraction of an FTE is reserved for planning for overseeing effort and planning for 2007. We can expect that even in FY06 there will likely be changing to the commissioning schedule for FY06-7 as the projects goes into full swing.



Hardware Commissioning Task Sheet

US LHC Accelerator Research Program
Task Sheet

Task Name: Hardware Commissioning

Date: 06 April 10

Responsible Person: Michael Lamm, FNAL (lead), Joseph Rasson (LBNL)

Budget for FY2006:

	BNL	FNAL	LBNL	Total
Labor	\$0.K	\$25.K	\$0.K	\$25.K
MSTC	\$0.K	\$10.K	\$8.K	\$18.K
total	\$0.K	\$35.K	\$8.K	\$43.K
% in MSTC	n/a	28.30%	100.00%	41.71%

Labor is covered by home institution, except for 0.1 FTE management oversight. MTSC is essentially all travel + relocation expenses for 3 people from Fermilab and one from LBNL.

Milestones

- 1) November 2006 First "long term commissioner" sent to CERN
- 2) January 2006. Completed list of US Candidates to Participate in Hardware Commissioning
- 3) January 2006. Completed Collaboration Agreement Between Fermilab and CERN
- 4) September 2006. Send second group "long term" hardware commissioner
- 5) Summer 2006. Begin commissioning of first IR
- 6) End of CY 2007 CERN's planned end date for hardware commissioning

Statement of work for current FY 06+:

LARP Involvement in Hardware Commissioning:

In the fall of 2004, CERN issued a document outlining the shortage of skilled personnel to complete the hardware commissioning task (See: Management Report on Resources for Hardware Commissioning, LHC Project Document LHC-PM-MR-0002 rev 1.0) The document showed that CERN would be short approximately 50 engineers and scientist for the 14 month duration task.

In response to this need and with the realization that this participation could be of benefit to the US HEP program, a task force was formed in February 2005. The results of this task force were published in July 2005. The report concluded that personnel would be available from the US laboratories .

Fermilab management has agreed to supply ~6 FTE staff, with the understanding that they will receive project associate at CERN. Thus LARP will be required only to support relocation expenses and possibly other incidental expenses during their stay.

Based on our recruitment effort, we expect 3 people from Fermilab to go to CERN in FY06, and one person from LBNL.

Through these long term commissioners, LARP will play an active role throughout the entire LHC hardware commissioning, which is estimated to be completed in the summer of 2007.

Oversight:

A fraction of an FTE is reserved for planning for overseeing effort and planning for 2007.



Beam Commissioning Task Sheet

US LHC Accelerator Research Program
Task Sheet

Task Name: Beam Commissioning (1.2.1.1)

Date: 20 Oct 2005

Responsible Person(s) (overall lead, lead at other labs): E. Harms, A. Drees, M. Furman

Budget (specified for each lab): The total budget for Beam Commissioning is \$400K. \$150K (37.5%) is allocated to Brookhaven National Laboratory and the remaining \$250K (62.5%) to Fermilab. For both laboratories, 70% of the funds, a total of \$280K, is designated for Labor and 30%, \$120K, to Materials, Services, Travel, and Contracts (MSTC). The bulk of MSTC funds are designated for travel expenses.

FY06 Milestones

- 1) January 2006. Participation in Chamonix workshop
- 2) Ongoing. Short (2-week to 1-month) visits to CERN for face-to-face meetings with US and CERN task team members
- 3) June 2006. Production of a document clearly defining U.S. participants and their duties
- 4) Summer 2006. LARP presence for SPS start up

Statement of work for FY06

The goals for FY06 are:

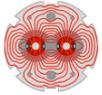
- continue building a U.S. presence at CERN during Beam Commissioning activities. This includes a presence prior to and including injector start up in the summer of 2006. For example, U.S. commissioning representatives are requesting an invitation to Chamonix 2006, where LHC sector testing with beam is expected to be a major topic of discussion. Individual short visits for specific BC topics are also planned.
- ongoing discussions with CERN and LARP collaborators on the involvement of U.S. Accelerator Scientists in the beam commissioning of the LHC.
- production of a task list, including names, proposed dates, and duties/responsibilities for a U.S. presence at CERN for commissioning-related activities. This will be completed in cooperation with CERN beam commissioning management.
- generation of an 'Operations model' which will spell out structure and staffing for U.S. involvement in commissioning both abroad and at home

FY06 0.875 FTE (FNAL), 0.525 FTE (BNL)

Statement of expected follow-on work in subsequent years (include "ultimate" goal and time scale for this sub-program, as well as plans for specific work and rough budget need for next 2 years):

The aim of this effort is to provide a US presence in beam commissioning of the LHC that provides mutual benefit to both LHC operation and to the US effort in accelerator physics. This work will proceed at an increasing level until peaking during LHC commissioning which is expected to begin in 2007. Prior to full beam commissioning, there will be a U.S. presence both at CERN and via remote access to the injector chain turn on and checkout and the LHC sector test with beam now planned for the first quarter of FY06. During commissioning, the goal is to have one significant U.S. presence on the commissioning teams.

FY07 2.0 FTE (FNAL), 1.5 FTE (BNL), 0.5 FTE (LBNL)



LARP