LARP

US LARP

BNL -FNAL - LBNL - SLAC

Accelerator Systems Commissioning

M. Syphers
Fermilab

AS/Commissioning

BNL -FNAL - LBNL - SLAC

- CERN's Beam Commissioning Plans
  - Update by Roger Bailey
- Beam Commissioning -- U.S. participation
  - Update provided by Elvin Harms
- IR/Hardware Commissioning
  - Update provided by Félix Rodríguez-Mateos and Mike Lamm (plenary) and more details of Hardware Commissioning by Félix in break-out
- LHC@FNAL
  - Update provided by Elvin Harms
- Round-table discussion held this morning
  - Budget, BC participation, new initiatives, etc.

Beam Commissioning

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- **Report from CERN --**
  - **Organizational Strategy**
  - **LHC Commissioning Working Group formed**
  - **Responsible parties identified; LARP participation acknowledged**
  - **Sector Test still in plan, though perhaps slipped -- will 'know' new schedule in ~June**
    - LARP participation

LTC Dec 14th 05 : LHC commissioning organisation

from Roger Bailey

Machine Coordinator
Weekly responsibility
3 needed

Accelerator Systems
As required
Defined responsibilities

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

EIC
Scheduled shifts long term
7 needed

Operator
Scheduled shifts long term
7 needed

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M.Gruwe	01.06
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EIC4	07.06
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EIC6	01.07
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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
Impedence	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…

Tests with beam

from Roger Bailey

		Priority	Duration	Intensity	# shots	ò Intensity	Cycle	Co
			h	p+		p+		
1	End TI8, 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

U.S. Beam Commissioning Status Report

BNL -FNAL - LBNL - SLAC

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

Recent Presence at CERN

LARP

US LARP

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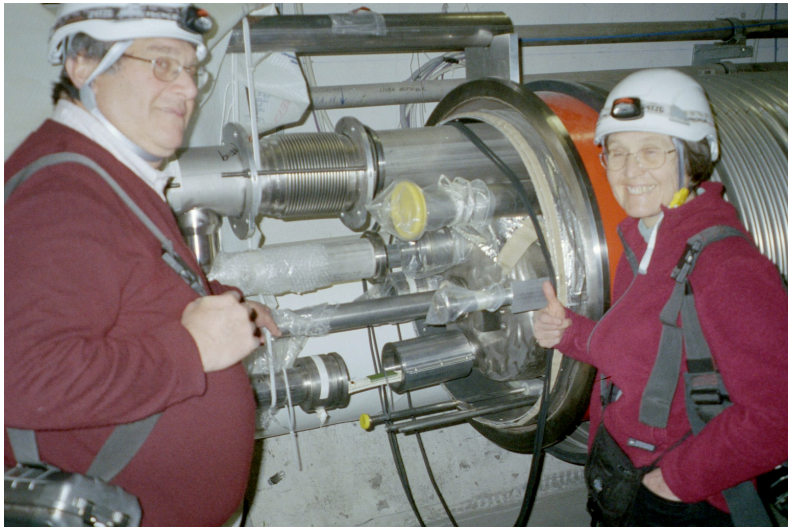
from Elvin Harms

- Several US visitors to CERN in January/February 06
  - Nearly continuous presence for ~6 weeks
  - Chamonix workshop
    - Peggs, Syphers, Harms, (Shiltsev)
  - Software
    - Gysin, McCrory, Slaughter
    - Application development/ Schottky 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



Upcoming Participation in Beam Commissioning

LARP

US LARP

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- Refining areas of involvement, beginning to assign names/share with CERN counterparts
  - ~13 LARP people identified + Toohig fellows?
- LARP presence during SPS running
  - 3 Fermilab people this summer – Ranjbar, Still, Tan
  - Others?
- Sector test presence
  - planning for late 2006/early 2007 for 2 weeks
- Software effort
  - Use Schottky as proof-of-principle
  - BC funds (1/2 FTE) reprogrammed for same
- Long-term visits planning

from Elvin Harms

Upcoming Participation – SPS Schedule

from Elvin Harms

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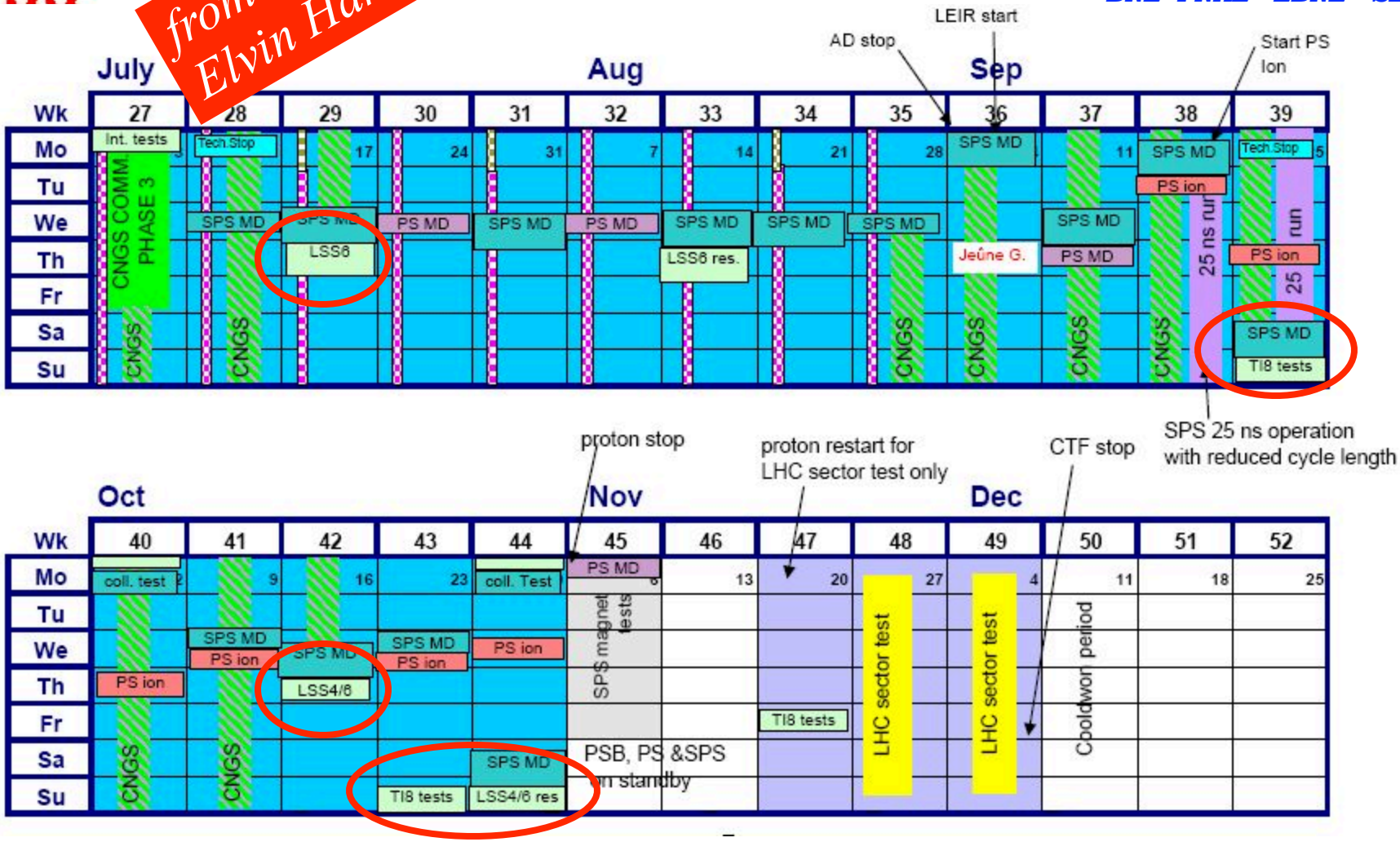

Beam Commissioning Expression of Interest

LARP

US LARP

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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 – 10 responses
  - Full roll-out this meeting
  - Please respond by 1 June 2006

from Elvin Harms

note: not JUST for long-term CERN visits

Hardware Commissioning

(Including IR deliverables)

BNL - FN

from Mike Lamm

LARP Hardware Commissioning Tasks

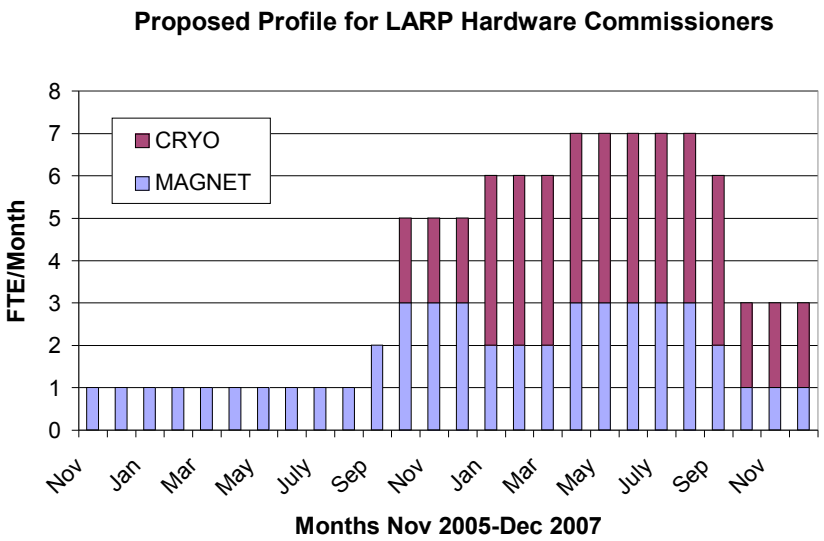
Installation Oversight

Since DOE Review Last Fall:

- First USLHC String (Q1-Q3/Feedbox/D1) transported to tunnel
- LARP Oversight and technology transfer for USLHC interconnects
- Transportation and Installation of Second IR quad/DFBX/D1 on going.
- Limited LARP oversight planned for all US deliverable installations

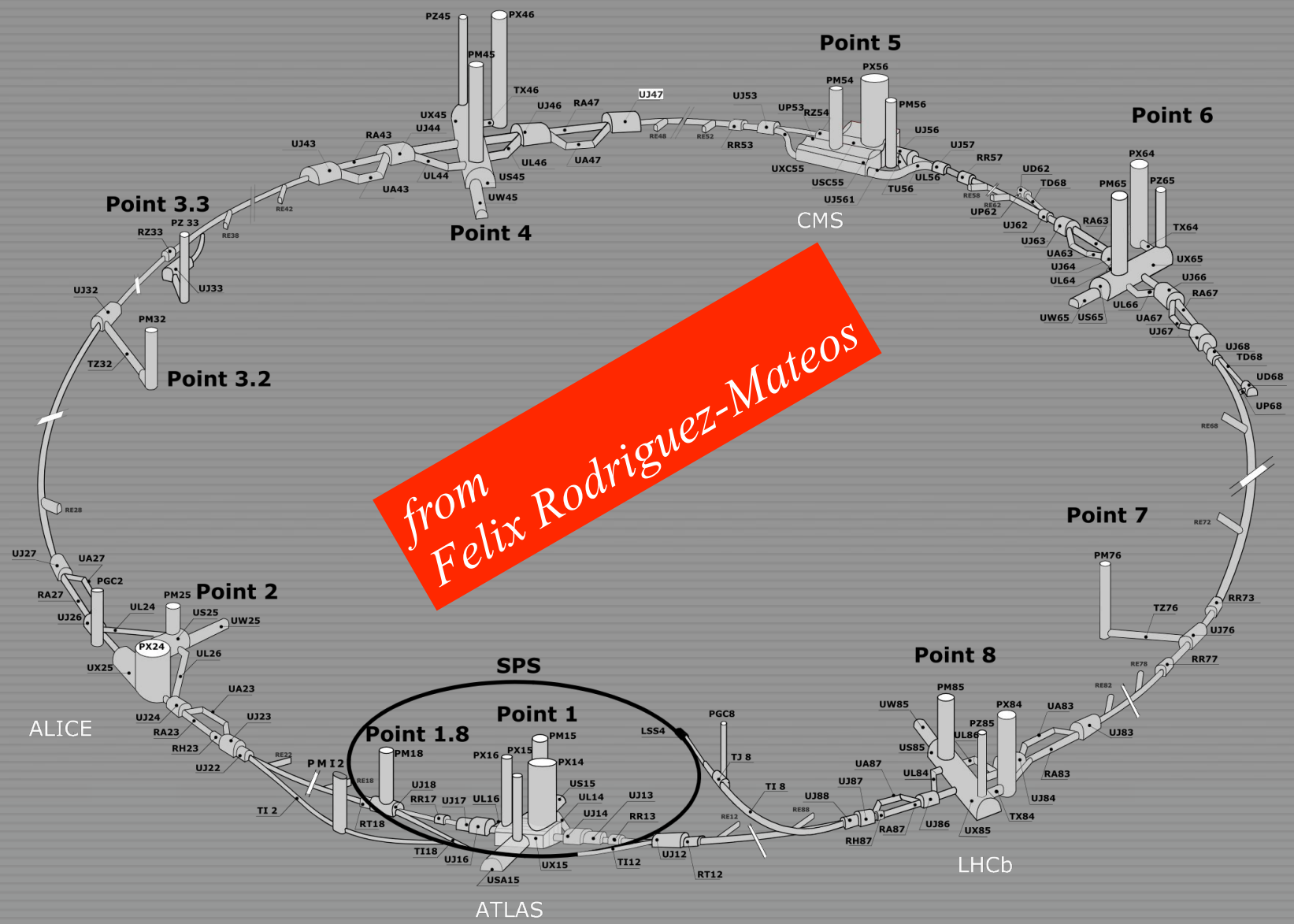
Photos from Jan 2006 IR 8L installation

- **Hardware Commissioners**
  - **lining up for 1-year stays**



One commissioner stationed at CERN now.
3-4 additional to follow in the fall of 2006.
Peak participation coincides with anticipated peak commissioning period FY07.

the sequence



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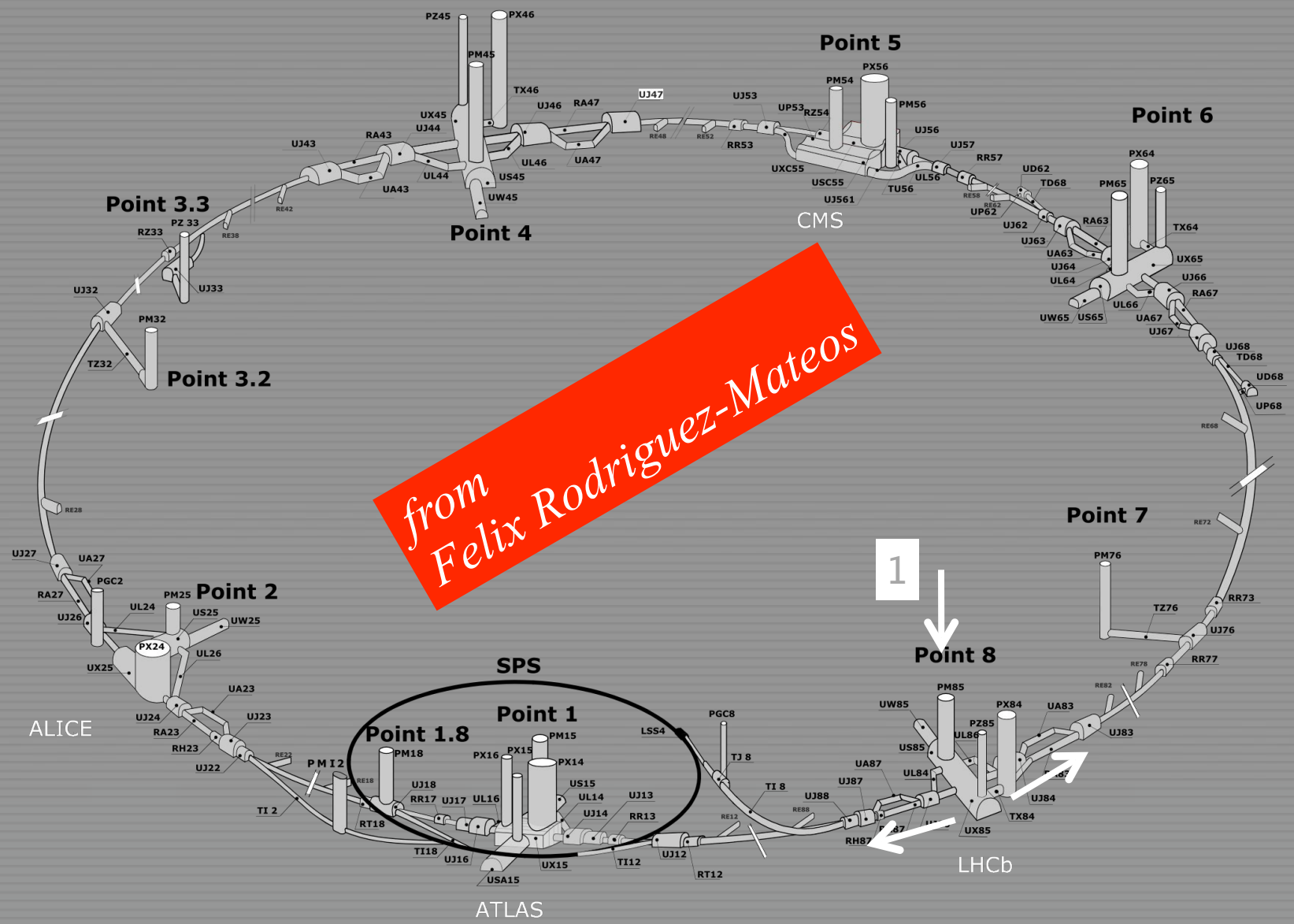

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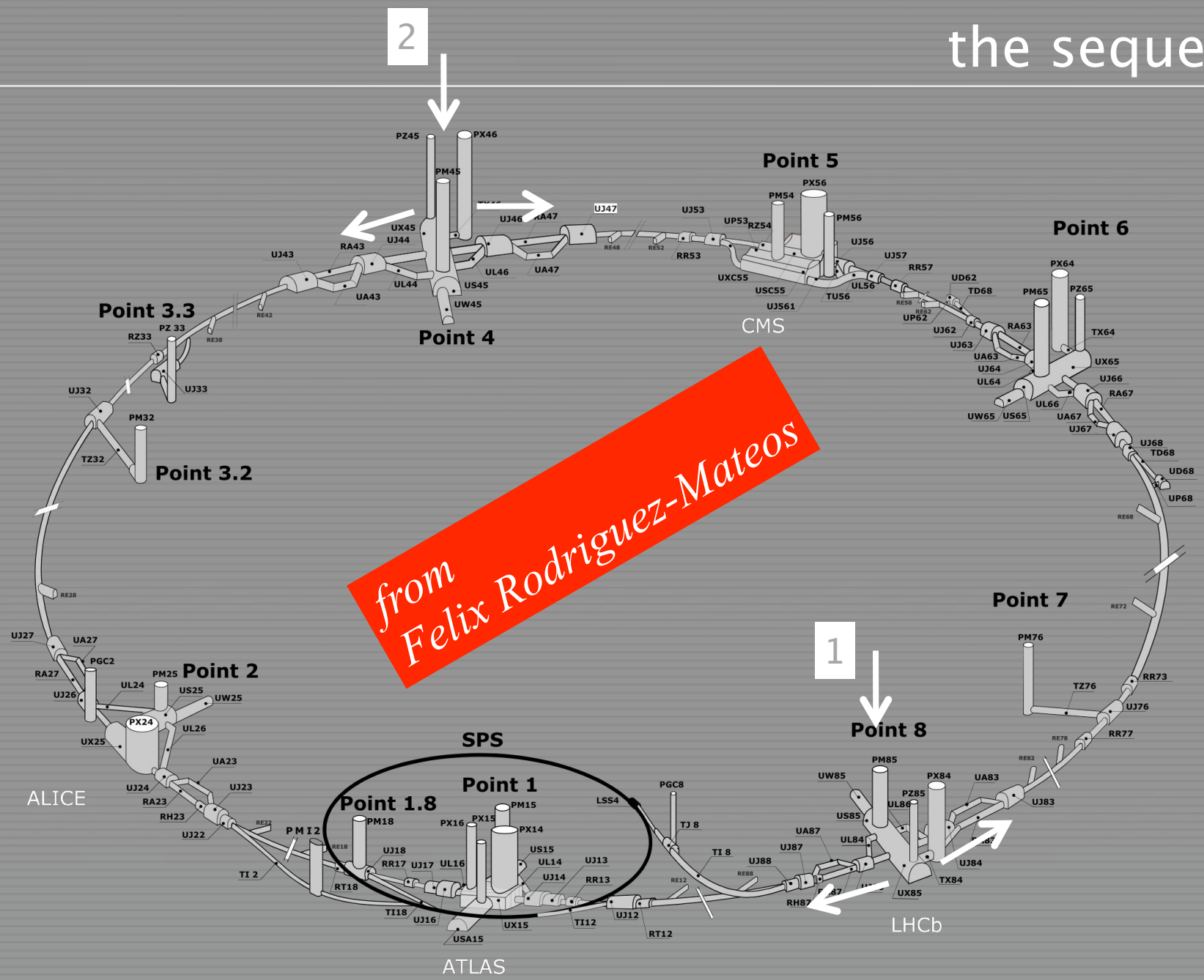

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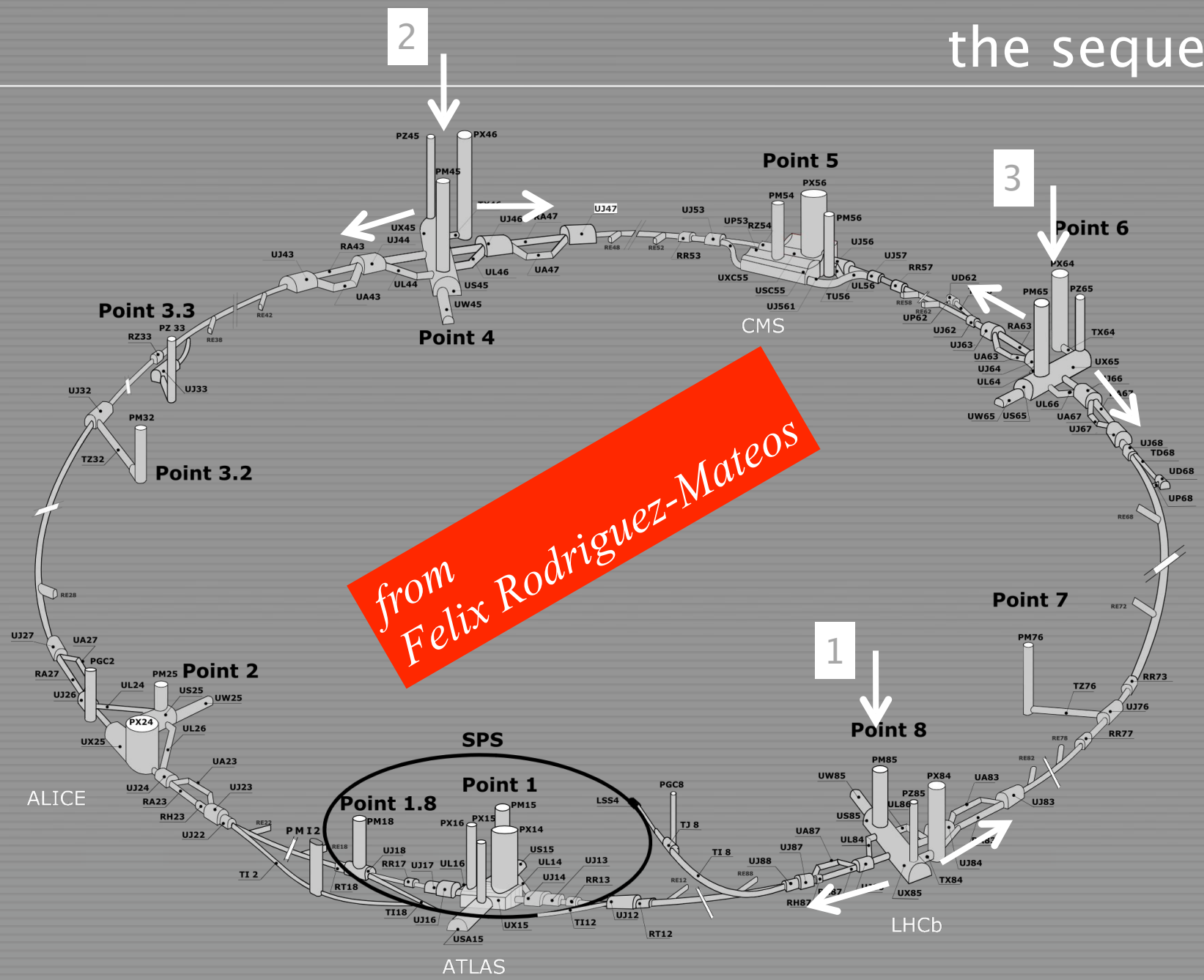

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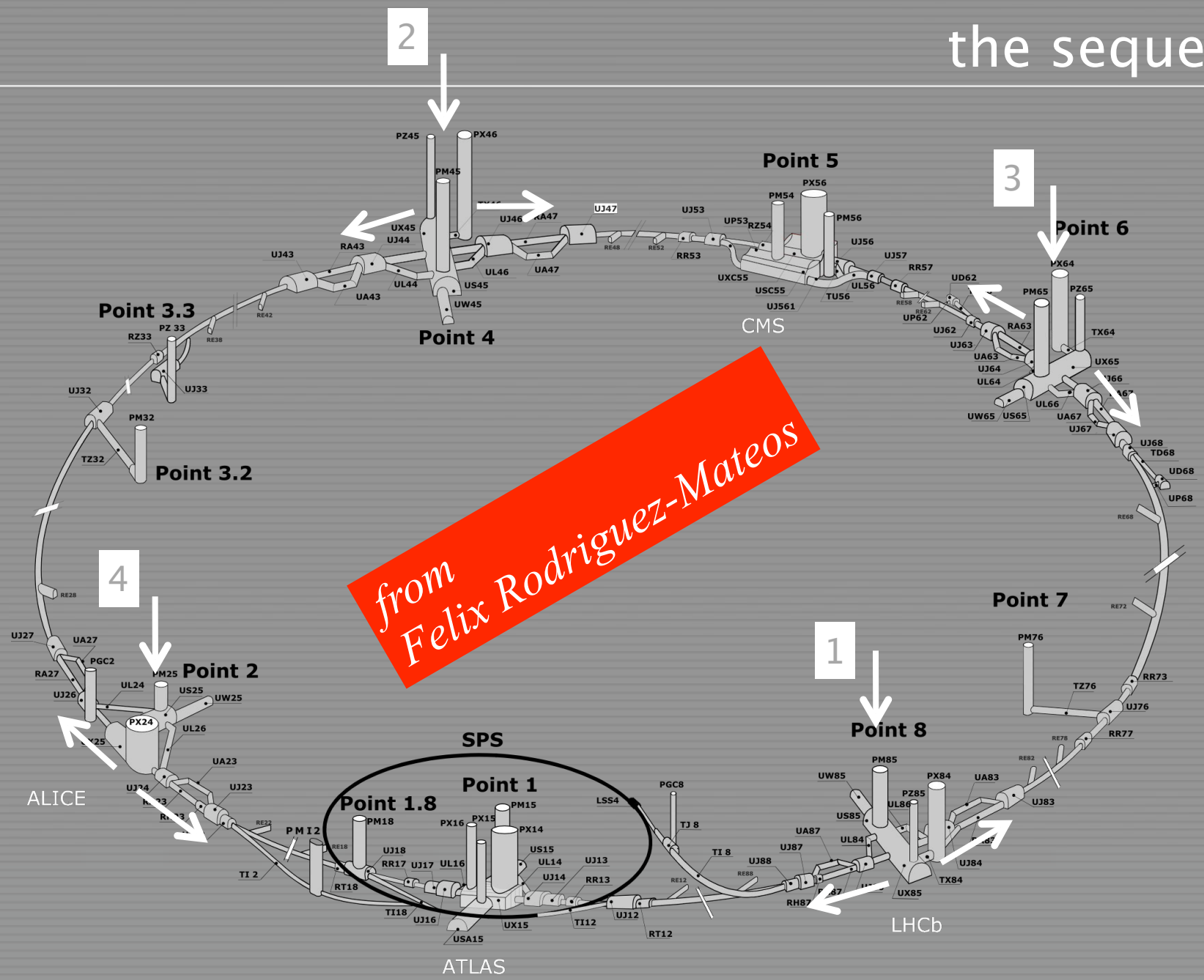
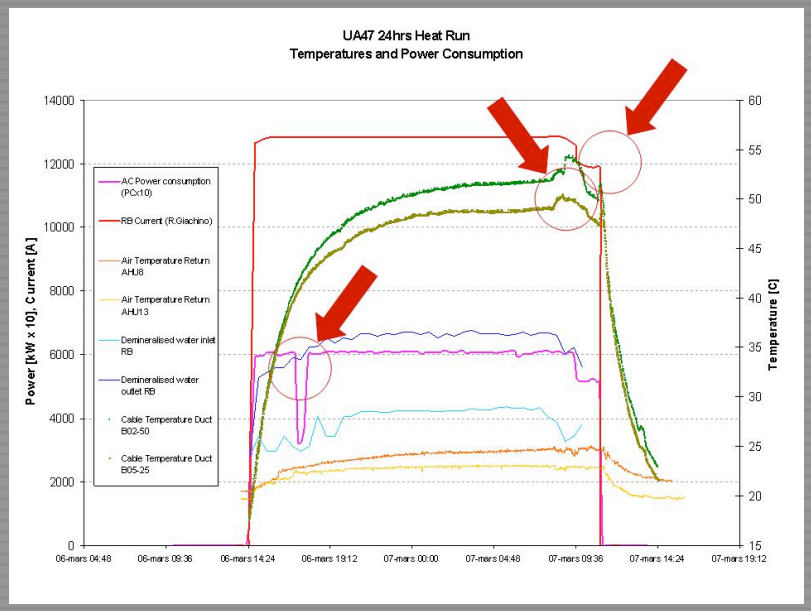


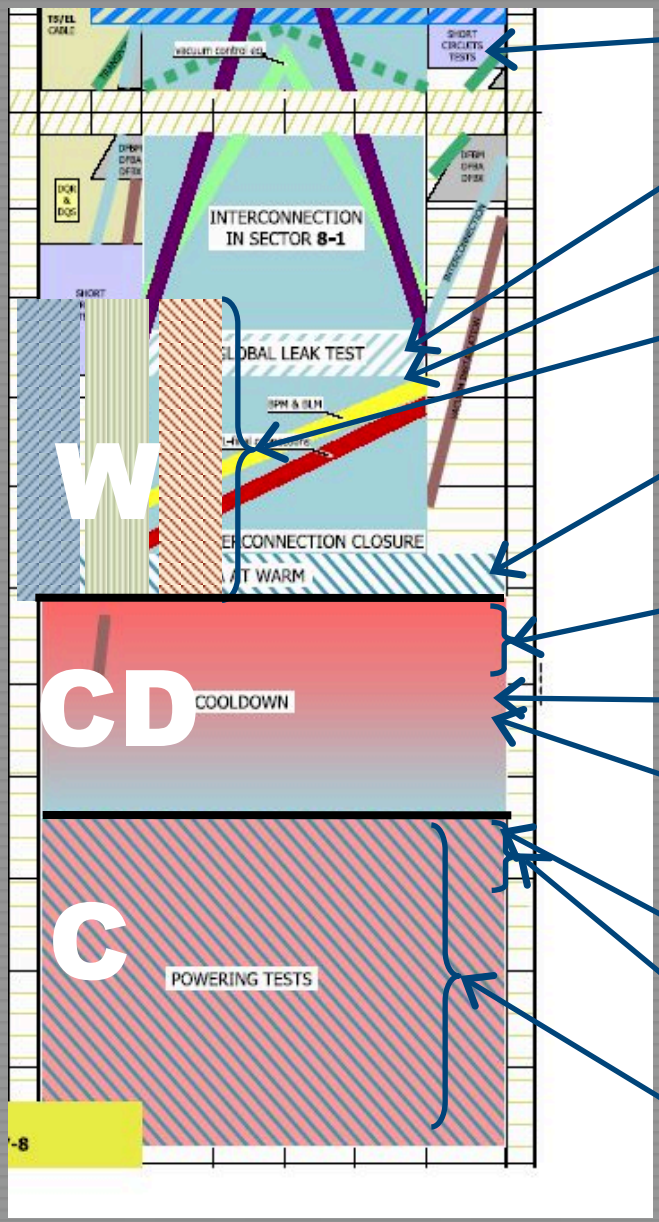
the first commissioning



Quads trip

from Felix Rodriguez-Mateos

the phases



W:SCT short circuit tests

W:LT leak test

W: PT pressure test

W:ISTs all sorts o… …s at warm

W:ELQA electrical quality assurance at warm

CD:1 cool down from 300 to 80 K

CD:2 cool down from 80 to 4.5 K

CD:3 cool down from 4.5 to 1.9 K

C:ELQA electrical quality assurance at cold

C:ISTs system tests at cold

C:PT powering tests

from Felix Rodriguez-Mateos

LHC@FNAL – LARP/LHC needs

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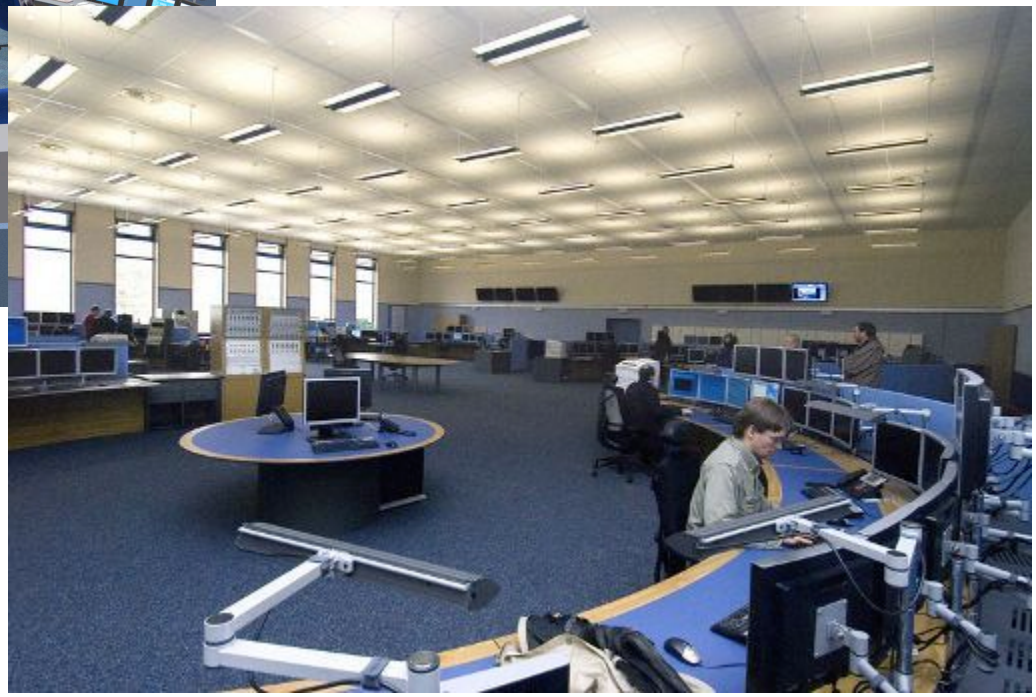
from Elvin Harms

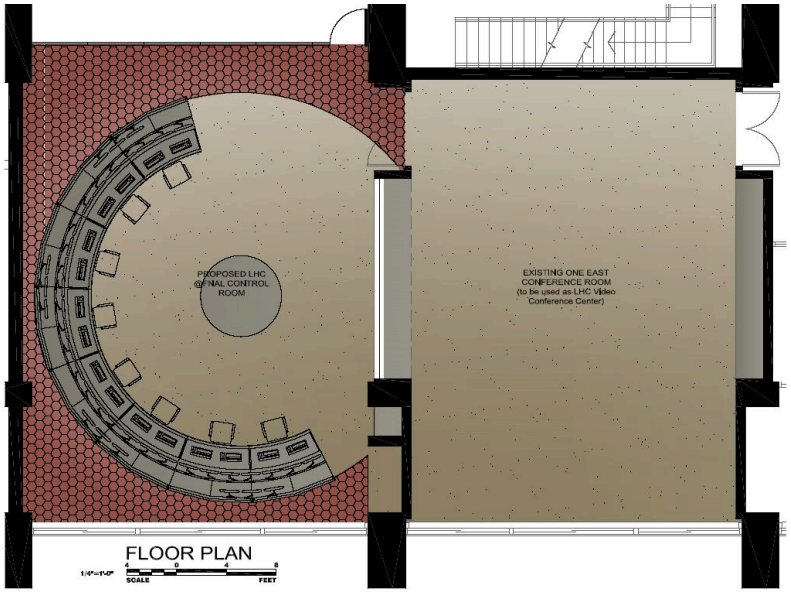


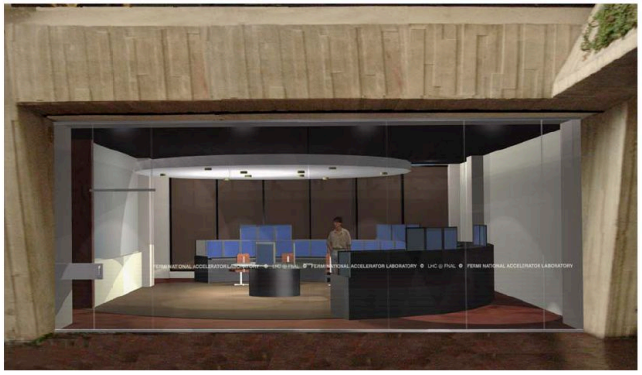
Model the CCC at CERN

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

LHC@FNAL – renderings

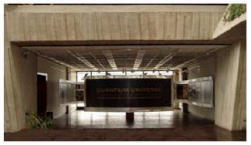
from Elvin Harms





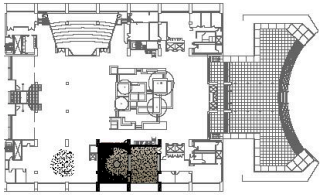
View of proposed control room - looking east from Atrium

View of existing conditions



View with projection on wall

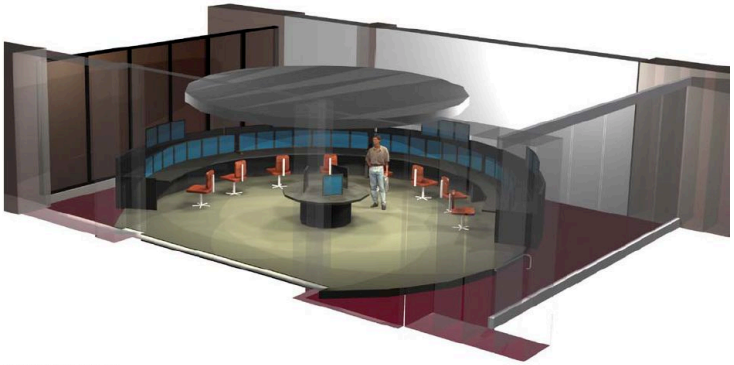
View with projection on glass



Atrium level key plan

LHC @ FNAL
OPERATIONS CENTER

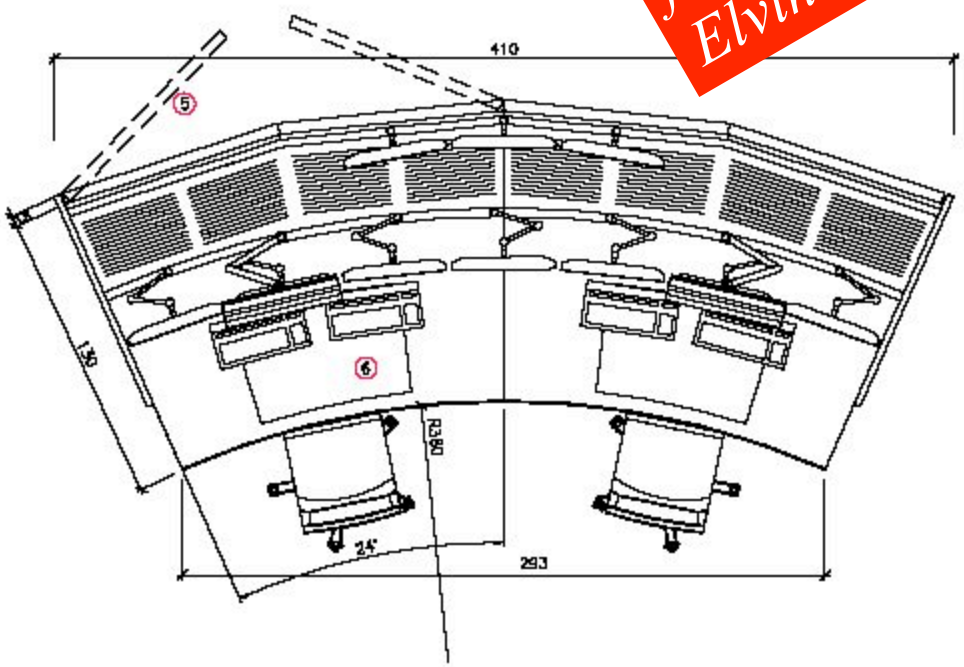
ATRIUM LEVEL PROPOSAL
April 25, 2006
FESS / Engineering

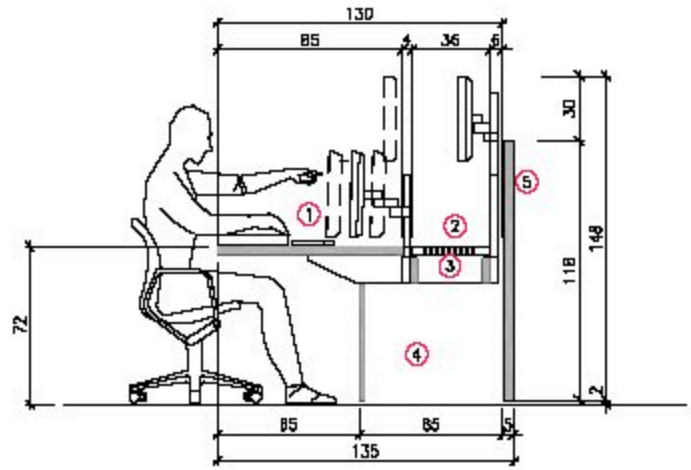


Isometric view of proposed control room

LHC@FNAL – Consoles

from Elvin Harms





① Work top
② Monitor top
③ Cable channel
④ Installation room
⑤ Acoustic screen doors
⑥ Insert
⑦ Light–top

LHC@FNAL

LARP

US LARP

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- 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

Other Discussions…

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MS, VS, RB, EH, JS, EM, SG, ML, MT

- **Friday morning discussions:**
  - **commissioning EOI form**
  - **budget issues**
    - in relatively good shape, following the re-tune, for all IR/HW/B Commissioning
  - **Software efforts within LARP**
  - **FNAL's recent SDA efforts**
    - Sequenced Data Acquisition, or "Shot Data Analysis"
    - applicability to CERN; while such is needed for LHC, should be through LARP? needs further discussion...

Software Discussions

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- Software development within LARP is not 'generic' code development; rather, part of the concept of delivering integrated packages and commissioning tools.
- R. Bailey pointed out in his talk -- need to have strong instrument commissioning teams: Instr + Ops/Controls + AP
  - should develop such teams for LARP instruments
  - implies stronger LARP presence in Commissioning

Software, cont'd

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- Instrumentation groups will need software to debug, diagnose, and implement their systems
- AP, Commissioners will require resources to help develop and use software to meet LARP needs
- Modest level of professional software engineering effort within LARP is wise investment of resources

Docs and Talks

BNL -FNAL - LBNL - SLAC

- DocDB implementation a great success!
- Thanks, Elliott!