

LARP

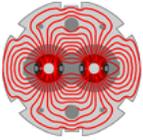
US LHC Accelerator Research Program

bnl - fnal- lbnl - slac

LARP

Accelerator Systems: Progress, Budget, Goals and Issues

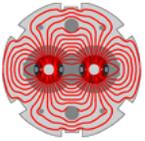
Vladimir Shiltsev



LARP

Content

- DoE Review recommendations, concerns
- LARP AS Org.Chart, changes since LBL Mtg
- Highlights of progress since LBL Mtg
- FY07 priorities: Instrumentation and Commissioning
- FY07 AS budget and consequences
- New proposals & "Group of 5+1"
- LAFS and LARP
- Valencia-2006
- This Meeting : special sessions, expectations, etc.



DoE/NSF Review June 12-14, 2006

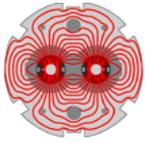
LARP

- "...Committee was very pleased with the order and content of presentations on beam instrumentation (and) accelerator physics"
- "Plans for commissioning of LHC hardware are starting to be implemented..."
- "It was felt that plans for participation in commissioning the accelerator were not being pursued with sufficient vigor..."
- "The work on collimators has accelerated, but ...it would be wise to reconsider (some) issues..."
- "...very pleased with the interest indicated by CERN to regard LARP items... as true deliverables."
- "...encouraged LARP participation in the Fermilab project LHC@FNAL"
- "...recommend a more effective bookkeeping system for managing expenses and progress on all active tasks..."



Internal Reviews

- Schottky Monitor Final Design Review
 - June 22, 2006, at CERN
 - Things going well...
- Tune FB Final Design Review
 - Oct. 23, 06, chaired by T.Shea, at BNL
 - Quite positive "...remarkable progress..."



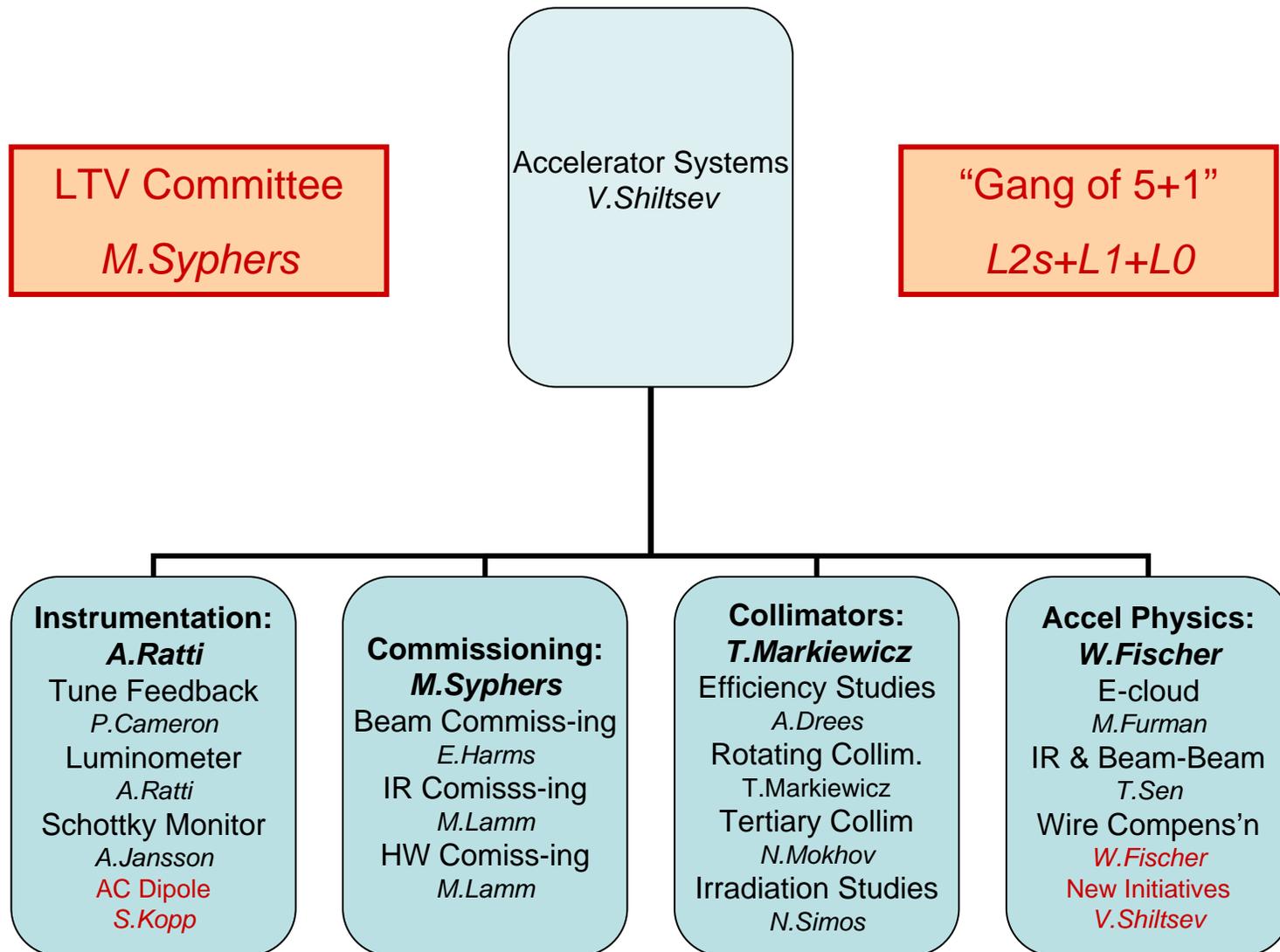
LARP

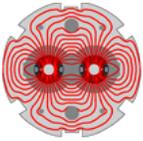
Changes in Organization

- First Year of “AD Dipole” Instrumentation L3 task
- Wolfram Fischer to take over “Wire Compensation”
Accelerator Physics L3 task
- “New Initiatives” L3 task formed and placed in AP
- “Gang of 5+1” (in)formally initiated
- Long Term Visitor ‘s Committee led by Mike Syphers



LARP Accel. Systems Organization

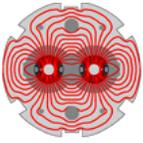




After LBL Mtg - AccSyst Highlights

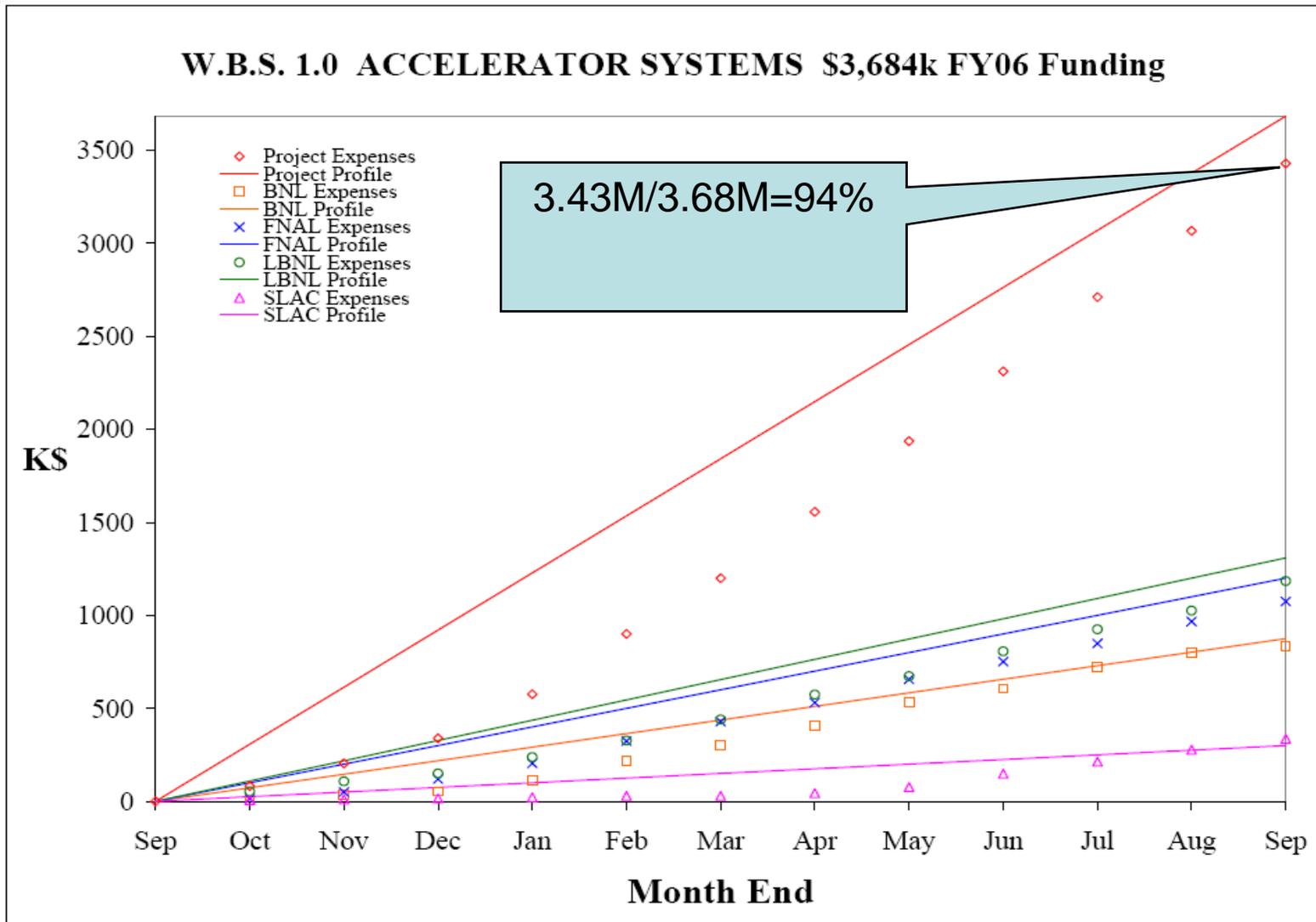
LARP

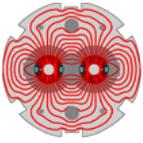
- Schottky being baked, goes into tunnel
- TCFB: success at SPS
- 4 long-term hardware commissioners @CERN
- SLAC joins commissioning forces
- LHC@FNAL to open in Nov'07, LAFS
- RC work at full speed
- SPS beam studies: BBQ PLL, Q' head-tail, bent crystal, etc
- Wires built for RHIC tests
- # of LARP presentations at Valencia workshop
- etc etc etc (details in breakout sessions)



LARP

FY06 Accel.Syst. Spendings

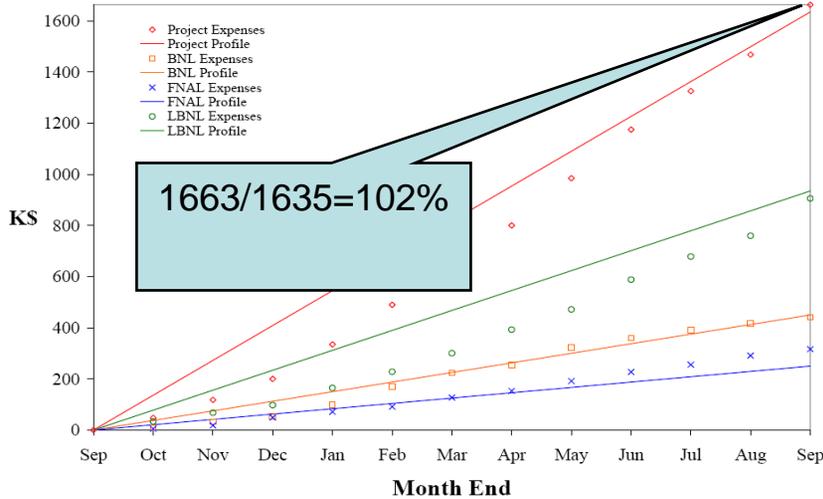




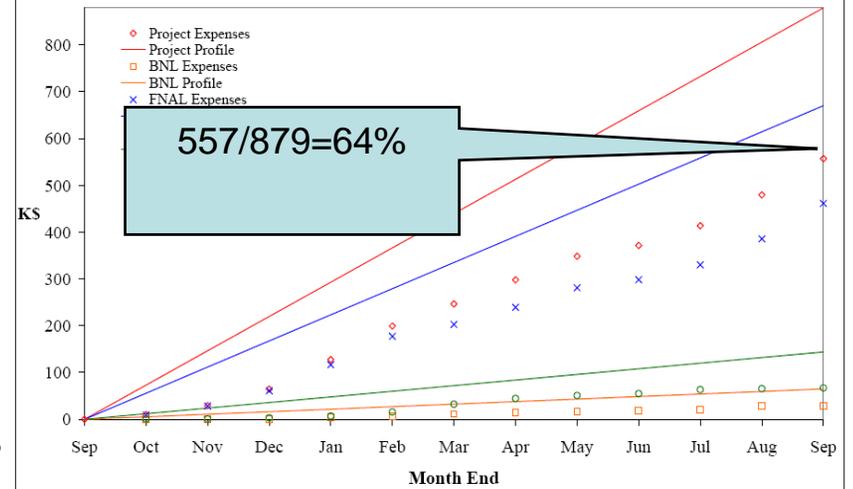
LARP

FY06 Accel.Syst. Spendings - II

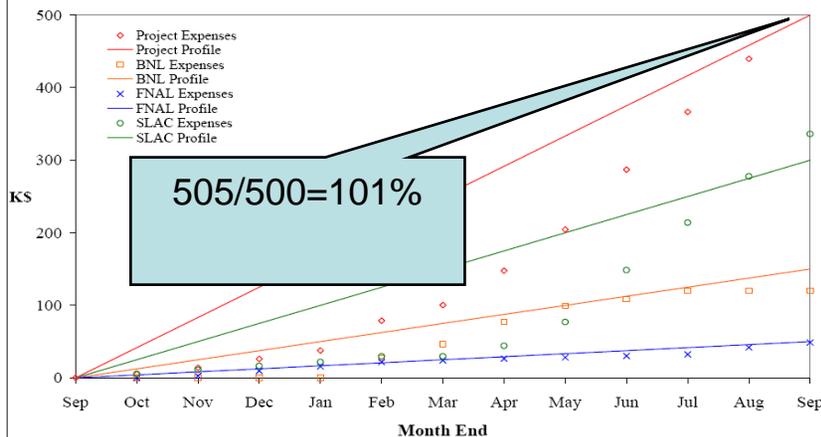
W.B.S. 1.1 INSTRUMENTATION \$1,635k FY06 Funding



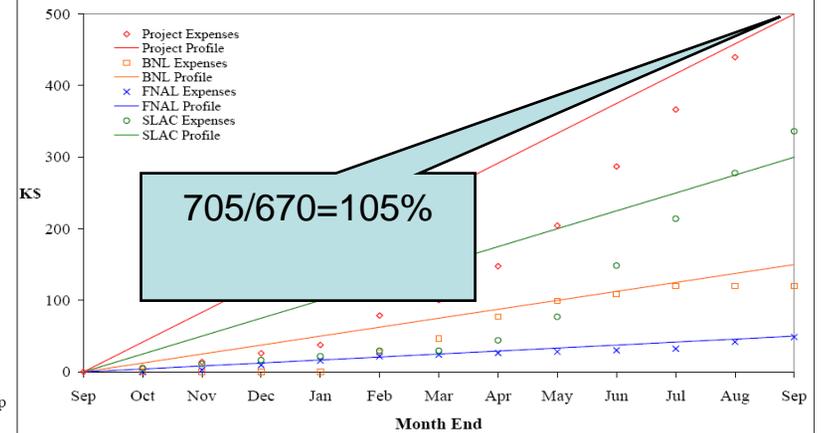
W.B.S. 1.2 COMMISSIONING \$879k FY06 Funding

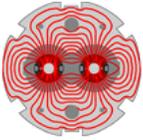


W.B.S. 1.3 COLLIMATION \$500k FY06 Funding



W.B.S. 1.3 COLLIMATION \$500k FY06 Funding

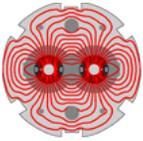




“Hard Deliverables” – High Priorities

LARP

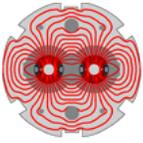
- As presented by H. Schmickler at the LARP Collaboration Meeting (April'06, LBNL, see the Meeting Summary)
- “Hard deliverables” are the projects which CERN needs but can not back-up itself in case of failure (thus, special attention and protection needed):
 - Lumi Monitors for 2 IPs (2007)
 - Tune Feedback (2007)
 - Beam Commissioning (2007-2009-beyond)
 - Phase II rotating collimators prototype (2009)
- Endorsed by the LARP Executive Committee (June 5, 2006)



LARP

Accelerator Systems FY07 Priorities

1. Lumi-Monitors: construct, install, start commissioning
2. Tune&Coupling FB: deliver design, participate in installation and commissioning
3. Schottky: participate in installation and commissioning
4. Hardware Commissioning: execute current plan – SAFELY!
5. Beam Commissioning: develop acceptable/detailed execution plan for FY08+ by ~mid-07
6. Other tasks: execute Task Sheet's Plans
7. "Gang of 5+1": formulate a plan of FY08 activities (incl. new ones) and prepare for budget discussions at ~mid-FY07



LARP

FY07 Accelerator Systems Budget

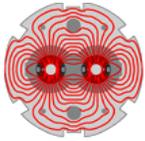
October 13, 2006			Total	Labor+MTSC			
WBS				BNL	FNAL	LBNL	SLAC
US LHC Accelerator Research Program			11000	2664	2688	4182	878
1	Accelerator Systems	Shiltsev	3611	648	821	1314	828
1.1	Instrumentation	Ratti	1506	315	222	969	0
1.1.1	Phase I						
1.1.1.1	Tune feedback	Cameron	310	250	60		
1.1.1.2	Luminometer	Ratti	994	25		969	
1.1.1.4	Space monitoring		100				
1.1.1.5	AC power supplies		102				
1.2	Commissioning	Syphers	540	48	329	145	18
1.2.1	Phase I						
1.2.1.1	Beam commissioning	Harms	192	18	156		18
1.2.1.2	Start-up region commissioning	Lamm	250	20	133		17
1.2.1.3	Hadron collimator commissioning	Lamm	98	10	88		18
1.3	Collimation	Markiewicz	930	135	15	0	780
1.3.1	Phase I						
1.3.1.1	Cleaning efficiency studies	Drees	50	50			
1.3.2	Phase II						
1.3.2.1	Residual collimation	Markiewicz	88				780
1.3.2.2	Tertiary collimator study	Mokhov	15		15		
1.3.2.3	Irradiation studies	Simos	82	82			
1.4	Accelerator Physics	Fischer	635	150	255	200	30
1.4.1	Studies						
1.4.1.1	Conductance studies	Surin	200	50		150	
1.4.1.2	Reaction regions central beam	Surin	70		19	50	30
1.4.1.3	Beam-beam wires	Fischer	150	100	50		
1.4.1.4	New initiative feasibility studies	Shiltsev	15		15		

AS budget is essentially flat

3611k\$ in FY'07 vs 3684k\$ in FY'06

except 200k\$ contingency

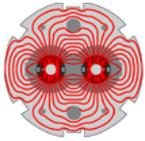
to be distributed mid-FY'07



LARP

Things not in FY'07 budget

<i>Project</i>	<i>Reason</i>
• Longitudinal Density Monitor	budget
• Fast Magnet Ramp Measurement System	budget
• Crab Cavity – hardware part	budget
• E-lenses	budget
• Bent Crystal collimation (see below)	too early
• LER-LHC 1.5TeV (see below)	little \$\$
• Optical Stochastic Cooling	too big for LARP



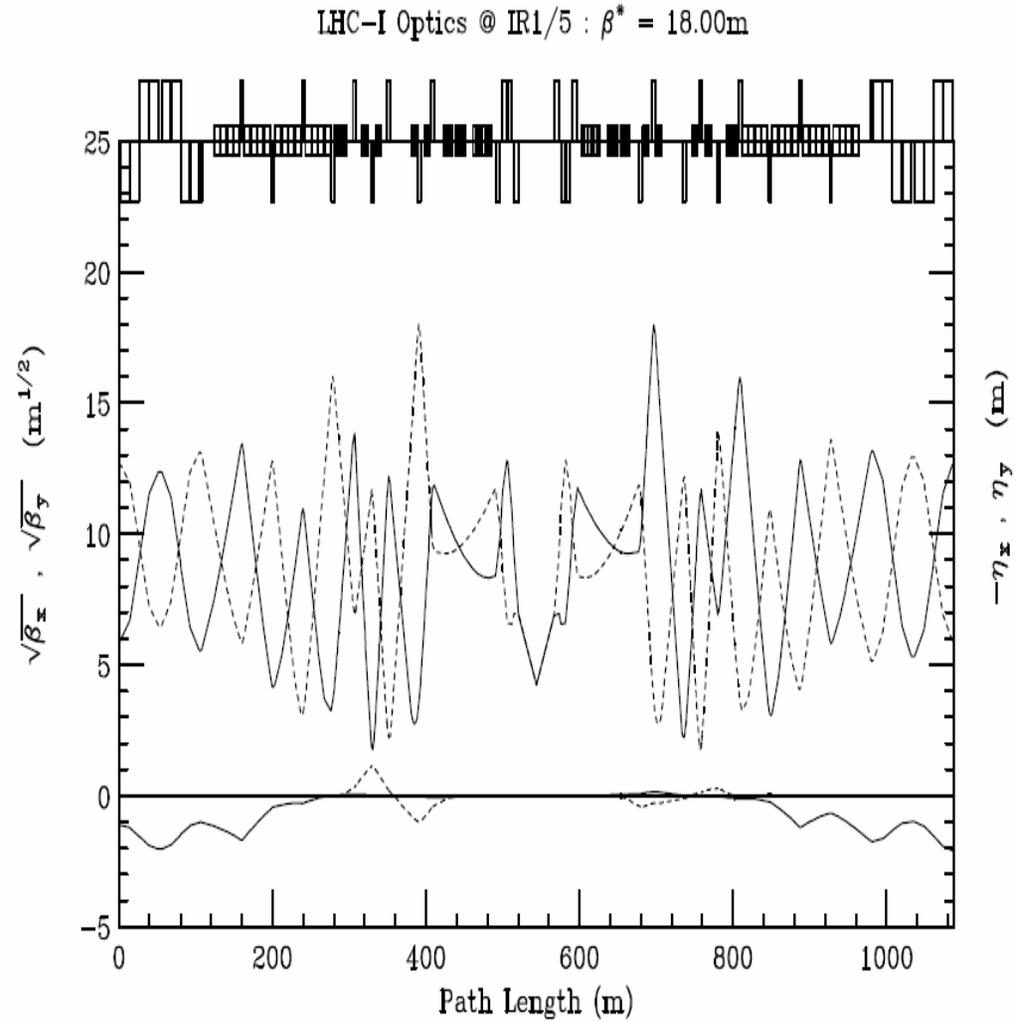
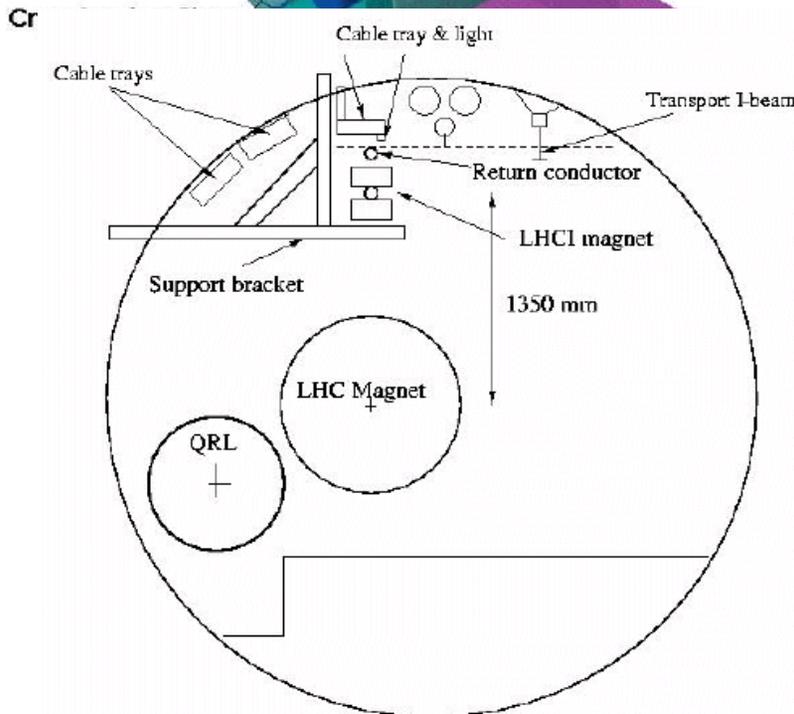
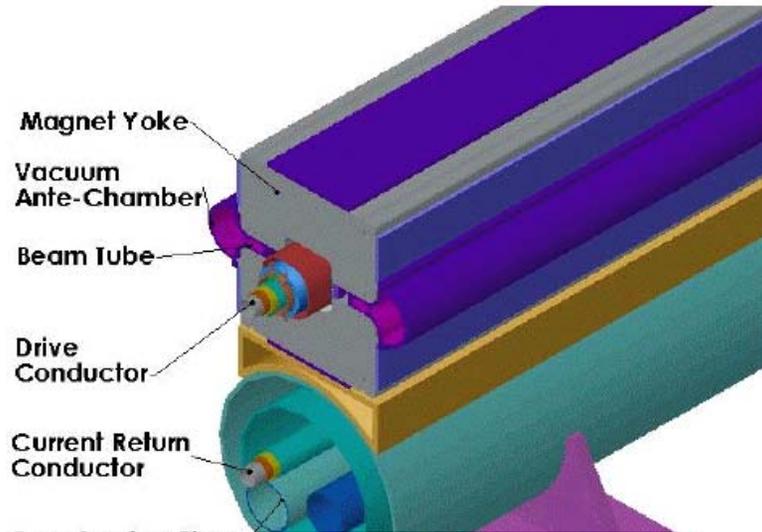
LARP

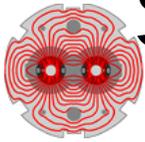
Today & Tomorrow We Will:

- Discuss Optical Stochastic Cooling (for LHC) Wed PM
- IR/HW/Beam Commissioning+CERN view+LAFS Wed PM
- Long Term Visitors: who/how/when/Labs' views Thur AM
- Accelerator Physics Thur AM
- Instrumentation Thur PM
- Collimation Thur PM

1.5 TeV SuperFerric Injector in LHC tunnel

H. Piekarz



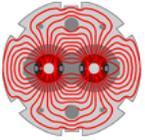


LARP

Summary of the LER Workshop

Oct 10-11, 2006 CERN

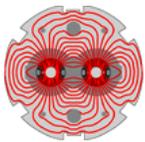
- LER in LHC tunnel
 - gains
 - Higher injection energy 1.5TeV
 - Faster turn around time
 - Better beam stability
 - Double Np/bunch by e.g. slip stacking
 - Save ~1yr or no-L time by installing during shutdowns
 - concerns
 - all the “gain” arguments are not strong
 - Problems: reliability, protection, n-flux, AC dQ, SlipSt.
 - 50GeV PS+ will address reasons #3-5
 - Pilot bunch.... many others concerning operation
- Team was very inventive in solving problems
 - E.g. pilot bunch problem – a neat solution found, etc



LARP

Another Outcome of the Workshop

- Proposal of ~ 500 GeV superferric SPS+ :
 - Addresses many (all) SPS problems
 - Promises same or faster filling time and x2 N_p
 - Enables technology for 1.5TeV LER in future



LARP

SuperFerric Synchrotron SPS+

Injection energy 50 GeV
(from PS+)

Extraction energy ~500 GeV
(to LHC thru existing lines)

Max field 1.67 T

Max current 67 kA

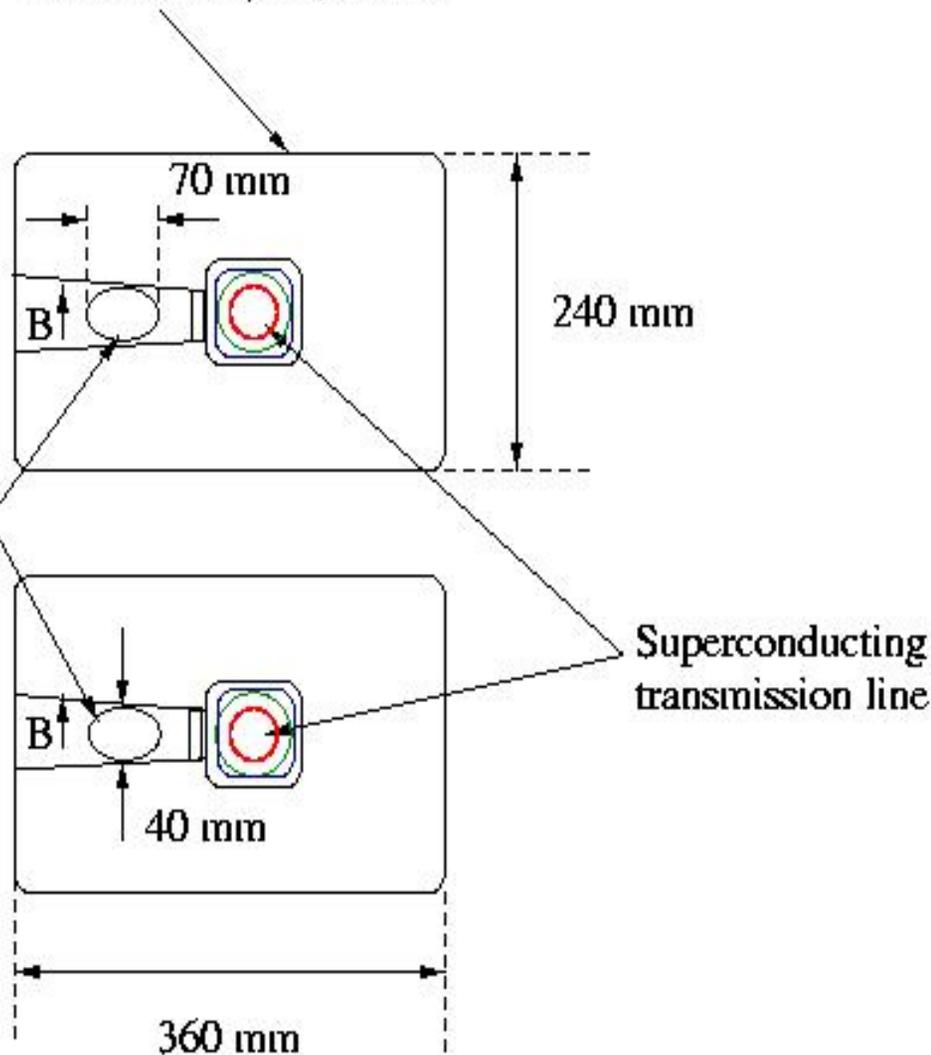
Packing factor ~90%

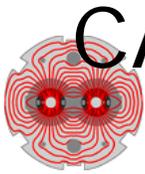
Cycle Time 6 s

Beam pipe 2x2b
(coated Al)

Total cost ~80M\$

Laminated core (1 mm)
Carbon steel, AISI 1008





• IR Upgrade:

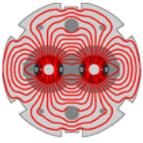
- both quad first paths NbSn, NbTi
 - Magnet R&D... Magnet R&D...Magnet R&D
- D0 3.5m from IP
- <1mrad Crab Crossing not excluded

• Low cost, potential high gain:

- low-noise feedback
- collimator schemes (RC, LEL, Crystals)
- beam-beam compensation schemes (W, LEL)

• Upgrade of Injector Chain:

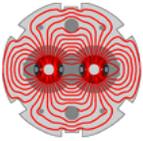
- new Linac, PS+, PS2
- SPS+ incl SF-SPS (initiative Task Force)



LARP

Collaboration/Coordination with CERN

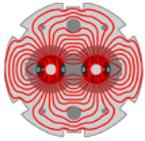
- Collaboration successful when:
 - There is strong driving force both on the CERN and US side
 - Both sides open to new ideas while working towards a common goal
- Examples:
 - Instrumentation: Alex \leftrightarrow Hermann, Rhodri
 - » Ralph \leftrightarrow Fritz
 - » Peter \leftrightarrow Rhodri
 - » Sacha, Andreas \leftrightarrow Hermann (?)
 - Collimators: Tom \leftrightarrow Ralph
 - Commissioning: Mike S, Mike L, Elvin \leftrightarrow Roger, Mike L
- There is room for improvement:
 - Accelerator Physics: Wolfram, TS, VS \leftrightarrow Oliver? JPK? WS?



LARP

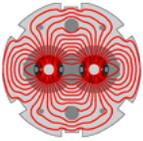
Art of Management





LARP

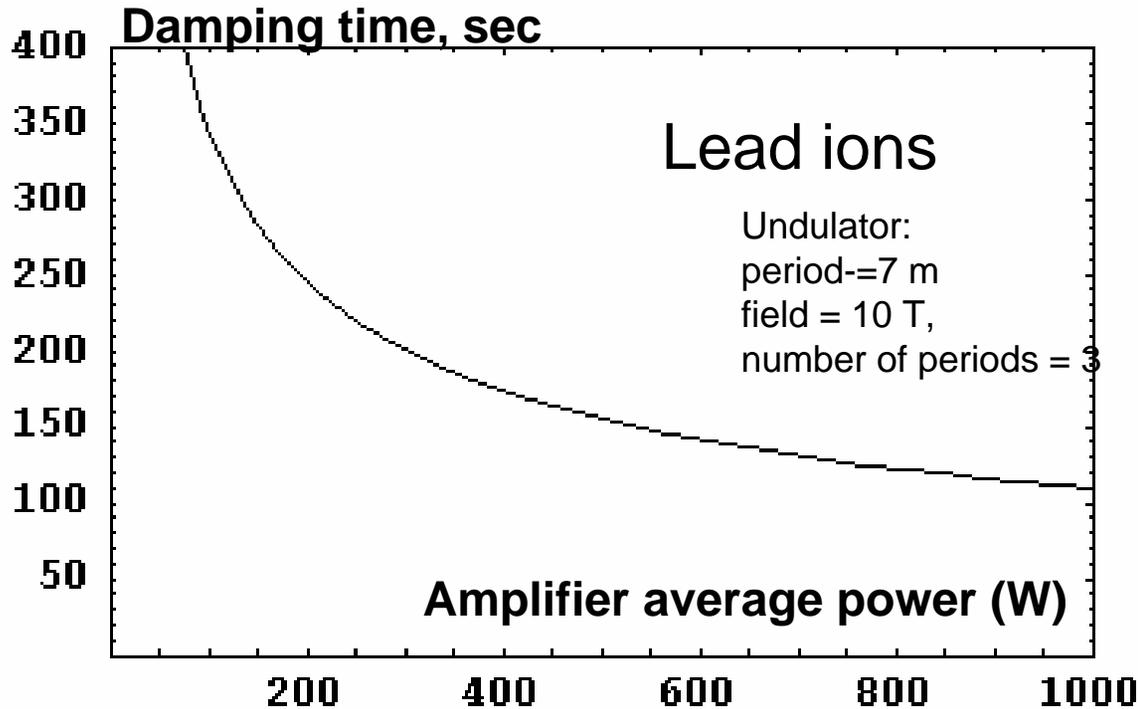
backup slide(s)



LARP

Optical Stochastic Cooling

A. Zholents



Needs for R&D:

- Bypass optics
- Optical amplifier
- Proof-of-principle with electrons

Damping time for protons ~ 5 hours at 1kW amplifier power

Plan of Action :

- support letter for OSC demonstration experiment (NSF)
- wait for results