Progress status of the LHC interconnections

- Sector by sector
- Technical issues: SSS-500 & PIM
- DFBs interconnections
- Inner triplets
- DS zones (dedicated presentation by C Vollinger)

Conclusion

Work done by the whole MCS-IC section in collaboration with MCS-ET, MCS-SC, AT-MEL, AT-VAC, TS-IC, TS-SU,… and IEG (F523 Contract) and especially:

- LSSs
  C Garion / I Slits

- DS
  T Colombet / C Vollinger / P Galbraith

- DFBs / DFBM
  F Laurent

- DFBs / Cryo ext / WRL
  I Slits

- Arches
  P Fessia, A Musso, M Struik, C Vollinger (1...7)
  A Poncet (7-8)
  F Bertinelli (8-1)

14th of March 2007
Progress status of the LHC interconnections

Sector 1-2
- IC works should start Mid of April 2007: Delay of a few weeks
  BUT : 20 weeks allocated in the schedule ; never achieved so far and
  looks not possible with the present resources (same for 6-7)
- Work foreseen on Fridays to consolidate the schedule and avoid any
  additional delay in the start of sector 1-2

Sector 2-3
- About 200 ICs are available for IEG
- 120 IC with beam lines connected (Installation has been resumed for 2 weeks)
- 120 IC with busbars connected.
- Line N interconnection is going on.
- Delay of 4 to 5 weeks : Work on Fridays ; see 1-2

Sector 3-4
- Interconnection of inner lines at more than 95 %
- Line N inserted everywhere ; closure of line N is on-going
- 75/212 ICs are closed
Progress status of the LHC interconnections

Sector 4-5
- Interconnection of inner lines completed except 2 (DS zones)
- Line N inserted in the whole sector including DS4R and 5L; and closed everywhere except in DS zones
- IC closure is on-going:
  175/212 done (83%) everywhere except DS zones
  10/14 vac sectors closed all but DS zones
- Should be on time for pressure test on 21-22/4 (except if impact of SSS-500)

Sector 5-6
- Interconnection of inner line is well advanced (90%)
Progress status of the LHC interconnections

Sector 6-7
- Interconnection of inner lines is progressing with 2 teams in production
- PIMs are NOT installed in this sector
BUT : 20 weeks allocated in the schedule ; never achieved so far and looks very difficult (same for 1-2)

Sector 7-8
- See further presentations
- Interventions after warm-up are under study for next summer

Sector 8-1
- IC closure is progressing (> 50%)
- Work is also going on in the DS regions
Progress status of the LHC interconnections

**SSS 500 Series** [Work done by R Lopez]

Origin:
SSS514 Q9R3:
- PAQ revealed a short to ground
- *Defocusing*
- *Without corrector*

- Damages to electrical insulation
- Proximity to end plate
  - 0.1 mm Vetronite insulation
## Progress status of the LHC interconnections

### SSS 500 Series

[Work done by R Lopez]

<table>
<thead>
<tr>
<th></th>
<th>Without Corrector</th>
<th>With Corrector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focusing</strong></td>
<td>Case 1</td>
<td>Case 2</td>
</tr>
<tr>
<td><strong>Defocusing</strong></td>
<td>Case 4</td>
<td>Case 3</td>
</tr>
</tbody>
</table>

**More pictures:**
G:\Departments\AT\Groups\CRI\SSA\PhotoTunnel\Roberto\busbarsinvest
Progress status of the LHC interconnections

SSS 500 Series

Focusing / Defocusing

Blockage of busbar on corrector
Progress status of the LHC interconnections

**SSS 500 Series**

Case 1:
- Focusing
- Without corrector
Progress status of the LHC interconnections

SSS 500 Series

Case 2:
* Focusing
* With corrector

Endoscopic examination of 530 not yet interconnected but at IC extension

Damages to electrical insulation

M3 line
Progress status of the LHC interconnections

SSS 500 Series

Case 3:
* Defocusing
* With corrector

Insulation plate unglued when busbar pushed, due to overlength
**Progress status of the LHC interconnections**

**SSS 500 Series**

Case 4:
- Defocusing
- Without corrector
- Q9R3 same as 514
Progress status of the LHC interconnections

SSS 500 Series [32 SSSs are concerned]

Conclusions:

**Drawing analysis shows that busbars are too long by 40 mm**

Case 1: (# 8)
- Use as is for already interconnected (# 4)
- Shorten busbars by 40 mm for not yet IC (# 4)

Case 2: (# 12)
- To be repaired for already interconnected (# 7)
- Shorten busbars by 40 mm for not yet IC (# 5)

Case 3: (# 4)
- To be repaired for already interconnected (# 2)
- Shorten busbars by 40 mm for not yet IC (# 2)

Case 4: (# 8)
- To be repaired for already interconnected (# 6)
- Shorten busbars by 40 mm for not yet IC (# 2)
Progress status of the LHC interconnections

SSS 500 Series

On-going actions
- Meeting tomorrow with specialists to finalise repair actions; never done before
- Visit scheduled to Accel to witness the last DS cold mass assembly
- No impact on arc SSSs
## Status of the LHC interconnections

<table>
<thead>
<tr>
<th>No</th>
<th>Position</th>
<th>Sector</th>
<th>Installed</th>
<th>cas</th>
</tr>
</thead>
<tbody>
<tr>
<td>501</td>
<td>Q7L3</td>
<td>2-3</td>
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<tr>
<td>506</td>
<td>Q9R7</td>
<td>7-8</td>
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<td>509</td>
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<td>1</td>
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<td>7-8</td>
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<td>1</td>
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<td>516</td>
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<td>1</td>
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<tr>
<td>518</td>
<td>Q8L7</td>
<td>6-7</td>
<td>YES</td>
<td>1</td>
</tr>
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<td>502</td>
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<td>7-8</td>
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</tr>
<tr>
<td>510</td>
<td>Q10L3</td>
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<tr>
<td>520</td>
<td>Q8L3</td>
<td>2-3</td>
<td>YES</td>
<td>4</td>
</tr>
</tbody>
</table>

By sectors:
- **4-5**: 2 cases to be repaired
- **3-4**: # 6; 4 to be repaired
- **5-6**: 2 cases to be repaired
- **2-3**: # 6; 4 to be repaired
- **6-7**: # 6; 4 to be repaired
- **1-2**: 2 cases to be repaired
- **8-1**: 2 cases to be repaired
- **7-8**: # 6; 4 to be repaired

This could delay closure of 4-5 and 3-4 by … a certain time

Sector 7-8 ? (2 cases 2)
Progress status of the LHC interconnections

**Plug-in modules**

- Due to missing PIMs, they are not installed in 1-2 and 6-7
  Date of last delivery is not yet confirmed (June ?)
- Interconnection sequence adapted (PIM installed in a second phase) so more displacements and not optimum
- A lot of damages are noticed;
  New protection procedure defined and applied
  Acceptable defect when delivered are to be defined
  Tests to calibrate acceptable damages are going on
  Small number of spares so cut a limited quantity
- 5 L (DFBLD)
* Work is going on on DFBL/DSL interconnection (preparation of extremities for connection)
- Repartition of wires not conform in the cables

<table>
<thead>
<tr>
<th>Cable 1</th>
<th>Cable 2</th>
<th>Cable 3</th>
<th>Cable 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q6.B</td>
<td>nu</td>
<td>Q4.C</td>
<td>Q5.A</td>
</tr>
<tr>
<td>Q6.B</td>
<td>nu</td>
<td>Q4.C</td>
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<td>Q6.A</td>
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<tr>
<td>Q6.C</td>
<td>nu</td>
<td>Q4.B</td>
<td>Q5.A</td>
</tr>
</tbody>
</table>

From A Perin

Decision to be taken tomorrow to avoid delaying the interconnection work; If repair or correction required, this will have an impact.
- 5 R (DFBLE)
Electrical interconnection is going on;
Thermal shield missing on DSLE at DFBLE extremity
To be put in place by ACR/Criotec?

- Point 3 (DFBLC)
Work to be started next week
As soon as greenlight is given
Progress status of the LHC interconnections
Inner Triplets

- 5 L :
  * M4 bellows are under installation
  * New heat exchanger tubes to be inserted this week (MEL)
  * H pieces are ready for 5 Left

- 5R
  * IC works is going on in 5R (electrical connections) ; not priority

- Other locations :
  * Preparation of extremities (cutting) is completed everywhere
  * 8L repair to be scheduled with warm-up of 7-8
### Progress status of the LHC interconnections

#### Inner Triplets

<table>
<thead>
<tr>
<th>QRL</th>
<th>WRL</th>
<th>QRL</th>
<th>WRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFBXA</td>
<td>Q3</td>
<td>Q2</td>
<td>Q1</td>
</tr>
<tr>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
<td>DFBXB</td>
</tr>
</tbody>
</table>

#### Cryomagnet IC

<table>
<thead>
<tr>
<th>Jumpers</th>
<th>not started</th>
<th>electrical</th>
<th>vacuum</th>
<th>cryogenic</th>
<th>closure</th>
</tr>
</thead>
</table>

- **Overall progress**: 38%

---

*Courtesy of O Denis*
Progress status of the LHC interconnections

**Overall progress in LSSs**

* Cryomagnet IC : # 40
  15 are completed ; 10 are in progress ; 15 not started
  (Not taking triplet repair into account;8L&R are completed)
* Jumpers : # 92
  33 are completed ; 14 are in progress ; 45 not started
  (Double jumpers count for 2 units)
* DFBMs : # 23
  12 are completed ; 7 are in progress ; 4 not started
* DFBLs : # 21
  5 are completed ; 5 in progress ; 11 not started
* HCM/LCM/Q6 : # 15
  3 are completed ; 4 are in progress ; 8 not started
  (Various difficulties / linked to DS)
Conclusions
* Necessity to have additional workforce (IEG on Fridays as a first step) even if not optimised cost to face aleas in the arcs
* SSS-500: Could have a huge impact on sectors 4-5 and 3-4 completion, repair actions not yet finalised
* PIMs: situation to be cleared; could be critical
* Triplets: Repair of 5L started… Should be OK with proposed schedule
* DFBMs: Progress according to availability (About 55%)
* DFBLD: Status about wires distribution to be given
* DS zones: See C Vollinger’s presentation
  Many teams involved: MCS, MEL, VAC, IEG, ICIT,…