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REFERENCE : **LHC-LBH-MIN-0006**

HL-LHC WP11 Interfaces Meeting Minutes no. 1

Date: 2018-04-24	***Project/Activity: HL – WP11***

Attendees:

Carlos Arregui, Robin Betemps, Nicolay Bourcey, Roderik Bruce, Paolo Fessia, Jean-Frederic Fuchs, Jose Gascon, Alvise Ghezzo, Massimo Giovannozzi, Gael Girardot, Maria Amparo Gonzalez de la Aleja, Ludovic Grand-Clement, Susana Izquierdo Bermudez, Anton Lechner, Simon Marsh, Michele Martino, Felix Rodriguez Mateos, Matthias Mentink, Pablo Andreu Munoz, Thomas Otto, Juan-Carlos Perez, Mirko Pojer, Herve Prin, Delio Ramos, Stefano Redaelli, Frederic Savary, Daniel Schoerling, Jean-Philippe Tock, Rob van Walden, Arjan Verweij, Gerard Willering, Daniel Wollmann, Samer Yammine

Agenda:

1. WP11 technical machine interfaces working group, Daniel Schoerling
2. Tour de Table

DISCUSSION

Frederic Savary opened the meeting and explained that Daniel Schoerling will organize a technical machine interface working group with the aim to identify critical issues related to interfaces of WP11's deliverables. The aim is to prepare two HL-LHC Interface Specifications (IS): WP11 Point 7 11 T Dipole and WP11 Point2 Connection Cryostat Full Assembly. Furthermore, two ECRs for WP11 Point 7 11 T Dipole and WP11 Point2 Connection Cryostat Full Assembly shall be established in May 2018.

1. WP11 technical machine interfaces working group (Link)

The mandate of the working group was presented.

All so far identified WP11 interfaces were listed together with the main responsible person (underlined in the following list) and the key persons working on the subject. The list was checked and completed during the meeting:

- Beam dynamics [WP2], Massimo Giovannozzi
- Collimation scenarios [WP5], Stefano Redaelli, Roderik Bruce
- Mechanical 3D model, Alessandro Bertarelli, Luca Gentini, Alvise Ghezzo, Christophe Yves Mucher
- Integration model, Maria Amparo Gonzalez de la Aleja Cabana
- Cryogenics [WP9], Rob van Weelderen
- Vacuum [WP12], Monika Sitko, Vincent Baglin, Germana Riddone, Pablo Andreu Munoz
- Geometry and alignment [WP15], Dominique Missiaen, Helene Mainaud-Durand, Jean-Frederic Fuchs
- Powering and trim circuit [WP6B], Hugues Thiesen, Samer Yammine, Michele Martino
- Trim current leads, Amalia Ballarino
- Machine protection, Daniel Wollmann
- QPS, Reiner Denz, Daniel Wollmann
- Software, Markus Zerlauth, Daniel Wollmann
- MCF-ELQA and voltage withstand levels, Felix Rodriguez Mateos
- MP3-LHC magnet circuits, powering and performance panel, Arjan Verweij
- Compliance to pressure equipment directive, Arnaud Foussat

- Integration, (de-)installation [WP15], Paolo Fessia, Michele Modena, Maria Amparo Gonzalez de la Aleja Cabana
- Cryo-assembly, Delio Ramos
- Cold mass assembly, Herve Prin
- Operation, Mirko Pojer
- Interconnections, Jean-Phillippe Tock, Herve Prin, Nicolas Bourcey
- HL-LHC Project Safety Officer, Thomas Otto
- HSE, Jose Gascon, Carlos Arregui Rementeria, Simon Marsh
- Cryo-magnet coordinator and Magnet Evaluation Board (MEB), Sandrine Le Naour
- Transport, Caterina Bertone
- Energy deposition, Anton Lechner
- Beam-loss monitors, Anton Lechner, Christos Zamantzas
- DC electrical distribution and instrumentation wires, Jean-Claude Guillaume, Gael Girardot
- 11 T electrical engineering, Arnaud Foussat
- Test station, Gerard Willering, Gaelle Ninet
- Storage of signals (TIMBER), Jakub Wozniak

Persons to be informed and invited to this meeting (e-group: HI-LUMI-LHC-WP11-Interfaces):
Vincent Baglin
Marta Bajko
Amalia Ballarino
Alessandro Bertarelli
Caterina Bertone
Robin Betemps
Nicolas Bourcey
Giuseppe Bregliozzi
Roderik Bruce
Maria Amparo Gonzalez De La Aleja Cabana
Juan Carlos Perez
Francesco Cerutti
Gijs De Rijk
Reiner Denz
Beniamino Di Girolamo
Delio Duarte Ramos
Paolo Fessia
Lucio Fiscarelli
Jean-Frederic Fuchs
Jean-Christophe Garnier
Jose Gascon
Luca Gentini
Alvise Ghezzo
Massimo Giovannozzi
Gael Girardot
Ludovic Grand-Clement

Jean-Claude Guillaume
Susana Izquierdo Bermudez
Friedrich Lackner
Sandrine Le Naour
Anton Lechner
Helene Mainaud Durand
Simon Marsh
Michele Martino
Matthias Mentink
Dominique Missiaen
Michele Modena
Pablo Andreu Munoz
Gaelle Ninet
Thomas Otto
Arnaud Pascal Foussat
Mirko Pojer
Herve Prin
Rosario Principe
Stefano Redaelli
Carlos Arregui Rementeria
Germana Riddone
Felix Rodriguez Mateos
Thomas Sahner
Frederic Savary
Daniel Schoerling
Javier Serrano
Monika Sitko
Jens Steckert
Hugues Thiesen
Jean-Philippe Tock
Ezio Todesco
Rob Van Weelderen
Arjan Verweij
Gerard Willering
Daniel Wollmann
Jakub Wozniak
Samer Yammine
Christophe Yves Mucher
Christos Zamantzas
Markus Zerlauth

Beam dynamics

The exact position of the magnet in the tunnel is being currently discussed between WP2, WP11 and WP15. Once a decision has been taken, (preliminary date May 22nd), a presentation on this subject will be given by Massimo Giovannozzi.

Vacuum

A delivery schedule of the different components is available and has to be aligned to the needs of WP11. Frederic Savary will present at the next meeting the needs of WP11.

During bake-out, the collimator is heated to ~300°C. This temperature level may yield to safety issues, if the adjacent 11 T dipole is filled with helium and operated at its nominal temperature of 1.9 K. Thomas Otto (PSO) has started a risk assessment to study the risks during bake-out, the exchange of a collimator and small repairs in-situ. In case, this analysis is not conclusive a test in SM-18 has to be foreseen. Thomas Otto will present his recommendations on May 22nd.

Collimation scenarios

A mock-up unit for integration is currently being installed in SM-I2. This mock-up could potentially be used for a cold-test in SM-18.

Integration with collimator and general integration model

An integration model exists, which is straight. It will be updated with the pending changes [curvature (see beam dynamics), DN200 valves (see cryogenics), feet position (see alignment)]

Cryogenics

The work on the integration of the DN200 pressure valves is ongoing. Once finalized the baseline design will be presented in this meeting.

Geometry and alignment

A number of open points were identified (position of feet, reference for roll measurement, and impact of position of DN200 valves). In the next meeting a summary of these open points (or their proposed solution, if identified in the meantime) will be presented by Jean-Frederic Fuchs.

The open points on the jacks for installation of the TCLD collimator are not treated in this meeting and will be followed-up by Stefano Redaelli.

Report of MCF

MCF has reported their activities concerning the powering of the 11 T dipole circuit, the protection strategy and the trim circuit.

The 11 T dipole electrical test criteria have been defined together with WP11.

Open points (11 T dipole trim quench protection) are being treated within MCF.

WP11 has to provide details of the trim circuit busbar layout. Robin Betemps and Herve Prin are working on the integration of the bus bars into the 11 T design. They will report their design to MCF.

MP3-LHC magnet circuits, powering and performance panel

The documentation will be handed over from MCF to MP3 once the equipment is installed. MP3 will work on the hardware commissioning powering tests procedures.

The two 11 T trim circuits are named as follows: RTB8.L7 and RTB8.R7.

Interconnections

The interconnects in the tunnel at P2 and P7 will be installed by the special intervention team of DISMAC (Sandrine Le Naour and Nicolas Bourcey). Jean-Philippe Tock stated that the design, the procedures, components and validations are not part of DISMAC.

Herve Prin and Delio Ramos will take care of the design, procedures, and components for P2 and P7.

Integration, (de-)installation

Integration is dealt with by the HL-LHC integration meeting. Integration reports (EDMS 1904996 and 1904620) are available and a list of open points is identified and worked on. An update of the documents is foreseen to be published in October-November 2018

HSE, TSO and HL-LHC

For WP11 HSE (Jose Gascon) takes the role of a notified body.

The HL-LHC PSO (Thomas Otto) ensures that all regulations are respected and followed.

Compliance to pressure equipment

The end cover circumferential welds cannot be inspected with the current design. The design and overall strategy is under discussion, also with WP3.

Thomas Otto confirmed that safety related questions on this topic are under the responsibility of Arnaud Foussat.

Cold mass assembly

The integration of the trim current leads and busbars is an open point, which is ongoing.

Cryomagnet coordinator and Magnet Evaluation Board

The installation of the 11 T magnets has to be approved by the cryomagnet coordinator and the Magnet Evaluation Board.

Other points: Energy deposition

The energy deposition in the coils and its impact for cryogenics and magnet performance was briefly discussed. It was agreed to discuss this topic on June 5th.

HL-LHC Interface Specifications (IS)

A generic template is available and after finalizing the first draft of the ECR, two Interface Specifications will be prepared (point 2 and 7).

Engineering Change Request (ECR)

The approval chain for the ECR is:

- TCC (HL-LHC)
- LMC (LHC)

The following table of contents has been agreed during the meeting. The content has to be made available until May 18th. Each meeting the progress on the ECR will be presented by Daniel Schoerling.

1. Introduction (D. Schoerling)
2. Description (with a focus on the deviation from the current status, once installation is done)

2.1 Integration (P. Fessia, final draft v0.9 released, v1.0 to be released Oct.-Nov. 2018)
2.2 Beam dynamics (integrated field, field quality, field stability) (M. Giovannozzi)
2.3 Vacuum modifications (M. Sitko)
2.4 Cryogenics modifications (R. van Weelderen)
2.5 Geometry and alignment modifications/changes (H. Mainaud)
2.6 Main dipole chain and trim circuit (H. Thiesen, S. Yammine, draft description 2.1-2.7; EDMS 1764166)
2.7 11 T dipole circuit protection modifications (D. Wollmann, F. Rodríguez: draft available)
- 2.7.1 Introduction to changes in the quench protection hardware
- 2.7.2 Changes to the quench detection system
  - a. Hardware
  - b. Cabling
  - c. Location
  - d. Interlocks
  - e. Controls
- 2.7.3 Changes to the n-QPS
  - a. Hardware and location
  - b. Cabling
  - c. Configuration
  - d. Controls
- 2.7.4 Changes to the rack containing the Heater Discharge Units
  - a. Hardware and implications
  - b. Location
- 2.7.5 Changes to Powering Interlock System (PIC)
- 2.7.6 Protection of trim current leads
- 2.7.7 Cabling

3. Impact
- 3.1 Impact on items/systems
  - 3.1.1 LHC Layout (WP15/EN-ACE)
  - 3.1.2 WP 11 drawings (D. Schoerling)
  - 3.1.3 Main dipole chain (H. Thiesen, S. Yammine, draft available)
- 3.2 Impact on utilities and services (short concise tabular description of impact)
  - 3.2.1 DC electrical distribution (J.C. Guillaume)
  - 3.2.2 Electrical cable pulling (any one concerned, please provide input to D. Schoerling)
  - 3.2.3 DEC/DIC (please forward any request to D. Schoerling)
  - 3.2.4 Racks (please forward any need to D. Schoerling)
  - 3.2.5 Vacuum (short list of impact, to not repeat the description 3.3)
  - 3.2.6 Special transport/handling (C. Bertone)
  - 3.2.7 Temporary storage (WP11 for deliverables of WP11)
  - 3.2.8 Alignment and positon (H. Mainaud)
  - 3.2.9 GSM/WIFI networks: Should be available during installation?
  - 3.2.10 Cryogenics (R. van Weelderen)

4. Impact on cost, schedule and performance
- 4.1 Impact on cost (F. Savary)
- 4.2 Impact on schedule (F. Savary)

4.3 Impact on performance
- 4.3.1 Optics/MAD-X (M. Giovannozzi)
- 4.3.2 Machine protection (D. Wollmann)
- 4.3.3 Cryogenics (R. van Weelderen)
- 4.3.4 MP3 (A. Verweij)
- 4.3.5 Operation (M. Pojer)

5. Impact on operational safety (T. Otto)
6. Worksite safety (T. Otto)
   - 6.1 Organization
   - 6.2 Regulatory tests
   - 6.3 Particular risks
7. Follow-up of actions by the technical coordinator (Daniel Schoerling)

Next meetings and preliminary agendas:

May 8:

Open issues alignment, Jean-Frederic Fuchs, Helene Mainaud
Schedule requirements for vacuum components, Frederic Savary
Progress of ECR, Daniel Schoerling

May 22:

Impact of bake-out on 11 T dipole: Recommendations, Thomas Otto
Position of 11 T dipole magnets in the tunnel, Massimo Giavannozzi
Progress of ECR, Daniel Schoerling

June 5th:

Simulations: Energy deposition in the 11 T magnet coils, Anton Lechner
Calculations: Impact on cryogenics and expected temperature levels, Rob van Walden
Measurements: Impact on magnet performance, Gerard Willering

ACTION		
See meeting list		
Documents:		
Prepared by: D. Schoerling, F. Savary	***Date:*** 2018-05-25	
Approved by: WP11 Interface Working Group	***Date:*** 2018-xx-xx	
Distribution List: Standing members of the meeting and participants		