



# Status of the LHC YETS 22-23

Marzia Bernardini, EN-ACE-OSS

8<sup>th</sup> March 2023

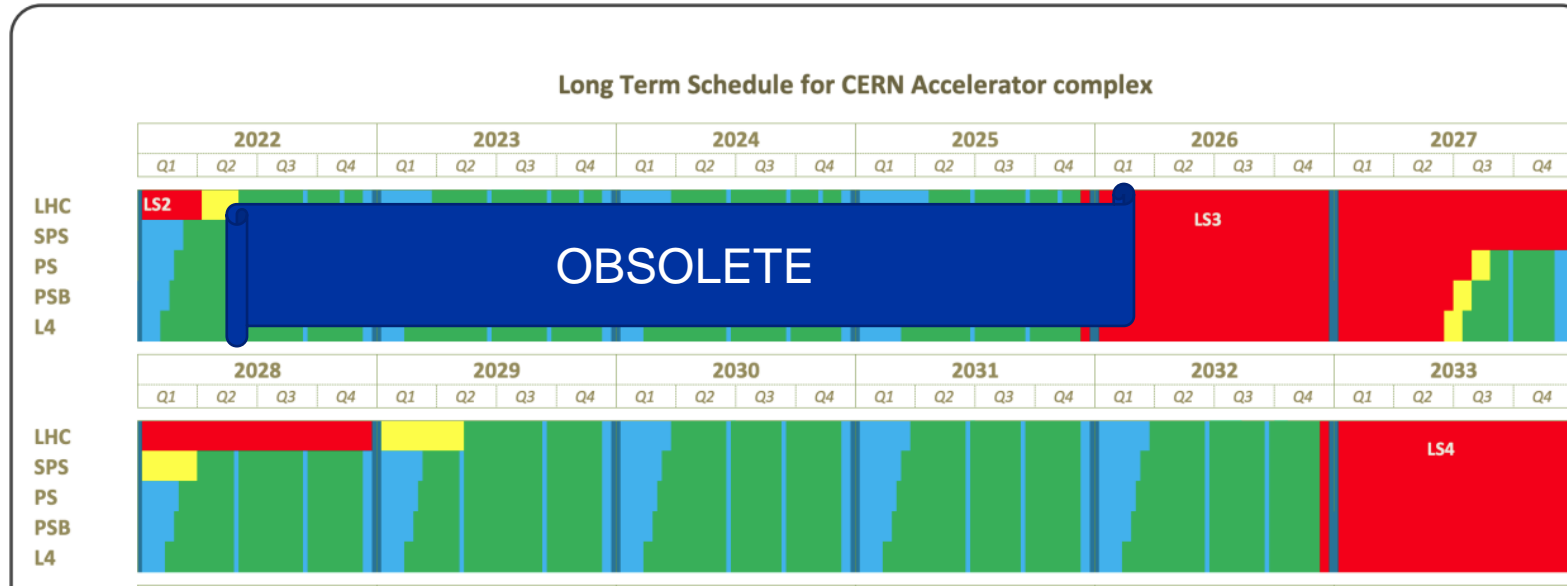
[153rd LHCC Meeting - OPEN Session \(8-9 March 2023\) - Indico \(cern.ch\)](#)

# Long Term Schedule for the CERN Accelerator Complex

ACC-PM-MS-0004



EDMS No. <b>2311633</b>	REV. <b>2.0</b>	VALIDITY <b>RELEASED</b>
REFERENCE <b>ACC-PM-MS-004</b>		



LHC Machine Committee (LMC #448) (14 September 2022)

19 weeks YETS 2023-24 duration (EYETS 2023-24 & 2024-25)

Long term schedule to be looked at during the LHC Chamonix Workshop (in progress)

LHC Machine Committee (LMC #449) (28 September 2022)

YETS 2022-23 : anticipated by 2 weeks and extended by 2 weeks

YETS 2023-24 : anticipated by 6 weeks and extended by 4 weeks

# Master Schedule in EDMS ACC-PM-MS-0006 Rev1

(Released 9<sup>th</sup> September 2022)



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Page 4		

## • Year-End Technical Stop 2022-2023

- Closure of the LHC Experiments and start of the LHC machine check-out on 23<sup>rd</sup> March 2023.
- Controls maintenance “SYS ADMIN DAYS” from 5<sup>th</sup> to 10<sup>th</sup> January 2023.



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### MASTER SCHEDULE

### MASTER SCHEDULE OF YETS 2022-2023

This is the master schedule of the Year-End Technical Stop (YETS) which is foreseen in 2022-2023. This document gives an overview of the year-end technical stop key dates and durations. This will be the reference for the detailed schedules edited by the Facility Coordinators.

This master schedule focuses on the information known for the following facilities: Linac3, LEIR, Linac4, PSB, PS, PS Switch Yard, SPS, LHC machine, ISOLDE (Low energy and HIE-ISOLDE), East Area, AD, North Area (EHN1, EHN2, ECN3 and TDC2/TCC2), nTOF and AWAKE.

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# RP Guidelines – NO LHC ION RUN

<https://edms.cern.ch/document/2683170/1>



REFERENCE  
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Page 4 of 8

### 1. Introduction

Appropriate cool-down times before the start of interventions are an important contribution to the general reduction of the exposure of personnel. This document defines the general Radiation Protection (RP) requirements for cool-down times before LHC Technical Stops, Injector Technical Stops, Year-End Technical Stops and Long Shutdowns. It does not cover short, urgent stops.

Installation specifics will have to be decided in agreement with RP beforehand, if different from the general requirements.

The individual interventions still need to be optimized according to the ALARA rule [1].

### 2. Beam categories

Instead of defining a global cool-down time applicable to all types of beams, cool-down times specific to categories of beam types are defined to optimize the beam availability of the CERN accelerator complex.

The beam types of the CERN accelerator complex can be classified into the following categories:

**Category 1 - proton beams contributing significantly to the activation in the injectors:**

- TOF
- ISOLDE
- SFTPRO
- EAST
- [HIRadMat](#)


**Category 2 - proton beams contributing significantly to the activation in target areas:**

- TOF
- ISOLDE
- SFTPRO
- EAST
- AD

**Category 3 - proton beams not in Category 1 nor in Category 2: This category includes, among others:**

- LHC type beams
- AWAKE

**Category 4 - Ion beams:** This category comprises all ion beams in the CERN accelerator complex independently of the ion species.



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Page 7 of 8

### 4. Cool-down time requirements for the LHC

The cool-down times requirements defined in this section are valid after the end of proton-proton operations. There are no additional cool-down times requirements due to ion-ion operation.

#### 4.1 LHC Technical Stops (TS)

A cool-down time between 3 - 6 hours must be respected (except for Point 3, Point 7 and the beam dump caverns UD62/UD68) after a beam dump to allow the radioactive decay of short-lived nuclides.

A minimum cool-down time of 48 hours shall be applied for Point 3, Point 7 and the beam dump caverns UD62/UD68.

#### 4.2 Year-End Technical Stops (YETS)

The term *cool-down time* refers in the context of a Year-End Technical Stop to the time between the stop of the proton beam and the start of interventions in the concerned area.

The requirements for a Year-End Technical Stop are:

- A minimum cool-down time of 1 month shall be applied for LHC LSS 1, 2, 4, 5, 6, 8.
- A minimum cool-down time of 10 weeks shall be applied for LHC LSS 3, LSS 7 and the UD62/UD68 caverns (LHC beam dumps).
- Access to the arcs can be granted after the RP survey has been completed.


The same requirements apply to an Extended Year-End Technical Stop (EYETS).

#### 4.3 Long Shutdowns (LS)

The term *cool-down time* refers in the context of a Long Shutdown to the time between the stop of the proton beam and the start of interventions in the concerned area.

The requirements for a Long Shutdown for the LHC are:

- A minimum cool-down time of 1 month shall be applied for LHC LSS 2, 4, 6 and 8.
- A minimum cool-down time of 3 months shall be applied for LHC LSS1 and LHC LSS5.
- A minimum cool-down time of 4 months shall be applied for LHC LSS 3.
- A minimum cool-down time of 6 months shall be applied for LHC LSS 7 and the UD62/UD68 caverns (LHC beam dump).
- Access to the arcs can be granted after the RP survey has been completed.



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Page 8 of 8

CH1211 Geneva 23  
Switzerland



EDMS 2683170

Date: 2022-07-13

Technical Note

General Radiation Protection requirements  
for cool-down times before  
Technical Stops, Year-End Technical Stops  
and Long Shutdowns

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### Table 2: Summary of cool-down times<sup>3</sup> requirements related to the LHC machine areas. Details of the cool-down times are defined in Section 4.

LHC machine area	Minimum required cool-down time <sup>4</sup>		
	LHC TS	E/YETS	LS
LSS 1 and LSS 5	6 hours	1 month	3 months
LSS 2, LSS 4 and LSS 6	3 hours	1 month	1 month
LSS 3	48 hours	10 weeks	4 months
LSS 7	48 hours	10 weeks	6 months
LSS 8	6 hours	1 month	1 month
UD62/UD68 (beam dump)	48 hours <sup>5</sup>	10 weeks	6 months

<sup>3</sup> from end of proton-proton operation

<sup>4</sup> before the start of interventions, unless agreed with RP

<sup>5</sup> recommended to access in the last day of the TS



# Long Term Schedule for the CERN Accelerator Complex

## YETS duration

(From Chamonix 2022 <https://indico.cern.ch/event/1097716/>)

### Run 3 programmed stops frame : “Standard” YETS before LS2

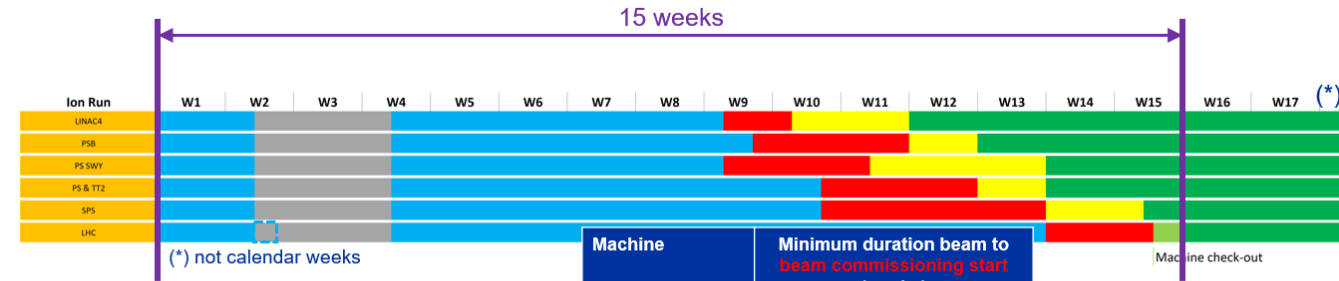
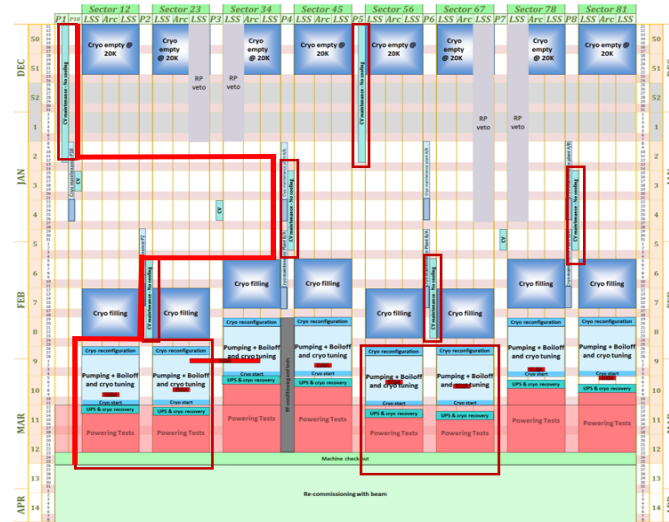
### Run 3 programmed stops frame : YETS 2022-23 as an example

#### — Critical path

- CV maintenance: **9 working wks**  
(1 wk less w.r.t. Chamonix 2016)  
Work during YE closure at points 1 & 5 (Experiments)
- Safety tests: **End of the Year closure: 2 wks**
- **Cryo reconditioning + pumping + boil off + cryo tuning + UPS & cryo recovery + ELQA:**  
**2 wks** (new w.r.t. Chamonix 2016)
- **LHC recommissioning & Machine check-out:**  
**2 wks** (1 week more w.r.t. Chamonix 2016)
- In the shadow of CV maintenance:
  - Cryo empty @20 K & cryo filling:  
4 wks (new w.r.t. Chamonix 2016)
  - Cryo maintenance: 6 wks
- No training quench period foreseen

**YETS: 15 weeks**

(including Year End Closure)



Refer to IEF presentation for injectors by F Pedrosa  
<https://indico.cern.ch/event/1063281/>

Machine	Minimum duration beam to beam commissioning start (weeks)
LINAC4	9.3
PSB	11
PS SWY	10.5
PS Ring & TT2	12
SPS	13
LHC	15

Machine check-out

Legend:

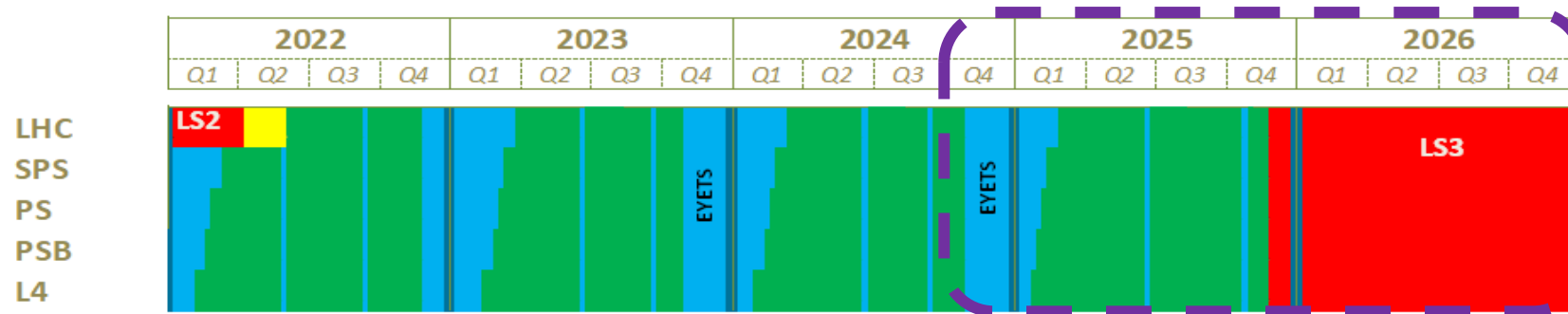
- Ion run
- Technical stop
- Hardware commissioning
- Beam commissioning
- Operation
- End of the year closure

**Very optimised YETS schedule across the LHC and its injectors**

Minimum YETS duration in LHC is 15 calendar weeks, assuming LHC @ 20 K during the YE closure

# Long Term Schedule for the CERN Accelerator Complex

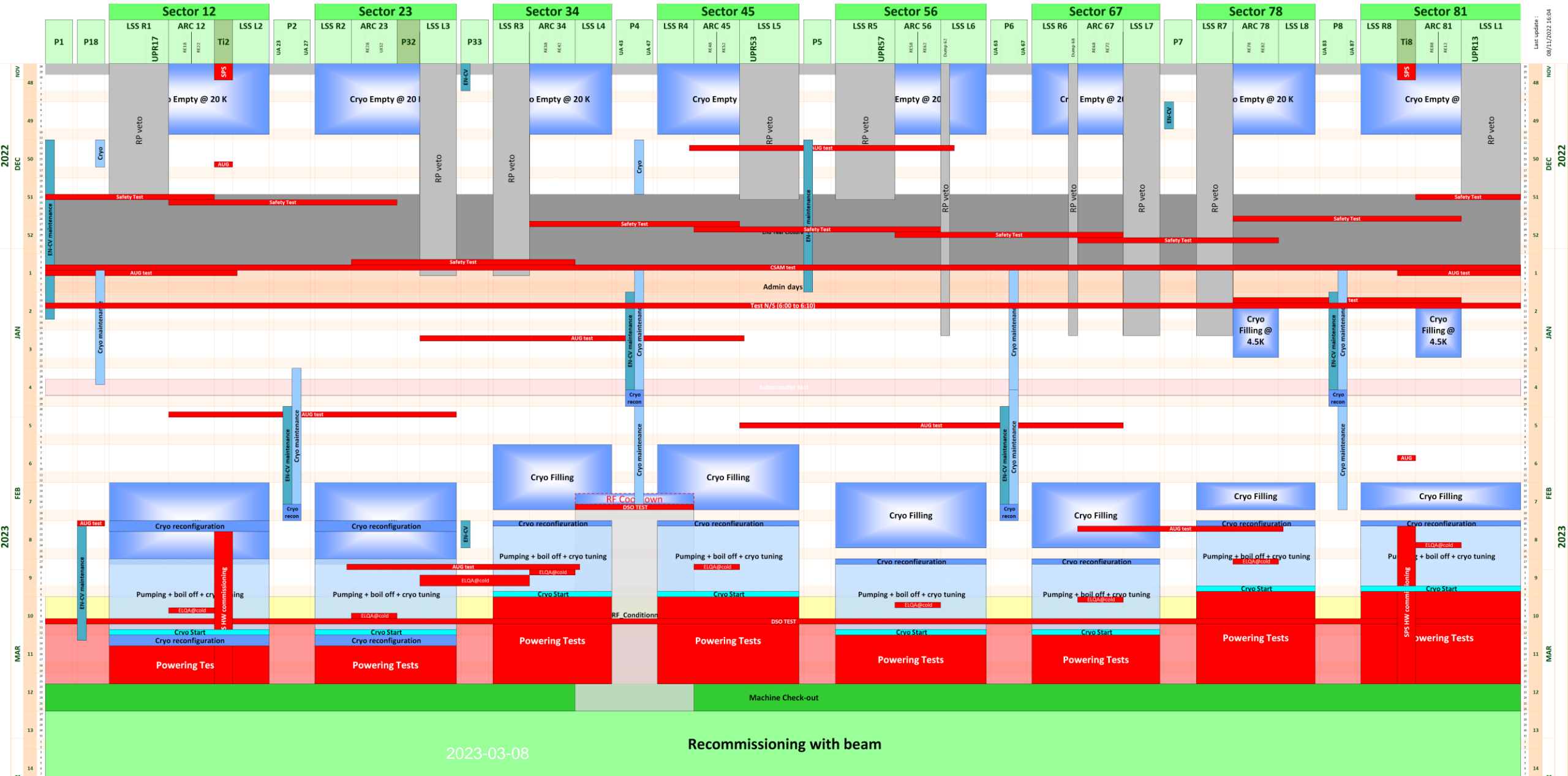
ACC-PM-MS-0004 V. 2.1 INWORK



- Run3 EYETS starting date is under discussion (proposal from BE-OP at LMC today)
- The start of the LS3 is being proposed as End October 2025
- The last EYETS before LS3 should be treated with the LS3
- Programmed stops timeline is now more driven by energy and indirectly availability and efficiency considerations than by minimising their duration

# The Frame Baseline YETS 22-23

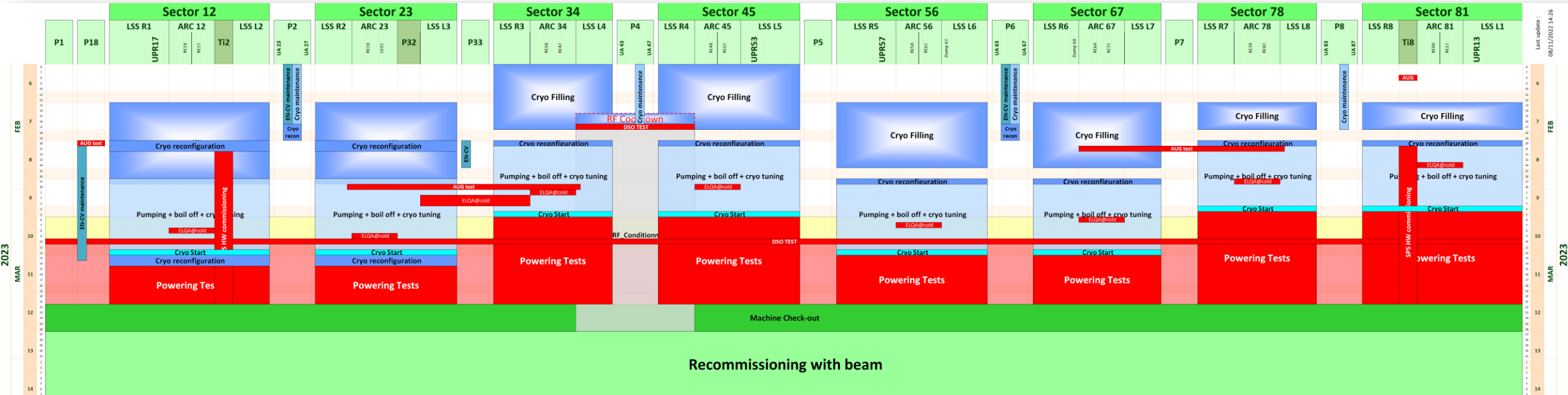
LHC-PM-MS-0021 v1.0



# The Frame Baseline YETS 22-23:

## recommissioning sequence

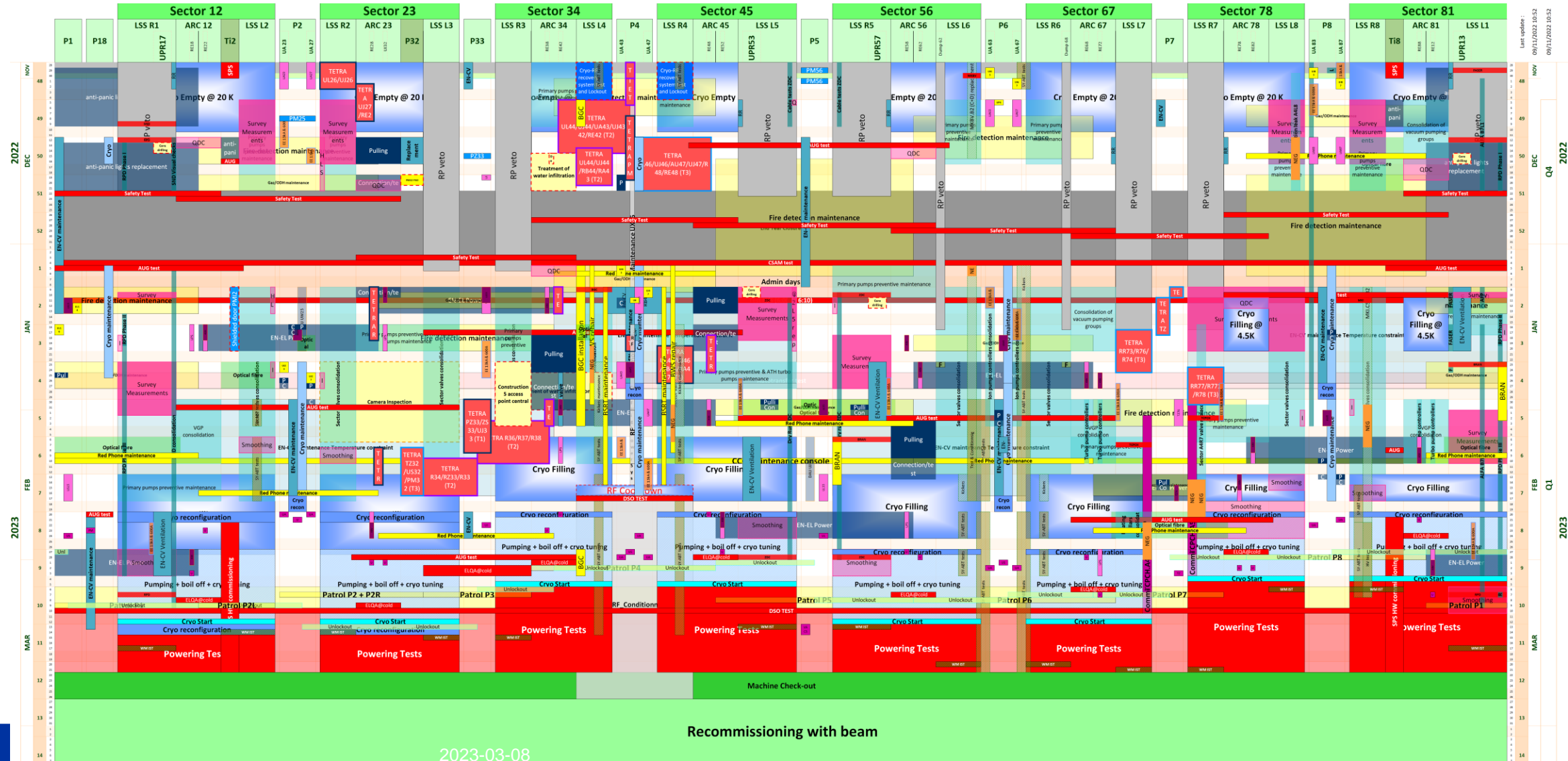
LHC-PM-MS-0021 v1.0



- DSO Test on Friday 10<sup>th</sup> March  
*Experiments closed and patrolled by Thursday 9th March @ 16h00*
- Machine Check-out from 22<sup>nd</sup> March to 26<sup>th</sup> March 2023 included
- Experiments valves open 23<sup>rd</sup> March 2023

# YETS 2022-23 Global Schedule BASELINE

LHC-PM-MS-0021 v1.0





# LHC & Injectors YETS 2022/23 Master Schedule ACC-PM-MS-006

## Injectors status – 7th March 2023

- LINAC4**
  - Beam commissioning completed with first beam to PSB on Fri 3<sup>rd</sup> March
  - 5 days downtime due to RF issues (communication with klystrons + debuncher problem)
- PSB**
  - Hardware Commissioning completed on 2<sup>nd</sup> March (on time)
  - Beam commissioning started on Fri 3<sup>rd</sup> March and progressing well (beam based alignment of H-orbit today with very good result)
- PS**
  - Hardware Commissioning almost completed, no blocking issue so far
  - IST of extraction kickers KFA71/79 ongoing (finishing this week)
  - Completion of HWC and start of beam commissioning on Fri 10<sup>th</sup> March with a possibility to inject LHCINDIV already on Wed 8<sup>th</sup> March thanks to good progress in PSB & PS
- SPS**
  - Hardware commissioning ongoing
  - Some issues identified and solved (water leak in TI8, damaged ion pump cable, BLM519)



LHCINDIV @ nominal intensity with good performance, ready for PS

legend

stop of the beam

RP survey before access

Year End Closure

Proton operation

technical stop (access to be defined)

hardware commissioning + cold check-out

beam commissioning

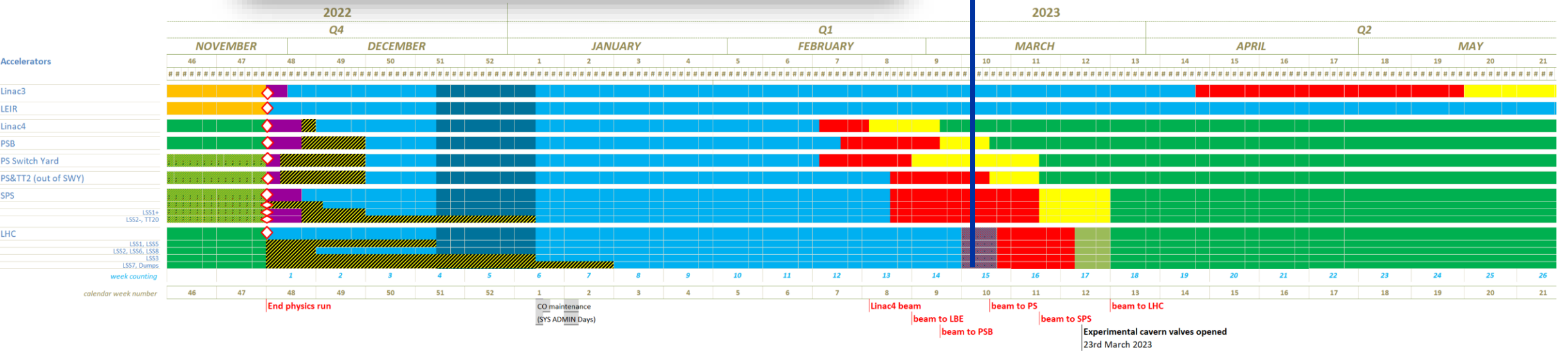
hardware commissioning and/or works

Powering test and Training quench in the LHC

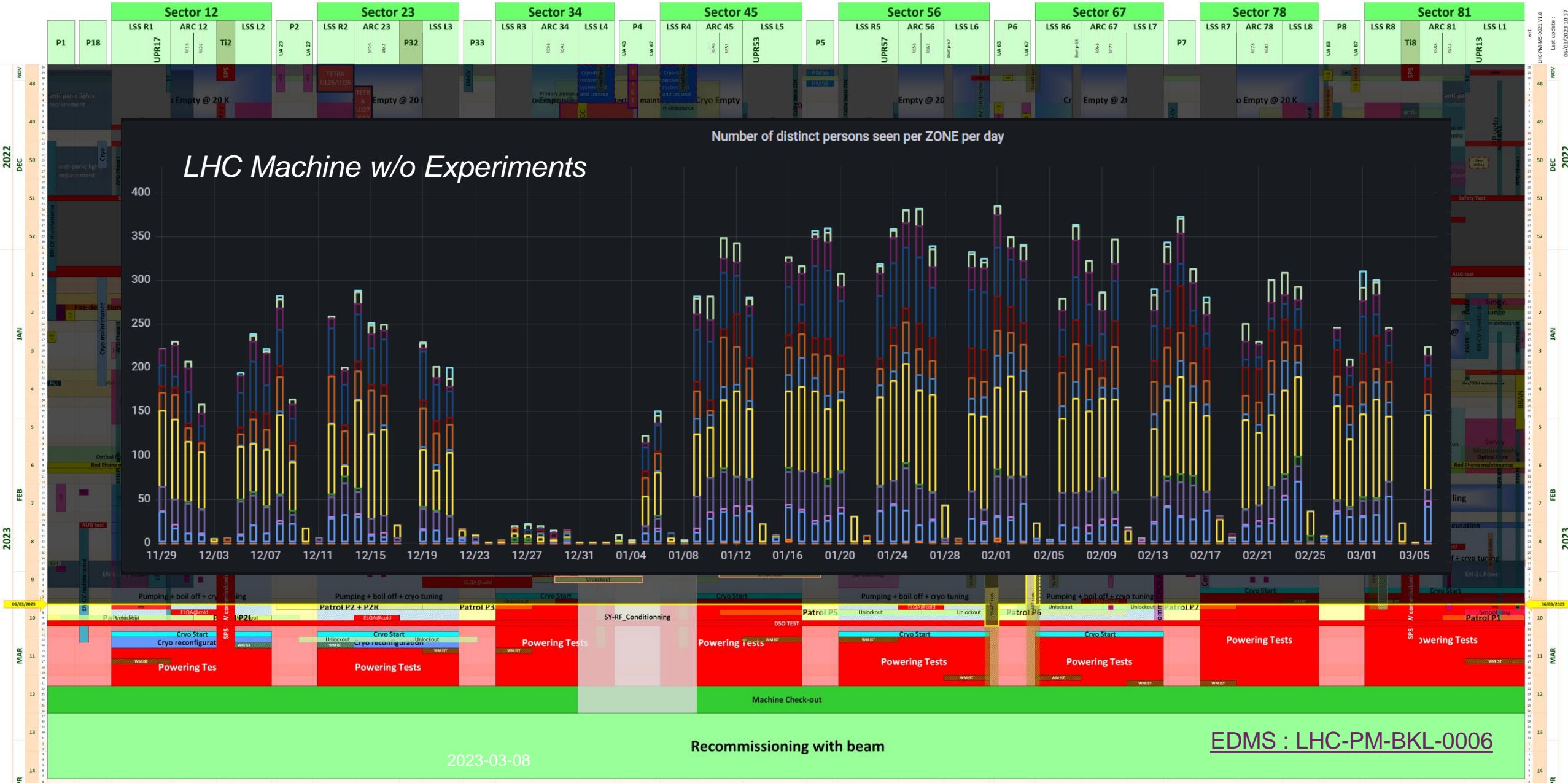
Check-out

Check-out transparent

Pb - Pb ion physics run

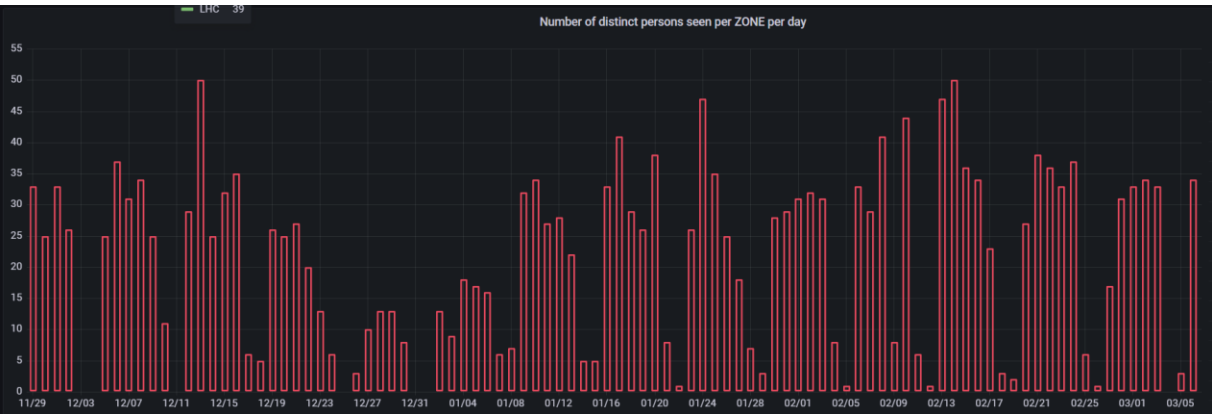
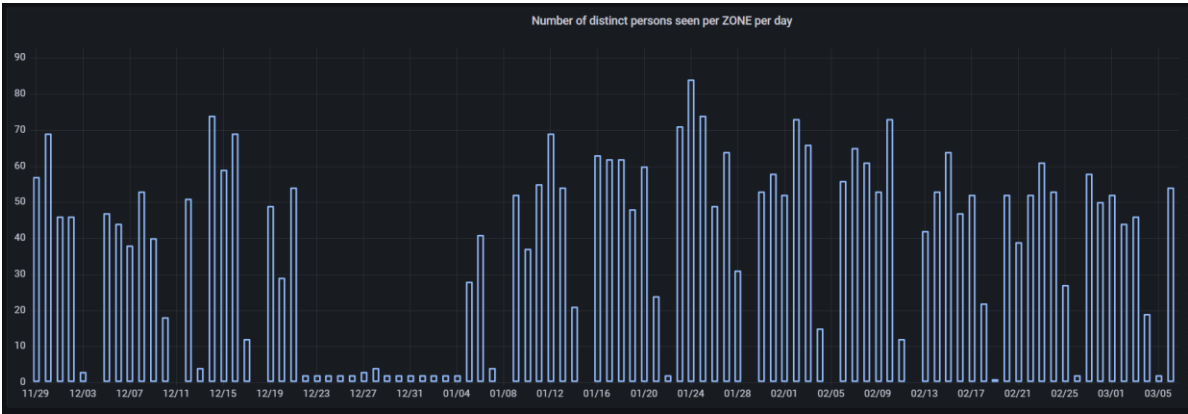
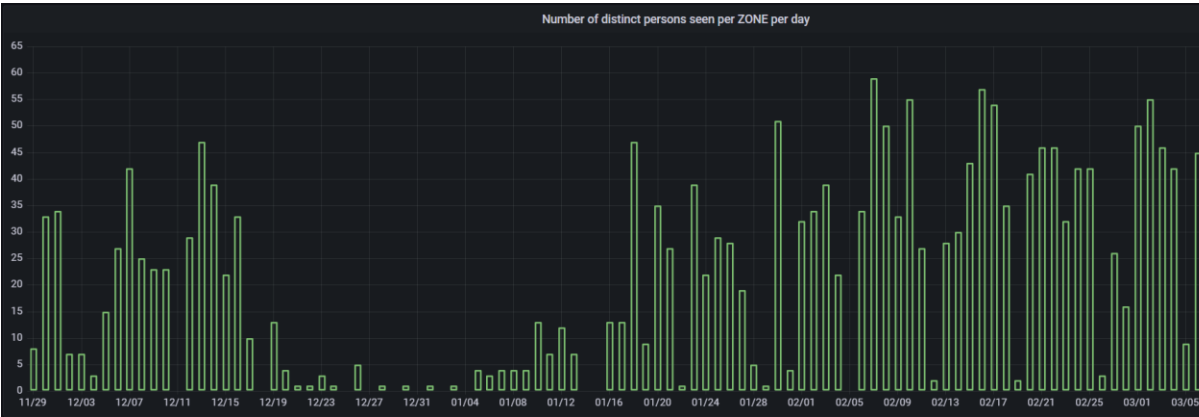
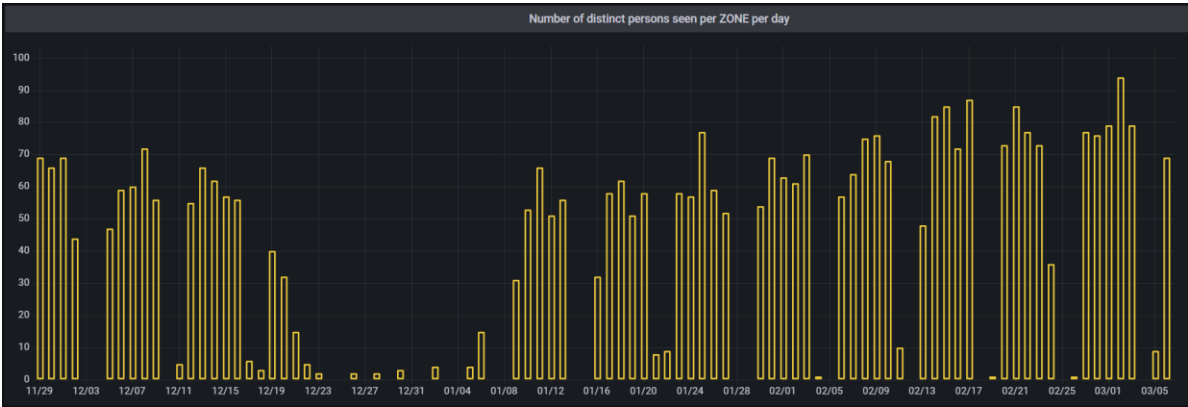


*Broken-line @ 8th March wrt **Baseline LHC-PM-MS-0021 v.1.0***






# Presence in the Underground



# Electrical tests

Complex		
all CERN sites	Auto-transfer	25 <sup>th</sup> 26 <sup>th</sup> 27 <sup>th</sup> January 2023 (W4)
	Normal Secours (N/S)	11 <sup>th</sup> January 2023 (6 a.m. to 6.10 am) (W2)
Meyrin site	AUG Adm. Zone Meyrin	4 <sup>th</sup> January 2023 (W1)
	AUG PS & PSB	14 <sup>th</sup> & 15 <sup>th</sup> January 2023 (W2)
	AUG West area	4 <sup>th</sup> February 2023 (W5)
Prévessin site	AUG Adm. Zone Preveessin	18 <sup>th</sup> March 2023 (W11)
	AUG North area (BA80-BA81-BA82)	14 <sup>th</sup> & 15 <sup>th</sup> February 2023 (W7)
SPS	AUG SPS1	18 <sup>th</sup> January 2023 (W3)
	AUG SPS2	13 <sup>th</sup> February 2023 (W7)
	AUG SPS3	19 <sup>th</sup> January 2023 (W3)
	AUG SPS4 + AWAKE	8 <sup>th</sup> February 2023 (W6)
	AUG SPS5	19 <sup>th</sup> December 2022 (W50)
	AUG SPS6	7 <sup>th</sup> February 2023 (W6)
	AUG SPS7	16 <sup>th</sup> December 2022 (W50)
LHC	AUG LHC1 (including HL) + ATLAS	5 <sup>th</sup> January 2023 (W1)
	AUG LHC18 + SM18	20 <sup>th</sup> February 2023 (W8)
	AUG LHC2 + ALICE	31 <sup>st</sup> January 2023 (W5)
	AUG LHC3 + LHC3Z	28 <sup>th</sup> February 2023 (W9)
	AUG LHC4	17 <sup>th</sup> January 2023 (W3)
	AUG LHC5 (including HL) + CMS	13 <sup>th</sup> December 2022 (W50)
	AUG LHC6	2 <sup>nd</sup> February 2023 (W5)
	AUG LHC7	21 <sup>st</sup> February 2023 (W8)
	AUG LHC8 + LHCb	10 <sup>th</sup> January 2023 (W2) – 9 <sup>th</sup> February (W6)

All SVC are in operation



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ELECTRICAL TEST

Electrical test during YETS 2022-2023

This document describes the dates of the electrical tests scheduled during the year-end technical stop (YETS) foreseen in 2022-2023. This will be used as a reference for the planning of other activities.

It covers the following electrical tests: Auto-transfer, Normal Secours (N/S), AUG Administrative Zone Meyrin, AUG PS & PSB, AUG West area, AUG Administrative Zone Preveessin, AUG North area (BA80-BA81-BA82), AUG SPS1, AUG SPS2, AUG SPS3, AUG SPS4 + AWAKE, AUG SPS5, AUG SPS6, AUG SPS7, AUG LHC1 (including HL) + ATLAS, AUG LHC18 + SM18, AUG LHC2 + ALICE, AUG LHC3 + LHC3Z, AUG LHC4, AUG LHC5 (including HL) + CMS, AUG LHC6, AUG LHC7, AUG LHC8 + LHCb.

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## Clarification on postponing AUGs (from offline discussion between EN-ACE, EN-EL, OP-TI and TIOC)

- **Clarification of the information flow**
  - In case an AUG test needs to be rescheduled after approval at the TIOC.
  - If the request to stop the test is longer than 2 working days, one should get in touch with the EN-ACE coordination team.
  - If the request to stop the test is shorter, one should get in touch with the TI desk in the CCC.
  - A reminder of the above will be added in the "Note de Coupure" circulated by EN-EL prior to the tests.

LHC Machine Committee (LMC #457) (22 February 2023)

# EN-CV & TE-CRG maintenance

	Point	Week	Start	Finish
EN-CV Maintenance	LHC1	50, 51, 52, 1, 2	12/12/2022	13/01/2023
	LHC1.8	8, 9, 10	21/02/2023	13/03/2023
	LHC2	5, 6, 7	30/01/2023	16/02/2023
	LHC3.3	48	28/11/2022	02/12/2022
		8 9	28/02/2023	03/03/2023
	LHC4	2, 3, 4	09/01/2023	26/01/2023
	LHC5	50, 51, 52, 1	12/12/2022	08/01/2023
	LHC6	5, 6, 7	30/01/2023	16/02/2023
	LHC7	49	05/12/2022	09/12/2022
	LHC8	2, 3, 4	09/01/2023	26/01/2023

	Point	Week	Start	Finish
TE-CRG Maintenance	LHC1.8	50	12/12/2022	16/12/2022
		1, 2, 3, 4	05/01/2023	25/01/2023
	LHC2	4, 5, 6, 7	23/01/2023	16/02/2023
	LHC4	50, 51	12/12/2022	21/12/2022
		1, 2, 3, 4	05/01/2023	26/01/2023
		4, 5, 6, 7	27/01/2023	17/02/2023
	LHC6	1, 2, 3, 4	05/01/2023	26/01/2023
		4, 5, 6, 7	27/01/2023	16/02/2023
	LHC8	1, 2, 3, 4	05/01/2023	26/01/2023
		4, 5, 6, 7	27/01/2023	17/02/2023

# Major changes

activities related to Experiments

Scope	Description	Location	Group	ECR link	Installation	Integration Studies
HL-LHC - WP5 - Collimation	Upgrade Of The Crystal Collimation IR7	IR7	BE-ABP	<a href="#">LHC-TC-EC-0015: Released</a> <a href="#">LHC-TC-EC-0020: Released</a>	YES	102616: Validated
HL-LHC - WP13 - Beam diagnostics & instrumentation	Upgrade of the BRAN Luminosity Monitors in LSS1 and LSS5	LSS1 and LSS5	SY-BI	<a href="#">LHC-BRAN-EC-0003: Approval Accepted</a>	YES	Not needed
HL-LHC - WP13 - Beam diagnostics & instrumentation	install the Beam Gas Curtain (BGC) Phase 2 - January 2023 - LHC Point 4	Point 4	SY-BI	<a href="#">LHC-BGC-EC-0005: Approval Accepted</a>	YES	Completed
HL-LHC - WP14 - Beam transfer & Kickers	<a href="#">Exchange of LHC Kicker Magnet MKI8</a>	LSS R8 MKI.C5R8.B2	SY-ABT	<a href="#">LHC-MKI-EC-0004: Released</a>	YES	Not needed
HL-LHC - WP17 - Technical infrastructures	UPR Modification of ventilation WP17 Phase 2/2	UPR (13, 17, 53, 57)	ATS-DO	<a href="#">LHC-U-EC-0008: Released</a> <a href="#">LHC-U-EC-0009: Released</a>	Ongoing	<a href="#">100094</a> , <a href="#">101388</a> , <a href="#">101389</a> , <a href="#">101390</a> : Validated
Physics Beyond Colliders	<a href="#">SND ventilation - Modification of the temporary extraction</a>	TI18	EN-CV	<a href="#">LHC-X1SND-EC-0001: Released</a>	YES	<a href="#">105074</a> : Completed
Physics Beyond Colliders	<a href="#">MoEDAL MAPP mQP detector in UA83</a>	UA83	BE-EA	<a href="#">LHC-X8MAPP-EC-0001: Released</a>	Ongoing	<a href="#">99926</a> : Completed
Upgrade	<a href="#">Modification of LHC DC-BCT 24-bit acquisition during YETS 2022-2023</a>	All LHC	SY-BI	<a href="#">LHC-BCT-EC-0006: Released</a>	YES	Not needed
Upgrade	Installing A BCCM Development System during YETS 2022-2023	P4	SY-BI	<a href="#">LHC-BCCM-EC-0002: Released</a>	W7-8	Not needed
Consolidation	<a href="#">Modification of power supply units of the LHC Monorail</a>	all LHC	EN-ACE	<a href="#">LHC-HHT-EC-0001: Released</a>	Ongoing	<a href="#">103434</a> : Validated
Consolidation	New access manholes to central drain Sector 3-4 (R34--> R37)	Between RZ33 and RE38	SCE-SAM	<a href="#">LHC-K-EC-0062: Released</a>	YES	<a href="#">107738</a> : Completed
Consolidation	<a href="#">Replacement of Telecom Radiating Cable in LHC point 3, 4, 7</a>	P3, P4, P7	IT-CS	<a href="#">LHC-CC-EC-0005: Released</a>	P4-P7 YES P3 ongoing	<a href="#">100066</a> : Validated <a href="#">103444</a> : Validated <a href="#">103443</a> : Validated <a href="#">100065</a> : Validated
Consolidation	Replacement of Telecom Radiating Cable in LHC point 2	LSS R2 + Arc 23	IT-CS	<a href="#">LHC-CC-EC-0004: Released</a>	YES	<a href="#">100065</a> : Validated
Consolidation	<a href="#">Upgrade of the Pumping System on LHC MKB Tanks with NEG Cartridges</a>	P6 - RA63	SY-ABT	<a href="#">LHC-V-EC-0029: Released</a>	YES	Not needed
Consolidation	Installation of a shielded doors at the PMI2 shaft bottom (shaft side)	PMI2	EN-HE	<a href="#">LHC-JS-EC-0002: Released</a>	W6-7	<a href="#">107026</a> : Validated
Consolidation	<a href="#">Upgrade of the Electrical Distribution Boxes of the VPI Heating Collars</a>	R74	TE-VSC	<a href="#">LHC-VPI-EC-0001: Approval Accepted</a>	W8	<a href="#">106396</a> : Validated
Consolidation	<a href="#">Modification of the pressure release safety system on the ACS RF cryomodules</a>	LSS4	SY-RF	<a href="#">LHC-ACS-EC-0002: Released</a> <a href="#">(TS1 change)</a> <b>ECR Needed</b>		<a href="#">108132</a> : In Progress
Consolidation	Installation protection Crystal Collimator	R771 - C6R7	SY-STI	<b>Not Needed (Technical note)</b>	YES	<a href="#">102616</a> : Validated
Consolidation	<a href="#">Protection Against Accidental Contacts for Normal Conducting Magnets of TI2</a>	TI2	TE-MSC	<a href="#">LHC-M-EC-0006: Released</a>	Ongoing	Not needed
Consolidation	Access control installation on a top of pit end-of-zone lhc door	SD1, SD2, SD3, SD4, SD5, SD6, SD7, SD8	EN-AA	<b>Waiting for CSAP recommendations</b>	Postponed	Waiting for information
Consolidation	<a href="#">Replacement of TCTPV.4L8.B1 by the radioactive spare</a>	4L8	SY-STI	<b>ARR:</b> <a href="#">LHC-TCTP-ARR-0001: Under Approval</a>	YES	Not needed
Consolidation	Insulation Vacuum Protection of QRL Extension for RF Cavities at LHC-P4	LSS4	TE-CRG	<b>LHC-QRL-EC-0005: In Work</b>		In progress
Consolidation	Upgraded Heating system in RRs for the LHC current leads	RRs	TE-MPE	<b>ECR Needed</b>	Ongoing	Not needed
Physics Beyond Colliders	<a href="#">Installation of shielding blocks at SND experiment</a>	TI18	BE-EA	<a href="#">LHC-X1FP-EC-0010: Released</a>	W6-8	Completed ?
Consolidation	Displacement of 2 diamond detectors on LHC LSS7	LSS7	SY-BI	<b>ECR Needed</b>	W9	Needed
Maintenance & Operation	<a href="#">Radial displacement of LSS5 during the YETS 2022-2023</a>	LSS5	BE-OP	<a href="#">LHC-G-EC-0016: Approval Accepted</a>	YES	Not needed
Decommissioning	<a href="#">Decommissioning of the LHC Interconnection alert systems (InterX)</a>	LHC	153th LHC-GM Marzia Bernardini	<a href="#">LHC-EC-0001: Released</a>	YES	Not needed
Decommissioning	Removal solenoid converters 60A RSOL	16L2 / 30L2	TE-MSC	<b>ECR Needed</b>	Ongoing	Not needed



# LHC-YETS 22-23: Experiments related to LHC

## Point 1

- **RPD**: installation, Remote Run and removal (in both sides)  
LHC-X1ZDC-EN-0002
- **FASER**: FASERnu box replacement, Detector consolidation and Cooling maintenance
- **SND**: Change of the wall emulsions, Detector consolidation and shield installation LHC-X1FP-EC-0010
- **ALFA/AFP**: Recover flooded ALFA B7L1 and improve cooling pipes insulation for AFP

## Point 2:

- **ZDC**: maintenance in both sides

## Point 5:

- **ZDC**: installation, Cable check and reparations, Run and **removal (in both sides, done today)**
- **TOTEM/PPS**: general interventions and installation of the new crane Wiener LV PS unit in RR57

## Point 8:

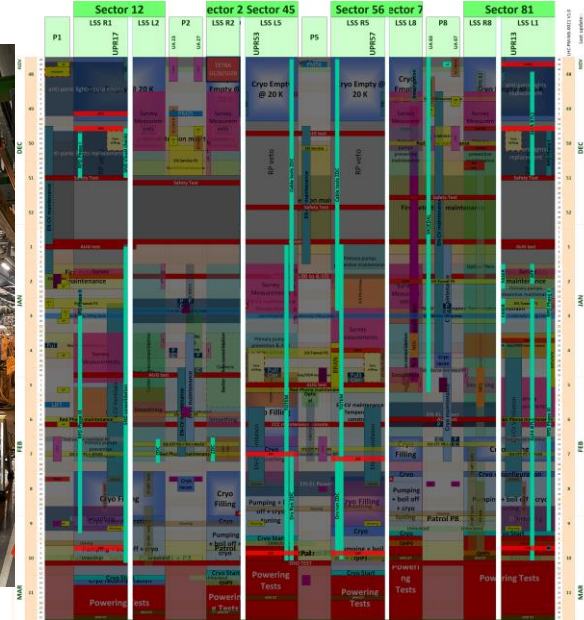
- **LHCb** handling UT detector above UXC85
- **MoEDAL**: Mapp detector installation in UA83



AFP works in B7L1



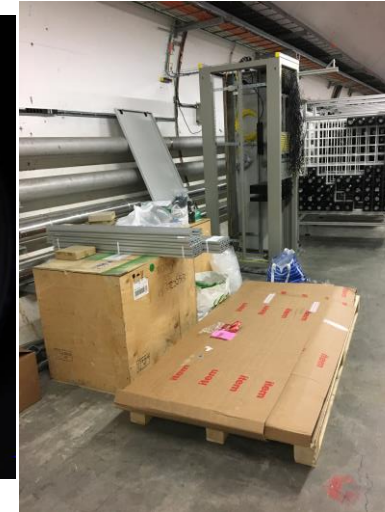
RPD installation in Arm12



TOTEM rack in RR57



MoEDAL in UA83



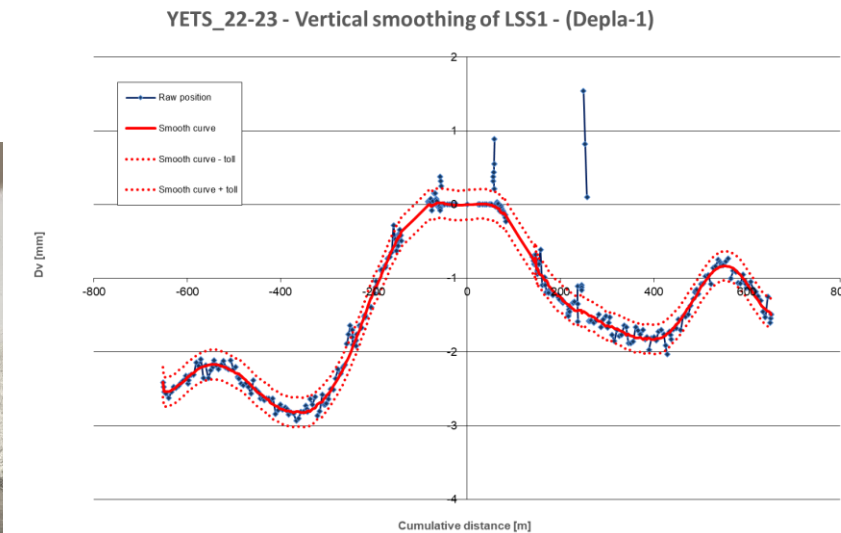
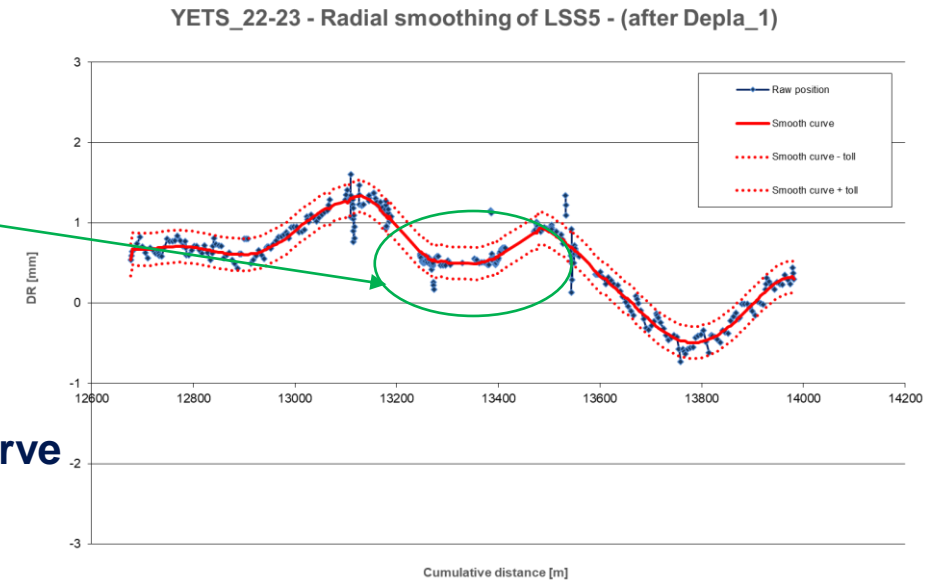
SND Shielding

# BE-GM LSS activities

## Survey activities in LSS :

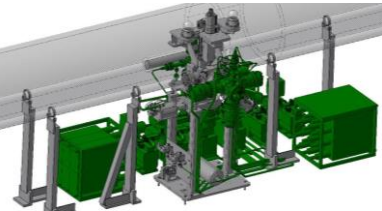
- **LSS1 and LSS5** : Vertical & Radial smoothing from Q7 to Q7
- **LSS2 and LSS8** : Vertical smoothing from Q6 to Q6
- **Main magnets and secondary components aligned w.r.t. the smooth curve**
  - Roman pot stations not realigned as requested by the Equipment owners
- **ALFA & AFP station LVDT calibration (LSS1)**
- **Lowbeta magnets aligned at their nominal positions as defined during LS2**

LSS5 components were radially shifted + 0.5 mm outside the LHC ring as requested by CMS

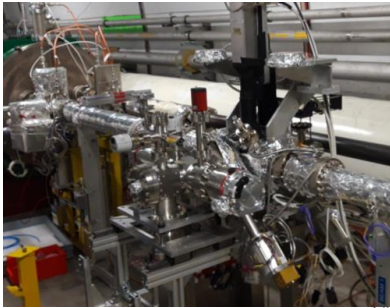




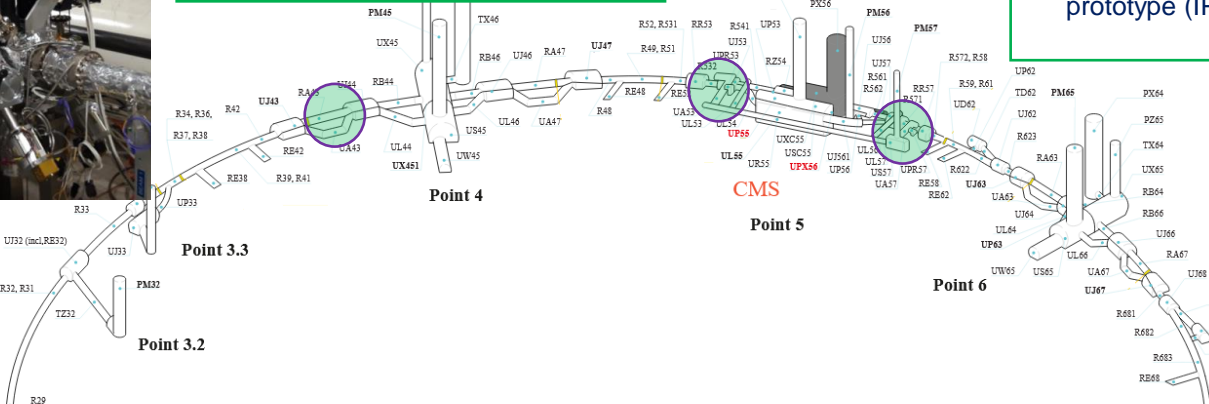
# HL-LHC during YETS 2022-23



BGC Phase 2

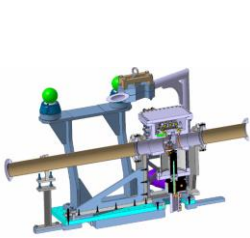


**WP13:**  
• BGC optical system [LHC-BGC-EC-0005](#)



**WP13:**  
• Remove of BRANA and replace by the new **BRAND** prototype (IP5 Right) [LHC-BRAN-EC-0002](#)

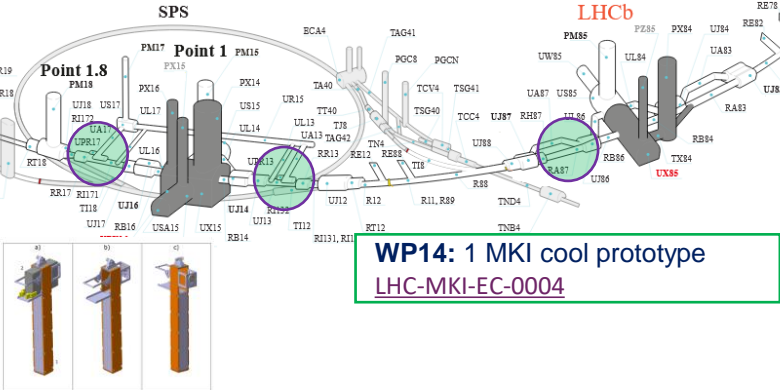
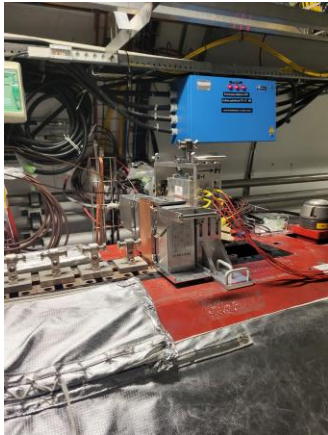
**WP13:**  
• Remove of BRANA and replace by the new **BRAND** prototype (IP1 Left) [LHC-BRAN-EC-0002](#)



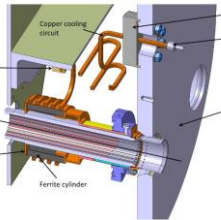
TCPC



**WP5: 2 TCPC crystal collimators**  
[LHC-TC-EC-0020](#)



**WP14: 1 MKI cool prototype**  
[LHC-MKI-EC-0004](#)



MKI Cool prototype



Core drilling at UPR17

BRAND assembly



# HL-LHC during YETS 2022-23: UPRs 13, 17, 53, 57

## WP17:

- **Core drilling** for the mechanical ventilation [LHC-U-EC-0009](#)
- Work in the HL-LHC from the LHC:

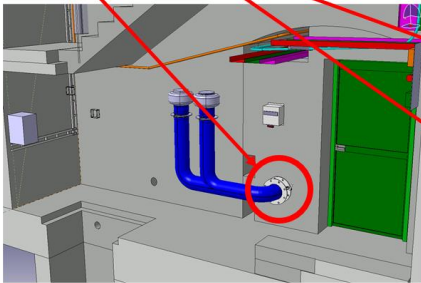
*Courtesy H. De Maynard*

Autorisation temporaire d'ouverture des portes YCPZ01=UA13, YCPZ01=UA17, YCPZ01=UA53, YCPZ01=UA57

### • UPR activities

- Installation done during YETS 22-23 ([HL-LHC TCC #135](#)). Final configuration with the cores (LS3)

- Drilling
- Dumpers

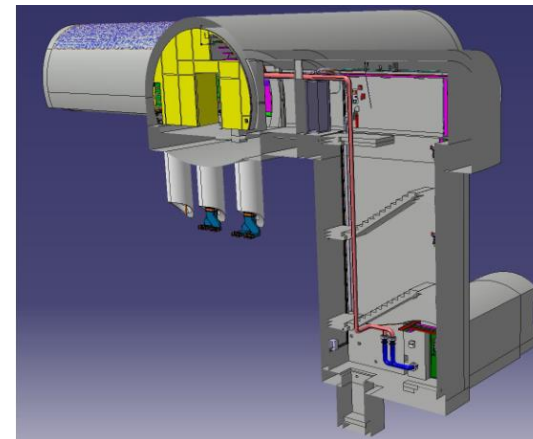


### • Operation & recurrent activities

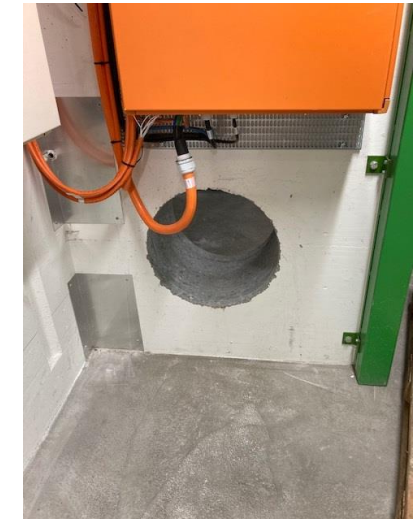
- Draining of the sump (each TS up to definitive installation ≈ 2023)



- CV System upgraded, including controls
- ODH issue solved during YETS 21-22
- Fire detection sniffers re-activated during YETS 22-23
- Cleaning of UPR&UA completed
- Wood door removed (HL side)
- IS37 revoked



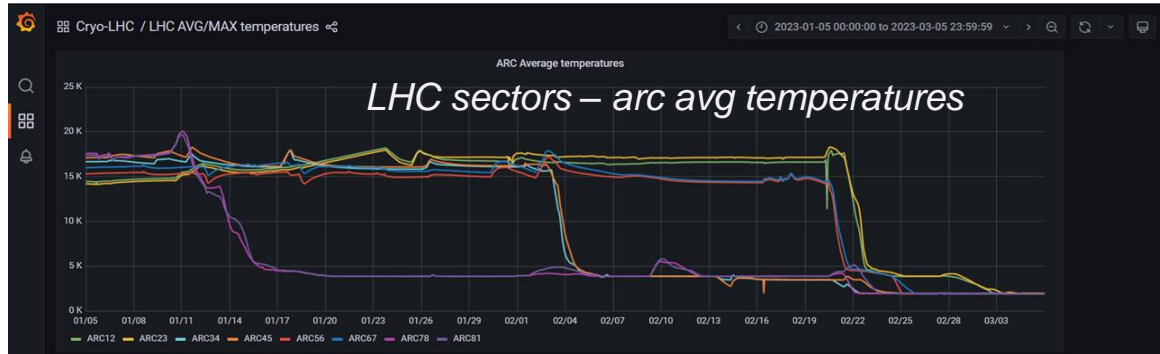
*Cores and Mechanical ventilation*



# Cryogenics status

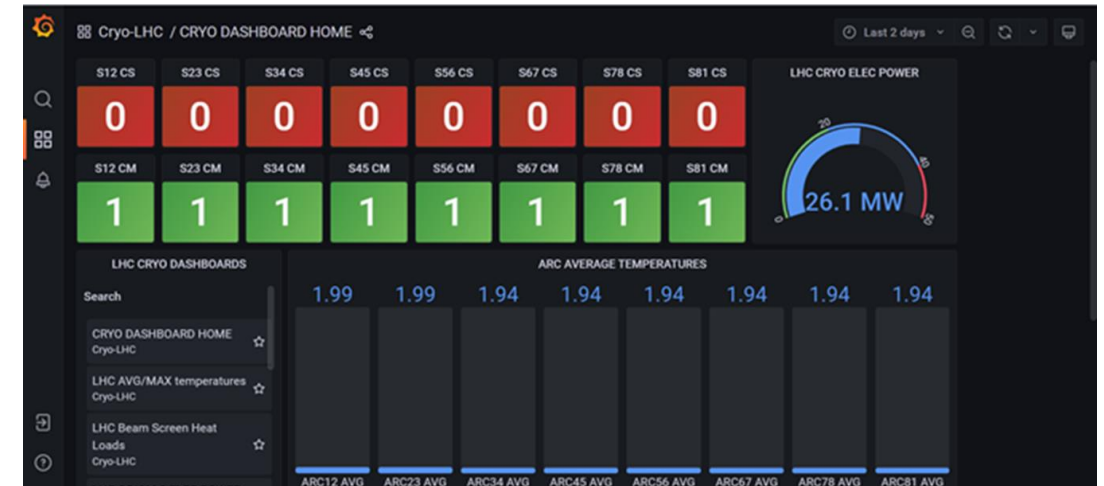
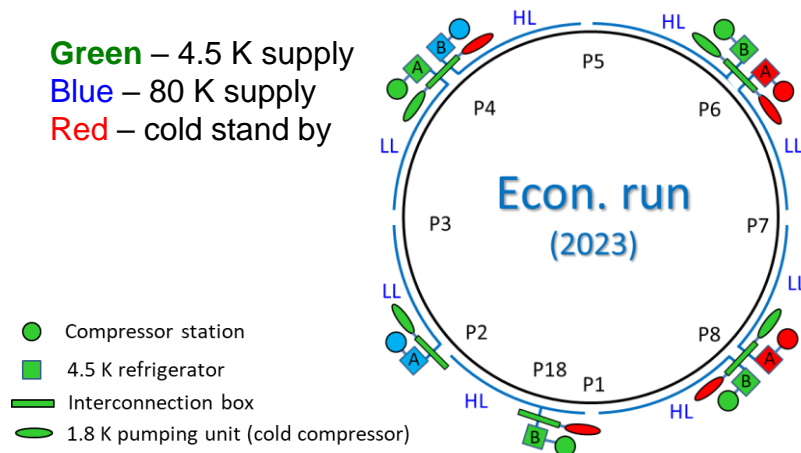
Courtesy TE-CRG, K. Brodzinski

LHC - maintenance completed, the evolution of arc temperatures and status of the cryoplants are presented below:



- LHC – presently with CryoMaintain signal for all sectors.
- The Beam Screen regeneration is completed
- Powering test has started on Monday this week.
- RF with CS/CM from 17<sup>th</sup> February – conditioning ongoing.

Economic configuration in place:



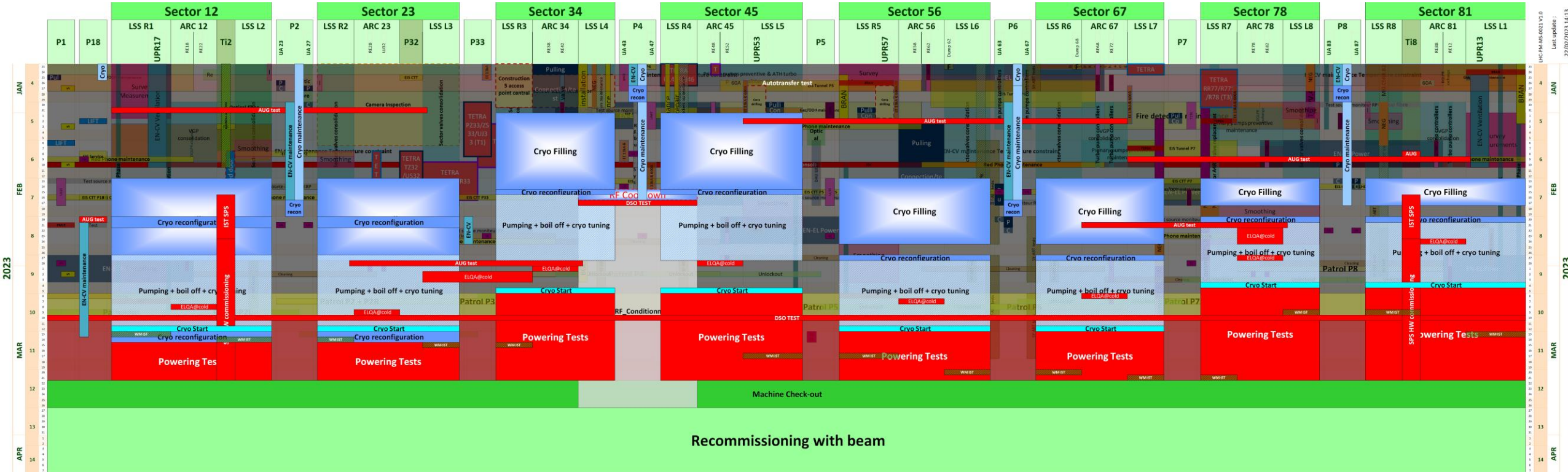
# Missing activities before the HWC

- Electrical Quality assurance tests (EIQA on 13 kA)
- Patrols
- Electrical unlockout (main circuits and warm magnets)
- Quench Heaters Switch on
- LSS1 & LSS5 Wire collimators: BBLR recommissioning, and tests needed
- HL-LHC: Intervention on Ventilation in the new UPRs 13, 17, 53, 57
- TOTEM: RR57 validation of the new crate (Wiener LV PS Unit)
- LSS5: removal of CMS ZDC
- USC55 (CMS) and UXA85 (LHCb): UPS batteries replacement & Maintenance in USC55
- Cryogenics reconfiguration of S.12&23, following the completion of CV Maintenance @ P18

→ DSO test



# LHC recommissioning: IST & HWC, present schedule



## RF recommissioning:

- Klystrons: High Power system recommissioning  
→ NO ACCESS UX45 from 27<sup>th</sup> Jan
- RF patrol → 14<sup>th</sup> February @ 3pm
- RF DSO Test → 15<sup>th</sup> Feb
- RF conditioning in progress from 17<sup>th</sup> Feb.

## SY-ABT:

- Kickers commissioning in progress

## TE-MSC:

- Warm Magnet tests in // with Powering Tests

## TE-MPE:

- Electrical Quality Assurance Tests on 13kA circuits in progress

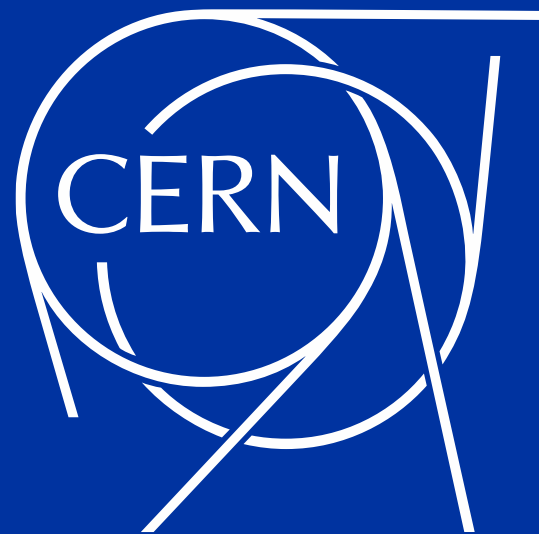
## LHC commissioning:

- DSO test 10<sup>th</sup> March
- Handover EN-ACE with BE-OP → 10<sup>th</sup> March
- Powering test → start from 5<sup>th</sup> Mar during nights
- Powering test all sectors from 13<sup>th</sup> Mar

# Conclusions

- The YETS 22-23 is touching its end
- Preparation for HWC commissioning is fully in progress
- Still some minor issues but NO showstoppers
- LHC Machine to BE-OP on Thursday 9th March evening
- Experimental caverns closed for DSO test on 9th March from 16h00 and 10th March
- Machine checkout starts on Wednesday 22nd March

*Many thanks for the fruitful collaboration during this YETS!*

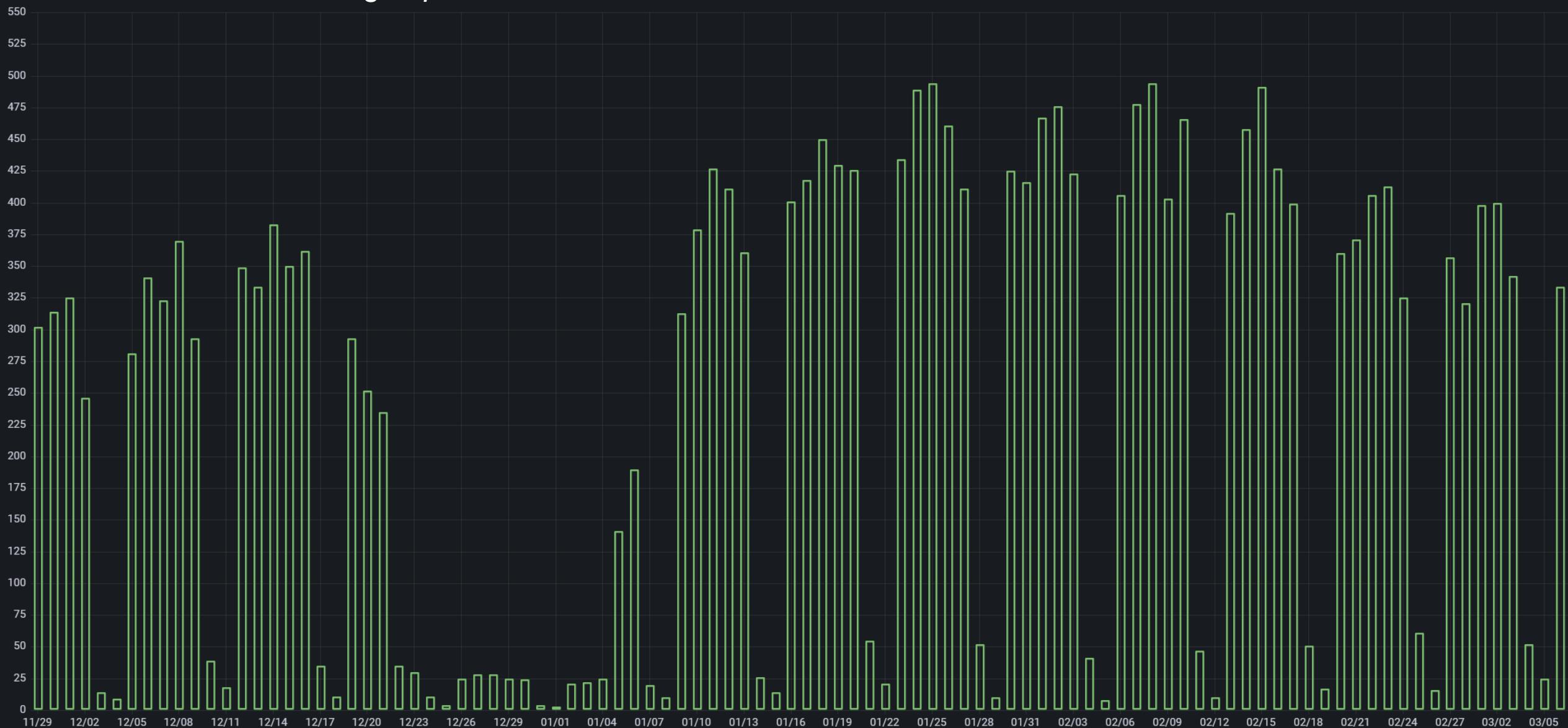


# Back-up slides



# LHC Machine including Experiments

Number of distinct persons seen per Accelerator per day



# EN-CV maintenance

P1, P2, P3, P4, P5, P6, P7, P8

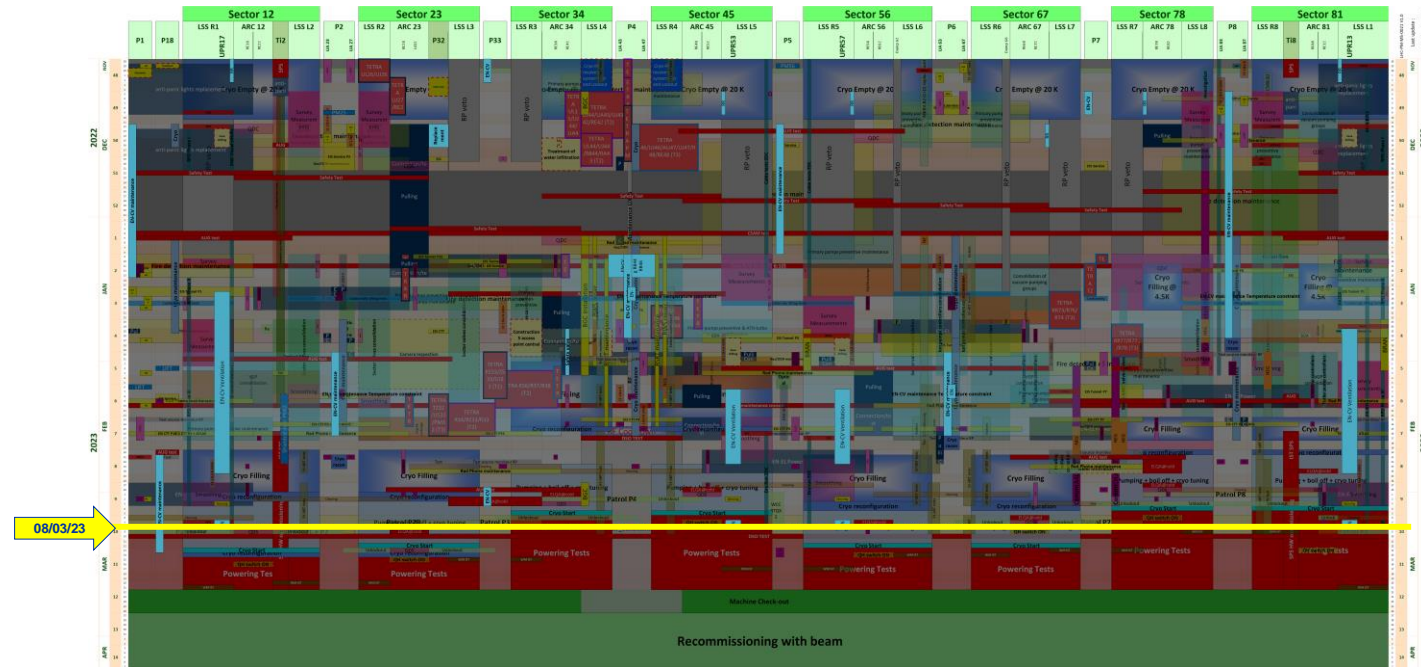
- Maintenance completed

P18

- Maintenance ongoing (as planned until 13/03)

UPR/UA 13,17,53,57

- Installation of the ventilation system completed
- Intervention on Ventilation for RUN conditions
- UPR 13,17 : Emptying of water tanks scheduled in the next few weeks during a BE-OP access (too early now)
- UA 57: Requested to replace a SAS pressurisation fan, awaiting for material & information (HL-LHC side)



S56

- Problem with the expansion tank valves => replacement completed

TI8:

- leak in demineralised water => repair performed on 2nd March

USC55

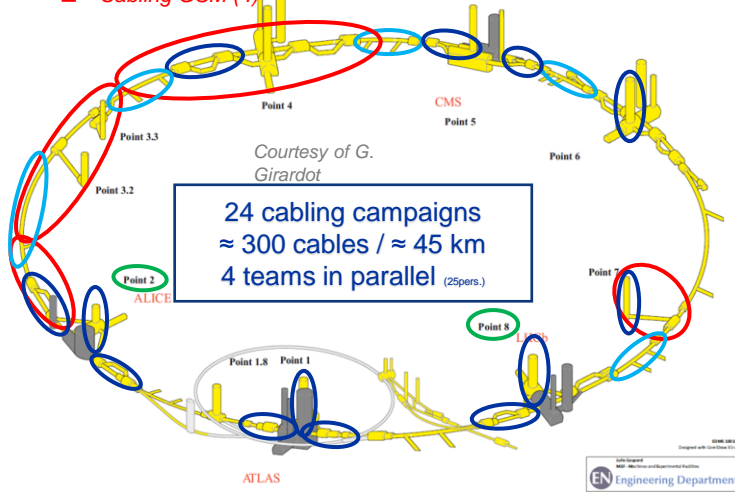
- Leaks on WCC RTQX2 repaired (see slide SY-EPC)

	Point	Week	Start	Finish
EN-CV Maintenance	LHC1	50, 51, 52, 1, 2	12/12/2022	13/01/2023
	LHC1.8	8, 9, 10	21/02/2023	13/03/2023
	LHC2	5, 6, 7	30/01/2023	16/02/2023
	LHC3.3	48 8 9	28/11/2022 20/02/2023 28/02/2023	02/12/2022 24/02/2023- 03/03/2023
	LHC4	2, 3, 4	09/01/2023	26/01/2023
	LHC5	50, 51, 52, 1	12/12/2022	08/01/2023
	LHC6	5, 6, 7	30/01/2023	16/02/2023
	LHC7	49	05/12/2022	09/12/2022
	LHC8	2, 3, 4	09/01/2023	26/01/2023

# LHC-YETS 22-23: Cable campaign and Optical fibers

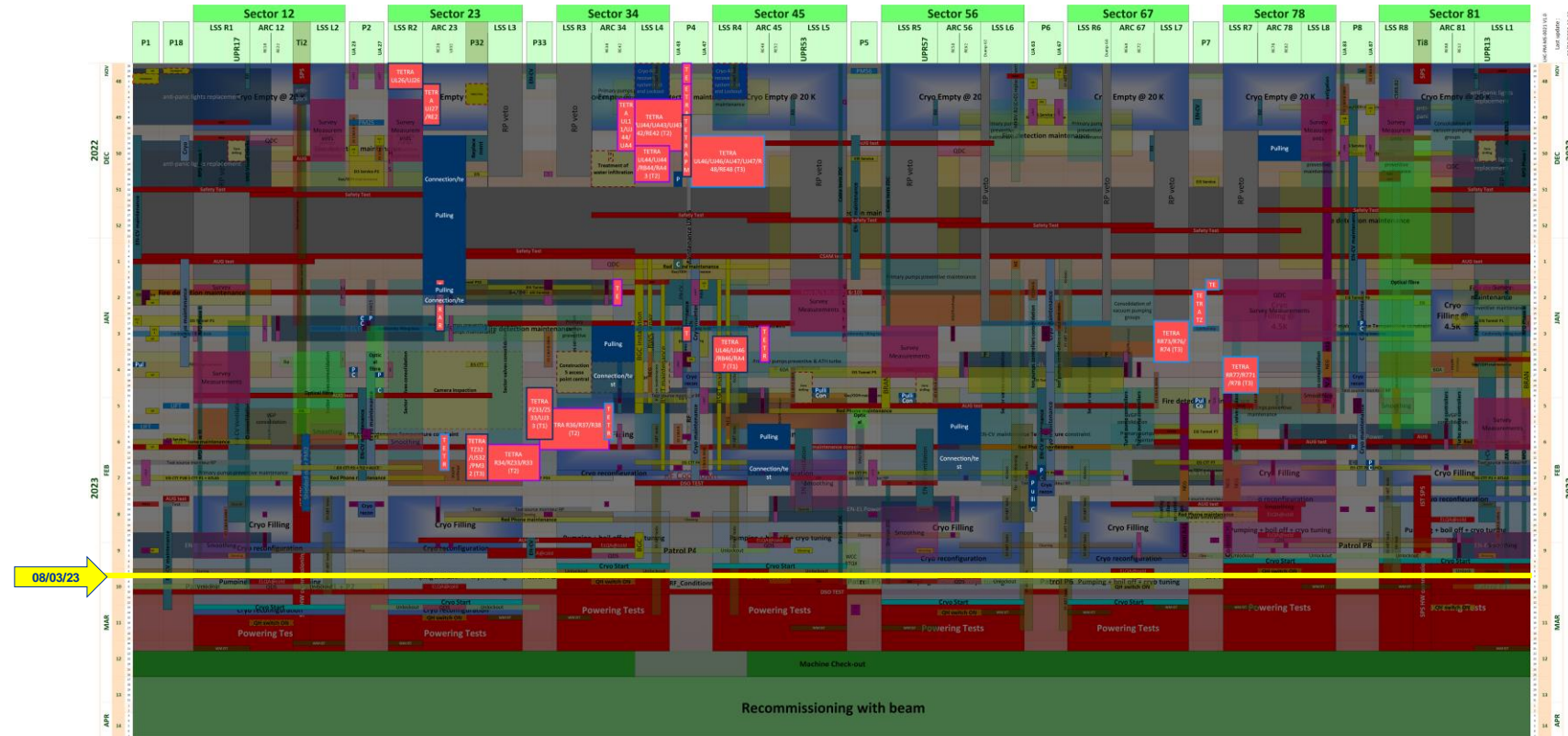
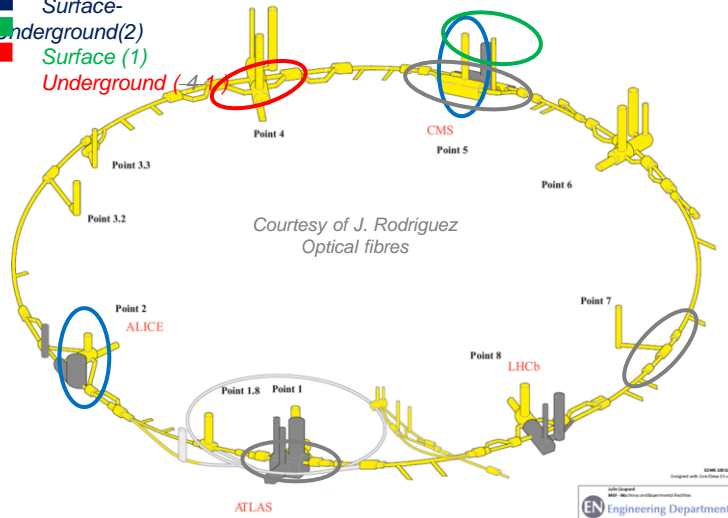
Legend:

- Cabling Arcs (5)
- Cabling LSS, US, Pits (13 +2)
- Cabling Surface (2)
- Cabling GSM (4)



Legend:

- Surface
- Underground(2)
- Surface (1)
- Underground (-4)



→ Ready for commissioning

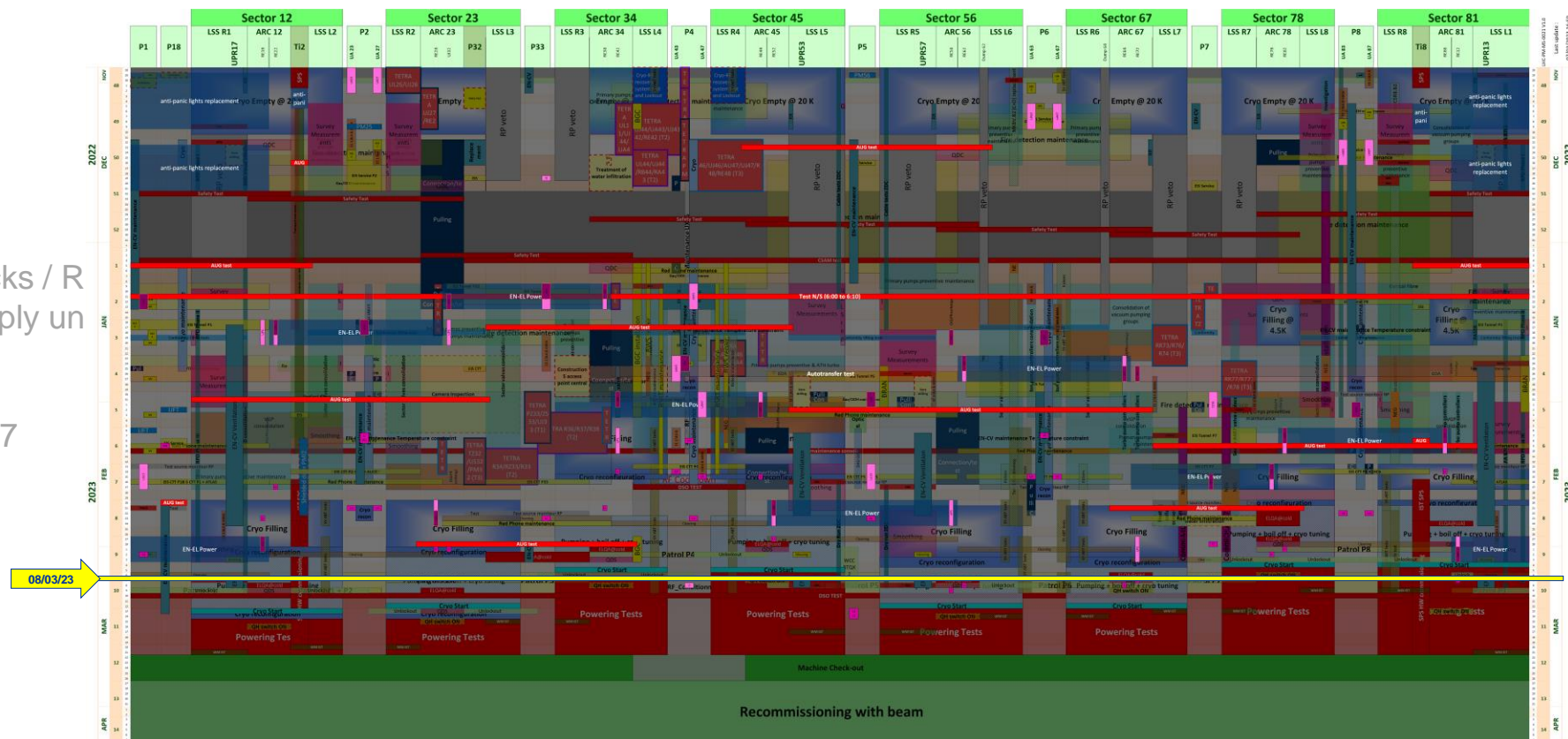


# LHC-YETS 22-23: EN-EL power

## EN-EL Power activities:

- Replacement of UPS batteries
- 48V maintenance
- UPS maintenance
- DAU renovation
- Grounding on 250 mini-racks
- Replacement of socket strips in racks / R
- Modification of monorail power supply un
- Addition of socket strips
- Replacement of panic lights
- Heating collar power supply in LSS7
- Electrical tests related to LHC  
ELG-GENNET-TD-0001 v.1.1

Complex	Electrical test	Date
all CERN sites	Auto-transfer	25 <sup>th</sup> 26 <sup>th</sup> 27 <sup>th</sup> January 2023 (W4)
	Normal Secours (N/S)	11 <sup>th</sup> January 2023 (6 a.m. to 6.10 am) (W2)
Meyrin site	AUG Adm. Zone Meyrin	4 <sup>th</sup> January 2023 (W1)
	AUG PS & PSB	14 <sup>th</sup> & 15 <sup>th</sup> January 2023 (W2)
	AUG West area	4 <sup>th</sup> February 2023 (W5)
Prévessin site	AUG Adm. Zone Preveessin	18 <sup>th</sup> March 2023 (W11)
SPS	AUG North area (BA80-BA81-BA82)	18 <sup>th</sup> January 2023 (W7)
	AUG SPS1	19 <sup>th</sup> January 2023 (W3)
	AUG SPS2	19 <sup>th</sup> February 2023 (W7)
	AUG SPS3	19 <sup>th</sup> January 2023 (W3)
	AUG SPS4 + AWAVE	8 <sup>th</sup> February 2023 (W6)
	AUG SPS5	19 <sup>th</sup> December 2022 (W50)
	AUG SPS6	7 <sup>th</sup> February 2023 (W6)
LHC	AUG SPS7 (including HL) + ATLAS	16 <sup>th</sup> December 2022 (W50)
	AUG LHC18 + SM18	20 <sup>th</sup> February 2023 (W8)
	AUG LHC2 + ALICE	31 <sup>st</sup> January 2023 (W5)
	AUG LHC3 + LHC3Z	28 <sup>th</sup> February 2023 (W9)
	AUG LHC4	17 <sup>th</sup> January 2023 (W3)
	AUG LHC5 (including HL) + CMS	13 <sup>th</sup> December 2022 (W50)
	AUG LHC6	2 <sup>nd</sup> February 2023 (W5)
	AUG LHC7	21 <sup>st</sup> February 2023 (W8)
	AUG LHC8 + LHCb	10 <sup>th</sup> January 2023 (W2) – 9 <sup>th</sup> February (W6)



Restarting the EKD205/2U cell following a problem with the operating lever (1h to 2h stop in the 3.3kV busbar) => Scheduled 13/03 in coordination with OP, Cryo & CV

→ Ready for commissioning

# LHC-YETS 22-23: EN-AA

## All points:

- Access systems Maintenance

## All octants:

- Fire Detection Maintenance
- ODH & Gas Detection Maintenance
- Safety Tests
- Red Emergency Phone Maintenance

## US15:

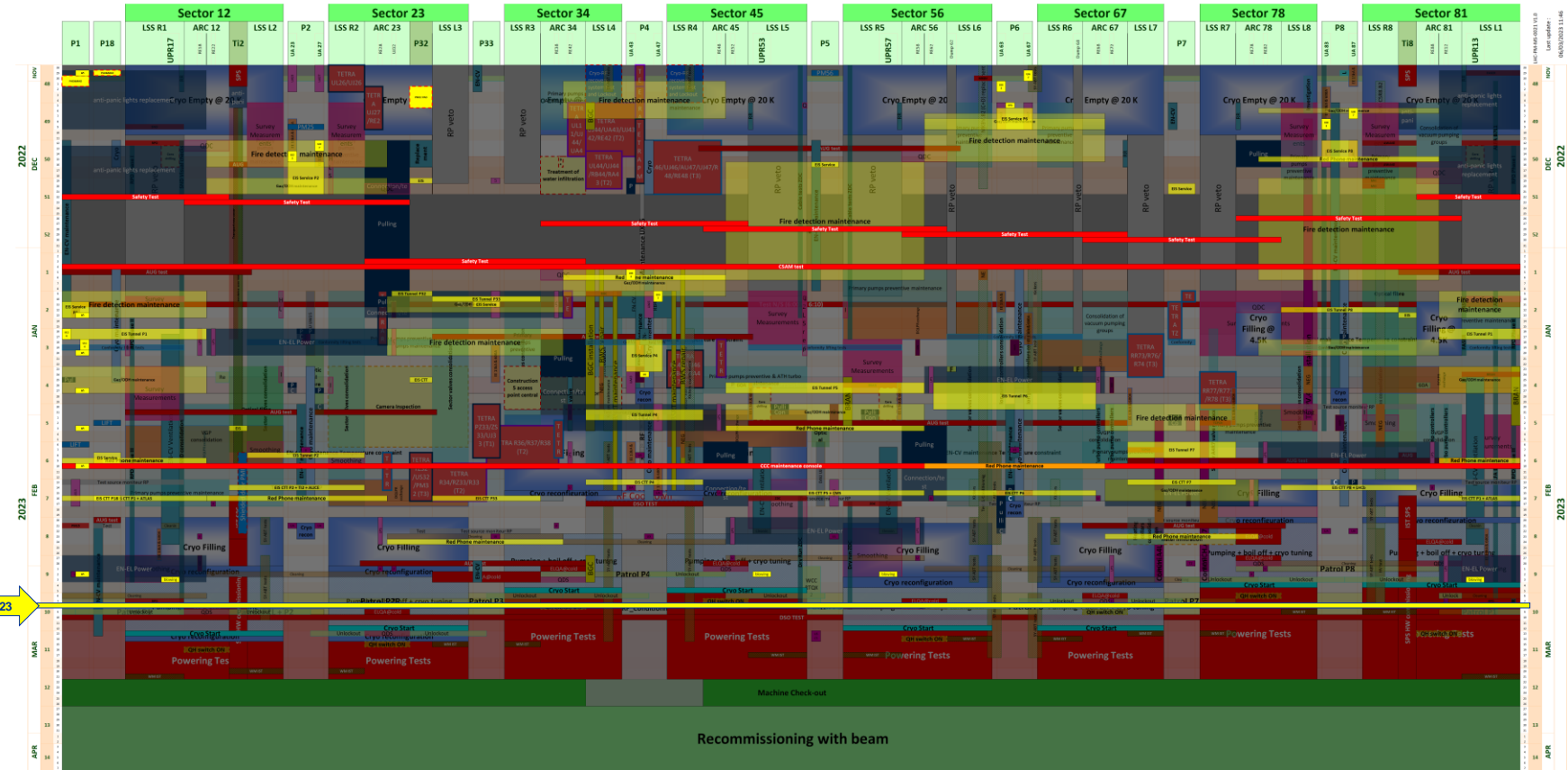
- SNIFFER Maintenance

## UJ23:

- Replacement doors MAD

## Intersite door P3 – P4 (R37)

- Problem with the mechanical door lock solved



→ Ready for commissioning



# LHC-YETS 22-23: SY-EPC

## All points:

- Power converter transformers maintenance
- RB converters maintenance

## P2, P4, P6, P8:

- SVC maintenance completed

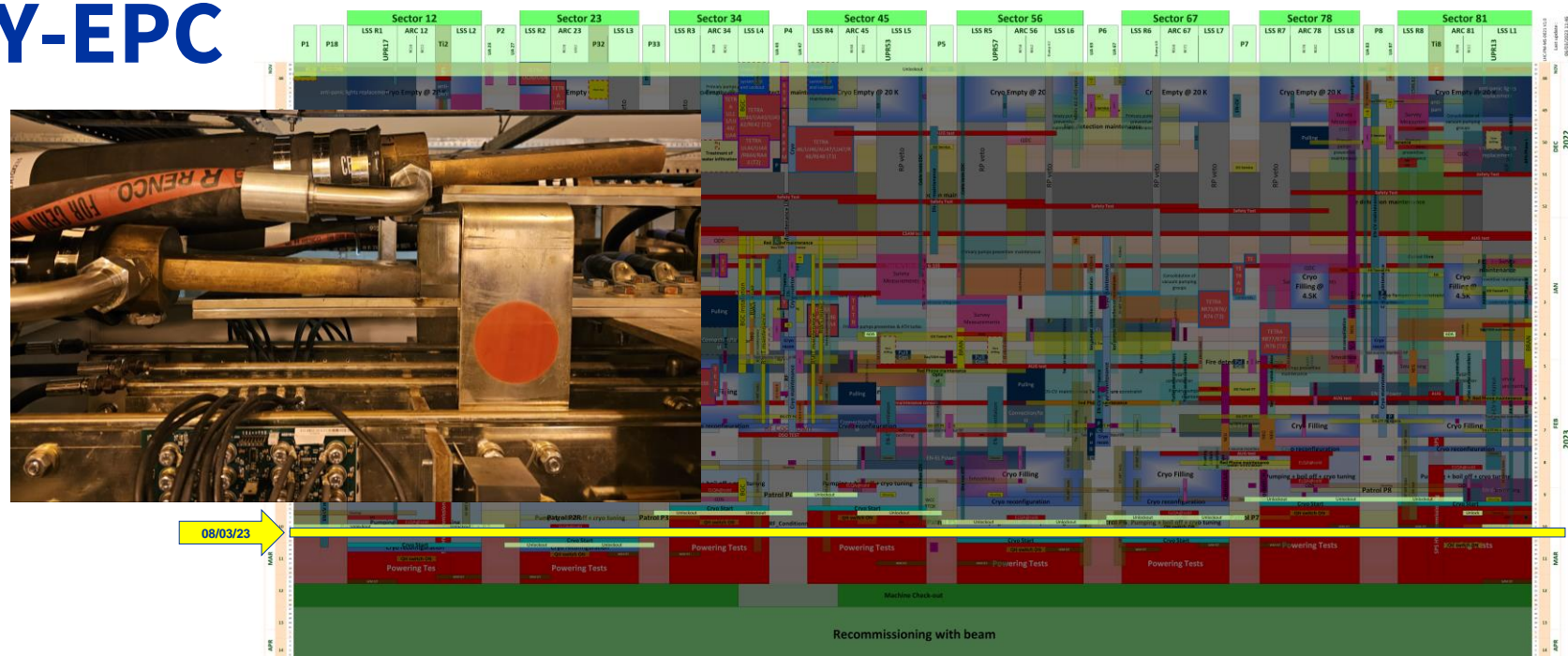
## P4:

- HV RF converters transformers maintenance

## P5 RTQX2 :

- Intervention to repair the Power Converter completed
- Investigation to understand what led to run the system without reconnecting the cables ongoing

→ Finishing electrical unlockout for commissioning



Name	Groups	March 2023																				
		27	28	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
Intervention WCC RTQX2 in USC55		ISC55																				
Disconnection of the 4 WCC (RTQX2 and RQX) on DFBX L5	TE-MPE																					
Partially emptying the cable RTQX2 concerned by the leak	EN-CV																					
Replacement of the Bouchon on the concerned WCC	EN-CV																					
Inspection of the cables	EN-EL																					
Cleaning the extremities of the WCC	EN-EL																					
Cleaning the Bus Bars on the Power converter	SY-EPC																					
Refilling of the cables	EN-CV																					
Pressure test - Intervention TBC	EN-CV																					
Reconnection of the 4 WCC (RTQX2 and RQX) on DFBX L5	TE-MPE																					
Reconnection of the 4 WCC (RTQX2 and RQX) on PC	SY-EPC																					
Electrical unlockout DFBs (RQX & RTQX2 => DFBX.L5)	SY-EPC																					

# LHC-YETS 22-23: BE-GM

## All sectors:

- QDC removal

## Sector 78:

- Measurement and alignment

## LSS1, LSS2, LSS5 & LSS8:

- Q6-Q6 measurement and alignment

## LSS5 Radial displacement:

- Measurement and alignment

## ITs:

- Maintenance alignment system

## IT2:

- HLS system test

## ITL5:

- Q2L5 jack inspection and measurement for analysis. Jack motor adapter replacement



→ Ready for commissioning



# LHC-YETS 22-23: SCE-SAM

## LSS3:

- New access manholes to central drain (LHC-K-EC-0062) performed

## UPR/UA

- Cores drilling and construction of a concrete sheath completed

## S.23:

- Camera Inspection completed

## S.34:

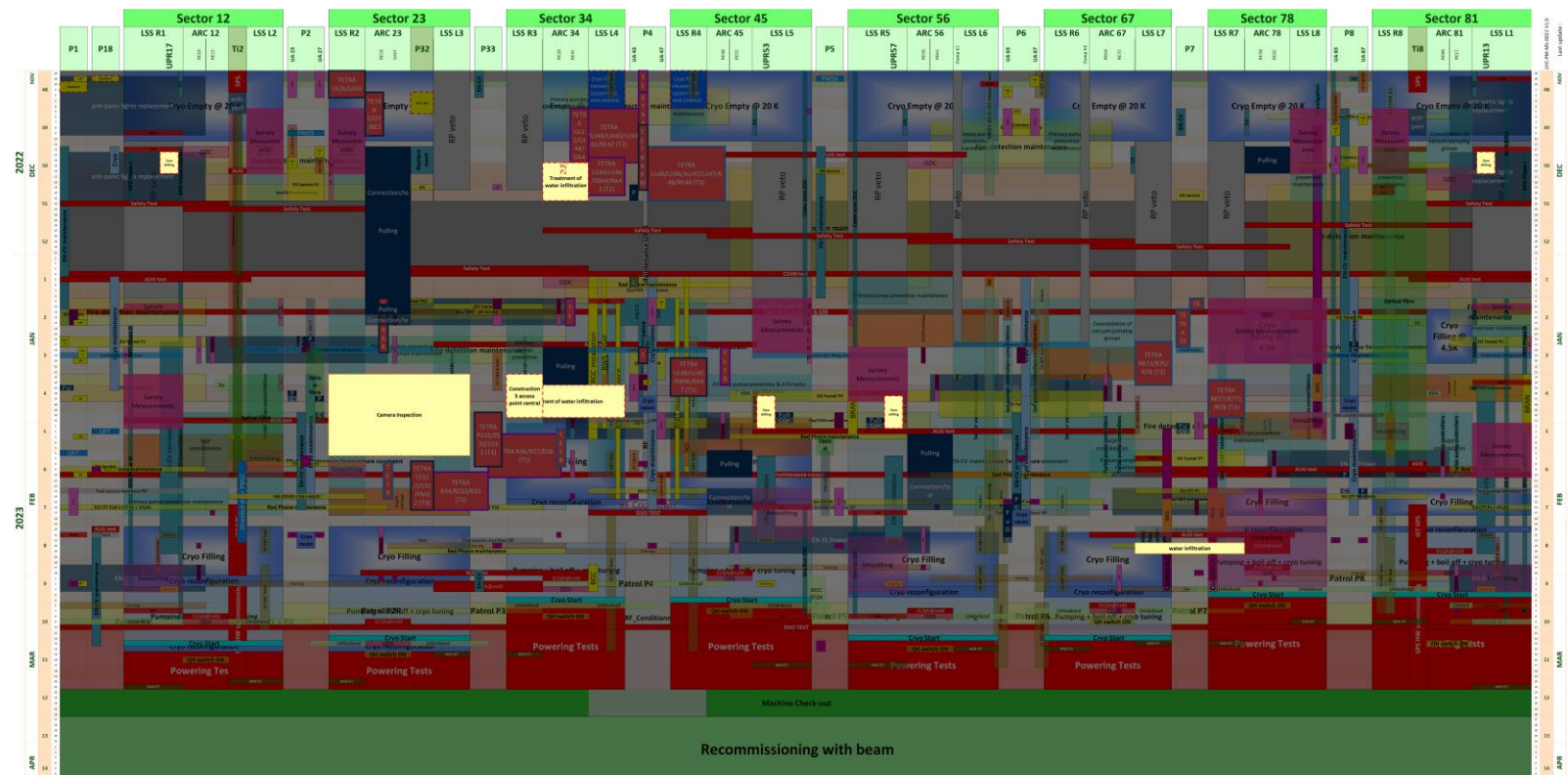
- Treatment of water infiltration completed
- Maintenance of pressure release valves

## ARC34:

- Pumping sumps completed

## LSS7:

- Treatment of water infiltration completed



→ Ready for commissioning



Core drilling at UPR13 Core drilling at UPR17

\*HL-LHC activities

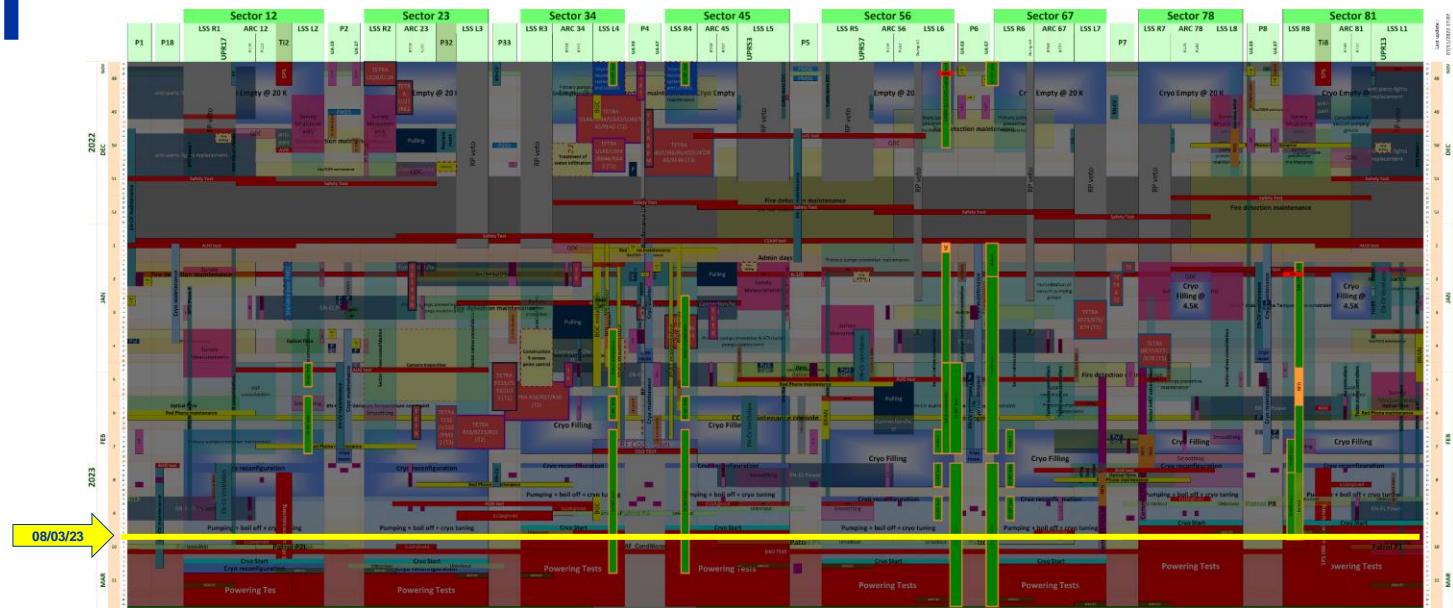
# LHC-YETS 22-23: SY-ABT

## Point 2:

- MKI maintenance; **Commissioning ongoing**

## Point 4:

- MKQA maintenance; **Commissioning ongoing**



## Point 6:

- MKBV replacement LSS6L
- LBDS Beam1 & Beam 2 maintenance; **Commissioning ongoing**
  - hardware OK, currently BE-CEM intervention on LBDS1 (MKD-UA63 and MKB-UA67) to replace ~100 FMC-ADC digitisers, followed by Remote Reliability, RMT, and the YETS

→ **Commissioning in progress**

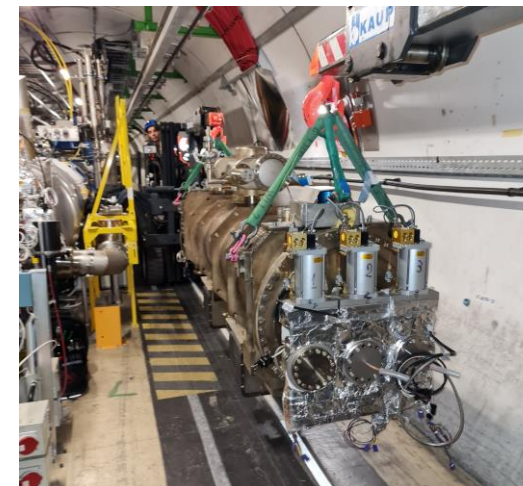
- TCDQ/S maintenance; **Commissioning ongoing**

\*HL-LHC activities

- final intervention this afternoon to check the displacement system with help from CCC



MKBV: Installation of cartridge



MKID cool prototype Installation



# LHC-YETS 22-23: SY-BI

## LSS1 & LSS5:

- **BBLR wire repair (new intervention)**
  - TCTV.4R1.B2 wire reparation and mechanical works completed;  
Test → Wednesday 8<sup>th</sup> March
  - TCTH.4L1.B1 → disconnection completed
  - TCTV.4R5.B2 wire reparation completed;  
Mechanical works ongoing;  
Test → Thursday 9<sup>th</sup> March
  - TCTH.4L5.B1 → disconnection completed
- **BRAN\*** installation

## LSSL/R4:

- **BGC\*** installation; Debugging ongoing
- **BWS** repair

## Different maintenance:

- **ALL** points: BPM, BLM, BTV maintenance
- **LSSL/R4** : BSRT maintenance  
→ Will be ready for commissioning on 9<sup>th</sup> March

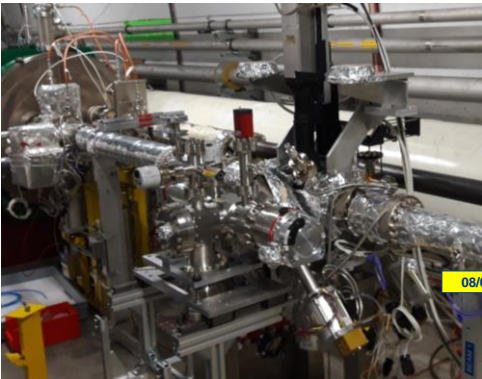
\*HL-LHC activities



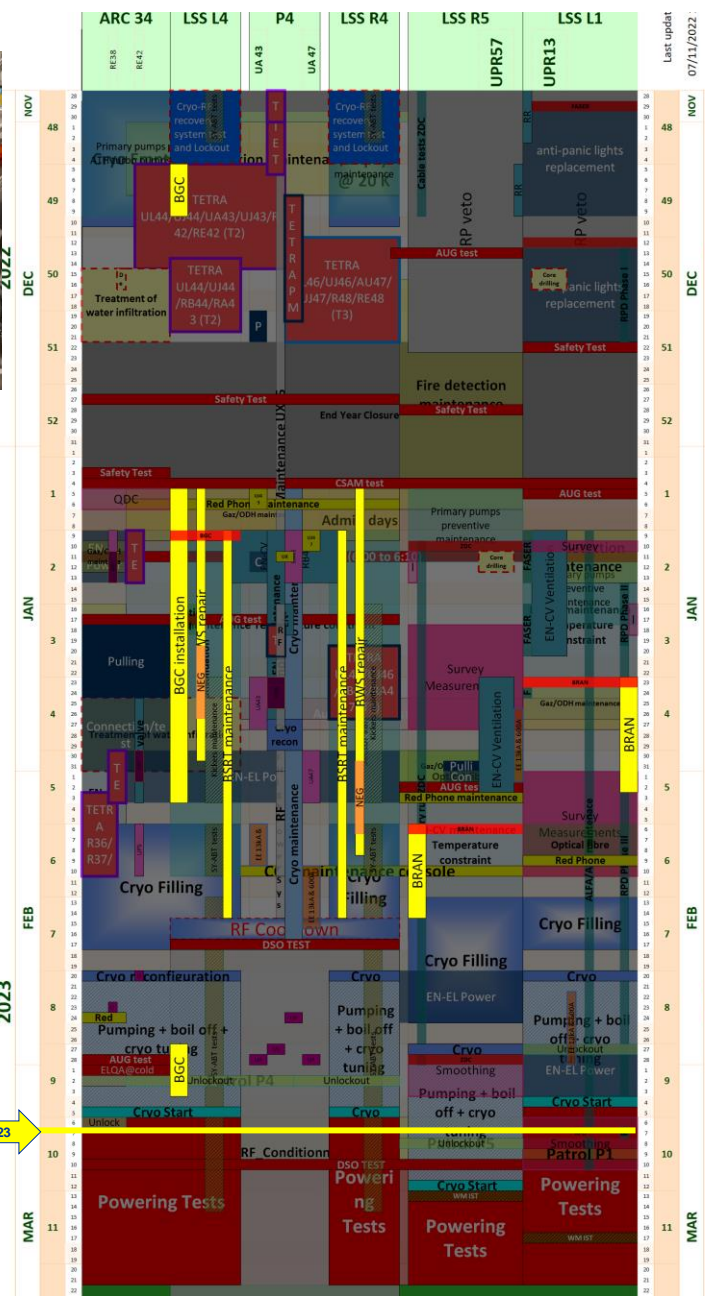
TCTV.4R1.B2 wire measurements



TCTV.4R5.B2 new brackets and wire insulation



BGC installation



# LHC-YETS 22-23: SY-STI

## LSS7:

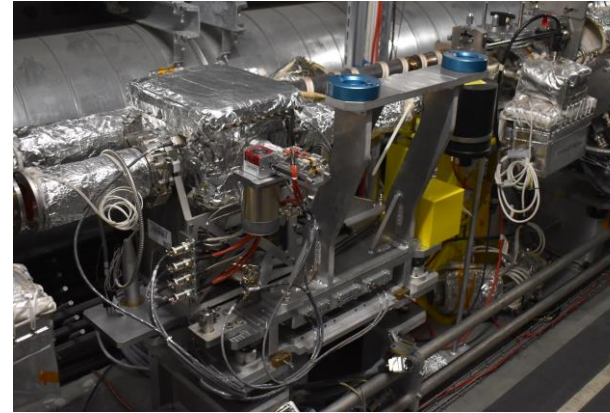
- 2 TCPC\* crystal collimators installation completed

## LSS8:

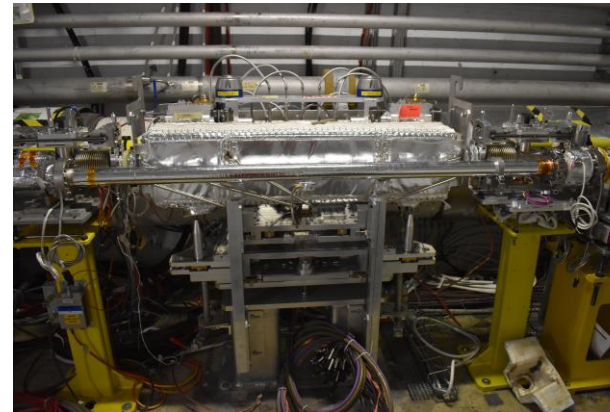
- A4L8 leak investigation
  - TCTPV 4L8.B1 replacement completed (new intervention)

## Dump Areas:

- Ready for beam



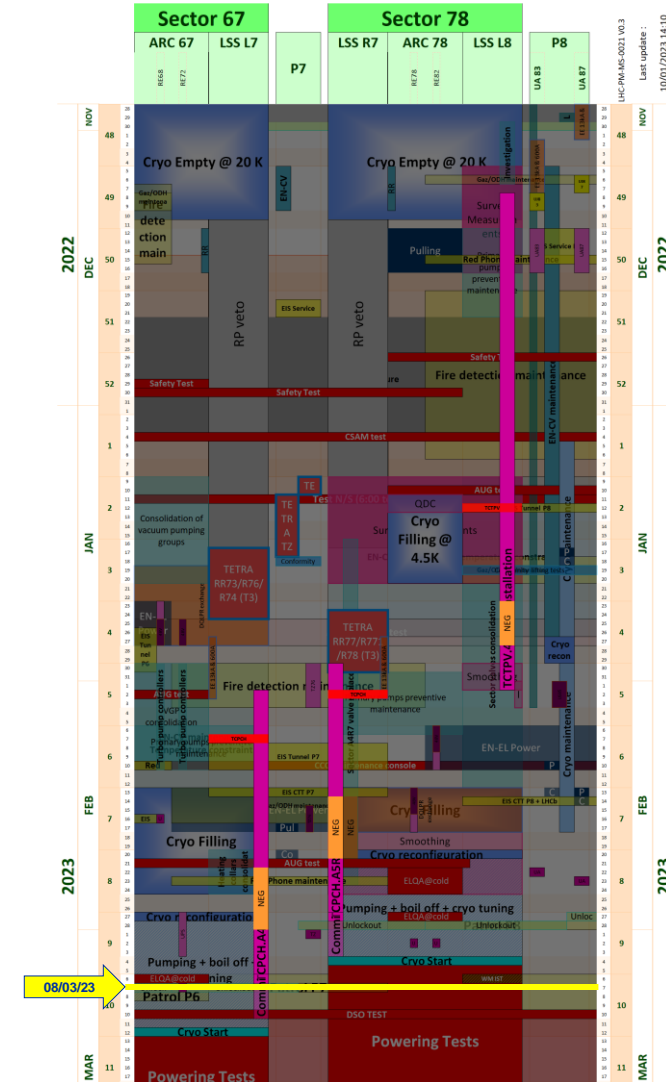
TCPCH crystal collimator installation



TCTPV.4L8.B1 installation

→ Ready for commissioning

\*HL-LHC activities

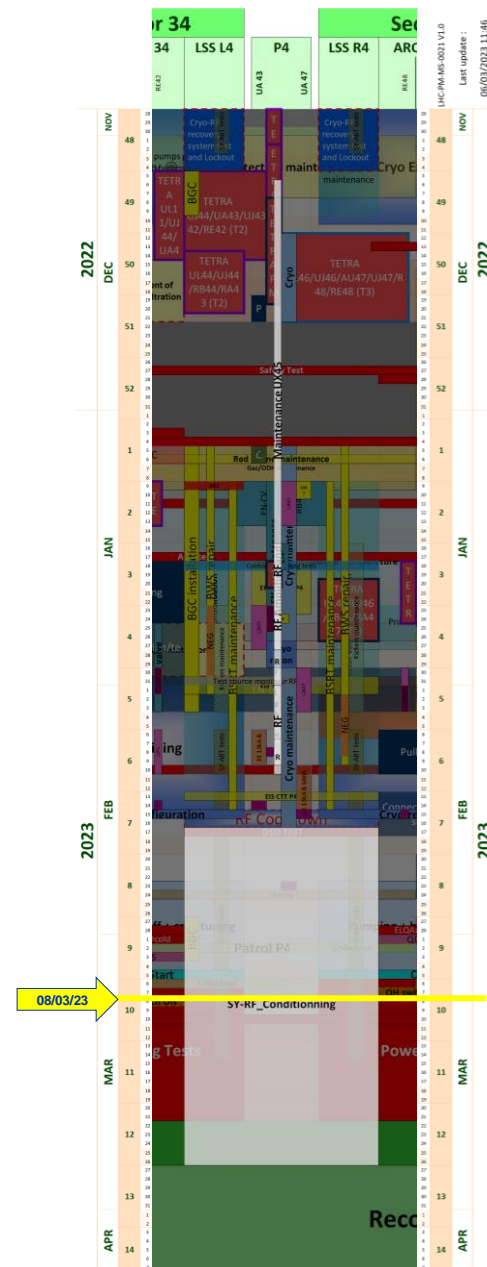
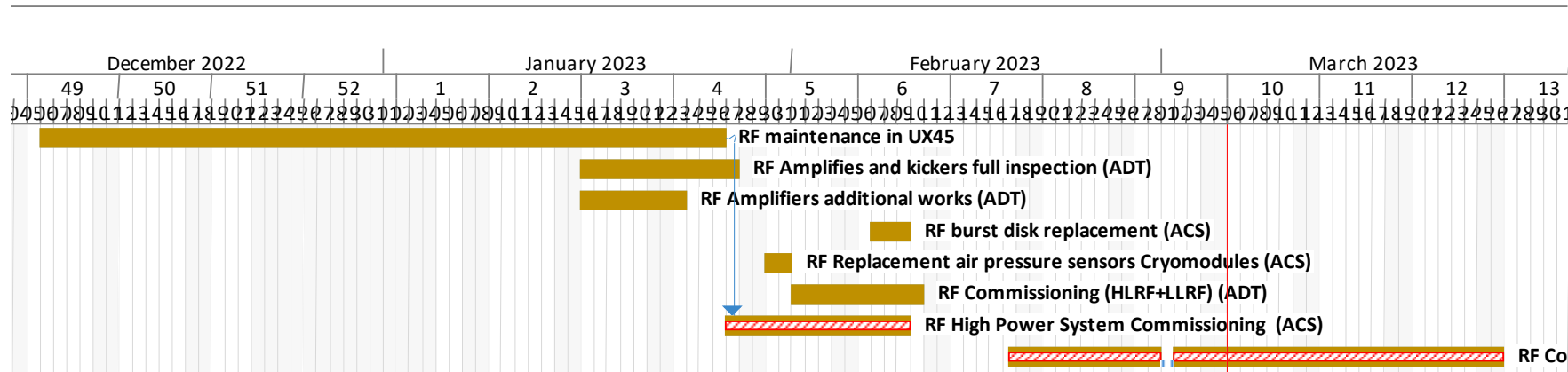


# LHC-YETS 22-23: SY-RF

- Maintenance in UX45
- Amplifiers and kickers full inspection (ADT)
- Amplifiers additional works (ADT)
- Burst disk task force actions (ACS)
- Replacement air pressure sensors Cryomodules (ACS)
- High Power System Commissioning (ACS)
- Commissioning (HLRF+LLRF) (ADT)
- **Conditioning and test (ACS)**

Cryo lockout and partial warm-up for VSC activities on 1st March.

→ Conditioning in progress





# LHC-YETS 22-23: TE-VSC

## BEAM Vacuum Activities

### LSSR2 – Arc23:

- **TCLD.11.R2.B1 inspection**
  - No actions defined for this YETS

### LSSL4:

- **BGC** optical system installation\* (See slide SY-BI)
- **RF finger** investigation E5R4.R
- Sector valve not opening remotely → access to LSSL4 needed yesterday

### LSSL6:

- **MKBV** replacement (See slide SY-ABT)

### LSS7: Activities for next year

- 2 **TCPC**\* crystal collimators installation W5 and W6 (See slide SY-STI)
- **A4R7** sector valve replacement

### LSS8:

- **MKI** cool prototype installation\* (See slide SY-ABT)
- **A4L8** leak investigation → **TCTPV** replacement (See slide SY-STI)
- **ISSUE** related to LHCb VELO (option 2)

## INSULATION Vacuum Activities

### All Sectors:

- Preventive maintenance primary pumps
- Vacuum system commissioning

**Sectors S23, S34 & S45:** preventive maintenance ATH turbo pumps

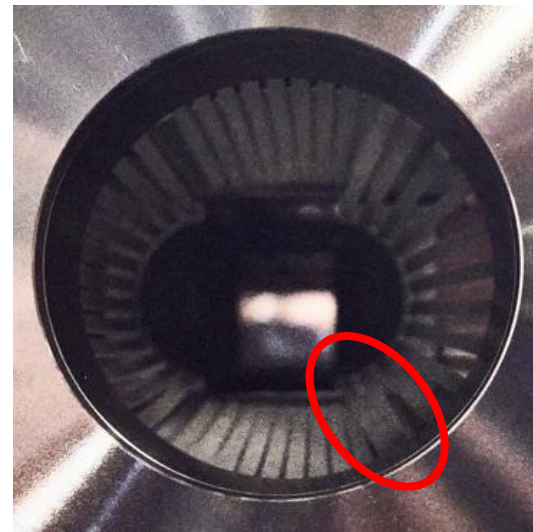
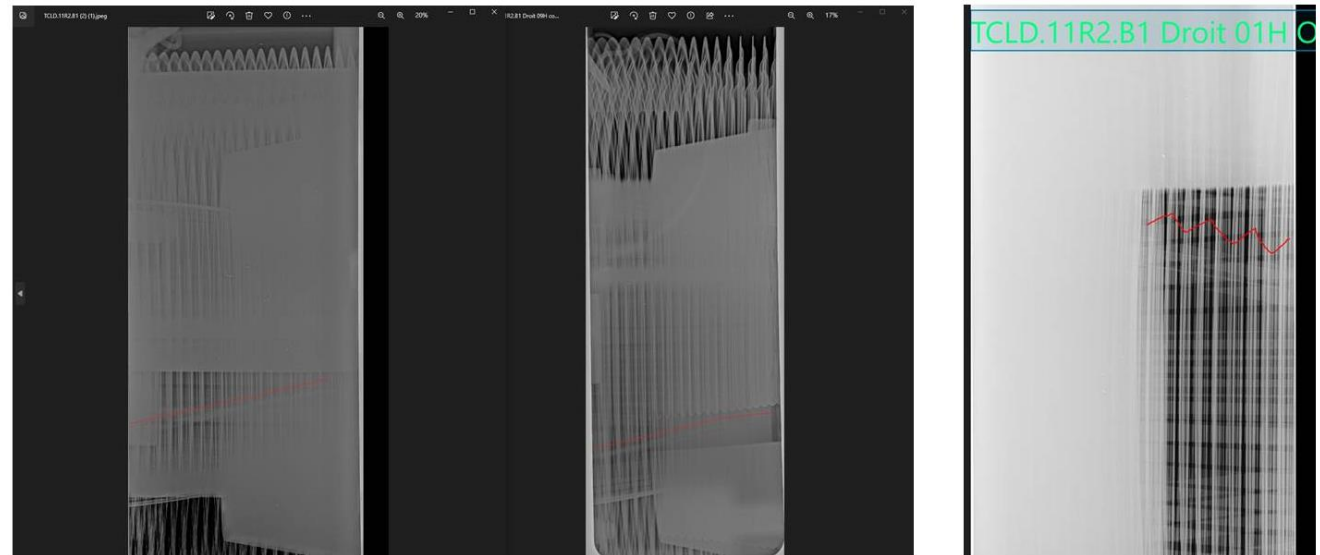
**Sectors S67 & S81:** Consolidation of vacuum pumping groups

### Intervention LSS4

- Primary pumps at B.ACS5R4 and B.ACS5L4 failure. Need of Cryo lockout and partial warm-up on 1<sup>st</sup> March

### Intervention LSSL2

- Problem with vacuum pump at 3L2, repair completed on 6<sup>th</sup> March



TCLD.11.R2.B1 installation picture

## CONTROL Vacuum Activities

**UA63/67:** Ion pumps controllers consolidation

**ARC12, 67 & 81:** VGP local crates consolidation

**RE68/72 & RE88/12:** Turbo pumps controllers installation

**LSS2, 3, 4, 6, & 8:** Sector valves consolidation

**LSS7L:** Heating collars consolidation

**LSSL4 & UA43:** BGC installation

→ Will be ready for commissioning on 9<sup>th</sup> March

\*HL-LHC activities

# LHC-YETS 22-23: TE-MPE

## All sectors:

- QHDS Power off the beginning of the YETS
- **QHDS Power on end of the YETS ongoing**
- DQLPR power supplies exchange completed (new)

## All UAs/RRs:

- EE 13kA maintenance completed
- EE 600A TRACO campaign completed
- Upgraded Heating system in RRs for the LHC current leads (new)
  - RR17 Completed
  - **RR13 Ongoing (new request)**

## All ARCs:

- **13kA ELQA@Cold on going**

## ARC 78:

- Local Transfer Function Measurements on RB Magnets completed

## IT.L5, IT.R8:

- Temperature sensor problem on DFBX repair completed with EN-EL& TE-CRG



→ Will be ready for commissioning on 9<sup>th</sup> March  
TBC

# LHC-YETS 22-23: TE-MSc

CERN  
Esplanade des Particules 1  
P.O. Box  
1211 Geneva 23 - Switzerland



EDMS NO.  
**2795110**

REV.  
**0.1**

VALIDITY  
**DRAFT**

REFERENCE  
**LHC-M-EC-0006**

Date: 2022-11-03

ENGINEERING CHANGE REQUEST

## Protection Against Accidental Contacts for Normal Conducting Magnets of TI2 TL

BRIEF DESCRIPTION OF THE PROPOSED CHANGE(S):

Installation of new safety covers to prevent access to the electrical connections of the Normal Conducting Magnets from underneath. This complementary measure is part of a CERN effort to remove the risks of accidental contact with live electrical parts in the installations.



Old TI2 cover protection

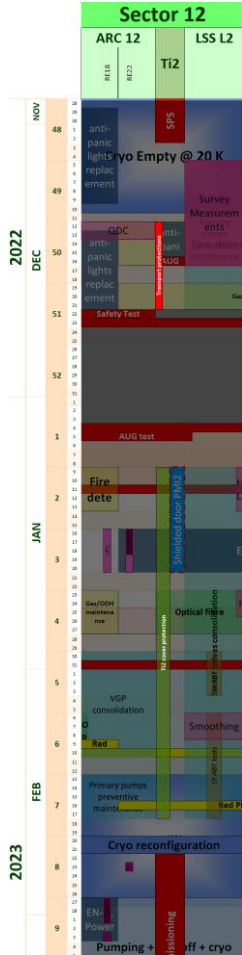
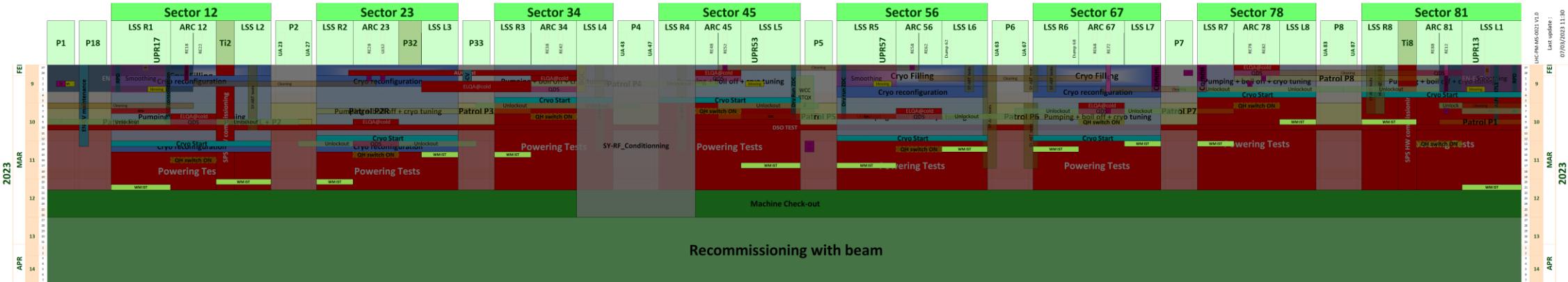


New TI2 cover protection

Ti2 cover protection

EDMS procedure: logistique pour échange des capots d'aimants en TI2

## Warm Magnet Test in parallel with Powering Tests



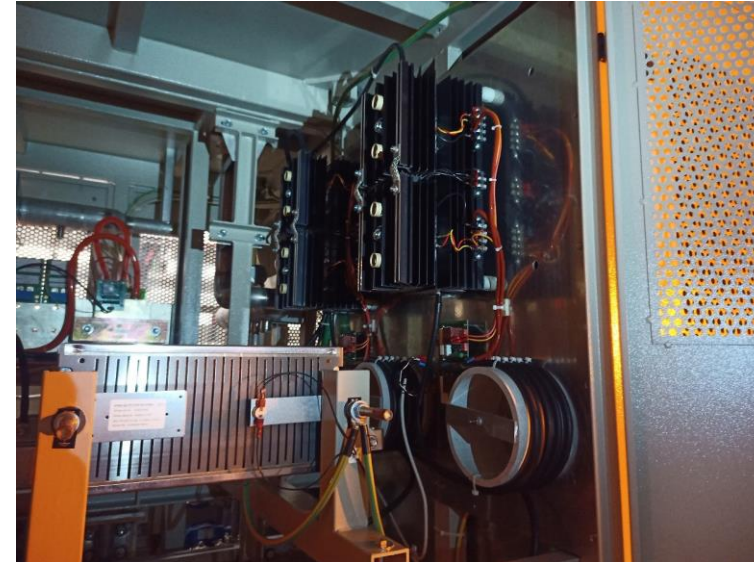


# LHC-YETS 22-23: Other activities completed

- Monthly lift maintenance
- Cranes maintenance
- IT-CS activities
- BE-CEM interventions and maintenance
- ...



Verification of TIM guillotine door passages



Power converter maintenance in  
UA67