Building 245 schedule update

LIU Booster Meeting 27-03-2014
Fulvio Boattini & Michel Obrecht
TE-EPC / EN-CV
Building 245 position
### MPSB Time Schedule

<table>
<thead>
<tr>
<th>physics</th>
<th>LS1</th>
<th>physics</th>
<th>LS2</th>
<th>physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>2013</td>
<td>2014</td>
<td>2015</td>
<td>2016</td>
</tr>
<tr>
<td>No resources</td>
<td>Services Integration (EL, CV,..)</td>
<td>GS/SE studies and procurement</td>
<td>Building construction</td>
<td>May 2016 Building Ready</td>
</tr>
</tbody>
</table>

- **Cabling integration studies**
- **Cable purchase**
- **Switching cabinets and cabling installation**
- **Magnet switch cables**: Paths A, C, D

**Magnet switch cables**:
- Paths B
- Main AC Power Cables
- B367 Dummy load Cables
- B245 aux power cables

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27/03/2014
Fulvio Boattini & Michel Obrecht
Review of cooling and HVAC requirements for Booster MPS

All circuits are aluminium

A 20um mechanical filter is required before entering the converters

Water flow will be adjusted to its nominal value during commissioning by means of dedicated regulation valves

During operation one of the 3 sets of circuits (and/or the spare circuit) could be disconnected. The flow in the other circuits shall remain the same (regulation and on-off valves separated).

<table>
<thead>
<tr>
<th>MPS</th>
<th>QPS</th>
<th>Spare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Units [Nu]</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Losses in water per Unit [PlossU]</td>
<td>100kW</td>
<td>77kW</td>
</tr>
<tr>
<td>Water flow per unit [Q]</td>
<td>Q1: 36 m3/h</td>
<td>Q2: 36 m3/h</td>
</tr>
<tr>
<td>Inlet temperature (Max) [Tin]</td>
<td>30±35 deg C</td>
<td>30±35 deg C</td>
</tr>
<tr>
<td>Inlet water conductivity [µS/cm] @ Tin</td>
<td>&lt;1.5 µS/cm</td>
<td>&lt;1.5 µS/cm</td>
</tr>
<tr>
<td>Estimated DP @ Q</td>
<td>4.0 bar</td>
<td>4.0 bar</td>
</tr>
<tr>
<td>Total Losses in water [PlossH2O] (alu circuit)</td>
<td>500kW</td>
<td>500kW</td>
</tr>
</tbody>
</table>

Fulvio Boattini & Michel Obrecht
Review of cooling and HVAC requirements for Booster MPS

<table>
<thead>
<tr>
<th></th>
<th>Temperatures [degC]</th>
<th>Losses [kW]</th>
<th>Sun Radiation [W]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Converter Hall</td>
<td>26</td>
<td>160 (*)</td>
<td></td>
</tr>
<tr>
<td>Control Room</td>
<td>human range (18deg winter 26 summer)</td>
<td>4 (*)</td>
<td></td>
</tr>
<tr>
<td>Capacitor rooms</td>
<td>human range (18deg winter 26 summer)</td>
<td>5 (for each room) (*)</td>
<td></td>
</tr>
<tr>
<td>False Floor</td>
<td>26</td>
<td>15 (*)</td>
<td></td>
</tr>
<tr>
<td>EN/EL area</td>
<td>26</td>
<td>10 (*)</td>
<td></td>
</tr>
</tbody>
</table>

Fulvio Boattini & Michel Obrecht
Conceptual Design based on:

- Independent cooling station:

- Cost optimised Air conditioning system:
  - No chilled water,
  - Units placed on the roof,

URS inputs

- Cooling power on water: confirmed 470 kW = 2 units at 100% + 30% of the third unit Flow rate, delta T of 2.3 °C,
- Conductivity of the water confirmed, maxi 0.8 micro S/cm at 30 °C,
- Need to run independently: **2 fully independent stations for cooling** located in the new building,
- Requirements for internal temperature revised, 26 °C in summer with maxi of 30 °C during limited periods
Building 245 CV Conceptual Design

Annual operating costs (water, power and capital costs)
Calculation example at €/m³ water price

<table>
<thead>
<tr>
<th></th>
<th>System 1</th>
<th>System 2</th>
<th>System 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Open</td>
<td>Closed</td>
<td>Jäggi</td>
</tr>
<tr>
<td>Evaporative</td>
<td></td>
<td></td>
<td>Hybridcooler</td>
</tr>
<tr>
<td>cooling tower</td>
<td>€/year</td>
<td>€/year</td>
<td>€/year</td>
</tr>
<tr>
<td>Water costs</td>
<td>63080</td>
<td>63080</td>
<td>13584</td>
</tr>
<tr>
<td>Power costs</td>
<td>1613</td>
<td>15927</td>
<td>5907</td>
</tr>
<tr>
<td>Capital costs</td>
<td>1646</td>
<td>2327</td>
<td>6901</td>
</tr>
<tr>
<td>Annual operating costs</td>
<td>€/year</td>
<td>66,339 (25%)</td>
<td>82,444 (31%)</td>
</tr>
</tbody>
</table>

Price of water €/m³

Operating characteristics of a Jäggi Hybridcooler (example)

Natural convection cooling: A considerable saving in power consumption by switching off the fans for a time.
Building 245 CV Conceptual Design

![Diagram of Building 245 CV Conceptual Design]
CV Integration
CV Integration
CV Integration
B245 Integration Milestones

• Update of the Electrical Power Consumption: 17th March 2014
• Final Decision on Dummy Load by TE/EPC: 17th March 2014
• Decision on number of galleries between b271 and b245: 24th March 2014
• Update of the Electrical Network schematic: 28th March 2014
• Integration of major CV 3D components in the b245 model: 28th March 2014
• Update of integration of EN/EL cabinets: 28th March 2014
• Final Modification of b245 structure: 11th April 2014
• Integration of pipes, cables ladders and others: 25th April 2014
B245 Integration Milestones

- Update of the Electrical Power Consumption: 17th March 2014

<table>
<thead>
<tr>
<th>USER</th>
<th>POWER [kW]</th>
<th>COMMENT</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN/CV</td>
<td>135</td>
<td>Water cooling and towers b.245</td>
<td>M. Obrecht 08/03/2013</td>
</tr>
<tr>
<td>TE/EPC</td>
<td>392</td>
<td>Auxiliaries</td>
<td>F. Boattini 22/11/2013</td>
</tr>
<tr>
<td>TE/EPC</td>
<td>6750</td>
<td>N.3 transformer 2.7 MVA (2@100%, 1@50%)</td>
<td>F. Boattini 22/11/2013</td>
</tr>
<tr>
<td>EN/EL</td>
<td>70</td>
<td>Lights, sockets, OH crane - b.245</td>
<td>F. Boattini 22/11/2013</td>
</tr>
<tr>
<td>EN/CV</td>
<td>153</td>
<td>HVAC b.245</td>
<td>M. Obrecht 08/03/2013</td>
</tr>
<tr>
<td>TE/EPC</td>
<td>15</td>
<td>Auxiliaries which need UPS</td>
<td>F. Boattini 22/11/2013</td>
</tr>
<tr>
<td>EN/CV</td>
<td>8</td>
<td>Smoke extraction</td>
<td>M. Obrecht 08/03/2013</td>
</tr>
<tr>
<td>EN/EL</td>
<td>25</td>
<td>Emergency light, fire detection</td>
<td>F. Boattini 22/11/2013</td>
</tr>
</tbody>
</table>

P. Converters power: 6750kW
Auxiliaries EPC: 392kW+15kW UPS
Auxiliaries CV: 288kW
B245: 103kW
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Approved by Serge Deleval
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1366598_V1_Booster_2GeV_cabling docx (2 Mb) pdf (923 Kb)
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DGS-SEE would like to have an UPS for smoke extraction. EN-EL replies it is not justified and not “CERN standard”.

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B245 Integration Milestones

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WU baselines

Excel file
Bulding 245 schedule update

THANKS FOR THE ATTENTION

QUESTIONS?
Building 245 layout
Building 245 layout (b271 side)
Building 245 layout (Isolde side)
Building 245 layout
Building 245 layout
Building 245 layout
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