DFHx-DFM meeting #1

Date: 2018/11/08	***Project/Activity:*** WP6a

Attendees:

TE-MSC: Amalia Ballarino [AB], Iole Falorio [IF], Jerome Fleiter [JF] , Yann Leclercq [YL], Vittorio Parma [VP], Yifeng Yang [YY]

TE-CRG: Serge Claudet [SC], Antonio Perin [AP]

EN-MME: Robin Betemps [RB], Julien Pascal Dequaire [JPD], Diego Perini [DP]

Agenda: *https://indico.cern.ch/event/771155/*

- Introduction [AB]
- Conceptual specifications for the DFHx cryostats [YL]
- Major Conceptual considerations for the SC-link Cryogenic Interfaces [SC]
- Discussion of key basic concepts for the DFHx [YL]

DISCUSSION

GENERAL INFO [AB]

- The weekly meetings on the DFHx-DFM aim at converging on a conceptual design of the DFHx cryostats before the end of the year, benefitting from the input of the different parts. YL is the meeting coordinator. These are technical meetings, where mechanical solutions are presented and discussed.

OVERVIEW ON CONCEPTUAL SPECIFICATIONS [YL]

- The DFH functional specifications status for DFHx and DFM is presented slide 4. Some topics need additional inputs/confirmation ;
  - Boundary conditions of splices; volumes, access, protection (to be provided by [JF]) ;
  - Instrumentation for both splices [JF] and cryogenics equipment (Juan Casas Cubillos) ;
  - General thermal contraction compensation strategy ;
  - Compatibility with the SC-Link transport configuration after testing ;
  - Acceptable length of MgB_2 and HTS cables and routing of instrumentations wires.
- Integration: the optimised length for HTS leads between the DFH and current leads is currently about 5-6m. This length shall be minimum 3 m for technical reasons and preferably not more than 6 m in length for costs limitations (post meeting precision) [AB];
- Electrical: 19 leads in DSHx link, 120 A correctors will be locally powered [AB];
- MgB_2 cables handling, fixing and protection need further discussion. No clear options yet [SC], different options are under study [YL];
- Cables are expected to be fixed to helium vessels at MgB_2-HTS splices location;
- Installation: To avoid handling the MgB_2 cables in the tunnel for splicing preparation, a pre-opening at the surface is discussed. The increased diameter associated to rigid protective sleeves lead to complicated transport of the link. [SC] suggests a “CERN logo” type transport configuration on the turret to be studied.
- To be added in the functional specifications :
  - Mechanical aspects on the functionalities (i.e. pressure/fixed point) [SC];

  - Safety aspects, nominal and ultimate flow parameters, expected heat load. [AB]
- Functional specifications and instrumentation documents shall be finalised and shared, see actions [AB].
- Transport, replacement and installation tooling shall be considered at the design phase [DP].

CRYOGENIC INTERFACES FOR THE SC-LINK [SC]

- Cryogenic will operate all the helium circuits in the future, matching the requirements from all the users including the SC-Link;
- The schematic of the cryogenic architecture in P1/P5 after the removal of the thermal shield of the link and the process flow diagram for P5 on the left and right side has been presented (see respectively slide 2,3 and 4);
- The cryogenic group will look at the cryo distribution at P5 where there are 40 m available between D2 and Q4. A decision has to be taken on where to place the service modules and how to access valves. Proposals will be available to discussion in the coming weeks;
- For the control: the temperature will be monitored on the warmest part of the link and on the splices. The most restricted requirement between the two will dominate the control [AB];
- Line D is available for recovery at the DFHx level to be used instead of the WRL but it has a cost in terms of valves, jumpers and integration. The cryogenic group will perform the cost and feasibility analysis;
- Nominal, transient and abnormal cases scenarios need to be specified and considered in the design.
- In case of a 2-units DFHx design, the downstream unit shall guarantee inlet gas temperature at 17 K:
  - The design is such that the gas enters at 17 K and splices operate at 20 K with a 5 K margin;
  - Temperature fluctuations around the set point temperature are admitted but in this case it would be preferable to have a set point at lower temperature, to be discussed [AB].
- Current leads heads:
  - The valve panel location need to be re-discussed and preferences from the cryogenic group are welcomed as input [AB];
  - Cryogenic prefers not to have the valves located close to the current leads top to avoid exposure of personnel unfamiliar with high voltage systems [SC];
- Juan Casas-Cubillos is the person in charge of the wires acquisition racks and will be invited to the specific meeting for discussion in due time [SC];

DFHx-KEY BASIC CONCEPT [YL]

- A quick overview of the topics is presented. Detailed discussions will follow during the next meetings:
  - The DFHx are proposed to be divided in two units, one dedicated to the high current leads and one for the low current ones to simplify the integration of the HTS cables to the power supply. A sketch of the two possibilities and how they meet requirements is desired.
  - An illustrative concept of the DFHx has been shown (see slide 6). The concept of today is ~ 4 m long and foresee splices individually routed in specific pipes to ensure proper cooling. This design will be discussed in details in an upcoming meeting.
- Input on the splice geometry for space occupation and cable handling is desired for next week.

ACTIONS

Functional specifications need to be finalised with the given input and shared	YL	ASAP
Listing of instrumentations required in the DFHx	JF	ASAP
Cost and feasibility analysis of using line D for the gas recovery instead of the WRL	SC	TBD
Listing of instrumentations required by cryogenics	SC	TBD
Comparison on One-module DFH vs Two-modules DFH solutions	YL	14-09-18
Comparison on splice routing into single pipe/multiple pipes	YL	14-09-18
Splice geometry input	JF	14-09-18

Documents:

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Distribution List: All attendees