Status report on the accelerator complex
LS2 activities
Content

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• Injectors status
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The main objectives

Increase **Intensity & Brightness** in the injectors to match HL-LHC requirements

- **LIU Project**

Increase injector **Reliability** and **Availability** to cover HL-LHC run

- **Consolidation Project**

Anticipate **Civil Engineering** works and **beam equipment**

- **HL-LHC Project**

Perform major **Maintenance & Infrastructure** Consolidations

- **M&O activities**
Baseline

Changes requested by ISOLDE & nTOF being implemented
**Injector status**

**Linac4**
- Connection is completed
- Individual System tests and Hardware commissioning started
- Survey smoothing: 3 weeks in September
- Low Energy Beam tests planned in October, followed by beam test until end of 2019

**PS Booster**
- New injection region installed
- New finemet cavities installed
- Transfer lines installation in progress
- Infrastructure consolidation and upgrade in progress
Injector status

**PS**
- Infrastructure consolidation and upgrade in progress
- Main units consolidation well advanced (34/43)
- Most of the straight sections have been re-installed
- New injection line installed and successfully leak tested

**Surface works (all CPS)**
Refurbishments of surface buildings to host new power converters and RF systems ... Hard work... very good progress

- Bg 361
- Bg 355
- Bg 269

New injection line (BTP)
Injector status

**SPS**
- Infrastructure consolidation and upgrade in progress
- LSS1 (ex dump region) dismantled
- LSS3: all RF systems dismantled
- LSS5 (new dump region):
  - Civil engineering work in progress
  - New beam dump installation being tested on surface on a mock-up
- Fire Safety & new access system in progress
LHC status

LHCC - LS2 Status of the Accelerator - K. Foraz

September 2019
Global progress

- 30% achieved vs 29% planned
  - 1000\textsuperscript{th} IC has been opened on 23.08.2019
  - 1 week ahead of schedule
Cryomagnets replacement

**19 cryodipoles & 3 SSS**
- All cryomagnets (not including HL WP11 assemblies nor 16L2) have been disconnected, removed and reinstalled;
- The reconnection of the first cryodipole in S81 (A26R8) is completed except the leak tests that are being performed. The others magnets reinstalled are being reconnected.

**16L2, CC@P2**: will be transported after the open days
Diodes consolidation

- 1st diode consolidated on 3.05.2019 (about 1 month ahead of schedule)

- Cleaning is complete in ~4 sectors
- The insulation plates and the inserts are installed in 3 sectors
Diodes consolidation & DISMAC QA review

New issues not expected during the preparation:

- **Quality of existing welds**
  - Perform further detailed analysis only in case of major NCs or if NCs are different from what has been analysed so far
  - Perform pressure test with higher Safety factor on 2 diode containers with similar major NCs

- **Cracks / break of some half-moon electrical insulation tubes.**
  - Confirmation of use of two materials for these insulation tubes
  - Cracks have been seen at the opening, but no tube was so far found broken at opening of the diodes containers

- **On-going actions:**
  - Extensive inventory of all the accessible cases
  - The repair solution has been studied, qualified and is being applied
  - Systematic reinforcement of all low-Q ones (in-situ method)

- **No Impact on global schedule**
DISMAC...next steps

• DISMAC status

😊 No (major) personnel accident so far
😊 Globally, about one week ahead of schedule
😊 Many non-conformities are encountered, mainly pre-existing ones; their management is efficient and implies frequent procedures optimisations, definition of new procedures and interventions by experts
😊 Some activities are ahead of schedule [Opening, cutting,…]
😊 The critical activity is the diode insulation consolidation
😊 Confident that the global schedule can be respected
😊 Impact of the insulation tubes reinforcement will be small thanks to a sound solution developed swiftly

• Next milestones

  • End -2019 : All cryoassemblies (but Q16/C16L2 and WP11 cryoassemblies) will be reconnected for December 2019
  1st sector completed
  • May 2020 : Last standard interconnection reclosed
  First pressure test (sector 81)
  • Q3-2020 : Last NC solved
  • End 2020 : Formal end of the project
  End of collaboration contracts, budget closure
WP5 - Collimation
- 8 Target Secondary Collimators TCSPM in LSS7
- 2 Dispersion Suppressor Collimators TCLD in LSS7 (11T)
- 2 Dispersion Suppressor Collimators TCLD LSS2 (CC)

WP8 - Collider & Experiment Interface: TANB both sides LSS8

WP9 - Cryogenics
- Cryogenics upgrade of refrigerator
- Installation of general infrastructure for the mobile refrigerator & compressor at P4

WP11 – 11T DS Dipole
- 11T in A9R7 & A9L7
- CC in C11R2 & C11L2

WP12 – Beam Vacuum: In-situ aC-coating Q5-Q6 at P2 & P8

WP13 – Beam Diagnostics
- New Wide-Band transverse pick-up BPW prototype at LSS4L
- Beam Gas Curtain BGC prototype at LSS4L
- BSRT (adding halo cleaning) at LSS4L/R

WP14 – Beam Transfer & Kickers
- Injection Dump TDIS at P2L & P8R
- Cooled MKI at P2
- Displacement of TCLIA in LSS2R (C4R2)

WP17 - Infrastructure Logistics and Civil Engineering
- UPR connections at P1 & P5

1st HL-LHC instrument in ! 😊
HL-LHC: Civil engineering works

Request for early opening of this UPR (discussion on-going with the LS2 coordination)

Delivery of the UPRs on the LS2 critical path (Plan B: missing UPR opening during the YETS’21-22 without impacts on technical infrastructure installation and on the YETS duration)

UR15 excavation rate lower than expected ⇒ Margin reduction from 80 to 5 days for the delivery of the UPR (hoping than softer molasses will follow)
HL-LHC: Civil engineering works

September 2019

K. Foraz
• 11T tests succesful
  • No impact on end date

• QEP & QEN around IP2

WP11 – QEP and QEN around IP2

• New TDIS prototype almost ready
**Maintenance NO ACCESS***

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<tr>
<th>Point</th>
<th>Day</th>
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<tbody>
<tr>
<td>LHC1 + ATLAS</td>
<td>6 - 10 January 2020 (W2)</td>
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<tr>
<td>LHC18 + SM18</td>
<td>23-25 April 2019 (W17)</td>
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</table>
| LHC2 + ALICE   | 11-14 June 2019 (W24) - Access OK  
|                | 20-24 January 2020 (W4)     |
| LHC3 + PM32    | 9-12 March 2020 (W11)        |
| LHC4           | 17-20 June 2019 (W25) - Access OK  
|                | 24-28 February 2020 (W3)    |
| LHC5 + CMS     | 20-24 May 2019 (W21) - Access OK  
|                | 24-27 June 2019 (W26)        |
| LHC6           | 3-6 June 2019 (W23) TBC - Access OK  
|                | 17-19 Sept. 2019 (W38)      |
| LHC7           | 23-27 Sept. 2019 (W39)       |
| LHC8           | 15-19 April 2019 (W16) - Access OK  
|                | 9-13 Dec. 2019 (W50)        |
| TEST SECOURS (10min) | All points on 19th December  
|                 | (6am – 6.10am) (W51)       |
| 400 kV Test    | Thu 20 Dec 2018 from 8am to 11am |

**AUG NO ACCESS***

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<tr>
<td>LHC1 + ATLAS</td>
<td>13 January 2020 (W3)</td>
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</table>
| LHC18 + SM18   | 26 April 2019 (W17)          
|                | 11 February 2020 (W7)       |
| LHC2 + ALICE   | 27 January 2020 (W5)         |
| LHC3 + PM32    | 30 April 2019 (W18)          
|                | 13 March 2020 (W11)         |
| LHC4           | 7-Oct-2019 (W41)             |
| LHC5 + CMS     | 27 May 2019 (W22) TO BE RESCHEDULED  
|                | 5 May 2020 (W19)             |
| LHC6           | 20 Sept. 2019 (W38)          |
| LHC7           | 30 Sept. 2019 (W40)          |
| LHC8           | 16 Dec. 2019 (W51)           |
| Preveessin     | 4 April 2020 (W14)           |
| Meyrin + Adm.  | 4th January 2019 (W1)        |

* NO ACCESS in SURFACE and UNDERGROUNG (Guardian at the point entrance)

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September 2019
Electricity supply at CERN after the Open Days

- **From 16 September 2019 to May 2020:**
  - **No auto-transfer available** (i.e. automatic reconfiguration of the electrical network in case of a voltage failure on the general services networks) until completion of the ME9 substation consolidation

  - Meyrin’s administrative loop will be manually re-supplied through a dedicated cable from ME10 in case of long power loss (thus by-passing the ME9 substation)
  - Resupply time: **30 minutes during normal working hours / 2 hours outside normal working hours**

- High voltage specialists (EN-EL and Contractors) will be fully available during the period with a single source to minimize downtime
  - **Re-powering the BE2 substation in case of failure expected within 2 hours in most cases**
FASER

- Cores drilling completed
- Dismantling activities completed
- Crane installation in progress
- Civil engineering Jan.-Feb 2020
Equipment readiness and beam vacuum SS

LHCC - LS2 Status of the Accelerator - K. Foraz

September 2019
Conclusions

• As a general fact, no major blocking point
  • New version of Master Schedule to cope with changes in n-ToF and ISOLDE to be approved by RB 18th September. Others stay **UNCHANGED**!
    • New versions of the Linear schedules to be released simultaneously to show reorganisations of activities
    • New broken lines to be presented on LS2C on 20th September
  • Injectors will be ready for start their commissioning by beginning of next year as scheduled with access restrictions to be expected.
  • LHC follows the master schedule
    • Maintenance activities proceeding smoothly
    • DISMAC on schedule, despite the new non conformities discovered
    • HL-LHC: 1st instrument in, request to anticipate the CE breakthrough of UPR57 (under evaluation)

• So far, so good 😊
Questions?

Accelerating Science and Innovation