

Status report on the LS2 activities

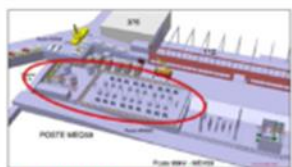
Council

Frédéric Bordry
21st June 2019

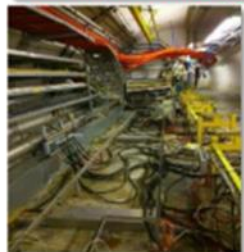


LS2 (2019-2020 period): coordination of multi projects

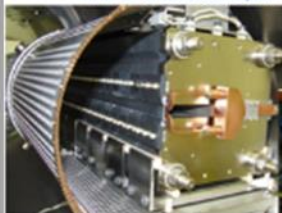
Maintenance & Consolidation



New MEQ59 Static Var Compensator



New MST SPS extraction septum



LHC EE controls



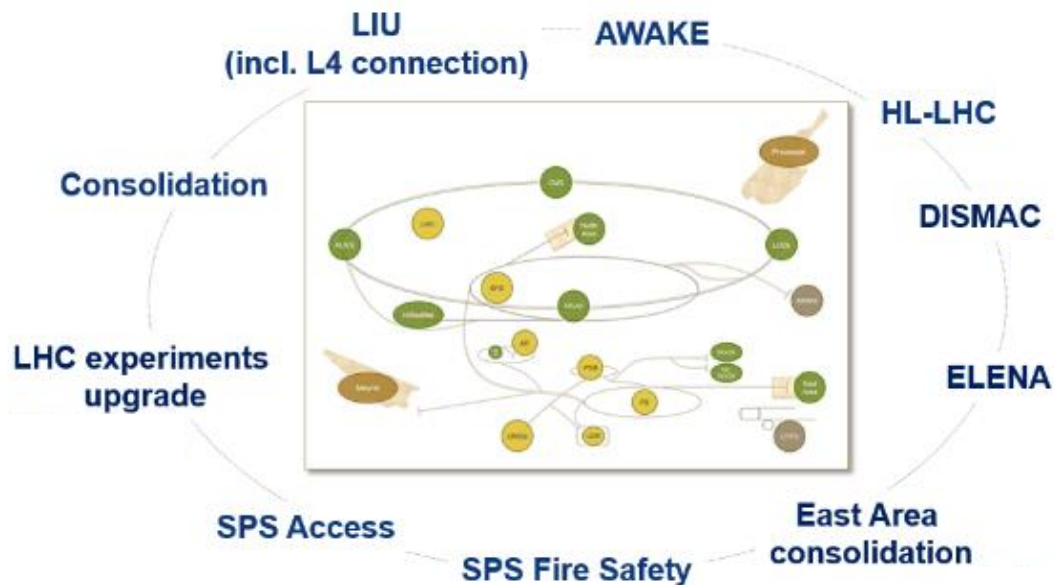
LS2
2015-2020
Coordination



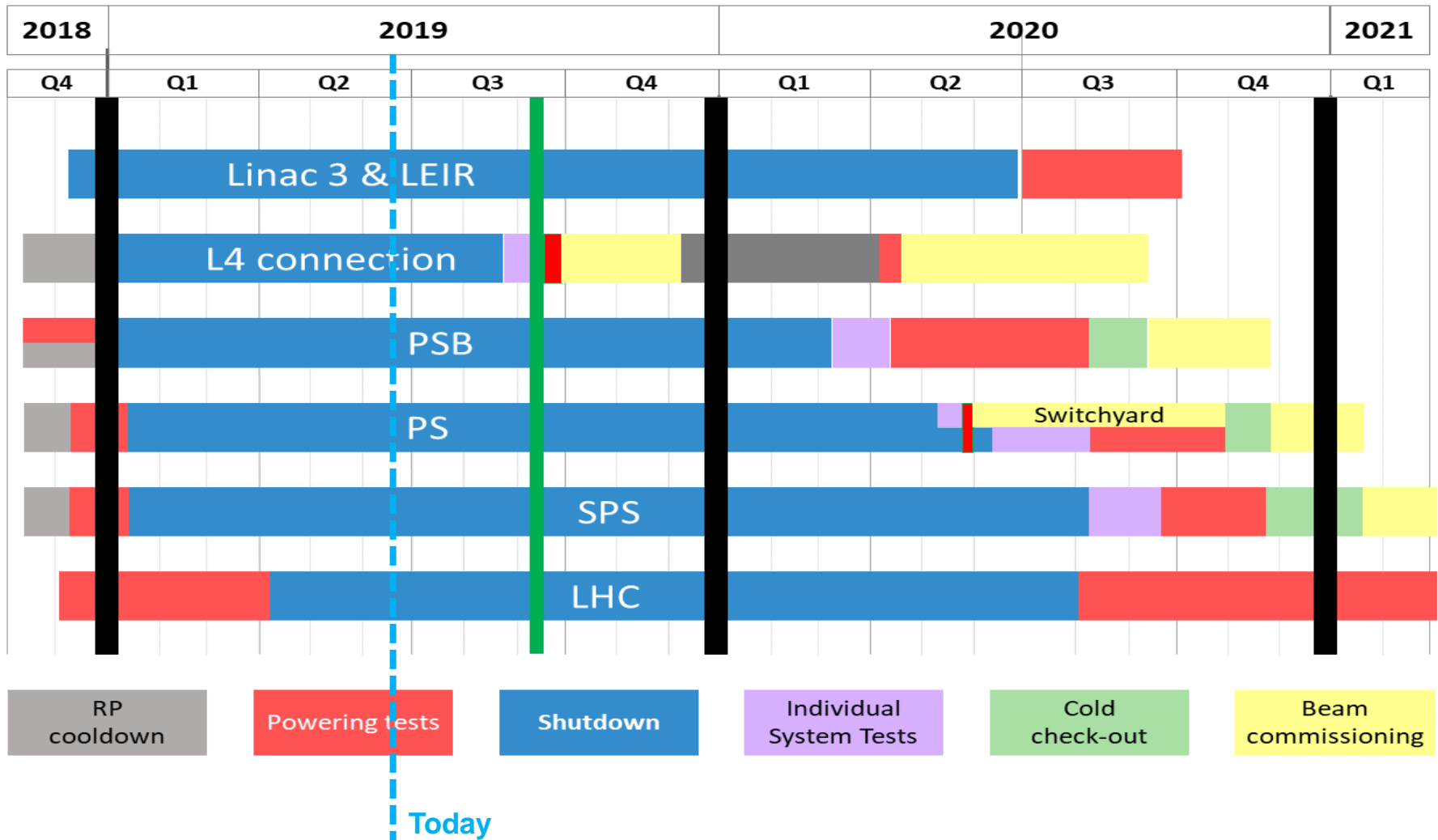
ASBESTOS removal

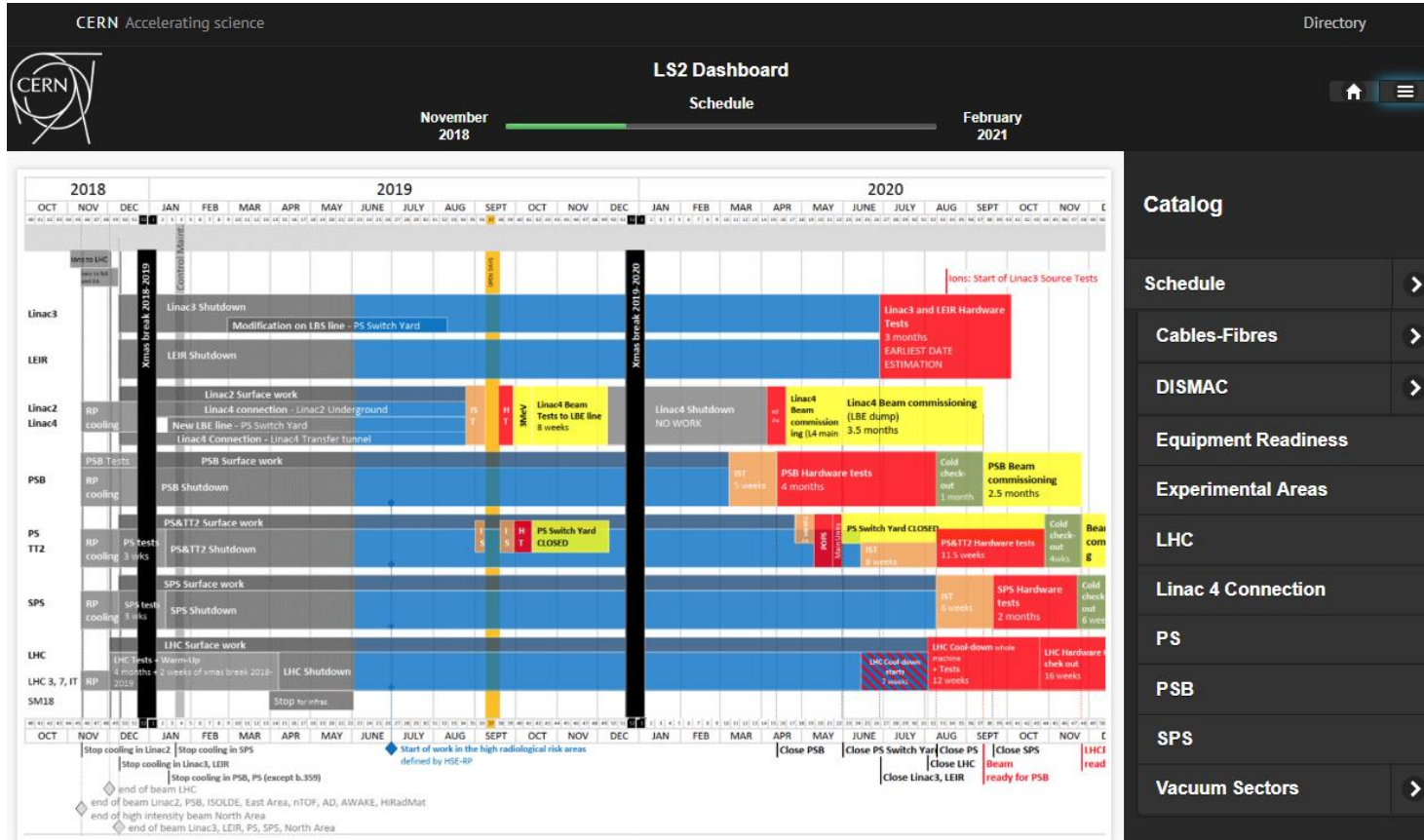
LS 2 is dominated by LIU

The main projects during LS2



LS2 schedule





Safety First



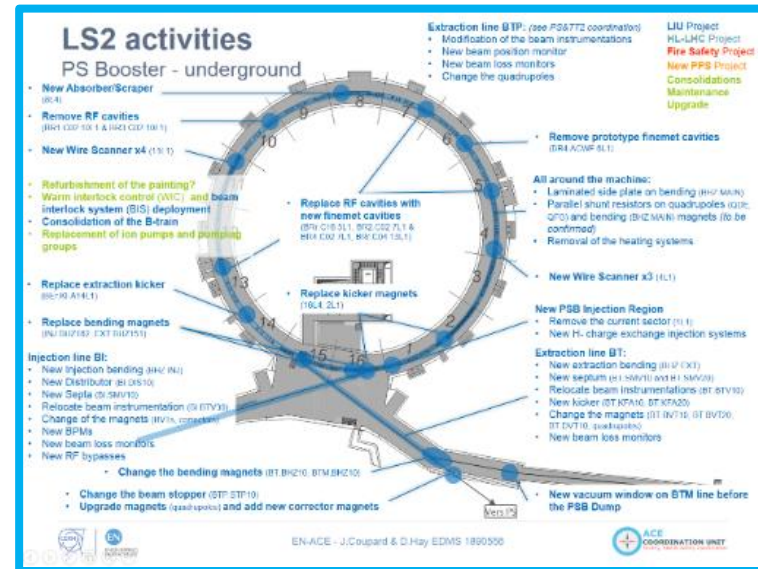
Quality second



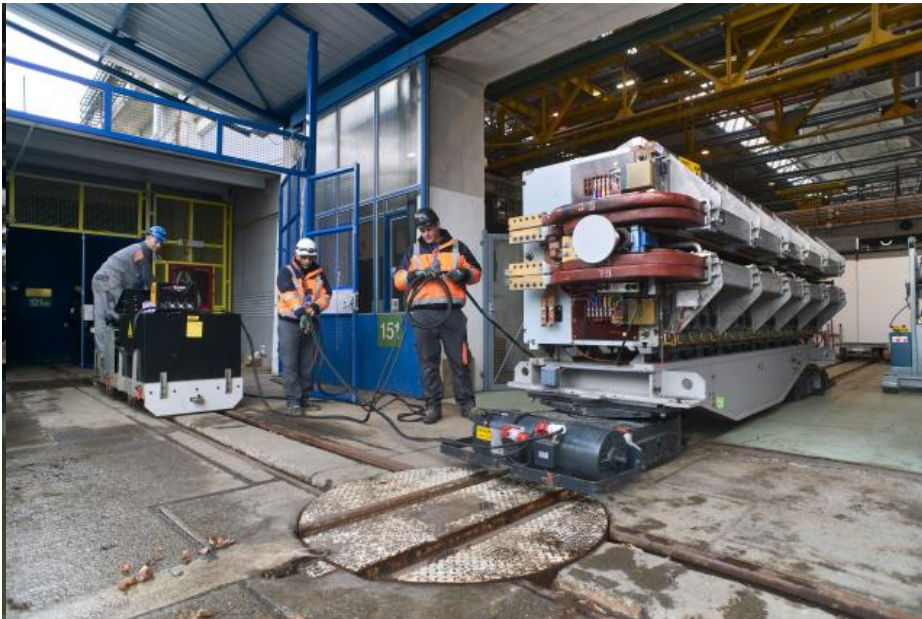
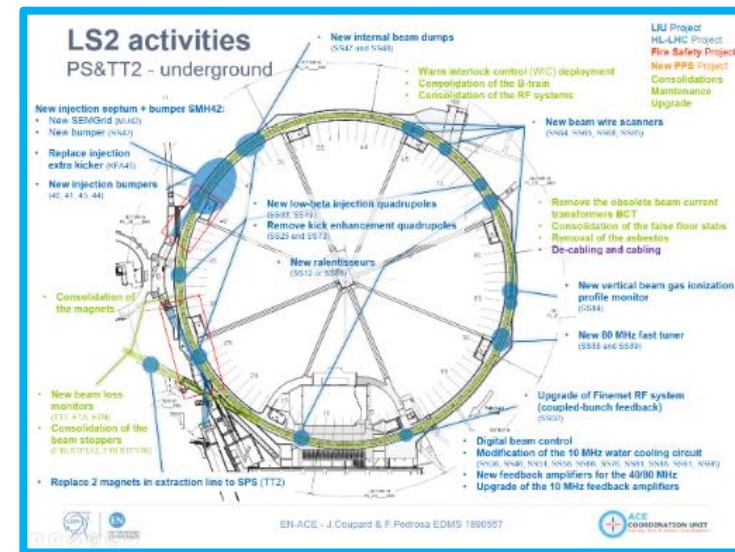
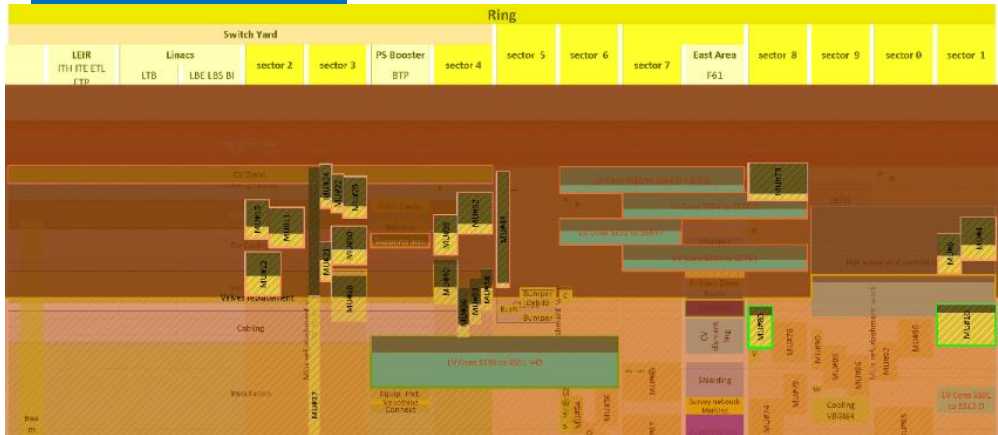
Schedule third

LS2: Booster

PSB injection region



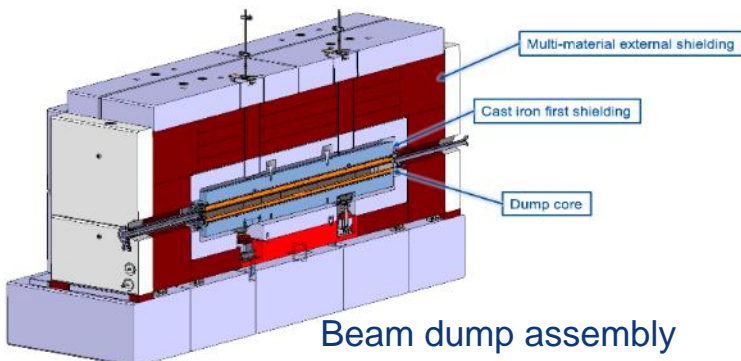
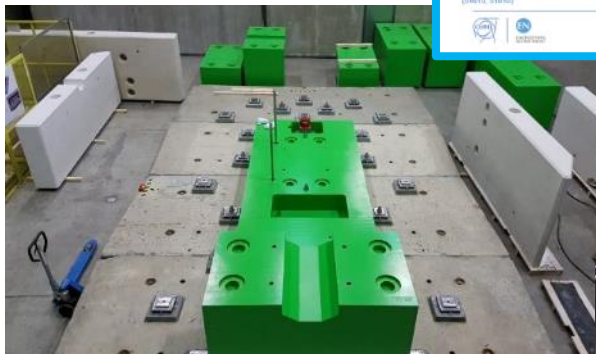
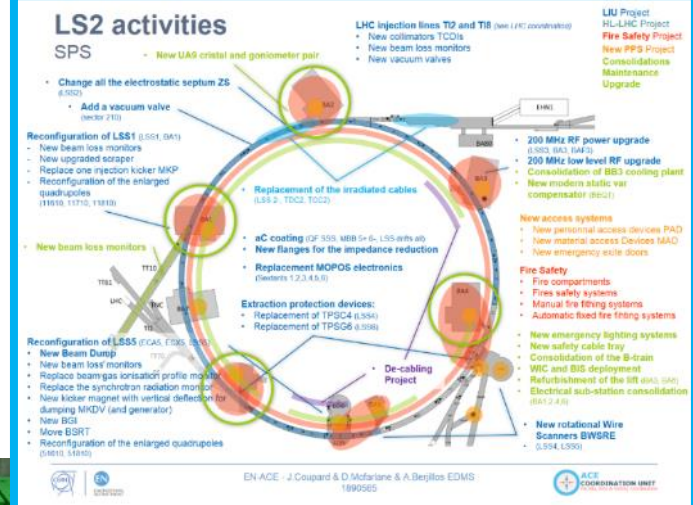
LS2: PS



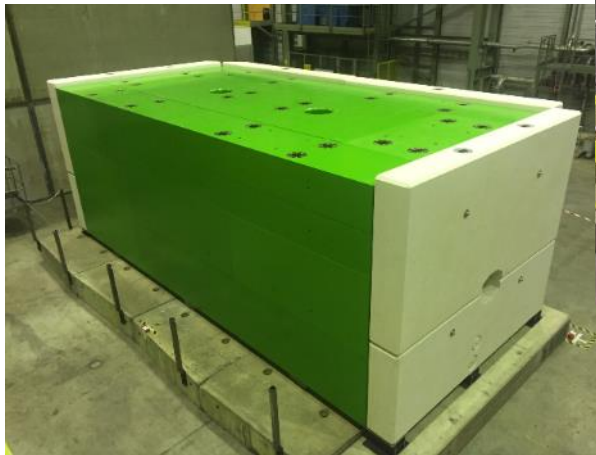
43 magnets (101 main magnets in PS)

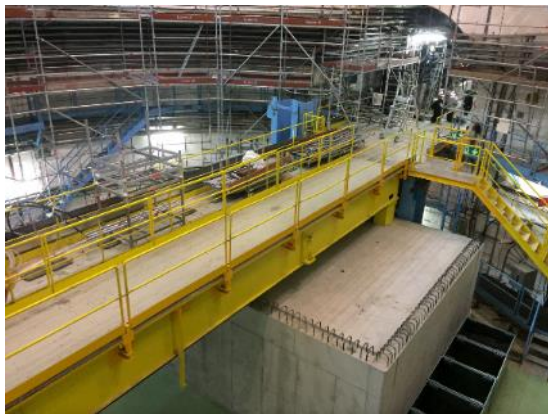
LS2: SPS

New SPS beam dump



Beam dump assembly





March 2019 – SPS tunnel: preparation of beam dump area prior to Civil Engineering – removal of cable trays



June 2019

- First phase of dump abutment completed
- Second phase of dump abutment (removable part) started
- Next phase of Civil Engineering (tunnel enlargement) will start in July as planned



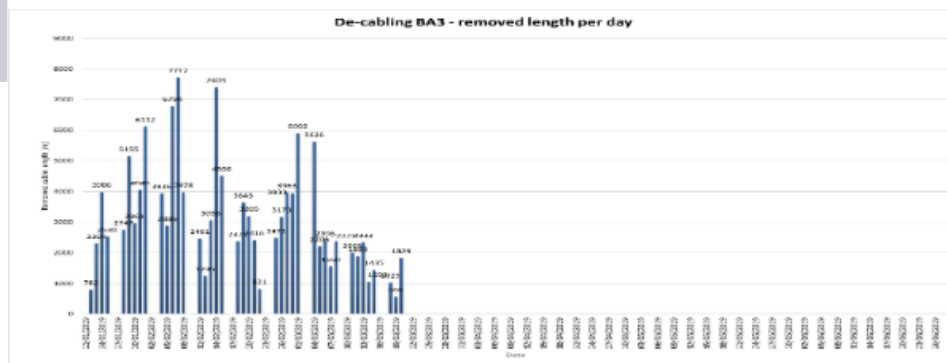
LS2: SPS

De-cabling BA3 (SPS)

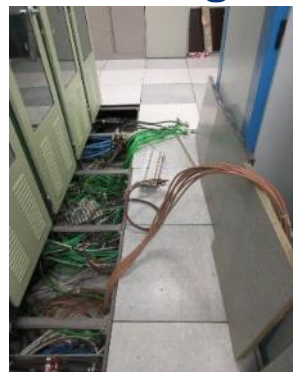
- Start date: 21/01/2019
- End date: 28/06/2019



	Provisional quantity [km]	Provisional quantity of cables	Removed quantity in km so far	Totally removed cables so far
SPS point 3	321	4171	130	1392

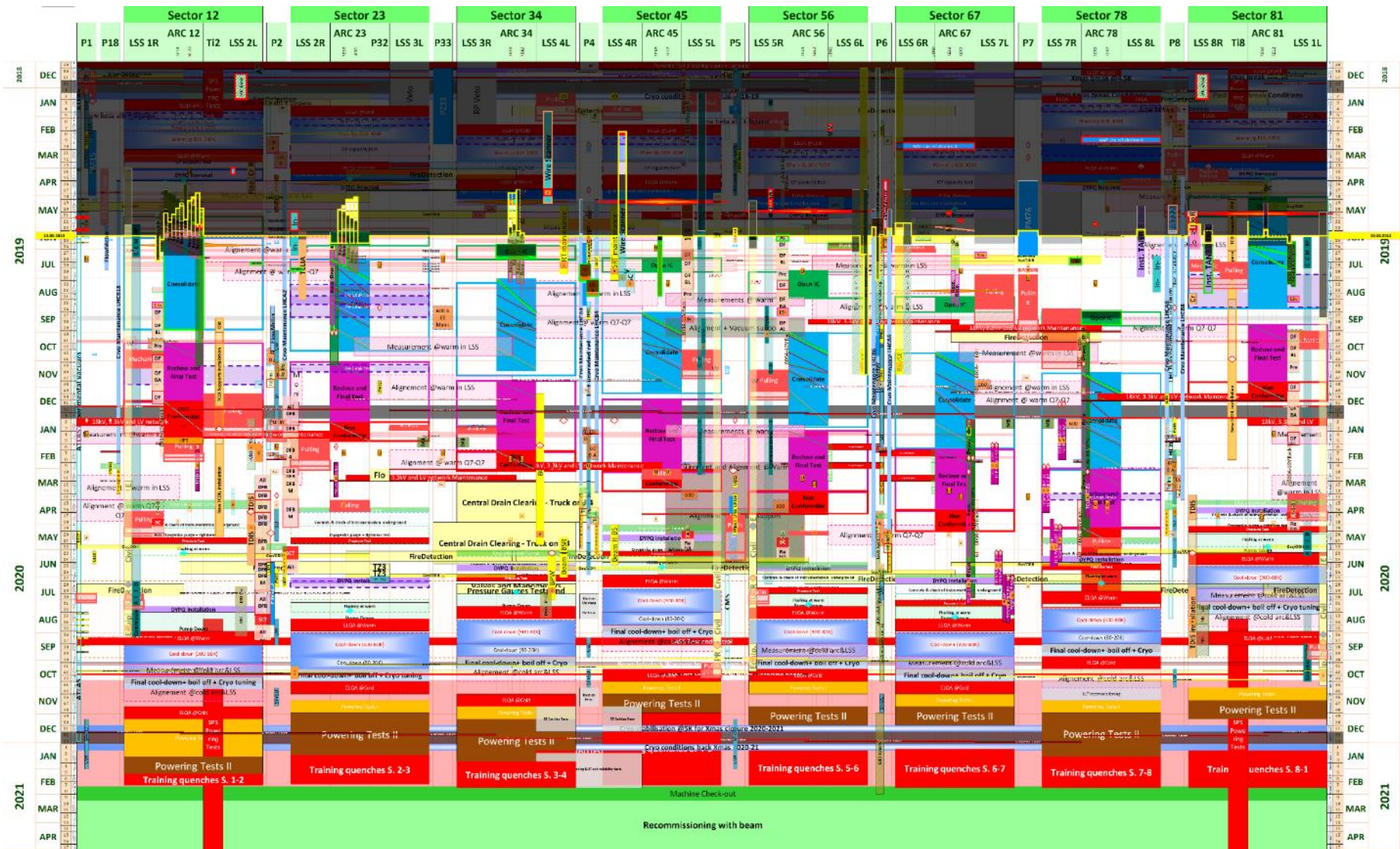


The works are ongoing according to planning



LHC: LS2 schedule ... so far so good !

<https://lhcdashboard.web.cern.ch/lhcdashboard/ls2>



Opening and final reclosure of 1360 interconnections

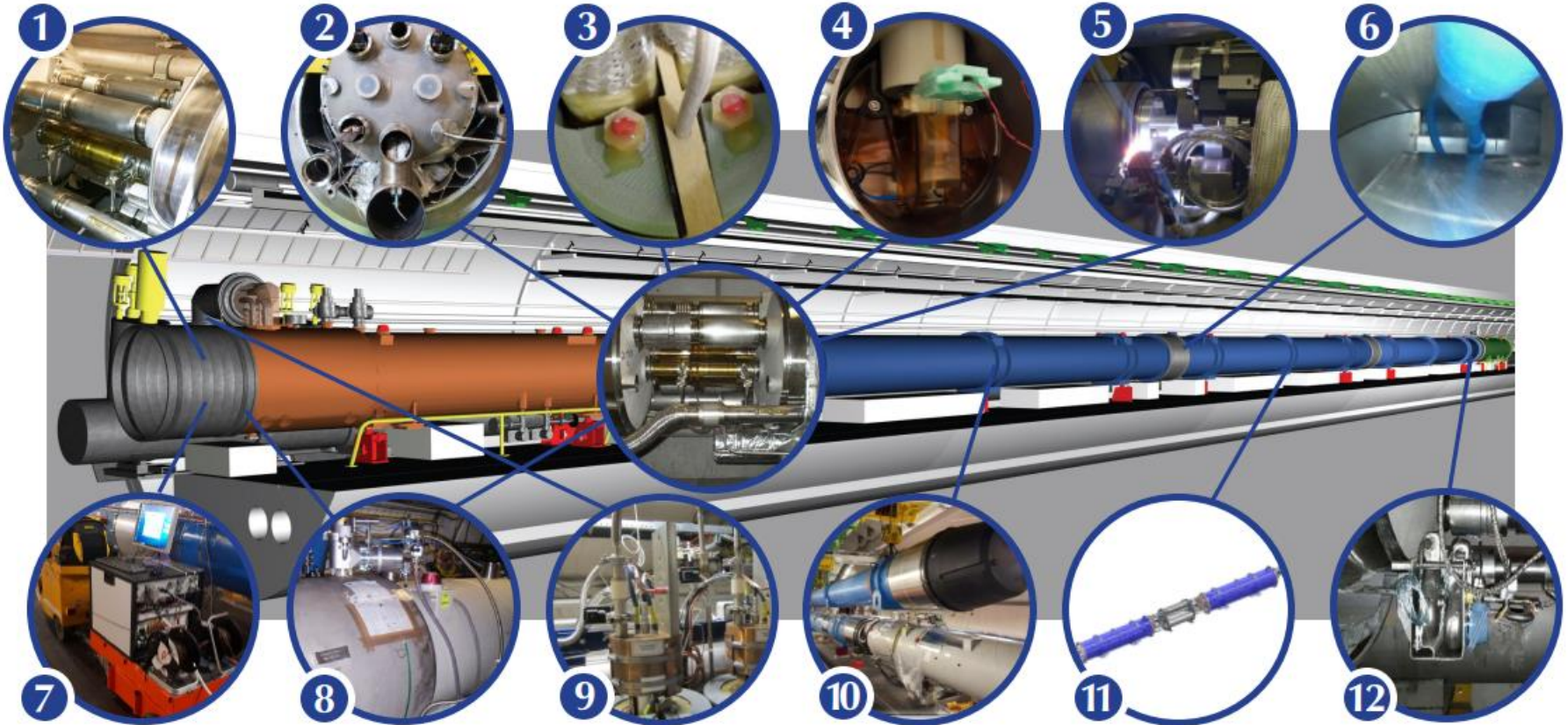
Mechanical opening of 2464 diode container covers

Cleaning and consolidation of 1232 dipole diode insulation systems

Installation of 1232 insulating inserts

Rewelding of 2464 diode container covers

More than 10 000 quality checks



More than 8 000 electrical quality assurance tests

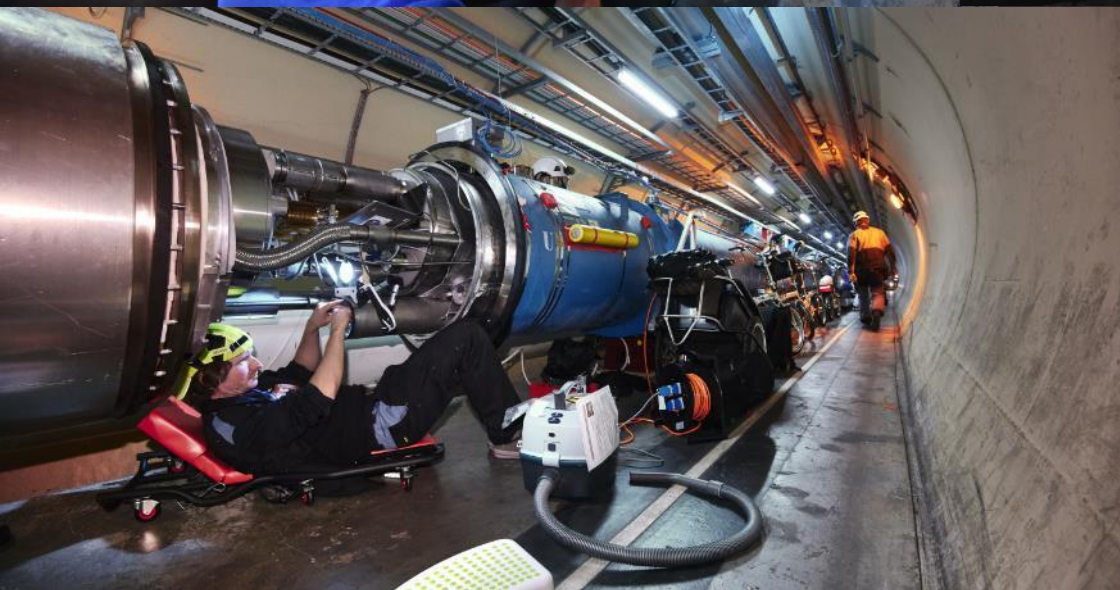
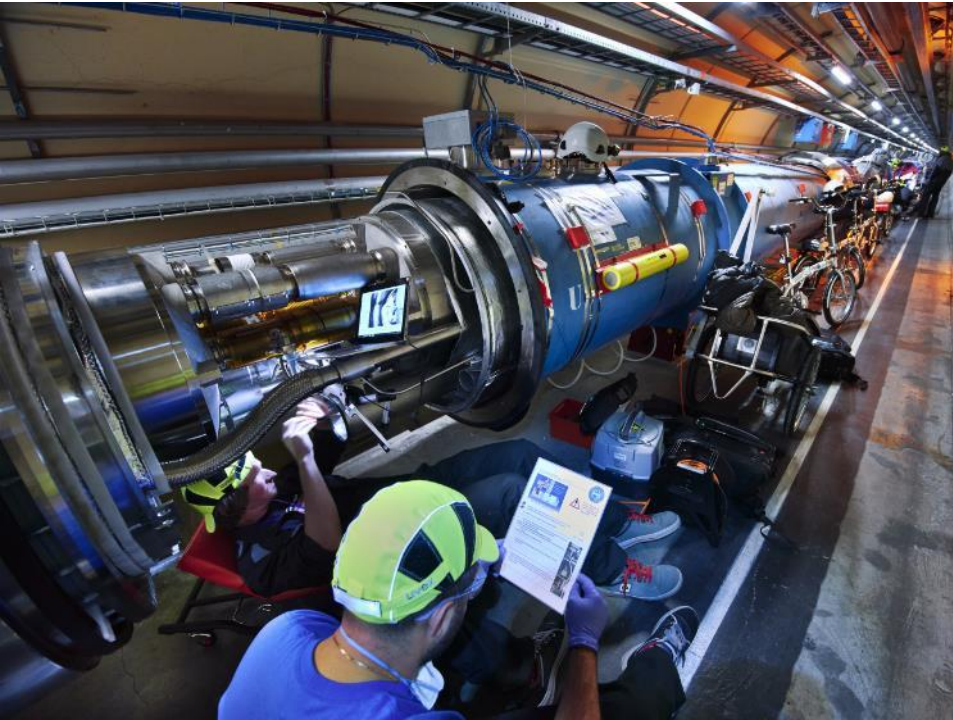
2 500 leak tightness tests

Maintenance of 2 829 current leads

Replacement of 22 cryomagnets

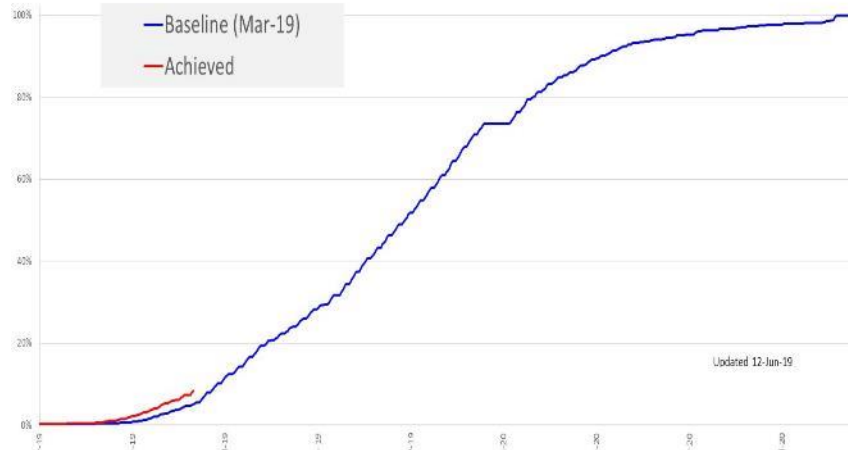
Installation of 4 full HL-LHC cryo-assemblies

Installation of 10 instrumentation systems for beam induced heat load study

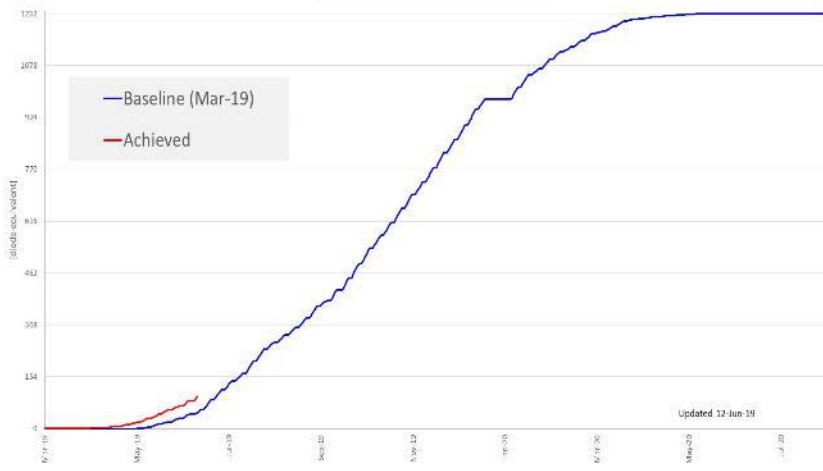


LHC: DISMAC project status

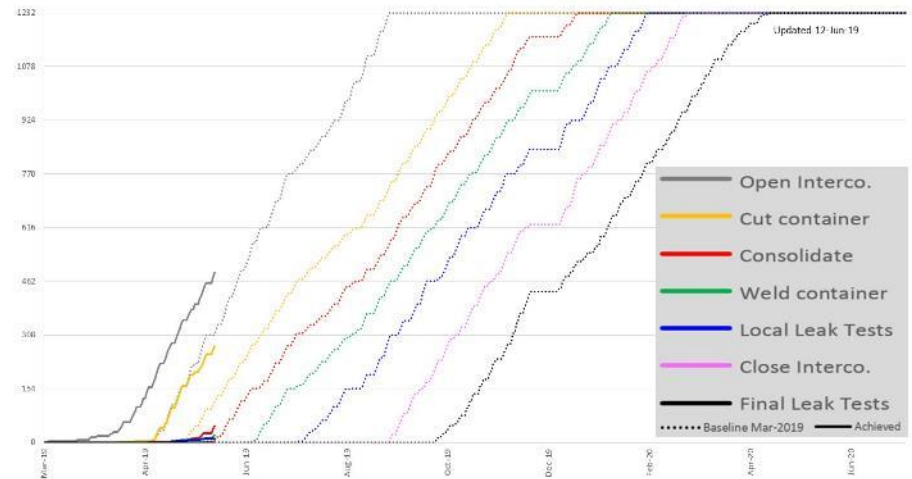
DISMAC (DISCO + SIT + CLEM)



DISMAC : Diodes consolidation

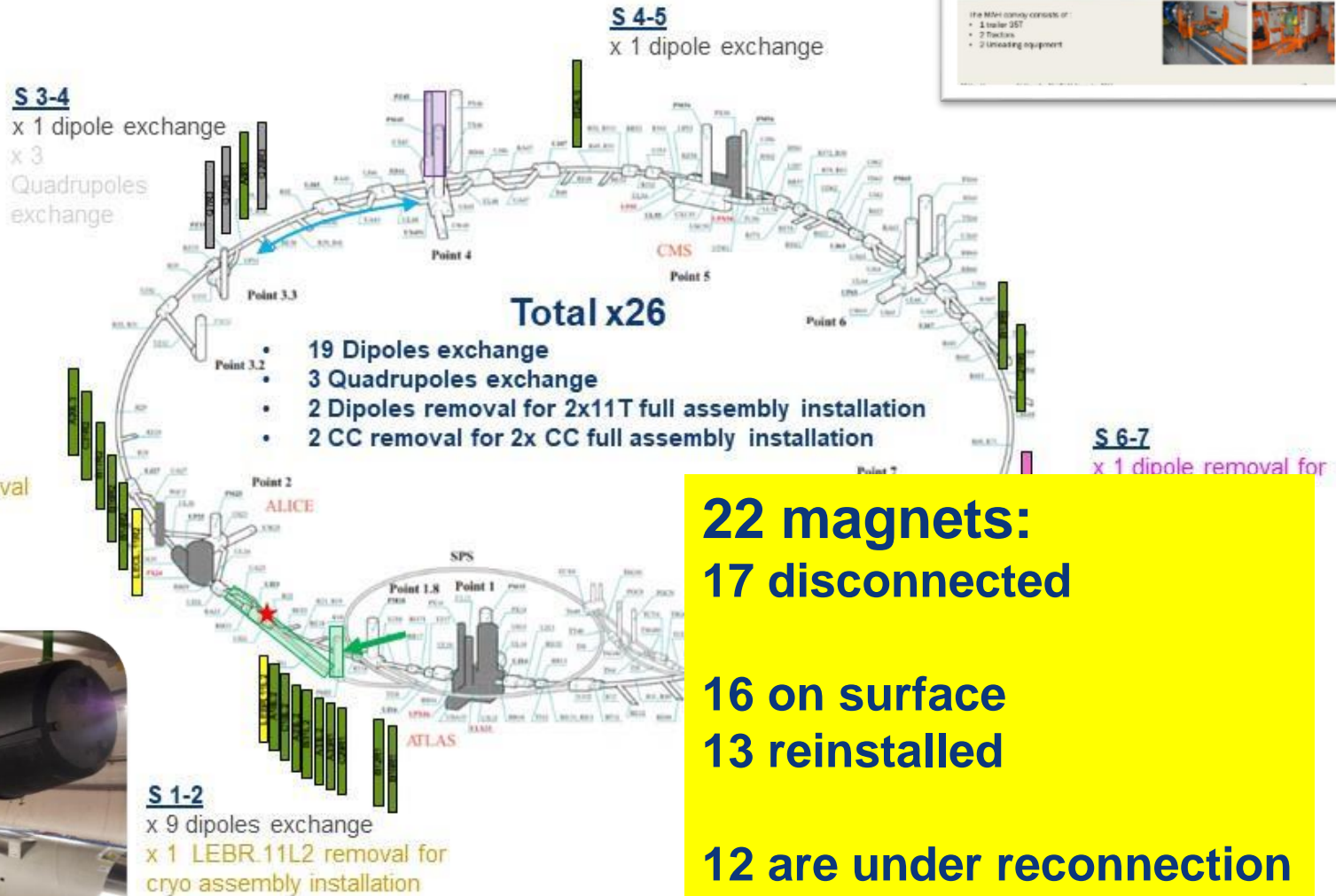


DISMAC : Diodes Consolidation : LHC



- >3 sectors are open
(2 weeks in advance)
- Diode boxes are open in almost 2 sectors
(2 weeks in advance)
- ~ 35 consolidated magnets
(a few days in advance)

LHC: cryo-magnet consolidation



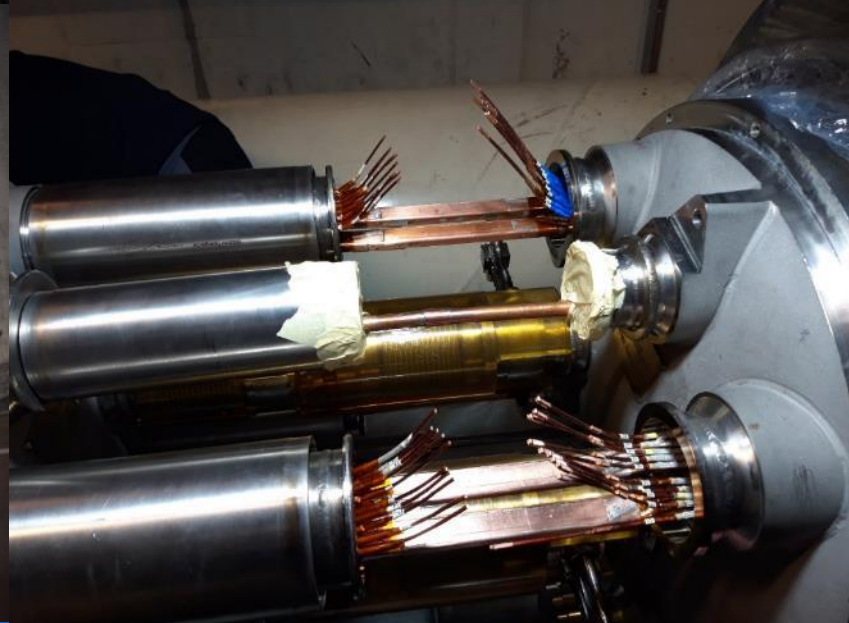
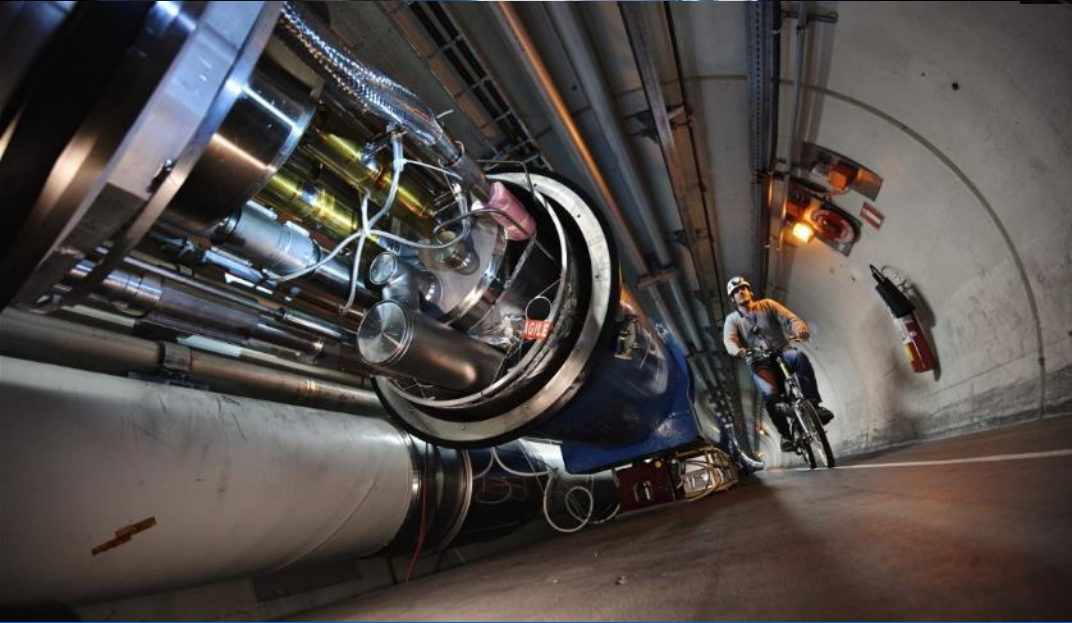
**22 magnets:
17 disconnected**

**16 on surface
13 reinstalled**

12 are under reconnection

Activities are "just in time"





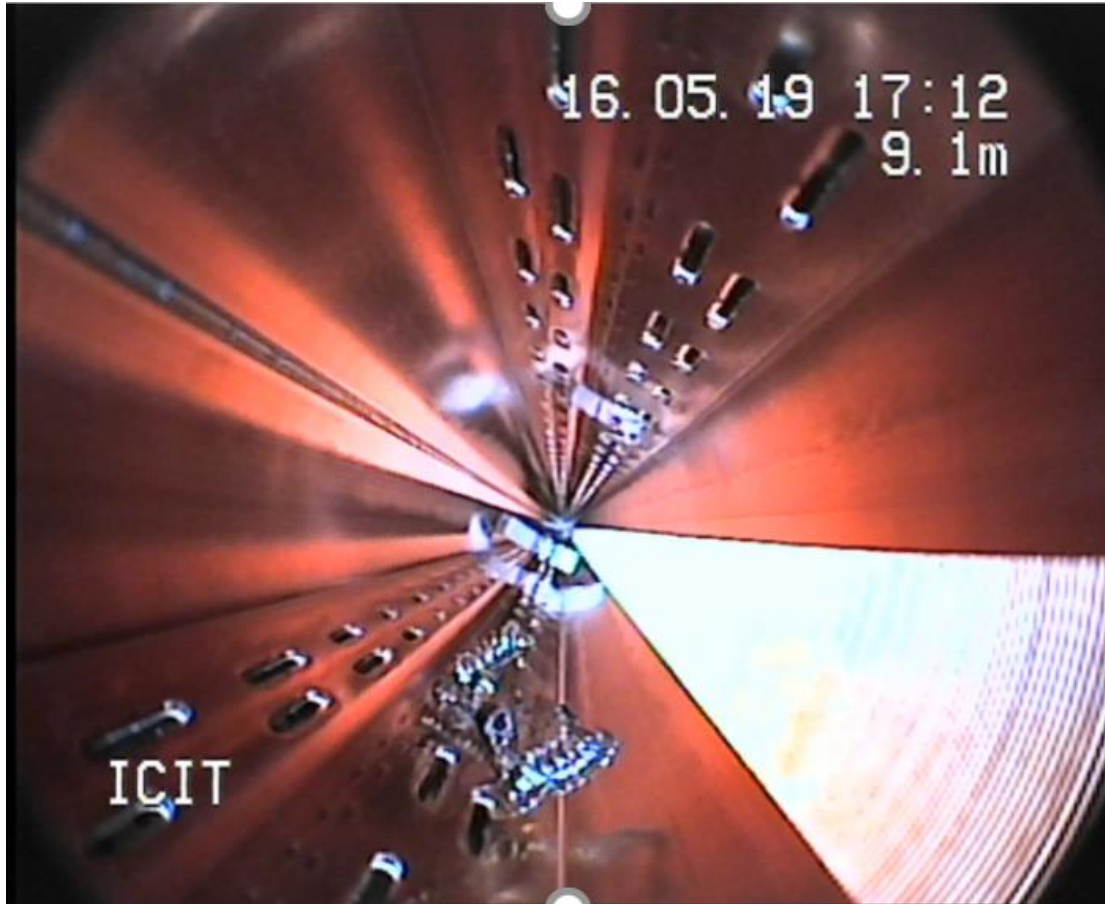




Reconnected dipole

LHC: removing the ULO in 15R8

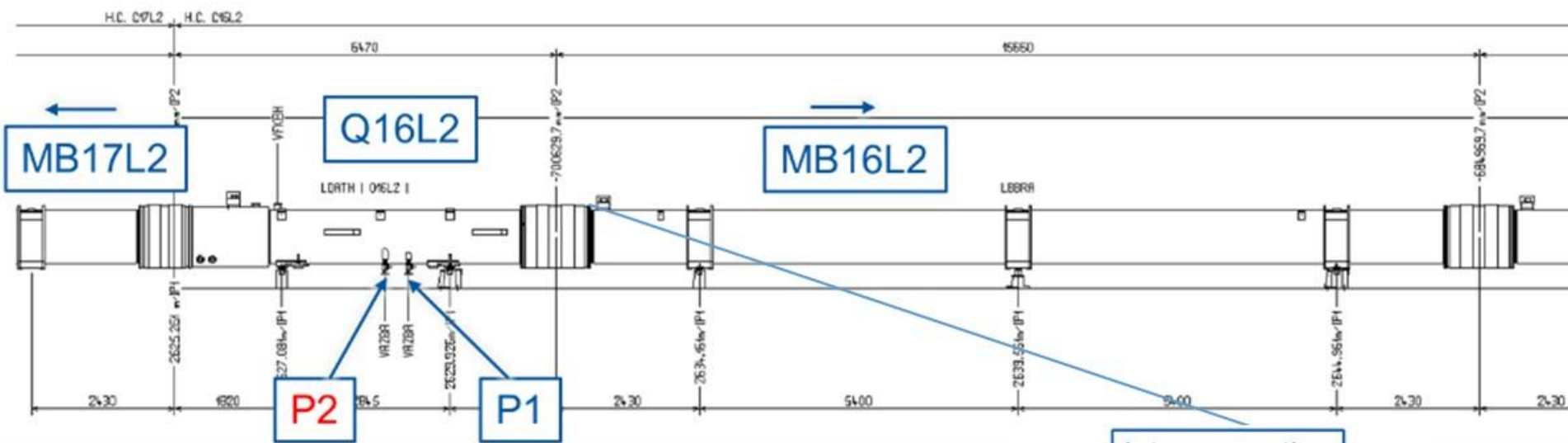
ULO (Unidentified Lying Object) => IEO (Identified Extracted Object)
(In Excess Of)



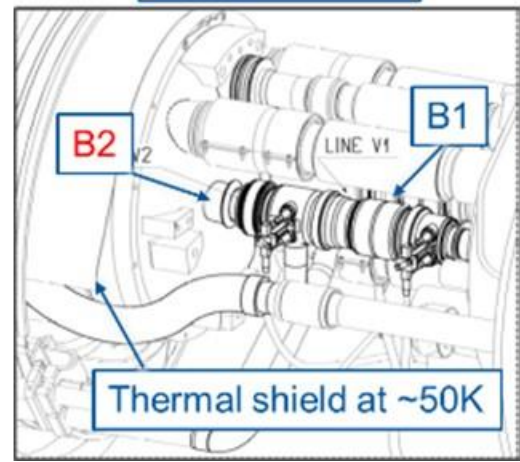
During removal the polythene broke into 3 part, all of which are recovered (small fragment not shown).

The plastic appears blackened and locally brittle (presently at the RP control bunker)

LHC: 16L2 saga

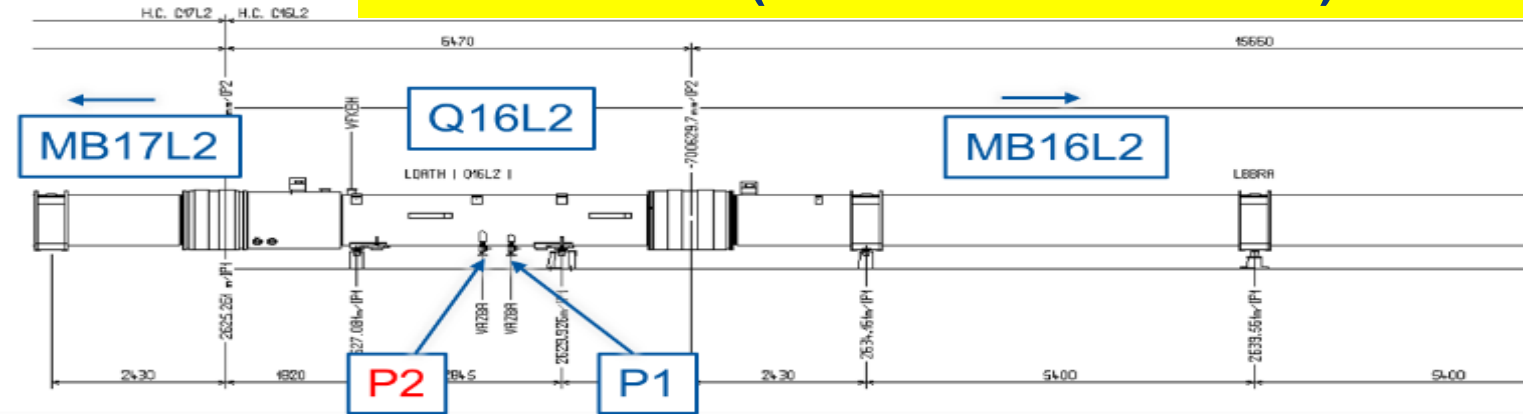


Interconnection

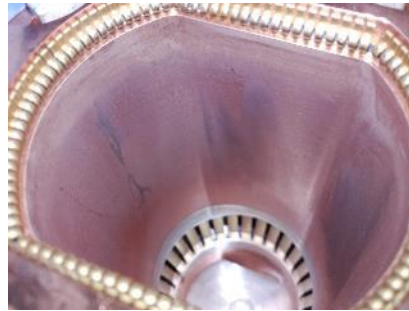


LHC: 16L2 saga

Decision to replace the quadrupole and dipole beam screens (to be done on surface)



Very oxidized surface with dark spot (up and down) on the beam screen slots	Beam 1	No important oxidation. White spots visible like dried liquid
No important oxidation. Some white diffused mark	Beam 2	Important oxidation with dark and large spot on the beam screen slots



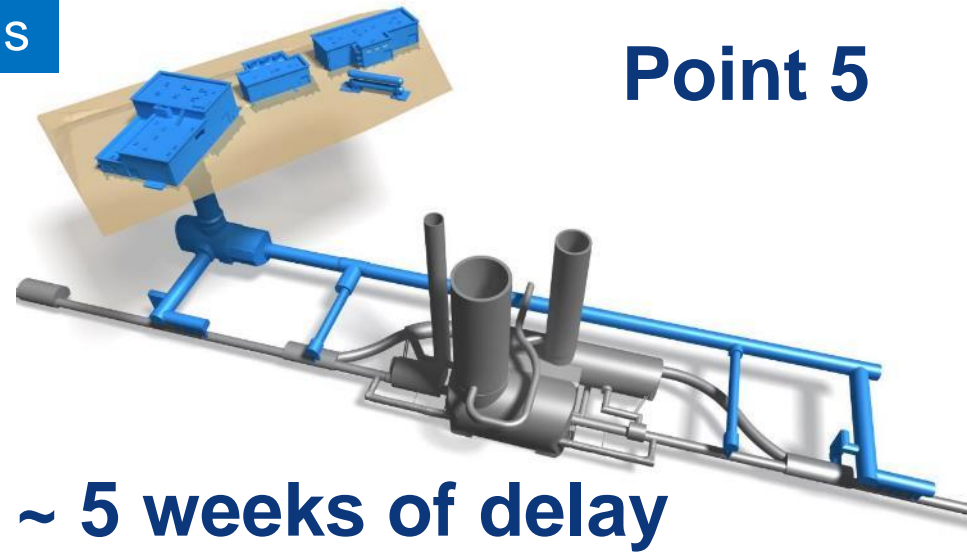
LS2: HL-LHC civil engineering status



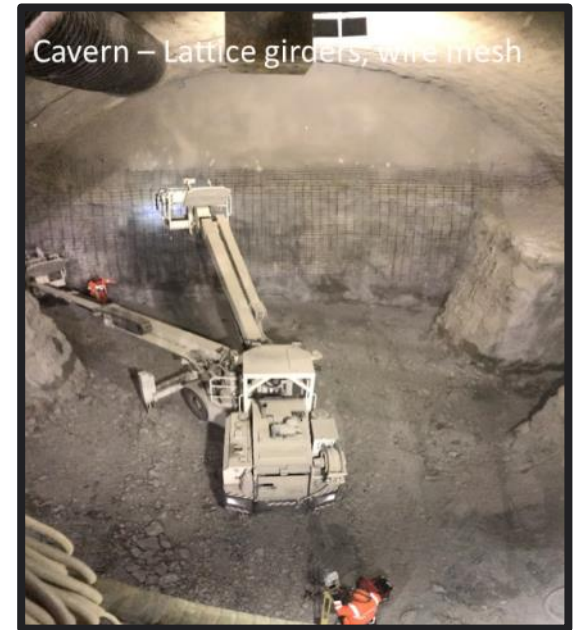
Point 1

On schedule !





~ 5 weeks of delay



Cavern – Lattice girders, wire mesh

Safety: LS2 Accidents



Facility	Total	Minor	With days of absence	Total days**
PS	2	1	1	19
SPS	5	3	2	21
LHC inc. Expt	10	7	3	52
Surface	9	6	4	79
Total	26	17	9	171

	ENTC	MPE	MPA	Total
Minor	11	5	1	17
With absence	5	3	1	9
Total	16	8	2	26

Description	All	Minor	With absence	Days of absence
Collision, false movement	2	2		
Electricity	1	1		
Fall	1		1	1
Handling and Manipulation	7	2	5	114
Hand tools and Power tools	6	6		
Machine tools	3	1	2	42
Object in Movement	5	4	1	14
Vehicles	1	1		
Total	26	17	9	171

Frequency rate : 6.8
Severity rate : 0.13

Frequency Rate = Number Accidents (with absence) per Million Hours worked
Severity Rate = Number of days Absence per 1,000 Hours worked

Safety in LS1

“Safety First, Quality Second, Schedule Third”

LS1 Accidents

Facility	Total	Minor	With days of absence	Total days**
PS	2	1	1	6
SPS	7	6	1	3
LHC	30	20	10	93
Surface	50	34	16	151
Experiments*	6	3	3	20
Total	95	64	31	273

- 3.7 Million Hours worked
- 64 minor accidents (no absence)
- 31 accidents with total 273 days absence

LS1
Frequency rate : 8.4
Severity rate : 0.07

Frequency Rate = Number Accidents (with absence) per Million Hours worked
Severity Rate = Number of days Absence per 1,000 Hours worked

Radioprotection LS2 : Personal Dosimetry

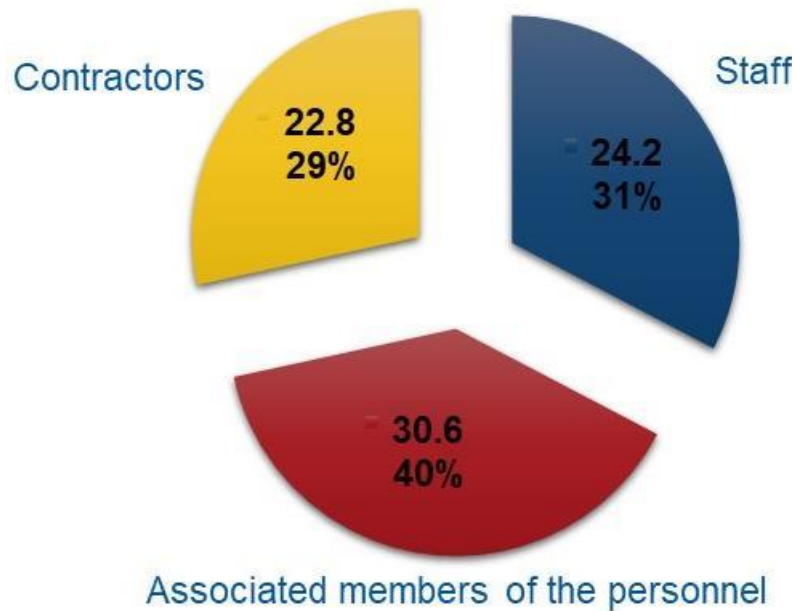
1st of January 2019 – 30th of April 2019

Collective personal dose: 77.6 person mSv
 Maximum individual dose: 1.3 mSv



6942 DIS dosimeters
 in use at CERN

Values in person mSv



Radioprotection LS2 : Operational Dosimetry

1st of January 2019 – 31st of May 2019

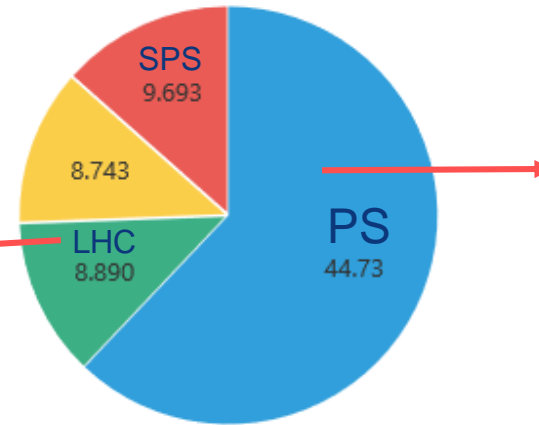
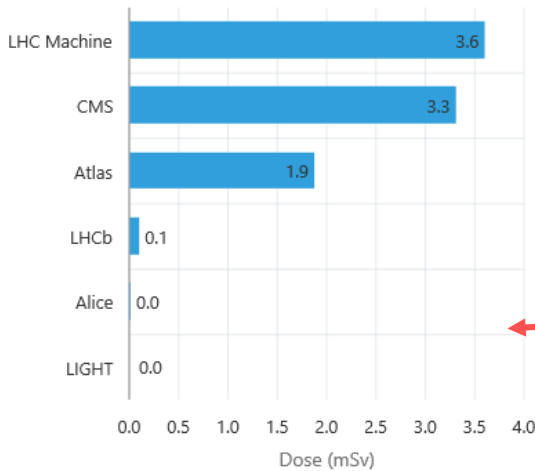
Collective operational dose: 72 person mSv

Online follow-up and statistics at any moment possible via **OpeDosi** tool



1659 DMC dosimeters in use at CERN

LHC complex



Dose by complex in person mSv

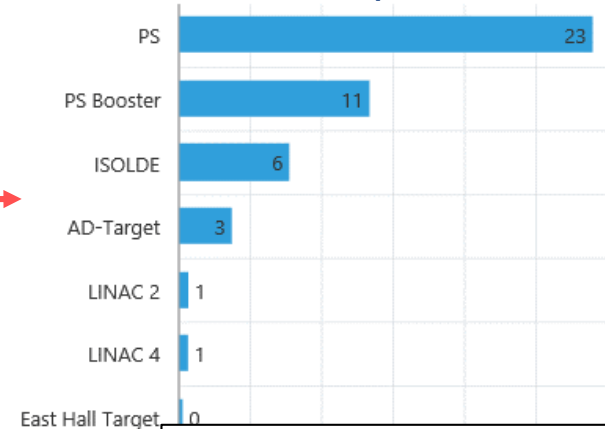
Dose (mSv)

■ PS ■ LHC ■ Other ■ SPS

LHC

- CMS Pixel detector upgrade
- CMS Beam Pipe Upgrade
- ATLAS LS2 beam vacuum system removal

PS complex



PS

- PS main magnet renovation
- PS low-voltage renovation
- Warm water pipes & duct consolidation

PBS

- Dismantling of 1L1 region, BI & BT Lines
- Installation of new lighting & power refurbishment
- De-cabling activities

Radioprotection LS2 : ALARA Level 3 interventions

CRITERION OF THE INDIVIDUAL DOSE

100 μ Sv

LEVEL 1	LEVEL 2	LEVEL 3
---------	---------	---------

1 mSv

CRITERION OF THE COLLECTIVE DOSE

500 man. μ Sv

LEVEL 1	LEVEL 2	LEVEL 3
---------	---------	---------

5 man.mSv

Location	ALARA Committee Date	Intervention	Collective dose (person mSv)	Max. ind. dose (mSv)
PS	21 Sep 18	Renovation of PS main magnet units	36	1.3
PSB	31 Oct 18	Dismantling of the PSB injection region and the BI and BT transfer lines	5.9	0.4
PS	02 Nov 18	PS Low Voltage distribution system refurbishment	29	1.1
SPS	09 Nov 18	Fire safety system SPS - BA3, 4, 5 and 6	19	2.0
SPS	22 Nov 18	SPS safety lighting infrastructure installation	14	1.1
AD target	25 Jan 19	AD target area dismantling	8.0	0.9
ISOLDE	11 Jan 19	ISOLDE front end exchange (waived)	17	1.7
SPS	08 Feb 19	SPS dump removal	8.5	1.0
EA target	01 Mar 19	East area target area renovation	5.4	0.6
SPS	08 Mar 19	SPS electrostatic septum magnet exchange	4.4	0.5
nTof target	03 June 19	nTOF target removal	9.9	1.0
SPS		Fire safety system SPS - BA1 and BA2		
BDF target		Beam Dump Facility test target removal		
AD target		AD target area installation		
NA extraction		TSCS collimator replacement		
SPS		BA1/BA2 cabling		

Work dose planning

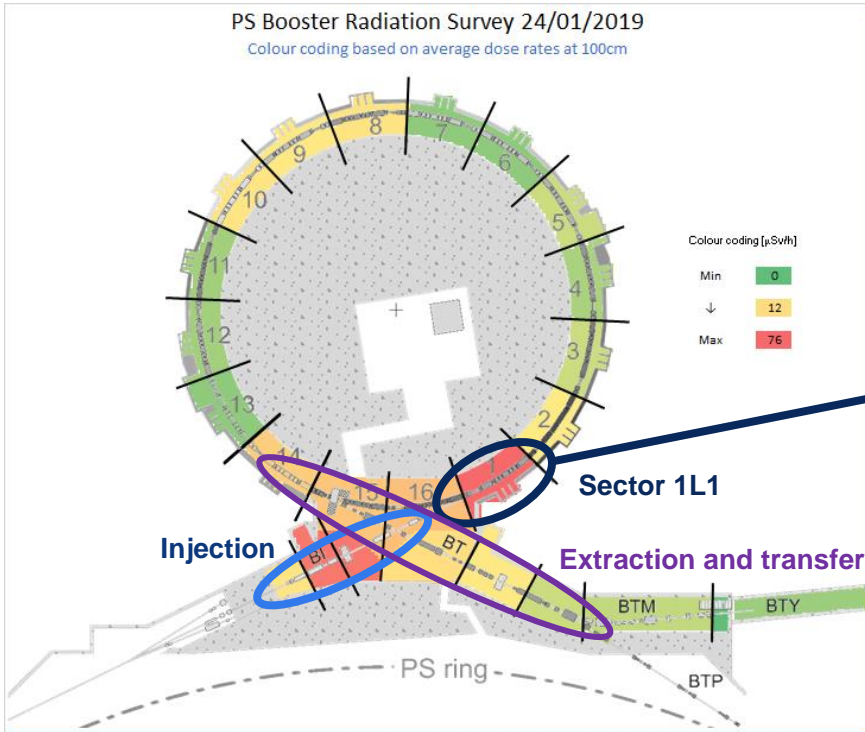
The ALARA committee consists of the following members or their deputies:

- Chairperson: Director for Accelerators and Technology
- Scientific Secretary
- Radiation Safety Officer of the owner/creator of the DIMR (Dossier d'Intervention en Milieu Radioactif)
- Group Leader responsible for the system or equipment
- Technical Coordinator (for interventions in an experiment)
- RP Group Leader



Radioprotection LS2 : PSB

Dismantling of injection / extraction area

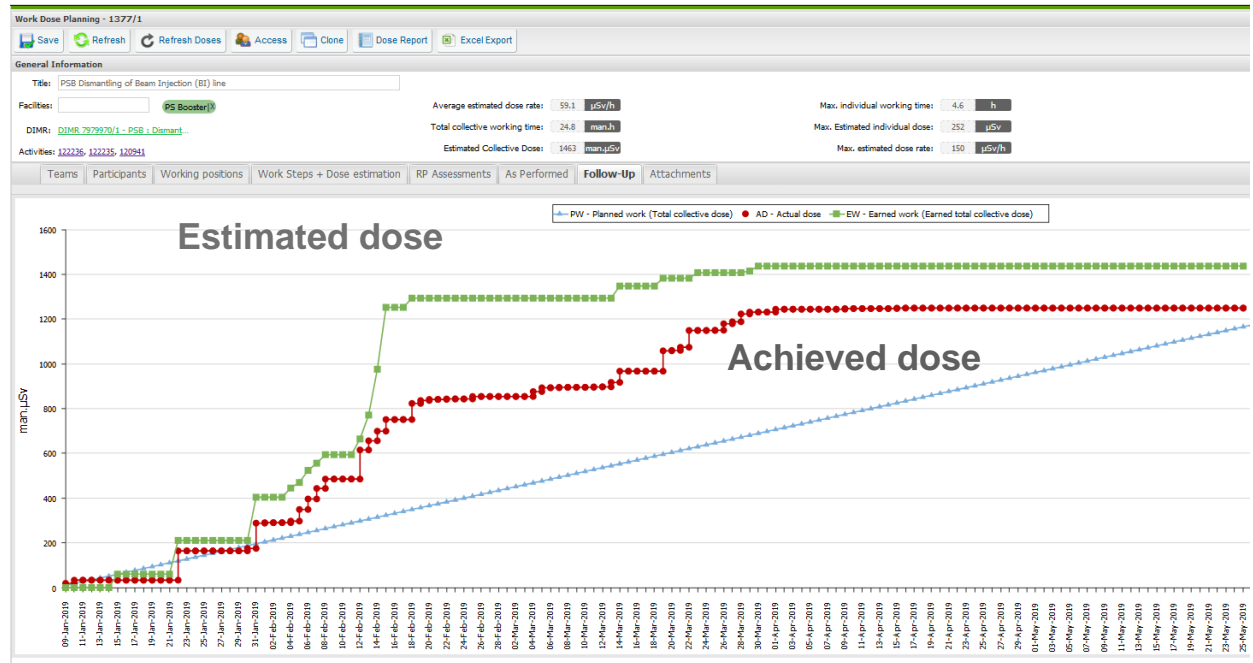


Radioprotection LS2 : PSB

Dismantling of injection / extraction area

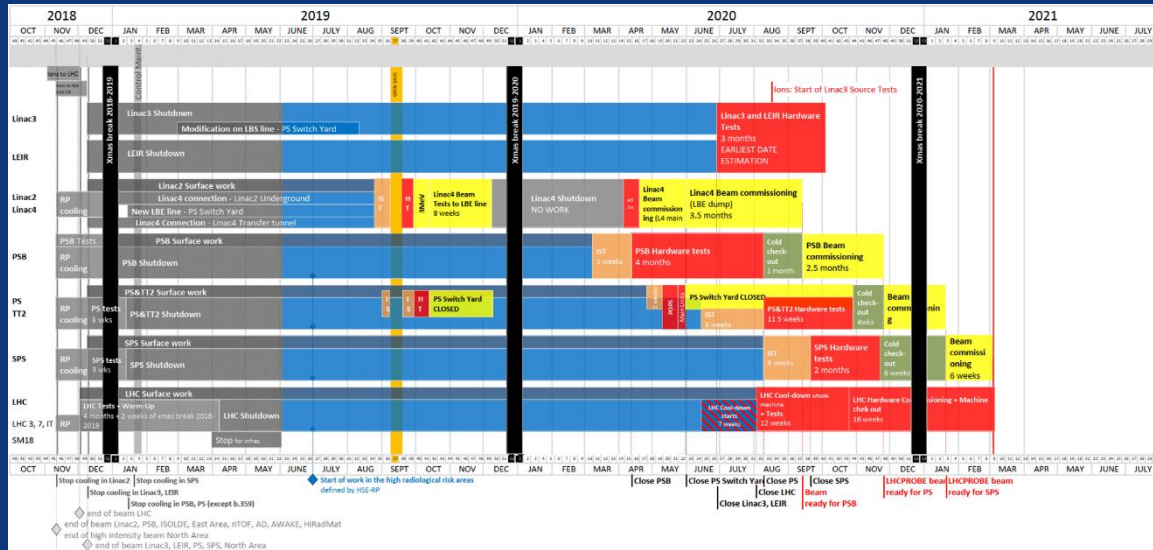
Detailed work optimization:

- Start of work only after radioactive **cool-down period of about 3 months**
- Most activated equipment removed first
- Obsolete cables rather cut than disconnected
- Whenever possible, minimum dis-assembly now, done at later stage
- **Close dose follow-up with OpeDosi and IMPACT**



LS2

On schedule thanks to massive preparation, to the dedication of numerous persons and continuous reaction from LS2 coordination team



www.cern.ch

keep calm, LS2 is a marathon...



11 km still 31.2 km

... trained and experienced teams

