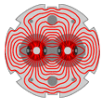


brookhaven - fermilab - berkeley - stanford

LARP Update

Steve Peggs, BNL/FNAL

Introduction
Magnet R&D (2 slides)
Accelerator Systems
Commissioning
Santa Rosa Review
Miscellaneous

LARP portfolio

About half of LARP funding goes to Accelerator Systems:

- Beam diagnostics instrumentation
- Accelerator Physics theory, simulations & expts
- Commissioning
- Collimation

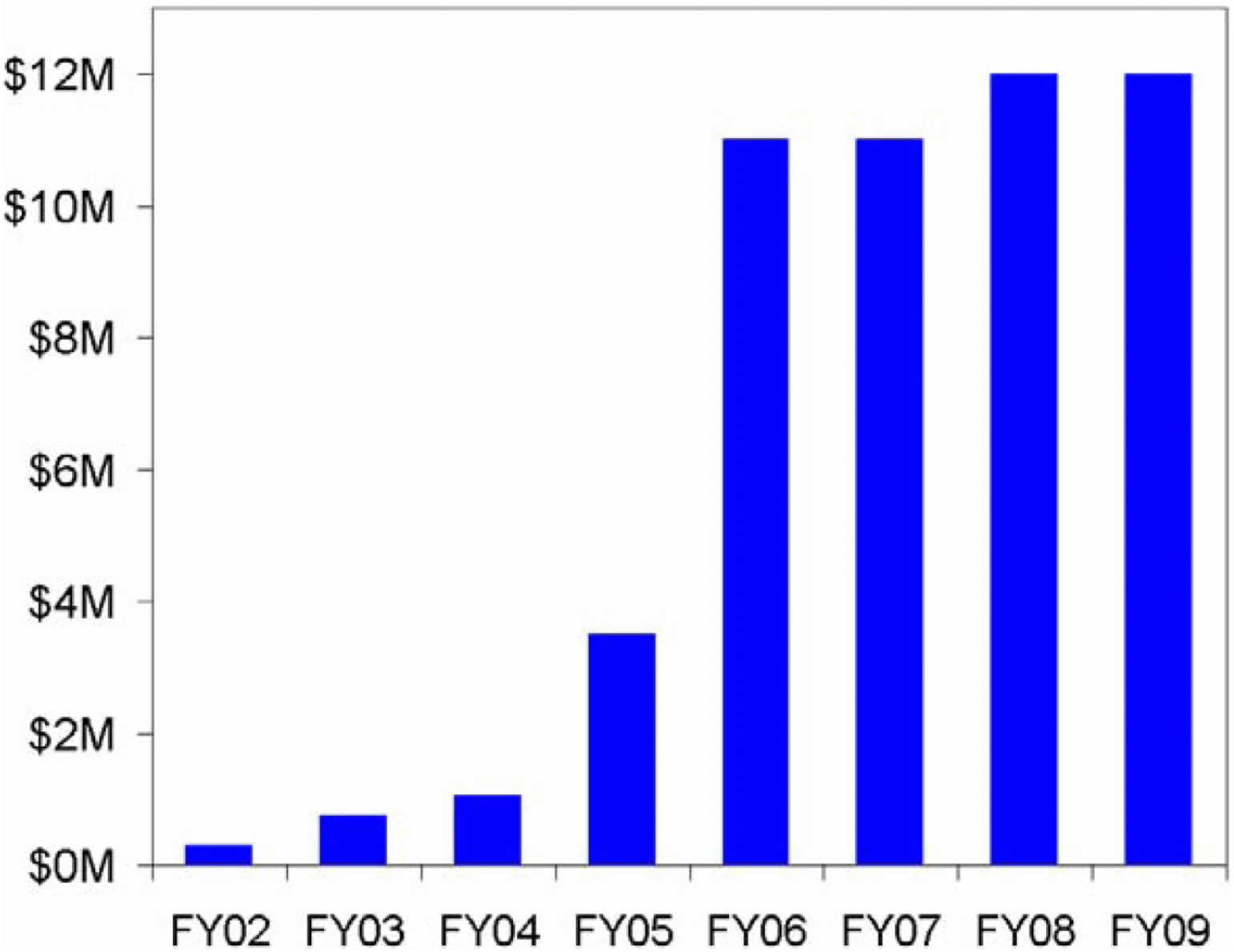
The other half of LARP is long term Magnet R&D for LHC Interaction Region Upgrade

- guided by Accelerator Physics extrapolations
- but depending on the "school of hard knocks": what will LHC really behave like?

Take optimum advantage of U.S. skills & resources by careful prioritization

- many potential worthwhile tasks fall off the list ...

Budget guidance from DOE



Budget allocation v2b

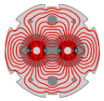
LARP

LARP FY06 budget request v2b

WBS			Sept 23, 2005 FY2006 BNL	FNAL	LBNL	SLAC	Total
US LHC Accelerator Research Program			**2838**	**3207**	**3975**	**780**	**11000**
1	**Accelerator Systems**	**Shiltsev**	**855**	**1150**	**1255**	**700**	**3960**
1.1	**Instrumentation**	**Ratti**	345	250	935	0	1530
1.2	**Commissioning**	**Syphers**	230	620	90	0	940
1.3	**Collimation**	**Markiewicz**	100	50	0	700	850
1.4	**Accelerator Physics**	**Shiltsev**	180	230	230		640
2	**Magnet R&D**	**Gourlay**	**1543**	**1787**	**2320**		**5650**
2.1	**Design Studies**	**Zlobin**	83	190	105		378
2.2	**Model Magnet R&D**	**Sabbi**	0	1334	1063		2397
2.3	**Supporting R&D**	**Ambrosio**	1282	67	504		1853
2.4	**Materials**	**Ghosh**	178	196	648		1022
3	**Program Management**	**Peggs**	**440**	**270**	**400**	**80**	**1190**

$11M is a significant increase from $3.2M in FY05

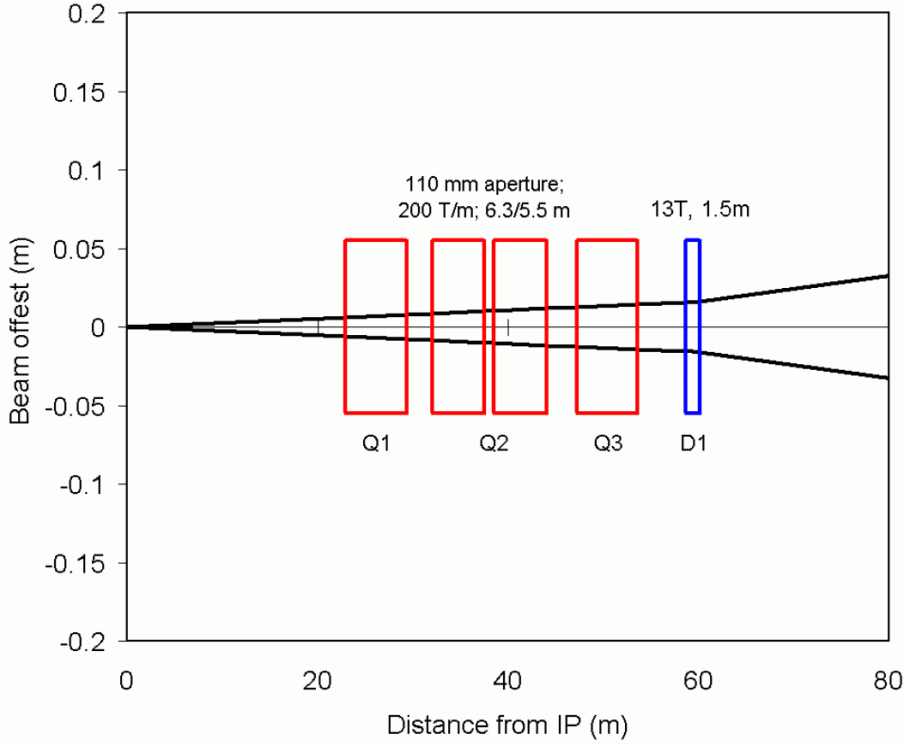
The Accelerator Systems proportion will increase somewhat in FY07 and FY08, to support commissioning



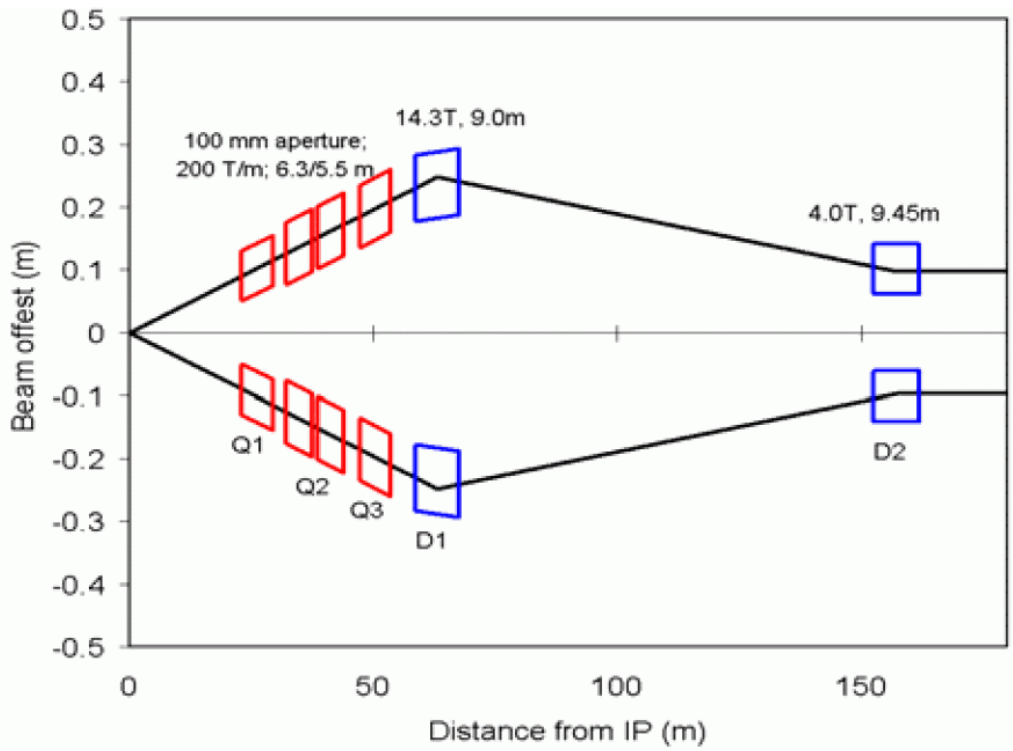
Magnet R&D

IR upgrade: two scenarios

Conventional (most likely)



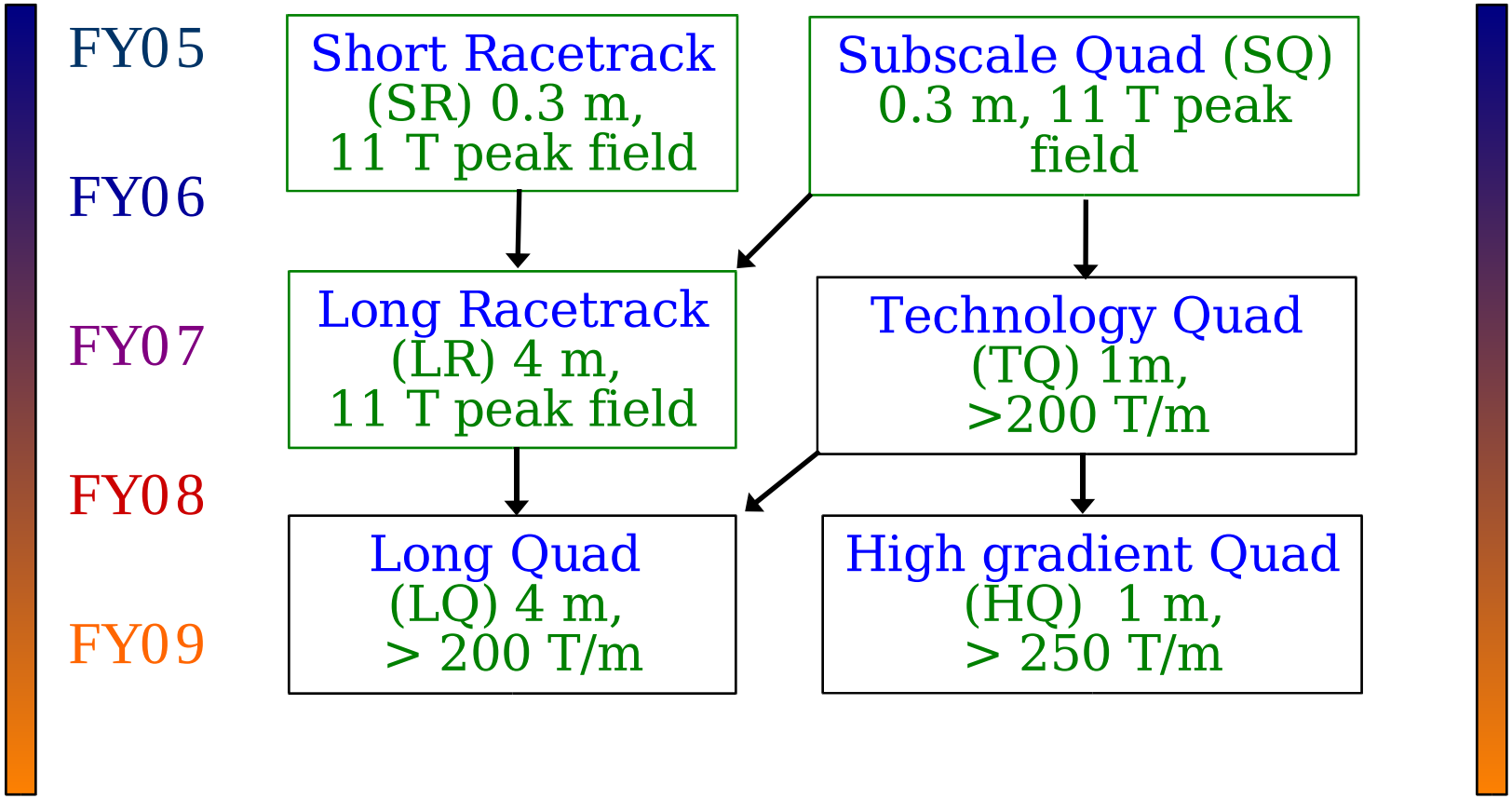
Large angle (later upgrade?)



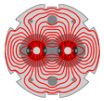
All scenarios require highest possible strength quadrupoles with Niobium-Tin conductor – success not guaranteed!

"Large Angle" scenario also requires SRF crab cavities. October workshop "failed to drive a stake through its heart".

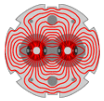
Magnet R&D flow chart (over simplified)



In reality, the boxes overlap in time …



Accelerator Systems



Start-up challenge chronology

LHC faces 4 (identified) challenges

Luminosity	Challenge	LARP activity
1) small	Snap-back	Tune Feedback
2) medium	Stored energy	Collimation
3) nominal	Beam-beam	Lens, wires, ...
4) upgrade	Debris power	IR Upgrade

LARP Accelerator Systems activities are linked to each of these early challenges, and to middle term enhancements

Later (2012?) comes an Interaction Region upgrade. Magnet R&D proceeds **now,** to be ready **then.**

LARP will be judged against the success of the U.S. LHC Construction Program that is currently winding down

Vital priorities

Early LARP performance will be measured by success in 3 vital Accelerator System tasks:

1) Luminosity monitors
2) Tune feedback
3) Commissioning – Beam, Hardware, IR

These tasks must be protected against

- Budget allocation shortfalls in future years
- Other Accelerator Systems tasks
- Many worthy tasks fall off the list .....

BNL activities (Acc Sys) = $855k

In order of $$s:
Tune Feedback
Beam Comm.
Beam-Beam wires
(IR Comm.)
Cleaning Efficiency
Electron Cloud
Irradiation Studies

< $50k
Luminometer
Schottky

other
Toohig Fellow?

LARP FY06 budget request v2b — **Blue: new WBS numbers**

WBS			Sept 23, 2005	FY2006 BNL	FNAL	LBNL	SLAC	Total
US LHC Accelerator Research Program				**2838**	**3207**	**3975**	**780**	**11000**
1	**Accelerator Systems**	**Shiltsev**		**855**	**1150**	**1255**	**700**	**3960**
1.1	**Instrumentation**	**Ratti**		345	250	935	0	1530
1.1.1	Phase I							
1.1.1.1	Tune feedback	Cameron		300	25			325
1.1.1.2	Luminometer	Ratti		25		935		960
1.1.1.4	Schottky monitor	Jansson		20	225			245
1.2	**Commissioning**	**Syphers**		230	620	90	0	940
1.2.1	Phase I							
1.2.1.1	Beam Commissioning	Harms		150	250	0		400
1.2.1.2	Interaction Region Commissioning	Lamm		80	370	90		540
1.3	**Collimation**	**Markiewicz**		100	50	0	700	850
1.3.1	Phase I							
1.3.1.1	Cleaning efficiency studies	Drees		50				50
1.3.2	Phase II							
1.3.2.1	Rotating Collimator R&D	Markiewicz			20		700	720
1.3.2.2	Tertiary collimator study	Mokhov			30			30
1.3.2.3	Irradiation studies	Simos		50	0			50
1.4	**Accelerator Physics**	**Shiltsev**		180	230	230		640
1.4.1	Studies							
1.4.1.1	Electron Cloud	Furman		50	0	150		200
1.4.1.2	Interaction Regions & Beam-Beam	Sen		0	180	80		260
1.4.1.3	Beam-Beam wires	Sen		130	50			180
2	**Magnet R&D**	**Gourlay**		**1543**	**1787**	**2320**		**5650**
3	**Program Management**	**Peggs**		**440**	**270**	**400**	**80**	**1190**

Luminosity Monitoring

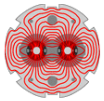
LARP is committed to delivering 4 ionization lumis for IR1 & IR5

- IR2 & 8 (ALICE & LHCb) have no current plans for lumi mons
- 4 more lumis would cost ~$200k of funding from CERN

Zero Degree Calorimeters good for Nuclear Physics & experiments

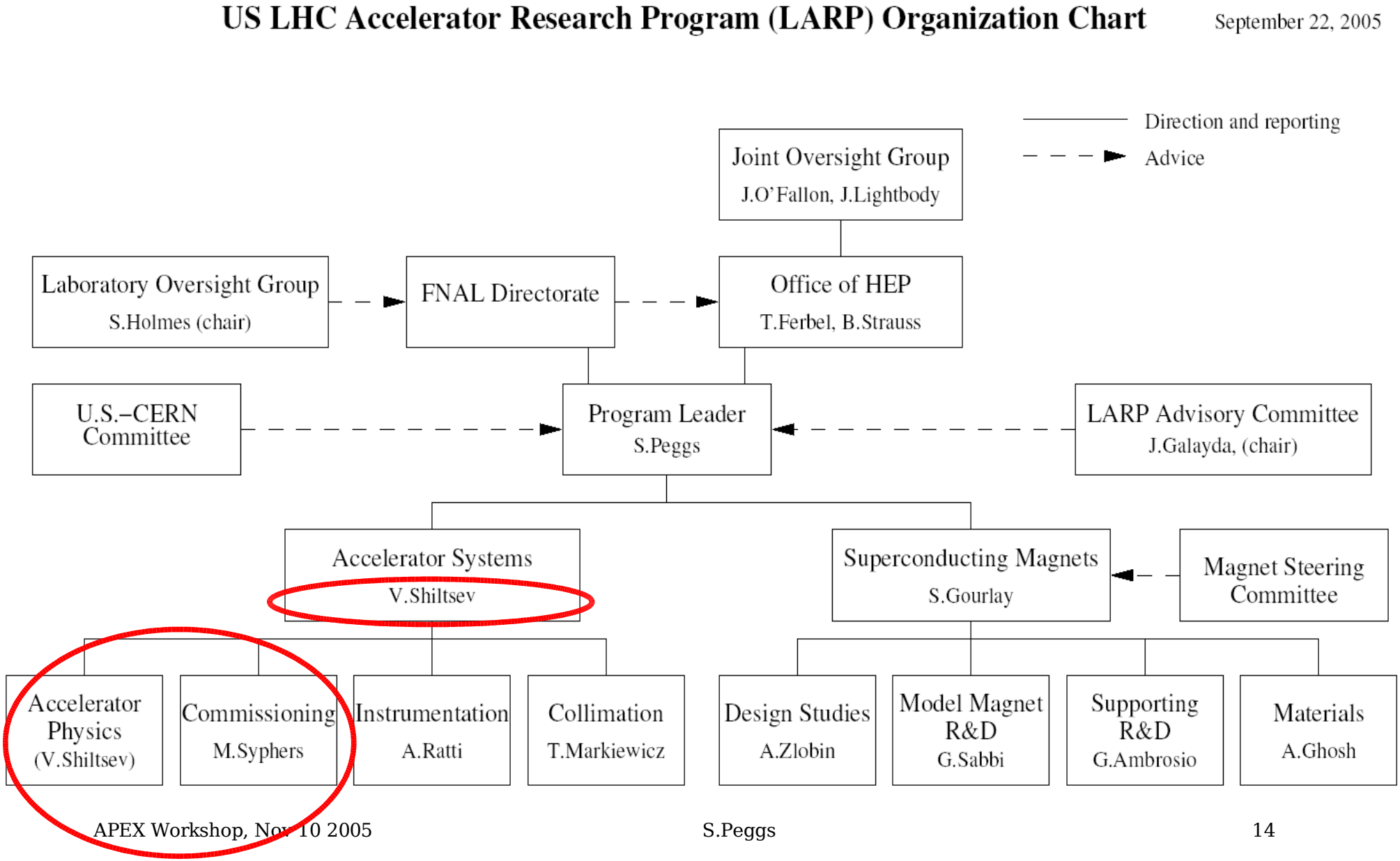
- Sebastian White (BNL) focuses ZDC attention on ATLAS
- “doubling up” IR5 monitors allows cross-calibration
- Sebastian seeks $140k from ATLAS, but no formal request yet
- Modest LARP support ($65k over 3 years) ONLY for common electronic interface

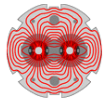
Four more luminosity monitors?



Commissioning

Organization chart





Hardware Commissioning
(non- U.S. deliverables)

A level of closure has recently been reached!

- CERN: Project Associateships: 4 or 5 kCHF/month
- LARP: incidental expenses: travel, relocation, ...
- U.S. Labs: will support from HEP base salaries

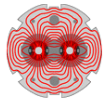
FNAL:	4 to 7 people
LBNL:	2 to 3
BNL:	“case-by-case basis”
SLAC:	0

Organization of Hardware Commissioning is an urgent, high priority

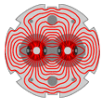
Beam Commissioning is not far behind

Mike Syphers is making rapid progress in both fronts ...

Commissioning plan under construction



	CY06												CY07												CY08								
Month:	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
	FY06												FY07												FY08											
SpS Start-Up						**	**	*																											
SPS w/ Beam								**	**	**	**	**	**	**	*						*	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
Sector Test														*	*																				
IR Comm	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**															
HW Comm			**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**													
Full Check Out																						**													
Beam Comm																							**	**	**	**	**	**	**	**	**	**	**	**	**	**
Chamonix				**												**												** (??)							
1st IR, detail:																																			
IR Installation		**	**	**	**																														
Cooldown								**	**																										
Power Up									**	**																									
LARP @ CERN																																			
TOTAL:	***1***	***1***	***8***	***7***	***6***	***4***	***4***	***8***	***9***	***10***	***9***		***13***	***13***	***10***	***12***	***10***	***8***	***9***	***9***	***8***	***9***	***7***	***9***	***7***	***7***	***7***	***7***	***7***	***7***	***7***	***7***	***7***	***7***	***7***
IR Comm:																																			
Feher					1	1	1	1	1	1	1		1	1	1	1	1																		
Rabehl								1	1	1	1		1	1	1	1	1	1	1	1															
others			3	3	3				1	1	1		1	1	1	1	1	1	1	1	1	1													
H/W Comm:																																			
Limon	1	1	1	1	1	1	1	1	1	1	1		1																						
Flora								1	1	1	1		1	1	1	1	1	1	1	1															
Tartaglia													1	1	1	1	1	1	1	1	1	1	1	1											
others				1	1	2	2	3	3	3	3		3	3	3	3	3	3	3	3	3	2	1	1											
Beam Comm:																																			
Sr LARP			2					1		1			3	3		2			1	1	2	3	3	5	5	5	5	5	5	4	4	4	4	4	4	4
TF's																1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3
Controls Interface																																			
Panacek			1	1						1	1	1	1	1	1	1	1																		
others			1	1										1	1																				
Lumi Comm																			xx	xx	xx	xx	xx	xx											
Tune/Shtky Comm																xx	xx	xx	xx					xx	xx	xx	xx								
Coll-II Comm																																			
LHC@FNAL					(remPC)					(tst cnsl)						(final Center)																			



Santa Rosa Review

Reviewer Comments

Recognition of priority of instrumentation deliverables was appropriate.

Appointment of Shiltsev as Accelerator Systems leader was a good step.

Good first steps in putting together Beam Commissioning plan.

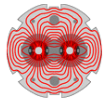
Coordination between LARP and CARE(-HHH) appears weak or absent.

Better coordination with CARE in terms of meeting schedules and technical planning should be encouraged

Budget and schedule for three approved instrumentation tasks are reasonable, but there is no budget for other possible LHC needs (e.g., Zero Degree Calorimeter, Head-tail Monitor, and AC dipole).

Proper caution is being exercised with regard to extra luminometers. Potential for scope creep on remote adjustment features.

Some concern over stretchout of luminometer funds; Need to make sure integral is maintained.



Action Items / Recommendations

Action Item:

Resource loading plan document available to DOE at end of calendar year. Ugh!

Recommendations (Beam Instrumentation):

1. Obtain funds commitment from CERN for the 2-4 extra luminometers for IP2 and IP8 in Dec 05.

2. Develop remote adjustment features for these electronics under CERN funds only if resources permit.

3. Evaluate priorities for new diagnostics with CERN input. (Even if LARP cannot fund, CERN might.)

4. Consider need for beam profiling diagnostics using OSR or OTR in LHC complex.

Recommendations - 2

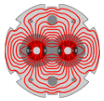
Recommendations (Commissioning):

1. Need to close the loop with CERN on BC tasks. Should be done before next review

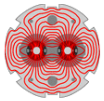
2. Suggest HC be carried as separate task, albeit under same management as IRC. Want to identify costs, as this does represent scope increase

3. Pursue involvement in LHC@FNAL activity. I believe it will be invaluable aid to BC and maybe HC as well

4. Consider need for travelers in French for tunnel work !!



Miscellaneous



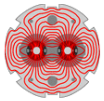
Budget re-tune - v2c

75% of the v2b funds have been allocated to the labs. Distribution of the remaining 25% to be determined by the end of Q2.

There is little contingency ($200k): scope trades off with risk

There is a need for a modest re-tune of the Accelerator Systems side of the budget, due to many minor issues, including:

- Interaction Region Commissioning re-scheduling
- RHIC re-scheduling
- Incorporation of Hardware Commissioning role
- Evolving Luminometer scope (+ IR2, IR8)



Strategic Resources

Two key strategic enabling technologies: SRF & SC Magnets

- LARP helps keeps U.S. Labs at magnet frontier, to the benefit of all

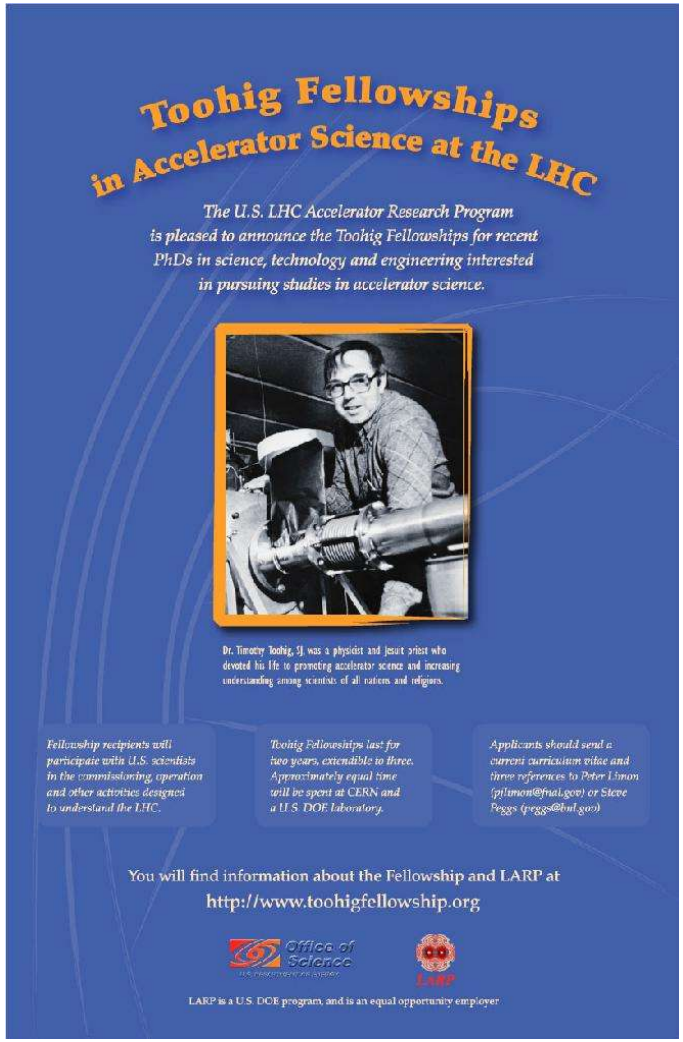
The large accelerator control room (and near it) is a unique training environment for junior staff – another "strategic resource"

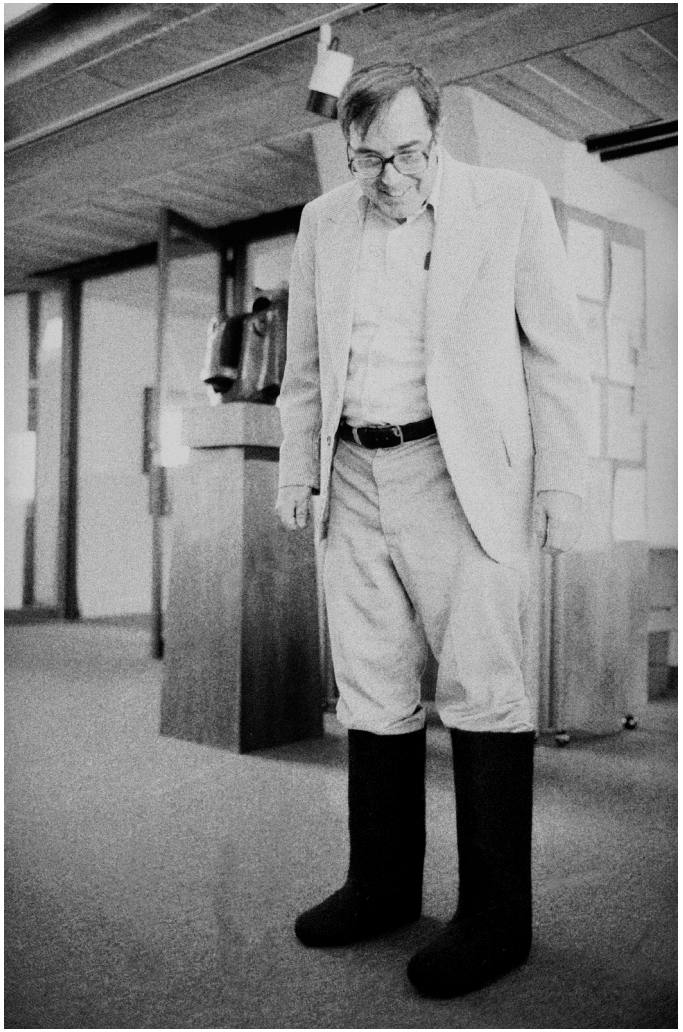
- reality bites: the best education is the new real world
- intelligent junior staff will vote with their feet, and go to the cutting edge accelerator, i.e. LHC

LARP must help to

- hire the best young staff to U.S. labs
- place them for long stays at LHC (50% duty factor)
- attach them to strategic technology R&D
- show a path to permanent positions for non-Europeans

Pursue the best & brightest





First Toohig fellowship offered to Rama Calaga (Stony Brook)