



CERN

European Organization for Nuclear Research

Organisation Européenne pour la Recherche Nucléaire

Long Shutdown 1 (LS 1) 2013-2014

Summary of sessions 5 & 6
from the 2012 LHC workshop at Chamonix

**Frédéric BORDRY
Katy FORAZ**



Session 5 and 6 : 13 talks

Session 5

- LS1 general planning and strategy for LHC, LHC injector Katy Foraz
- Powering tests before LHC warm-up: What is new from Chamonix 2011? Mirko Pojer
- LHC consolidation of the superconducting circuits Jean-Philippe Tock
- R2E strategy and activities during LS1 Anne-Laure Perrot
- Vacuum upgrade Jose Miguel Jimenez
- Cryogenics system: strategy to achieve nominal performance and reliable operation Laurent Tavian

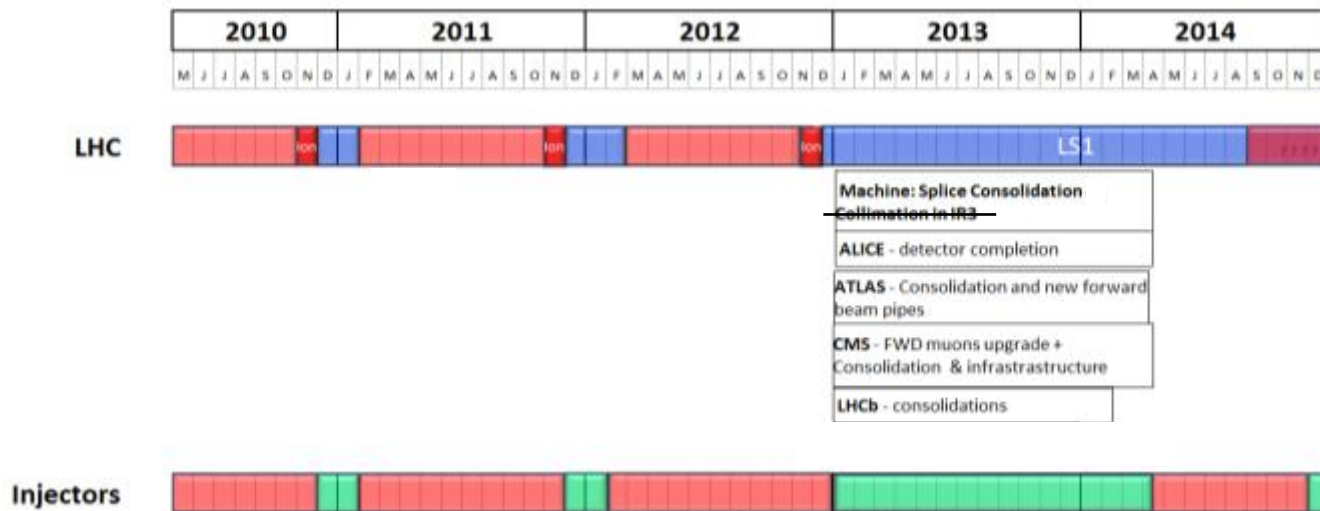
Session 6

- LHC experiments upgrade and maintenance Marzio Nessi
- QPS upgrade and machine protection during LS1 Reiner Denz
- EN-EL upgrade and consolidation Francois Duval
- EN-CV upgrade and consolidation Mauro Nonis
- Access strategy in the accelerator complex and experimental areas Rui Nunes
- RF upgrade program in LHC injectors and LHC machine Erk Jensen
- What is the maximum reasonable energy? Ezio Todesco



2013-2014 Long Shutdown (LS 1)

2012



- **Repair defectuous interconnects**
- **Consolidate ALL interconnects with new design**
- **Finish off pressure release valves (DN200; 4 sectors: 2-3, 4-5, 7-8, 8-1)**
- **Bring all necessary equipment up to the level needed for 7TeV/beam**
- **Repair He leaks (sectors 3-4 and 4-5)**
- **R2E (mainly Pt1 and Pt5)**
- **Maintenance of all the systems after 3 years of operation**

10-15 % of interconnections to be opened and to be re-welded
 100% (10'000) to be consolidated

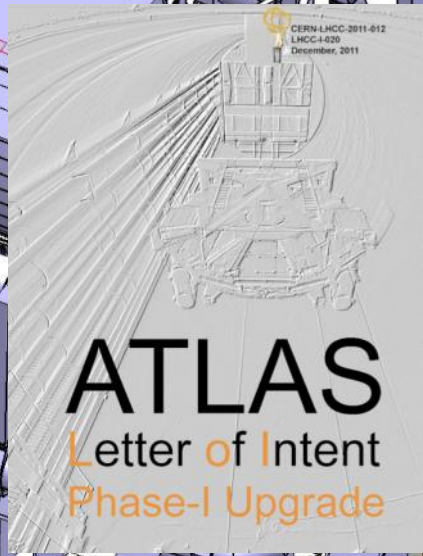
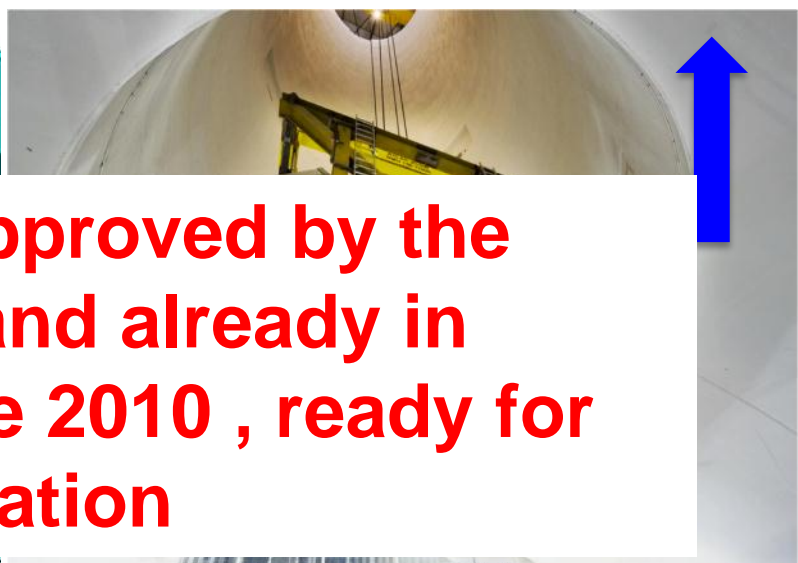
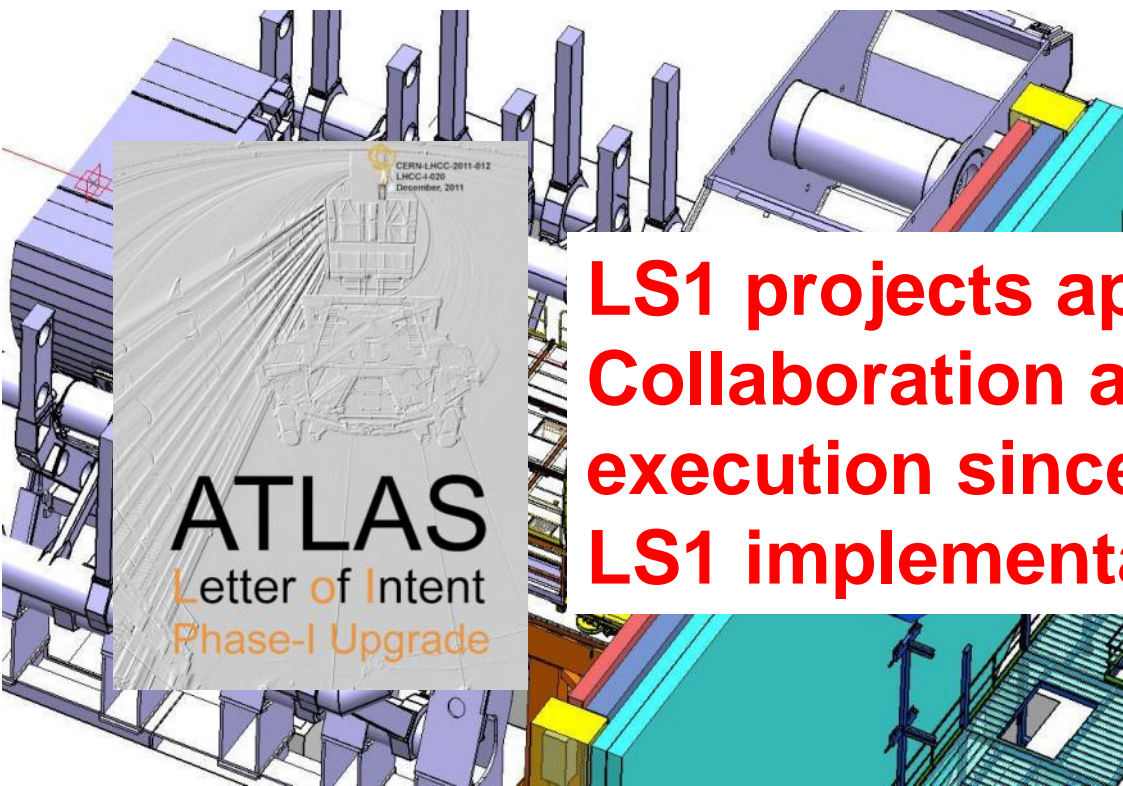


LS1 ATLAS Schedule

Driven by the work to install the new pixel layer (Insertable B-Layer (IBL) detector):

- open fully ATLAS (large opening : 2 months)
- bring Muon Small Wheel (9m diameter) on the surface
- bring pixel detector on the surface
- integrate IBL, pixel detector and nSQP in SR1 clean room
- reinstall everything and close
- commission before beam injection

**20 months
necessary**
(Ok for beam on
1st August 2014)



**LS1 projects approved by the
Collaboration and already in
execution since 2010 , ready for
LS1 implementation**

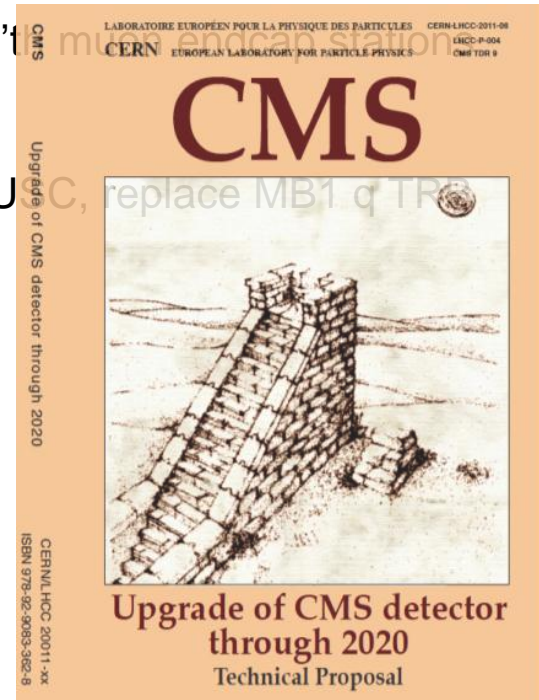


LS1 CMS Schedule

- Yoke Endcap disk 4 construction at +z and -z ends in situ, finish 4th quarter
- +z and -z (CSC & RPC)
- 1'st endcap muon station readout granularity restoration +z & -z
- Mu barrel electronics consolidation and move sector collectors to U

CMS technical proposal for the upgrade through 2020 (LS1 + LS2) [CERN-LHCC-2011-006; CMS-UG-TP-1

- Fixer concentric adjustment system
- Barrel -endcap seal revision for colder Tracker operation
- Piping and test structures for 4-layer pixel cooling
- PLT installation, BRM consolidation & upgrade
- N2/dry-air system upgrade for colder tracker operation



The complete programme of all desirable activities would require 23.5 months, but CMS can be ready for beam on 1 Sept 2014.
21.5 months from LS1 start on Nov 2012, by concentrating on critical items. In fact, a later LS1 start date, <17Jan 2013, would still allow completion on 1 Sept 2014 due to critical delivery dates locking the sequence.

21.5 months necessary
(Ok for beam on 1st September 2014)

The present CMS pixel tracker is designed for 25ns, 1×10^{34} . Pixel upgrade. It will be ready to install from June 2016 (matching LS2 baseline, pre-Chamonix 2011). => LS 1.5 (5 months)

F. Bordry, LS1@Chamonix, 15th February 2012



LS1 LHCb and ALICE Schedules

LHCb

LS1:

- Exchange of the beam pipe UX85/3
- Exchange of beam pipe support structures around transparency in the acceptance region
- Consolidation work on the magnet replacement support brackets.
- Regular maintenance work on all
- Establishing correct pressure

LS2: *A major upgrade of LHC to 7 TeV with a data taking rate of 36.1 fb^{-1} per year. This is too short for the upgrade. Presentation to the Council in 2011. LHCb and ALICE activities compatible with LHC LS1 (12-15 months)*

*to $2 * 10^{33}$ events per year – might be preparation, for*

ALICE

LS1:

- In
- serv
- Comp. *Detector system by adding the*
- Opening *to get access to the tracker for*
- consolidation
- Major consolidation work on electrical infrastructure and cooling infrastructure, with dates from LEP times



LHC Experiments General remarks

- *CMS might require a LS1.5 of 5 months after summer 2016, for the pixel installation*
- *ALICE and LHCb advance the possibility that a 1 year LS2 shutdown is not long enough, more info after LHCC step*
- *In LS1 all experiments require a very high level of support by various CERN groups. A careful planning is necessary to avoid surprises*

- BE/ABP-SU
- DGC-RP
- EN/EL,CV,HE
- TE/VSC,CRG
- PH/DT
-



LS1 activities, requests and schedule

- Meetings being held with stakeholders **(LHC machine, Injectors and LHC experiments)**
 - ✓ Goal of activities
 - ✓ Time key drivers
 - ✓ Support needed
- For accelerator complex: database of requests is being filled : **LHC and injectors**
- To **detect** conflicts/overloads & to **decide** what is compulsory, what we can afford & what we have to postpone to LS2
- **Priorities set for LHC machine**
 - P0: Safety
 - P1: Beam to 6.5-7TeV, nominal performance
 - P2: Reliable operation improvement
 - P3: CERN approved projects
 - P4: no CERN approved projects

Status: Proposed Priority:

Preliminary powering tests

Please indicate a title for your request

General Information

• Group: BE-OP Technical responsible: M. Pojer

• Goal: Complete test up to 7 TeV: of the missing 600 A circuits (RQS.L2B1, RQT13.R1B1, RQS.R2B2, RQTF.A45B2, RSS.A45B1, QT13.L5B1, RCO.A7B2, RQS.L8B1, RQS.R8B2) RD3.R4, RD3.R4, RD2.R8 and RQX.L5 Train 600A and 80-120A circuits to 7TeV - 2-quenches rule was introduced to shorten commissioning RQT11.R5B1,

• Mod. Operandi: Power the circuits up to 7 TeV equivalent current
In case of quench, power again; repeat up to n quenches (number to be defined with MP3 and experts)
If the circuit cannot reach 7 TeV, then diagnostics have to be carried out to identify the problem; in case of a serious problem, a decision must be taken
Notes - Non conformities on splices, shorts and open circuits (already known and well documented):

• In which period do you intend to perform the activity? LS1

• Facility concerned: LHC-machine

Resources, schedule, support

• Resources: (please describe your resources, and the external resources needed to perform the activity)

• Duration: 4 edays/sector - 2 sectors in parallel Constraints on schedule: before warm-up

• Support needed from other groups

CV <input type="checkbox"/>	HE <input type="checkbox"/>	CRG <input checked="" type="checkbox"/>	MSC <input checked="" type="checkbox"/>	MME <input type="checkbox"/>	OP <input type="checkbox"/>	ICE <input type="checkbox"/>	RP <input type="checkbox"/>
EL <input type="checkbox"/>	VSC <input type="checkbox"/>	SU <input type="checkbox"/>	MPE <input checked="" type="checkbox"/>	EPC <input type="checkbox"/>	CO <input type="checkbox"/>	MEF <input type="checkbox"/>	GS <input type="checkbox"/>

Information on support needed from other groups: Cryo OK needed

• Budget: N.A.

Other Relevant Information

• Please describe the impact on other equipment:

• Please describe the impact on other facility:

• Please describe if a test is needed afterwards:

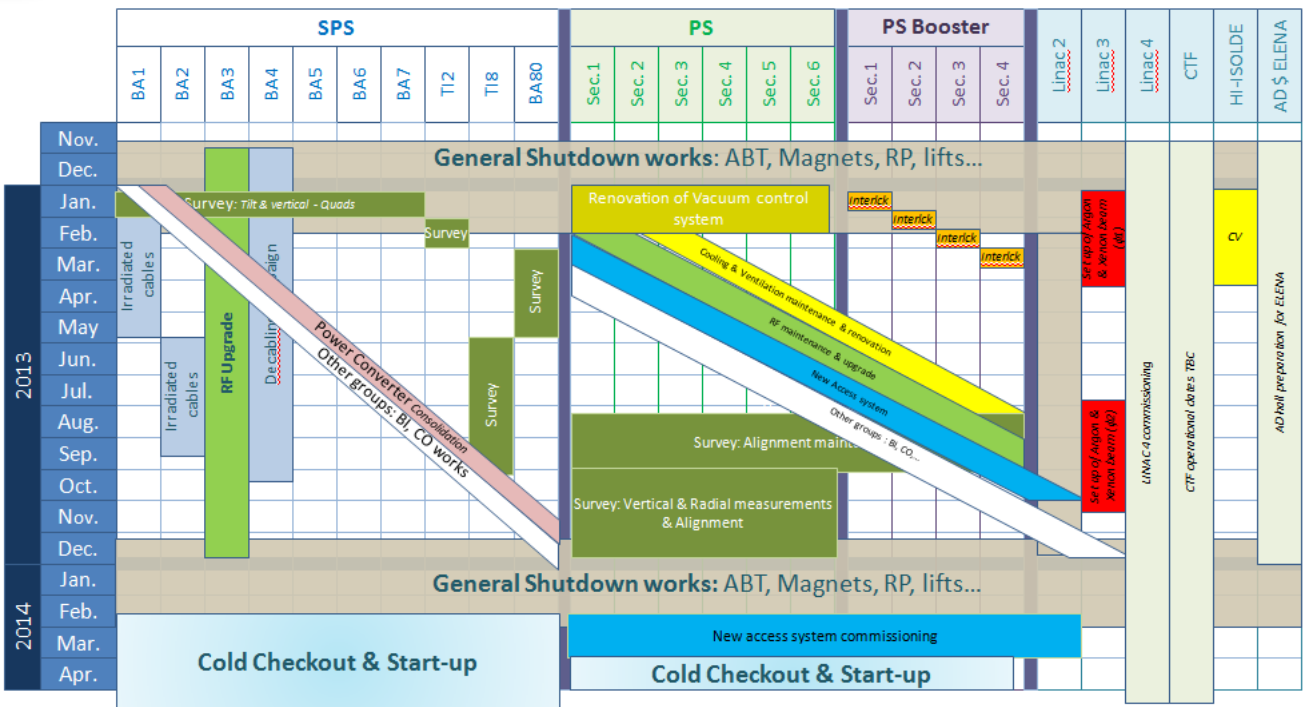
• Please describe the preparatory works needed (in particular if you need support from other groups):

• Please indicate any other relevant information:

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LS1 Global Schedule of LHC injectors



- **Early 2014 :Cold check-out and Start up**
- LINAC3 : set up of Argon and Xenon beam
- LINAC4 commissioning
- CTF operational – dates TBC
- HI-ISOLDE: Cooling & Ventilation works
- AD & ELENA: AD hall preparation for ELENA

Will be detailed during IEFM workshop 7-9 March 2012

LS1 – LHC :one typical sector

Powering and ELQA tests prior to Warm-up (4+4 d)

- qualify circuits except mains to 7TeV
- fault localization..
- CSCM (1 sector)

Warm-up: incl. vacuum leak tests at 80K (1wk) to localize leaks

Maintenance & consolidation

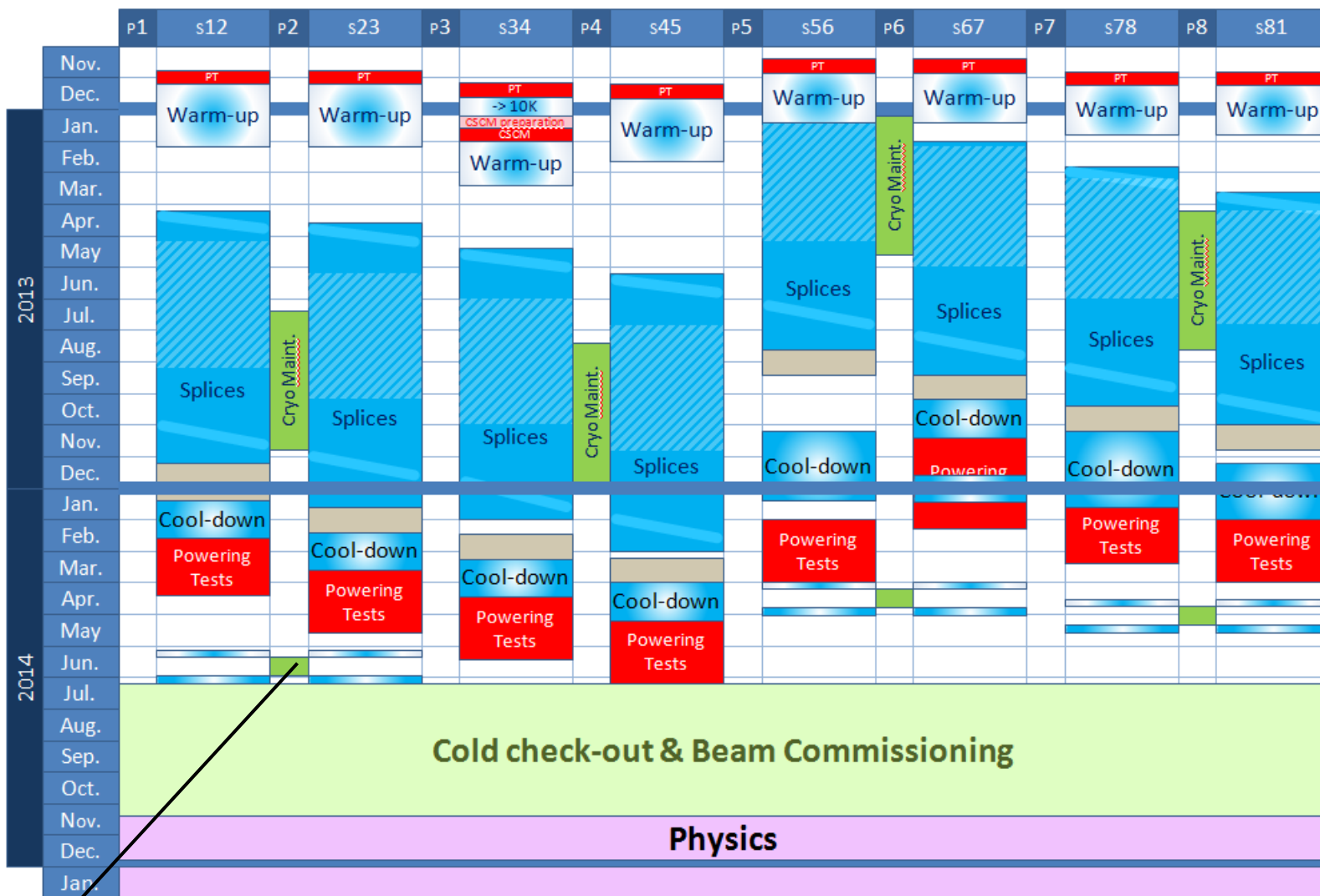
Preparation for & cool-down

Powering tests





LS1 Global Schedule: LHC

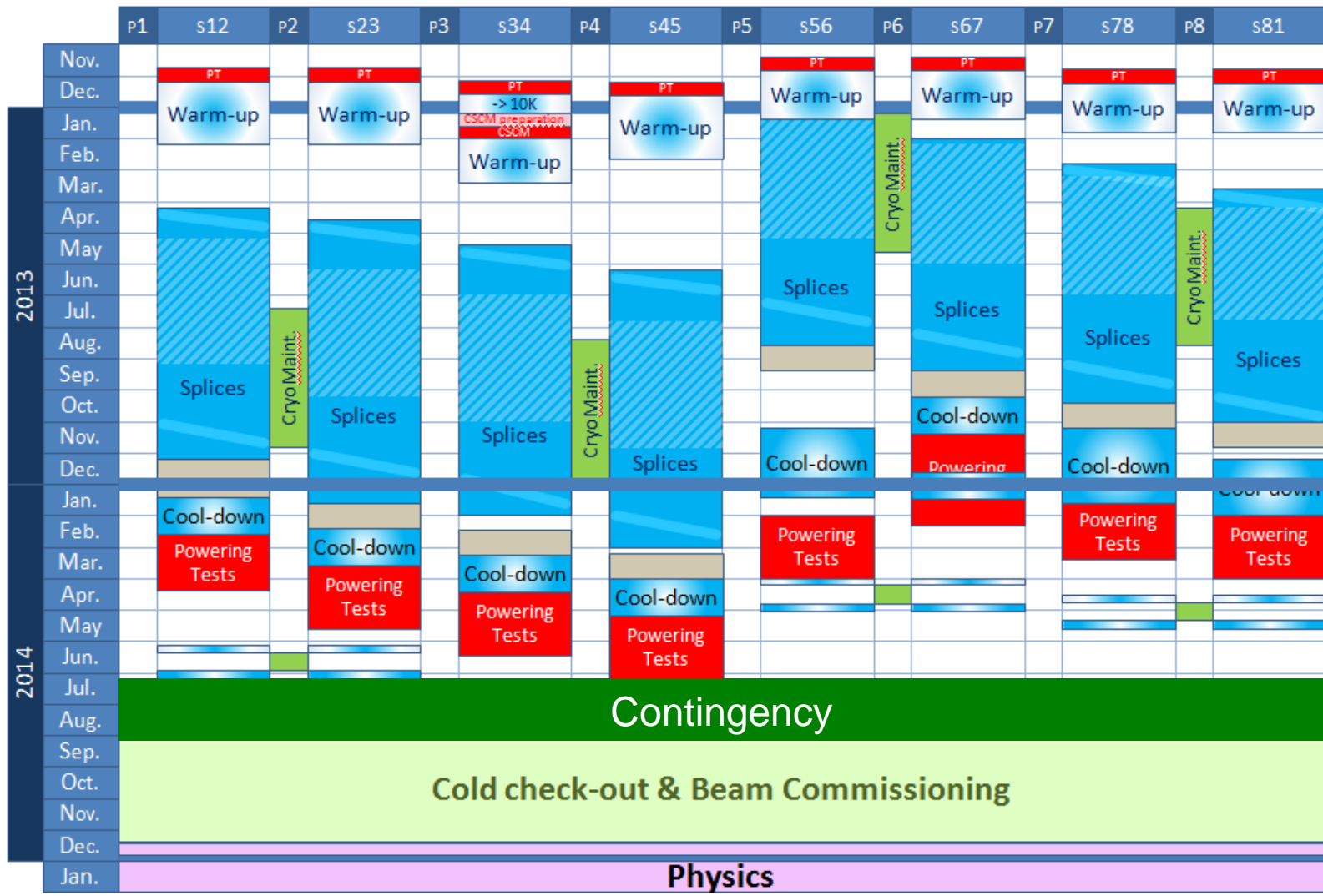


Additional period of maintenance in 2014

1 week stand-by 2014-2015



LS1 – Physics to Physics 24 months





Powering tests before LHC warm-up

• Excluding the main circuits (RBs, RQD/Fs) and not considering sector 34, at the end of 2008, all circuits were commissioned to 7 TeV equi. current, except:

- RQX.L5 was commissioned to less than 5 TeV, due to change in nominal current
- IPDs
 - I_nom was changed for RD3.R4 and RD4.R4 after commissioning, which then resulted in less than 7 TeV (6.6 and 6.3 TeV, respectively)
 - **RD2.R8 quenched 4 times (5816, 5788, 5856 and 5854 A) at less than 6.8 TeV**

**Commission up to 7 TeV all circuits, in particular:
RD3.R4, RD4.R4, RD2.R8 and RQX.L5
plus all missing 600 A circuits
plus all circuits in sector 34**

- RCBYH4.R8B1 had a ramp-down quench after attaining the nominal (limited to 50 A)
- (IPQs all fine for 7 TeV)



Strategy for the powering tests (4 TeV => 7 TeV)

	p1	s12	p2	s23	p3	s34	p4	s45	p5	s56	p6	s67	p7	s78	p8	s81
Nov.																
Dec.		PT		PT		PT -> 10K		PT		Warm-up		Warm-up		PT		PT
Jan.		Warm-up		Warm-up		CSCM preparation CSCM		Warm-up		Warm-up		Warm-up		Warm-up		Warm-up
Feb.						Warm-up										

- Full support by experts (QPS, EPC) during the testing phase
- nMP3 should quickly analyze critical cases
- To reduce the impact on other activities (i.e. EIQA), powering tests will have to be performed during evening/night for the high current circuits; 600 A and below are in phase I
- Documentation:
 - **Powering procedures** will be written this year on the tests to perform and the way to execute them
 - **Status report** will be written after the campaign, including
 - Powering history
 - Electrical NC
 - EIQA test results: transfer function, etc...



Consolidation of the main splices

1. Functional specification has been edited
2. A final design for shunt and insulation is available
3. Qualification criteria have been found adequate
4. The consolidated "shunt" design has been endorsed by the Review Committee
5. The installation of a single shunt on the quadrupole circuit has been endorsed by the Review Committee under conditions

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the
Large
Hadron
Collider
project

LHC Project Document No.
LHC-QBBI-ES

CERN Div./Group or Supplier/Contractor Document No.
TE-MSC

RWRS Document No.
1171853

Date: 18/11/2011

Functional specification

SPECIFICATION FOR THE CONSOLIDATION OF THE LHC 13 kA INTERCONNECTIONS IN THE CONTINUOUS CRYOSTAT

Abstract

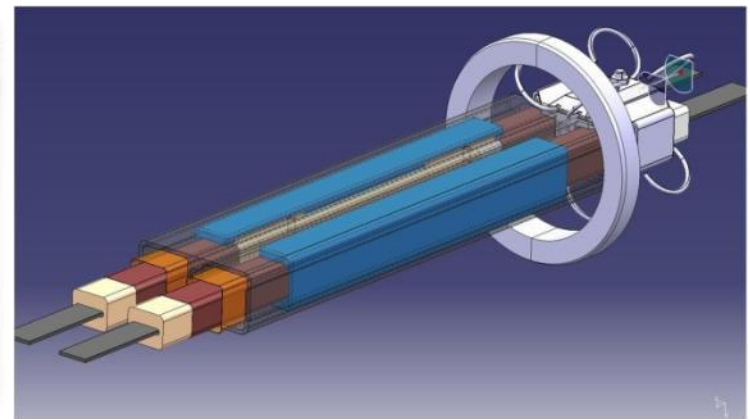
This document summarises the functional specification and the derived engineering specification for the consolidation of the 13kA interconnections that connect in series the LHC Main Dipole magnets (MB) in the RB (3390 interconnections) circuit and the LHC Main Quadrupole magnets (MQ) in the RQ circuit (6700 interconnections).

Prepared by :
Paolo Fessia

Checked by :
The splice task force
(A. Perin, A. Verveij, C. Garion, C. Scheuerlein, D. Duarte Ramos, F. Bertinelli, Frederic Savary, F. Lackner, G. Willering, H. Ten Kate, H. Prin, JP. Tock, N. Catalan Lasheras, P. Fessia, S. Mathot, S. Sgobba)

G. Dangelo, R. Momo, A. Siemko, L. Bottura, S. Atieh, R. Principe, F. Cerutti, S. Rosler, E. Cennini, Ralph Trant

Approved by :
F. Bordry



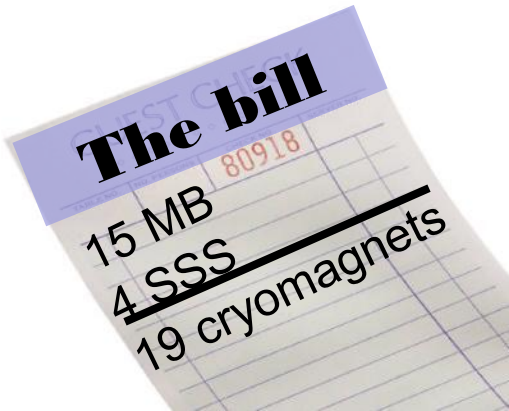


Special interventions : List is defined

Exchange of cryomagnets

Reason	dip	SSS	Tot	Remark
High inner splice R	8	1	9	For possible low mechanical strength (2336-2395)
Damaged QH circuit	4	0	4	7 in total but 3 can be repaired in-situ (IFS)
Wrongly oriented BS	2	0	2	Out of 12 dip and 2 SSSs
Restore RQS in 34	0	2	2	EDMS 103939 (Q23 & 27R3)
Low voltage withstand	1(0)	0	1(0)	1.6 kV instead of 1.9 kV, maybe in-situ repair : beginning of LS1
Replace RCBCHS5.L8B1	0	1	1	Q5 L8 / NC 831927 / 2 nd priority
Leaks	0	0	0(1)	Hopefully repairable in-situ or acceptable
Undulator	(1)	0	0	To be decided in 2012
	15	4	19	

spread all around . WORK ON LEAKS, FIVIS,

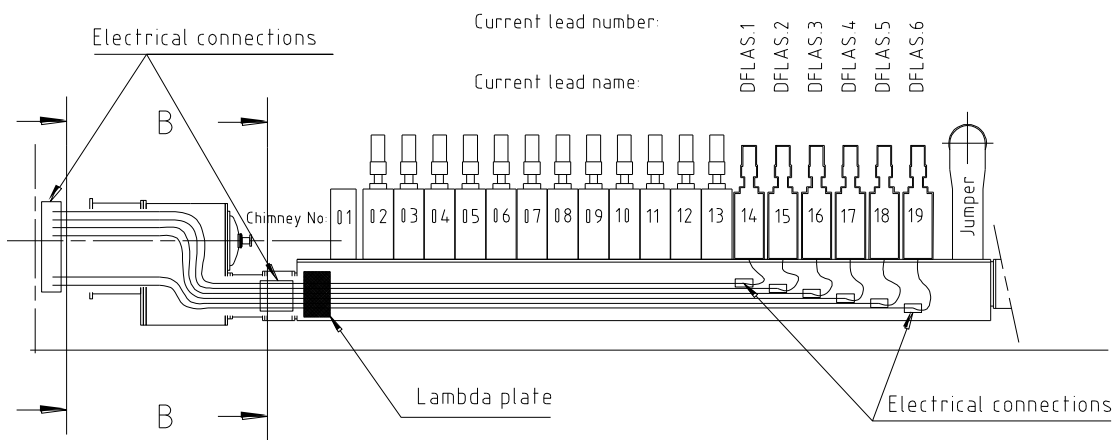
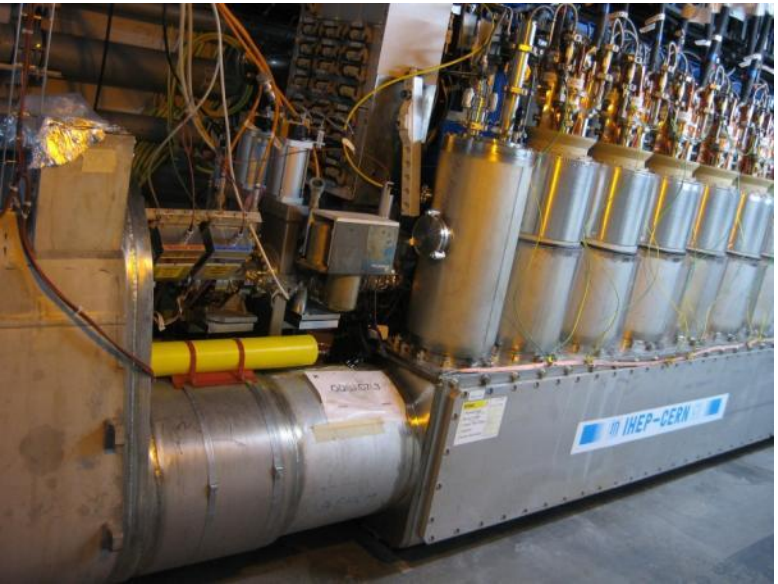




Consolidation of the DFBA splices

- It has been decided to consolidate the 13 kA splices inside the DFBA's
- Same standard as the magnet to magnet ones
- Same crew for the repair of splices
- Important differences exist wrt to the arc splices so specific design has to be **quickly initiated**

- 2 out of 16 DFBA's will be very difficult to repair in-situ
- Failure in the DFBA would lead to a very long repair time
- Mock-ups are necessary to define and test tooling and procedures

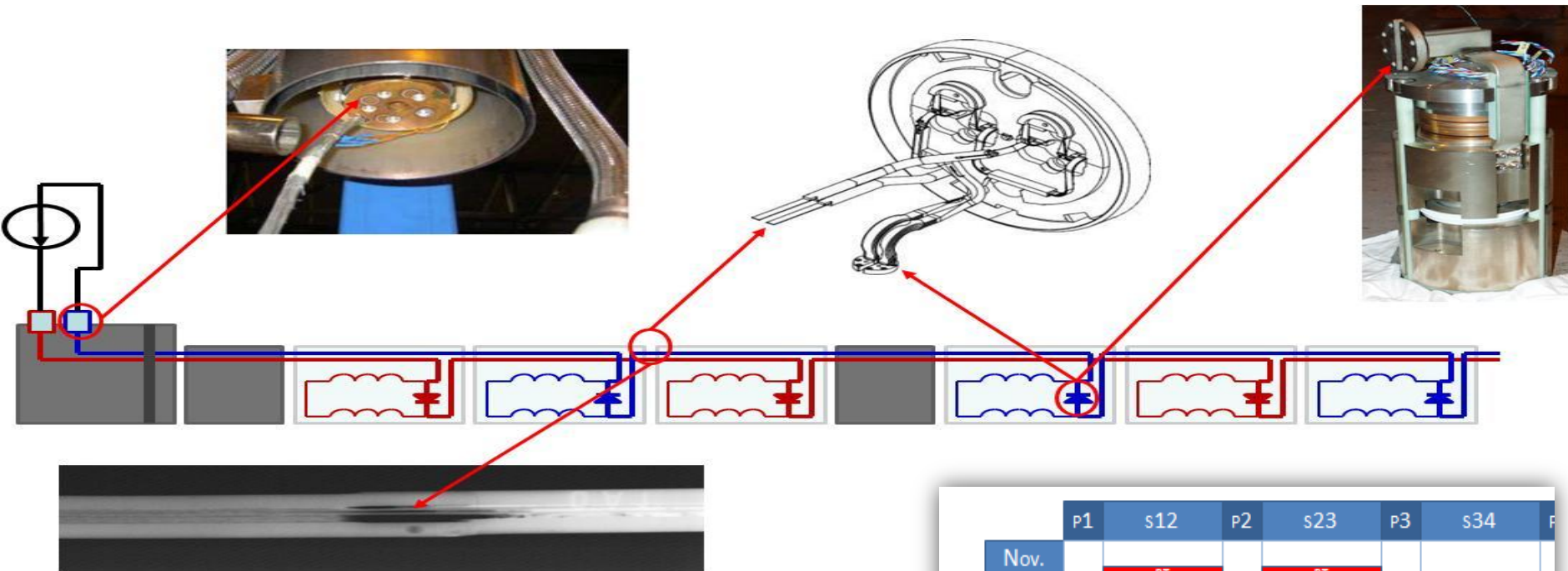




Open issue : CSCM (Copper Stabilizer Continuity Measurement)

Proposal :

Use this method to qualify the consolidation of the splices (And other parts of the 13 kA SC circuits) for 7 TeV operation and validate the whole bypass circuit



Planning:

	p1	s12	p2	s23	p3	s34	p4
Nov.		PT		PT			
Dec.		Warm-up		Warm-up		PT -> 10K	
Jan.						CSCM preparation CSCM	
Feb.						Warm-up	

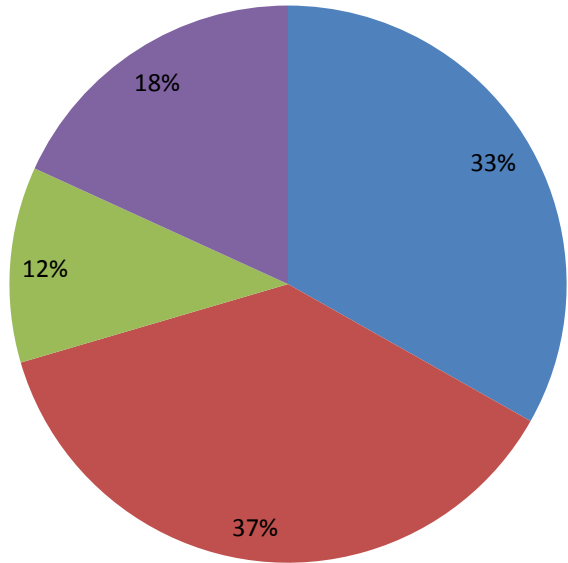
- Final approval in October 2012
- Type test to be done in one sector at the end of the run (4 weeks) (sector 34 in Jan. 2013)
- CSCM campaign at the end of LS1 (Impact 4 weeks if 8 sectors)

Resources / Planning for IC/magnet work

- Current estimate for IC/magnet work (IC train, SIT, DN200):
- ~220 persons needed
- ~80 % are identified (but not all at CERN and experienced)
- Still unknowns (DFBA, NC, undulator, open issues,...)
- Contribution from CERN groups outside TE under finalisation (Keep commitment)
- Only 1/3 of staff is trained ; training will be a challenge in 2012

- Schedule is ambitious

■ Trained ■ Ident, To train ■ New FSU ■ Mssing





R2E strategy & activities during LS1

Foreseen improvements

2011:

- **Failures (beam dumps): expected: ~100 -> observed 70**
- **Performed mitigation actions:** IR7 Shielding, QPS/Cryo Patches, early relocations (PLCs, B/P/WIC, RTUs, Fire/ODH)

2012:

- **Failures (beam dumps):**
 - without further improvements: ~ **200 (extrapolated from 2011)**
 - with additional mitigation actions: **30-50 (expected)**
- **Performed mitigation actions:** P1 Shielding, QPS/FGC/Collimation Patches, additional relocations (UPS, PLCs, Fire)

After LS1:

- **Failures (beam dumps):**
 - without further improvements: **>600 (extrapolated from 2011)**
 - with additional mitigation actions: **< 20 (expected)**
- **Mitigation actions:** remaining relocation (UJ14/16/56/76, US85), remaining shielding (RR 13/17/53/57), new developments (QPS, FGCs, PC R&D)



R2E mitigation activities during LS1

Point 1

10 groups involved

relocation (UJ14/16 to UL14/16): 15 racks & 2 power converters

shielding (RR13/17): cast iron wall

Point 5

12 groups involved

relocation (UJ56 to UL557 and USC55): 35 racks & 2 power converters

shielding (RR53/57): cast iron wall

Point 7

11 groups involved

relocation (UJ76 to TZ76): 40 racks

Point 8

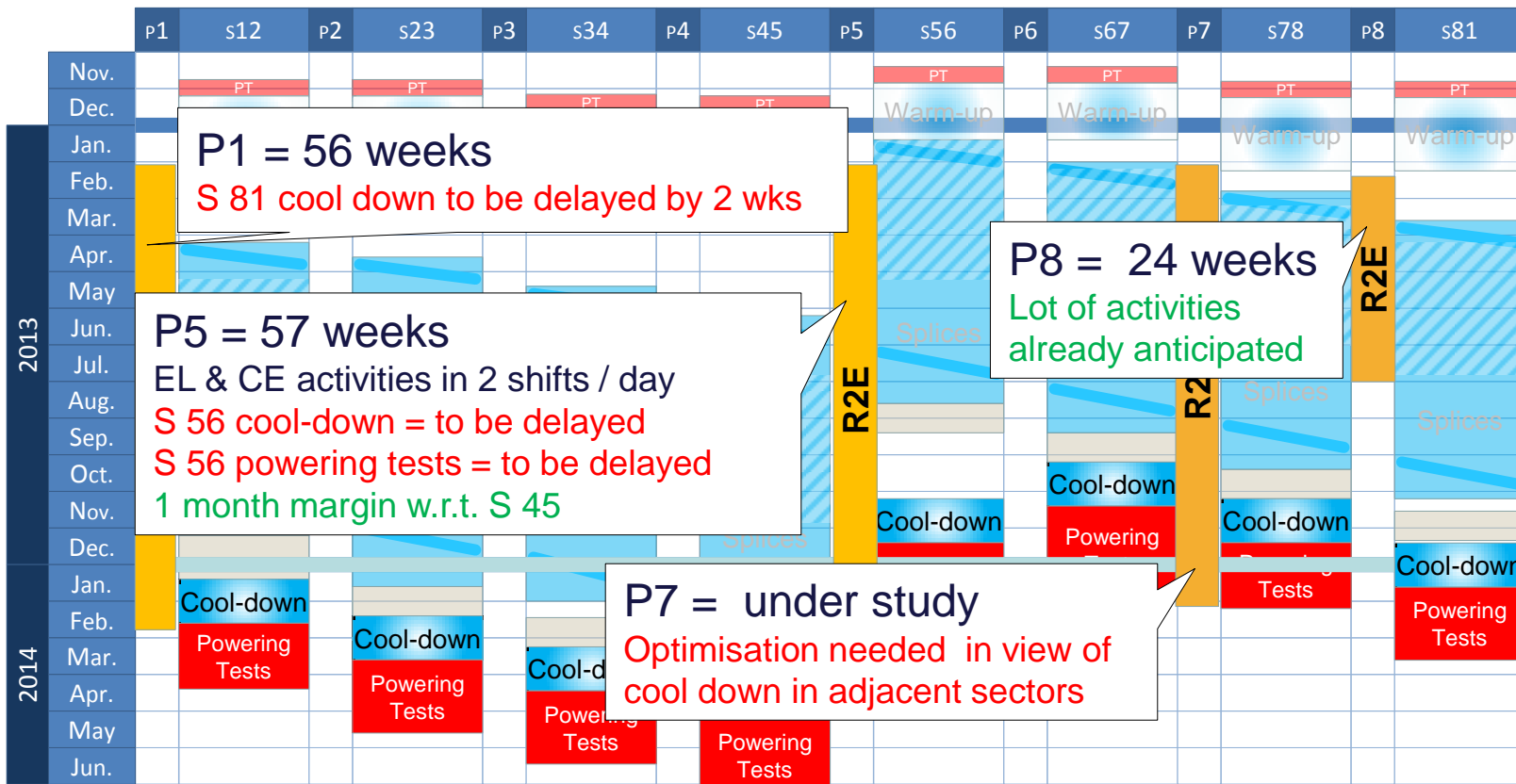
7 groups involved

relocation (US85 to UL84/86 and UA83/87): 2 UPS, 4 racks, 24 valves positionners,

shielding (US85): cast iron wall



R2E activities schedule during LS1

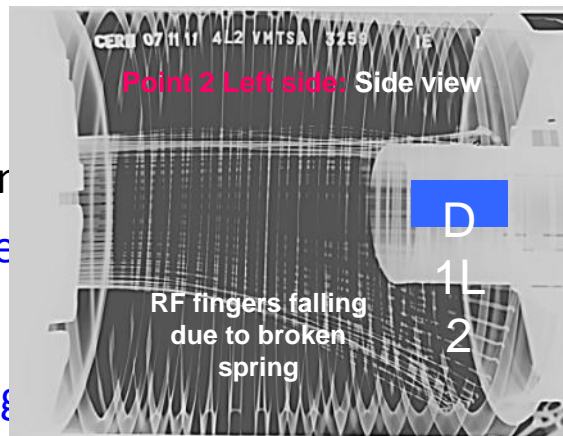




Vacuum activities during LS1: LHC

- Safety
 - All consolidations related to Safety of personnel and of the accelerator will be completed
- Performances
 - Vacuum system will be prepared for 7 TeV operation with high bunch populations up to ultimate
 - Electron Cloud will be mitigated whenever feasible (at reasonable cost: resources & budgets)
 - Sources of background to Experiments is a priority: HOM, RF inserts, ferrite heating...
 - Review all the vacuum devices that have RF impedance fingers (redesign or repair)

- Reliability
 - Vacuum systems and in... will be increased: target
- Operation margin
 - Will give room for mitigation





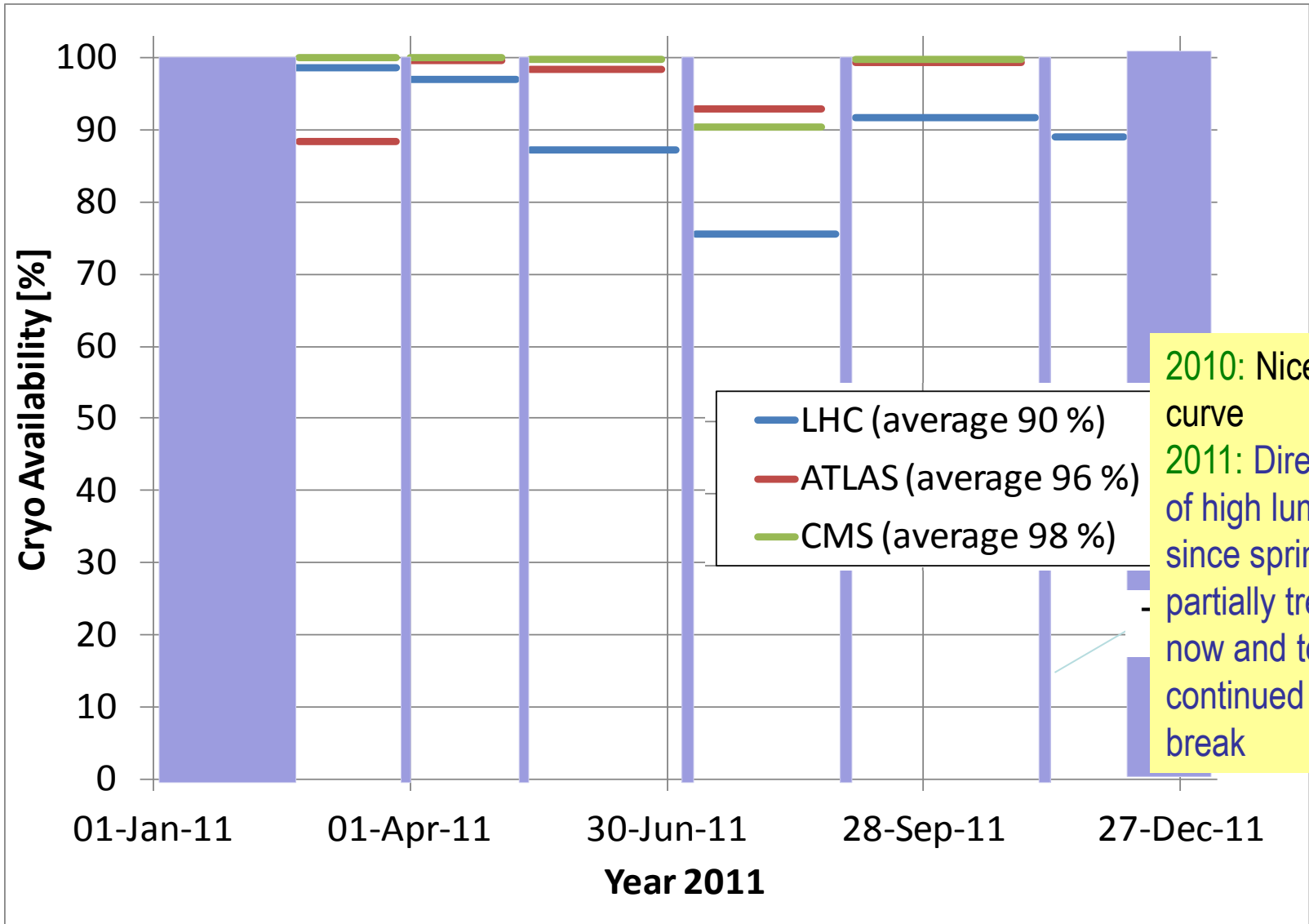
Vacuum activities during LS1: injectors

- PS Complex & TLs
 - LINAC 2&3: Maintenance
 - LINAC 4: Acceptance tests and start of the installation
 - PSB & TLs & ISOLDE: Maintenance and modification of TLs
 - PS & TLs: Maintenance and Upgrade of vacuum controls
 - AD: Maintenance
- SPS Complex & TLs
 - TE-VSC: Maintenance, new vacuum sectorisation and pumping layout
 - Needs expressed by other equipment owners: ABT, BI, RF, ATB, MSC
 - Project's related studies: LIU-SPS Electron Cloud preparatory work, COLDEX studies

TE-VSC group MUST be informed of new demands as soon as known



LHC Cryogenics global availability



LS1 cryogenics strategy

- Nominal performance
 - Safety (personnel, hardware, He inventory)
 - Cryogenic equipment
- Reliability/availability improvement
 - Cryogenic equipment (hardware)
 - Spare strategy (hot vs stored)
 - Redundancy
 - Upgrades (sectorization, ...)



Planned Cryo. consolidation & upgrade

- Consolidation for nominal performance of cryogenics is about on tracks
- Improvement of the cryogenic availability:
 - Some measures already taken → **2012 objective: overall cryo-availability improvement from 90 % to 95 %**
 - Direct cryo-downs (including SEU) represent 50 % of the total stops
→ improvement of user and utility stabilities is also important
 - Some long cryo-stops avoided in 2011 thanks to cannibalization and operation sharing of non-used cryoplants
→ no more possible for nominal operation after LS1
→ **A strategy of warm compressor spares is proposed: additional budget estimated to ~7-8 MCHF and manpower need must be consolidated.**
- Improvement of sectorization in-between sectors:
 - Already optimized for Work 1 (e.g. splice/diode repair)
 - Optimized on 7 sectors for Work 2 (e.g. intervention)
 - Could be improved on 7 sectors for Work 3 (e.g. Maintenance)
→ ~ 1 MCHF for interconnection box upgrade





Planned RF consolidation & upgrade

	2011	2012	2013	2014	2015	2016	2017	2018	2019
LHC			LS1: Splice Consolid., Collimation IR3					LS2: Collimation, CC preparation	
Injectors								L4 Connection, PSB -> 2 GeV	
LHC work									
LHC klystron collector ug.		4	8 remaining						
Thyratron ug/replacement		verify spare		Swap with spare					
Replace module M1B2			ug. cabling, PU						
ADT									
Linac 4	IS/Services Installation		Acc. Installation		Commissioning				
PSB RF Power upgrade									
Finemet 5-cell, 6L1R4	Design-install	Beam tests							
Full system 6L1R4			Build,install	Beam tests					
Full system all rings					Design, build, install				
PSB LLRF upgrade									
Prototype hardware	Beam tests								
New hardware		Beam tests R4	Series production	All rings					
Linac4 connection					interlock system, ring synchro				
SPS 200 MHz upgrade									
RF hardware		Studies/tendering	Hardware construction/test		Equipment installation				
Tunnel LSS3			AEWB, BPWA, WP&K					Rearrange cavities	
Building BA3/BB3		Authorizations	Construction	Services	Equipment installation				
LHC Crab Cavity									
Technology Validation	Technology validation		Technical Design				Construction		
Beam Tests					SPS		LHC IR4		
LHC P4 cryo upgrade				possible?					
Preparation (Coldex)			Prepare Coldex & CC cryo						
Injectors Consolidation									
PS C201-C206			Renovation						
PS C10		Renovation (1-turn delay FB, fast FB, driver, gap relays, long. damper, coupled bunch FB, ...)							
SPS TWC800			Renovation						
SPSTransverse Damper			ug. PU, kicker, PS						



Planned Quench & machine Protection consolidation & upgrade

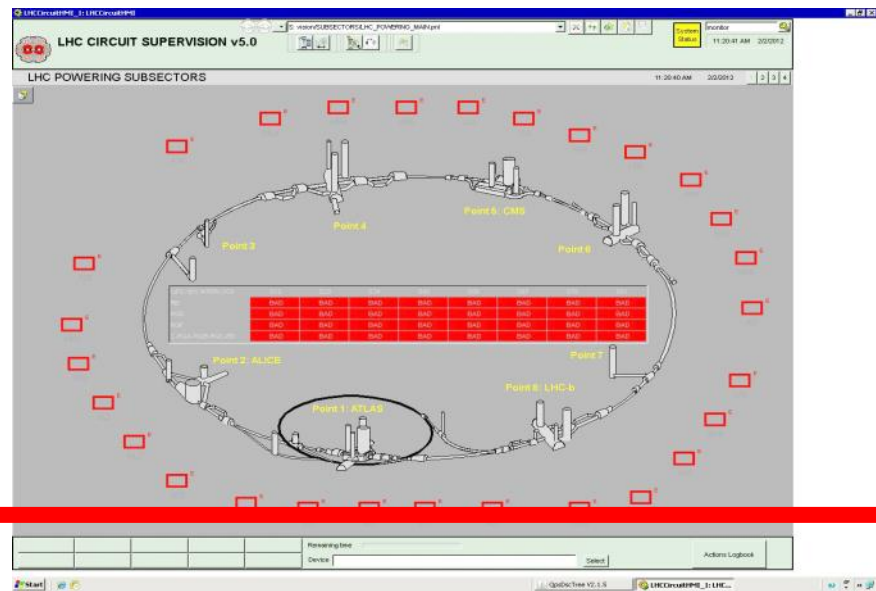
- Major upgrades can only be smoothly implemented during long shutdowns
 - Re-furbished / upgraded systems should be able to run without major overhaul at least for 3 to 4 years
- No principal change of the protection functionality required for the LHC after LS1
 - Some protection settings to be adapted to higher energy
- Several requests for enhanced supervision & diagnostic capabilities by equipment owners, experts and users
 - Requested for LHC operation as for hardware commissioning
 - Maintainability of the protection systems to be improved
 - Enhanced remote control options, less accesses, more automatic analysis and maintenance tools, configuration databases





Re-commissioning of the protection systems

- The work performed during LS1 by will require a full re-commissioning of all protection systems prior to the powering tests
 - Complete electrical quality assurance for all superconducting circuits
 - Test of all QPS instrumentation cables
 - Quench heater circuit qualification prior to implementation of enhanced supervision
 - Complete individual system tests: interlock tests, quench heater discharge tests etc., verification of data transmission
- The re-commissioning will profit from the experience gained so far but will remain challenging (as usual)
- Additional tests will be required during the powering tests in order to qualify some newly installed items



nonix, 1th February 2012



Individual system test, short-circuit campaign and re-commissioning

More than 6 months of powering tests





LS1 : EN-EL & EN-CV Activities

Priority	Definition
0	Safety
1	Beams to 6.5 - 7 TeV
2	Reliable operation improvement
3	CERN approved projects
4	Not approved projects

Priority 1 & Priority 2
but also Priority 3 & 4 →

Priority 2 →

Four different types of activities are planned

- Operation
- A large amount of requests from equipment groups
- The consolidation of the infrastructure
- The maintenance of the infrastructure



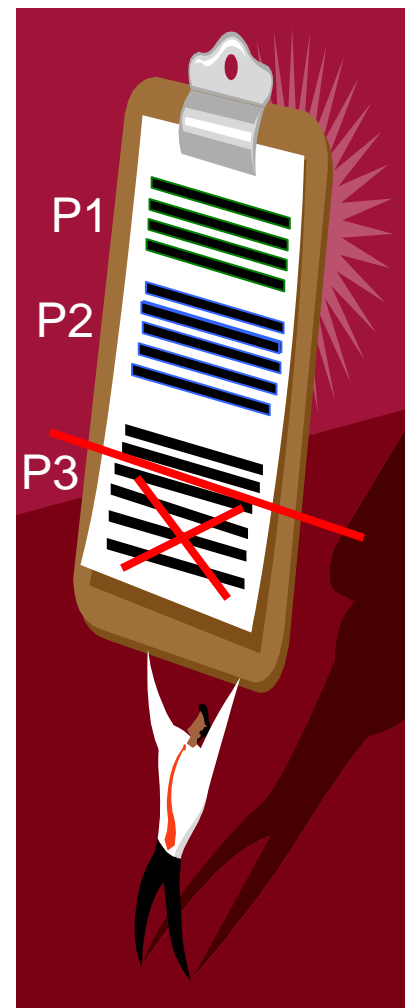


LS1 : EN-EL & EN-CV ACTIVITIES

- During maintenance and tests, the availability of EL & CV services will be affected
- EL and CV involvements during LS1 are at the maximum of its capabilities in terms of workforce
- A substantial increase of resources to cope with the work which has reached the limit of the supervision capacity of the EL & CV staff
- *Probably* all the needs of the equipment groups are not yet known (What, Why, When, Where)

They must be notified asap to be included in the detailed planning (especially cabling !)

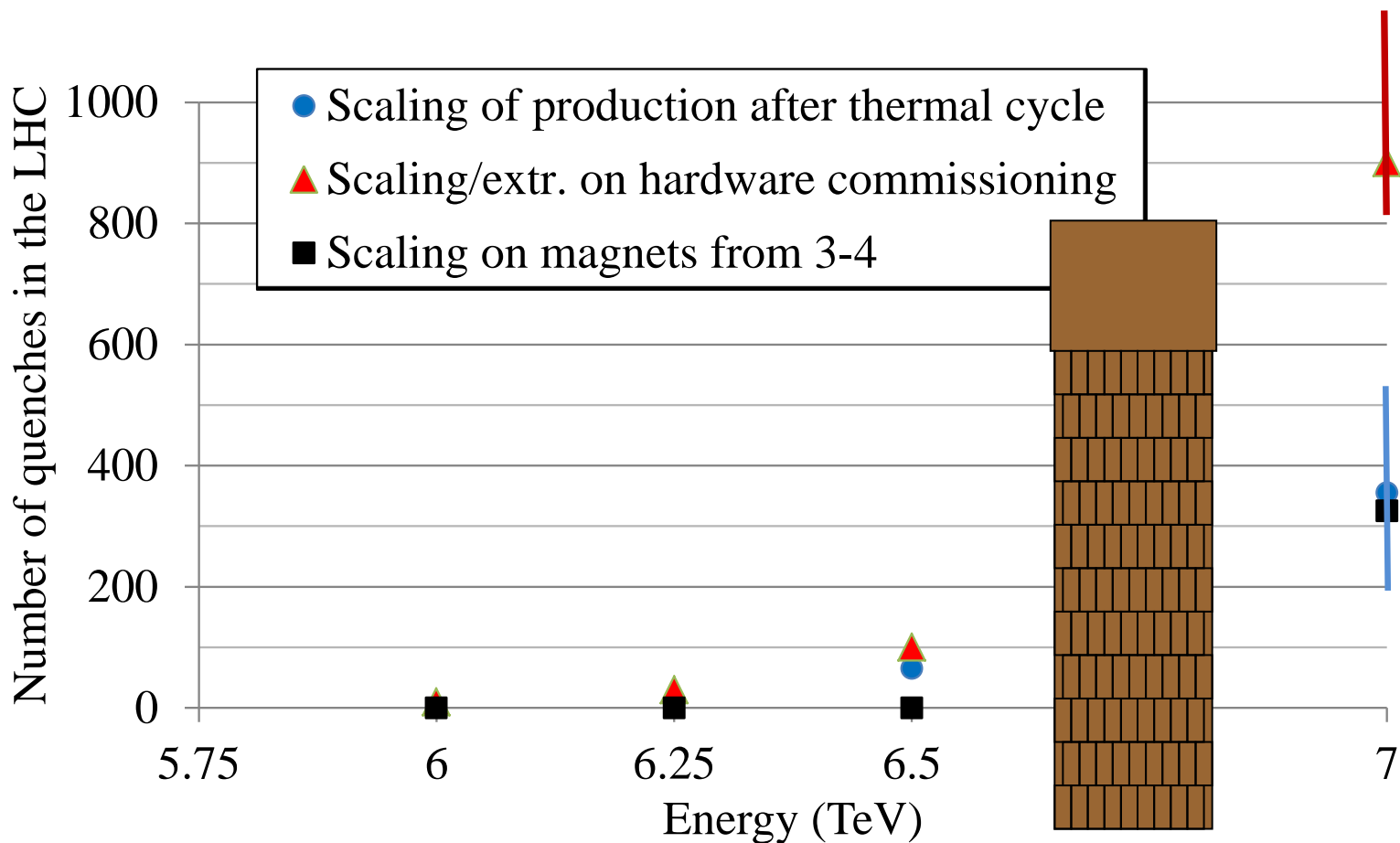
- **Priorities will be applied and some requests will have to be delayed**





Energy of the LHC after 2013-2014 long shut-down

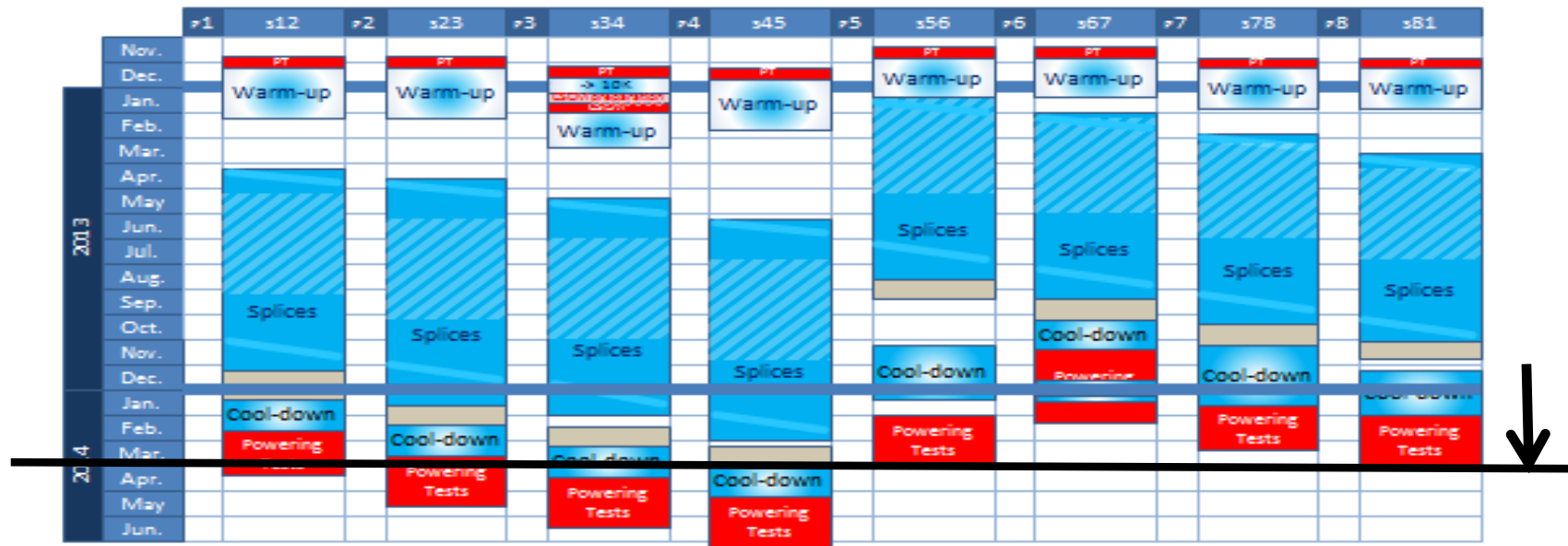
Comparison of different estimates



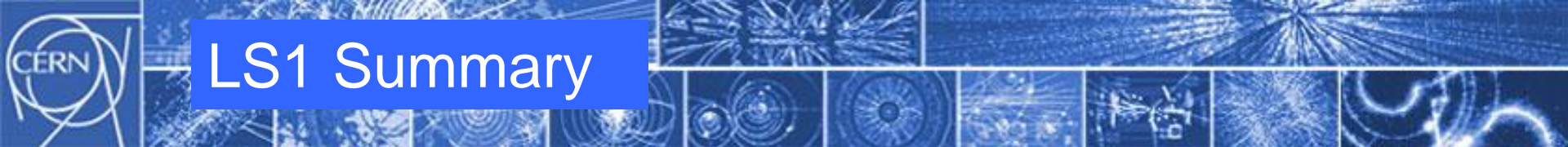


Energy of the LHC after 2013-2014 long shut-down: Strategy

- Push the four initial sectors to 6.5 TeV (Nov 2013- Mar 2014)
 - See if estimates are valid: ~50 quenches expected in four sectors

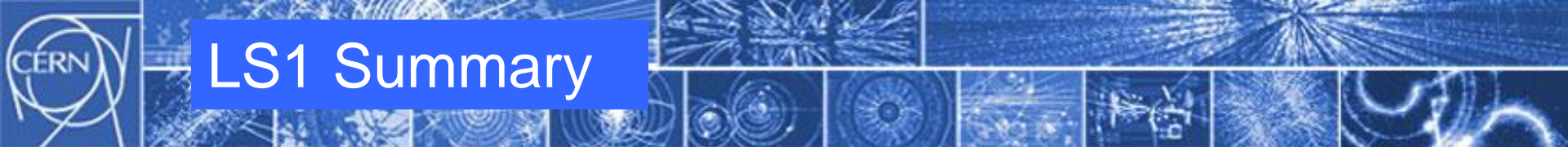


- ☺ Fix 6.5 TeV as LHC energy and push the other four sectors there
- ☺ If more quenches are needed, fix 6.25 TeV as LHC energy and push there the other four sectors (~10 quenches expected in four sectors)



LS1 Summary

- LHC machine needs 20 months (splices, magnets and R2E)
 - ✓ Baseline Start date: 17th November 2012 (break points end of June & August; importance to have powering tests and LHe out before Xmas)
 - ✓ Resources globally OK for Priority 1, thanks to collaborations (Poland, Russia, Pakistan,...) , move from departments and groups (BE-OP to be finalized)
 - ✓ Detailed resources review (incl. injectors) in progress (**EN-EL, EN-CV, TE-VSC, survey, transport,...**) – **Priorities must be applied, all requests will not be satisfied**
 - ✓ Physics to physics : 24 months ; Xmas 2014: **NO** Technical stop (one week of standby ?)
- LHC experiments need 12-21.5 months: **important maintenance and upgrade**
 - ✓ From 12 months (LHCb 12, Alice 15) to 21.5 months (ATLAS 20, CMS 21.5)
 - ✓ New vacuum chamber for 3 experiments (LHCb, ATLAS and CMS) : delivery date is the bottleneck (no closure of caverns before end of August 2014)



LS1 Summary

- LHC injectors and experimental facilities closure in 2013
 - ✓ Resources redirected towards LHC upgrade and consolidation (MSC, VSC, EPC, MPE, OP, MME, EL, CV,...)
 - ✓ 2014: a standard year (LINAC4 will not be connected to PSB during LS1)
 - ✓ Exceptions in 2013 should be justified, limited and validated according to maintenance work (water, electricity,...) with limited specialist support

**More in IEFC workshop
7-9 March 2012**

Global planning is in a good shape and detailed schedule being implemented (“On y voit *plus clair* !”)

We must maintain regular discussions and meetings between accelerators (LHC and injectors) and experiments to finalise the best program

It’s crucial that ALL the groups fill the “activity database” and announce the needed supports (LHC, injectors, experimental areas) to get a CERN-wide “resource-loaded planning”.

It’ll be more and more difficult to move the LS1 start date



Thanks for your attention