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REFERENCE : NOT REQUIRED

INTEGRATION meeting #1

Date: 2018/11/12

Project/Activity: WP6a

Attendees:

TE-MS: Amalia Ballarino [AB], Iole Falorio [IF], Jerome Fleiter [JF], Alan Gharib [AG], Yann Leclercq [YL], Tomas Stephen Northam De La Fuente [TN], Vittorio Parma [VP], Patrick William Retz [PR].

EN-MME: Robin Betemps [RB]

Excused : Yifeng Yang [YY]

Agenda: <https://indico.cern.ch/event/772395/>

- Introduction [AB]
- Layout of DFH and current leads: status of on-going optimization studies [YL, JF]
- Ancillary equipment to be located in the new underground galleries [JF]

DISCUSSION

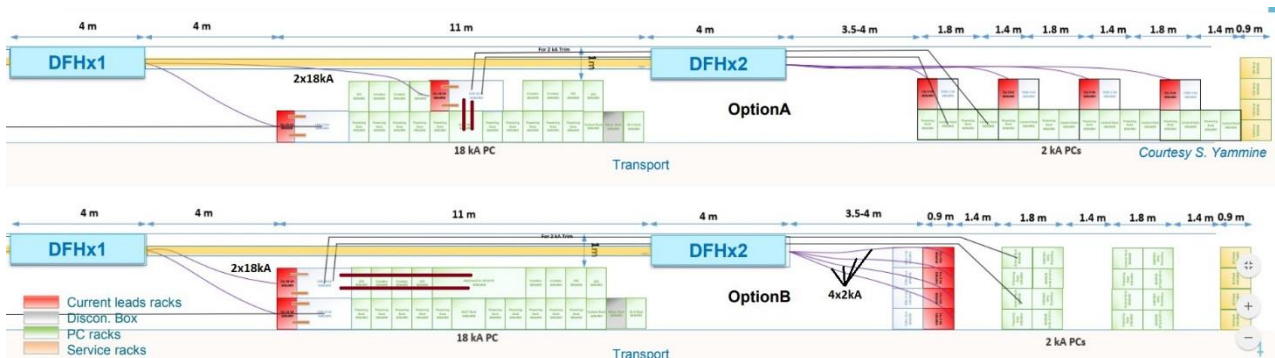
GENERAL INFO [AB]

- The weekly integration technical meetings aim at discussing the integrations aspects of the all the cold-powering system components. Yann Leclercq is the designated person to report to the wp15 on the requirements and the proposals discussed within wp6a;
- A representative person from both the transport and the integration team will be invited in the future meetings, possibly Caterina Bertone and Paolo Fessia respectively;
- The topics on which it is desired to converge before the end of the year are:
 - Understanding and defining the baseline for the equipment location (i.e. room temperature (RT) leads, cables, SC-Link, DFXs, DFMs, DFHs) and present a proposal to the integration team;
 - Defining an integration document where it will be listed: the main equipment, the volume and the proposed location in the galleries of the main components and of the ancillary equipment. The document is required to identify and reserve enough space for cables and trays in the galleries including the space for allowing cables connection and maintenance. JF is invited to work on this document preparation.

LAYOUT OF DFH AND CURRENT LEADS: STATUS OF ON-GOING OPTIMIZATION STUDIES [YL, JF]

- The baseline proposal is aimed to be presented to wp15 before the end of the year. Ideally a first iteration on a proposal should be presented to wp15 by the end of November/beginning of December in order to receive the relevant feedback before the finalisation[YL];
- The integration layout for the DFHs and the current leads has been presented. The study is still ongoing and took into account two DFH units.
- Some of the boundary conditions from the power converter team:
 - The power converter (PC) racks must be accessible from the transport area;
 - The current leads (CL) racks layout is composed by three units: 2x13kA, 2x18kA and 4x2kA;
 - Access to ESS, Crowbar racks from footbridge.

- In order to simplify and minimise the intervention requirements on the water cooled cables (WCC), the power converter team suggested the introduction of circuit connection/disconnection boxes (CDB).
- The installation for the CDB is not baseline yet but preliminary integration studies of CDB, PC and CL racks have been carried out and two options (A and B) are under attention:



- Option A has been suggested by the power converter team and it is oriented at minimising the distance between the 2x18kA CL rack from the central located PC rack for energy recovery purposes (dark red lines in the sketch). However this configuration does not provide access to the HTS cables rack after installation (not even with a lifting tool) since both the PC and the CL racks lie on the second line with respect to the transport area;
- Option B is oriented at grouping together the CL racks (by grouping high current CL racks on the left side and the low currents ones on the right side) with the advantage of being independent on the integration sequence and of having access for maintenance to the CL racks.
- Note that in option B the orientation of the low current CL racks and disconnection boxes (CDB) on the right has been changed. The cables from the racks can pass underneath the CDB and can be easily extracted from the back in case of maintenance (the current leads cables can move backwards);
- Option B appears to be an improvement from Option A in terms of access to the low current CL racks, but the high current CL racks still requires a special lifting tool for maintenance that will have to be discussed with the transport group [VP]. Another option could be to relocate both the high current CL racks and respective CDC further on the left with similar order as done for the low current side [JF];
- Option B on one side has the advantage of having a reduced (and equalised) the HTS cables length, however the high current warm cables between the disconnection box and the central PC are now longer and most luckily will need to be water cooled [YL];
- If not water cooled, another solution for the high current RT cables is to thermally anchor them to separate water cooled copper pieces, whilst ensuring electrical insulation [RB];
- JF and YL should investigate and follow up, through discussion with S. Yammine (power converter section), the cooling requirements of the high current RT cables and study the possibilities of having them or not water cooled. [AB]
- S. Yammine will be invited in due time to participate to the integration meeting to provide an insight on the schematic layout of the RT cable routing, required access and space occupancy [AB];
- The specific racks for the cold-powering system and for the cryogenic system are still missing from the Option A and B proposals [VP];
- A preliminary study of the service racks needed for the HTS leads is desired. It could be started by investigating the electrical connections envisaged for the RT leads and their volume occupancy. JF and AG are kindly asked of discussing these points with S. Yammine from the power converter group [AB];
- VP is invited to take care of the safety aspects of the system [AB]. A preliminary study is suggested to be started by assuming the following inputs: the inventory of helium being of about 100 L and the peak mass flow release corresponding to the present estimated volumes of the SC-Link, DFX and DFH boxes [AB];



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- The highest level of risk should be taken into account when studying the safety aspects: the service gallery will be a highly humid environment, with presence of high voltage systems (20 V) and possible presence of personnel at any time [AB];
- RB is invited to present the naming convention for all the underground areas in the next coming meeting, for clarity of discussion [AB];
- Similarly to the DFH side a proposal has to be done also for the DFHM one. The final proposal should be presented for all the wp6a system components as a package.

ANCILLARY EQUIPMENT TO BE LOCATED IN THE NEW UNDERGROUND GALLERIES [JF]

- A list of the ancillary equipment of the SC-Link has been listed in slide 2. Among the components listed there are: the quench detection system (QDS) + thermoswitch, the heater for the current leads, the vacuum pumping units, the He gas panel and valves, the cryogenic instrumentation racks, the RT power cables and the CDB. A discussion with the colleagues from other work packages than wp6a is required in order to insure the appropriate integration of all the equipment [JF];
- Some of the missing items or that require further discussion are:
 - Vacuum instrumentation (i.e. pressure gauges) [VP];
 - Collectors: not collectors are foreseen today in case of release of cold gas due to the system overpressure. The evacuation will be done in the tunnel and appropriately located deflectors will be installed to protect the electronics situated in the service galleries. If the deflectors are not enough to guarantee a safe environment, the presence of collectors should be further studied but it will come with a cost in integration and constrains [VP];
 - The instrumentations required to monitor the flow in the current leads need to be structured and organised (i.e. valves, pipes, flowmeters) [JF];
 - It is desired to define the boundaries between different work packages in order to clarify which are the ancillary that needed to be looked after by the wp6a and which ones are not [JF];
- On the Quench detection System and thermoswitch:
 - It is recommended that the new QDS (uQDS version 2.0) will be tested during Demo 1 and Demo 2 to ensure if fulfils the protection requirements of the system [AB];
 - The thermoswitch will be provided by the SCD section [JF];
- On the heater for the current leads:
 - The heater voltage is 28 V, a transformer for each lead is required [JF];
 - It is desired to start investigating the location of the heaters, of the transformers and of the control station with respect of the current leads in order to be able to ask for space reservation [AB];
- On the he gas panel and cryogenic instrumentation:
 - A dedicated panel will be prepared for the gas valves and a rack for the cryogenic instrumentation needs also to be integrated [JF].
 - This task belong from CRG but the wp6a needs to follow up and ensure that enough space is reserved [AB];
- On the vacuum pumping units:
 - The insulation vacuum layout has been specified in a document produced by YL that needs to be released [AB];
 - Two pumping units are required in both the service gallery and the tunnel for redundancy, but it has to be confirmed with the vacuum team [YL];
 - It would be beneficial to pump the SC-Link from both sides [JF];
 - Wp6a have to insure to provide enough vacuum interfaces [YL]. Further discussion with the vacuum team is required to define the vacuum ports dimensions and the most reasonable place to locate them in the system [VP].

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- AG is invited to preliminary study a the racks organization (dedicated to the wp6a system) in terms of number, volume occupancy and location [AB];
- JF and YL are invited to prepare a document with the declaration of needs for the ancillaries [AB];
- AG and RB are invited to update the team in the next meeting on the SC-Link status of integration studies [AB];
- AG is invited to present a preliminary study on the dimensions/geometry of SC Link spools [AB];
- YL and YY are invited to start a preliminary study on the installation of the DFX in the tunnel [AB];
- The space reservation for the SC-Link integration will be discussed later on [AB].

ACTIONS

Integration document with listing of components and relative info	JF	ASAP
Follow up on the calculation for water cooled cables	JF,YL	ASAP
Collection of information on RT leads electrical connections, volume occupancy and access required	JF,AG	ASAP
Preliminary study on the ancillaries safety aspects	VP	Start
Preliminary study on the heaters for current leads and transformers location	JF	Start
Release of Insulation vacuum layout document specified in EDMS2019348	AB	ASAP
Iterations with cryogenics to follow up on the cryogenic ancillaries	JF,YL	Ongoing
Iterations with vacuum team to follow up on the vacuum ancillaries	JF, YL	Ongoing
Proposal on the wp6a system rack organization	AG	Later
Document with declaration of needs for the ancillaries	JF, YL	Start
Discuss with the transport team how to access the high current CL racks	JF, YL	Start
Presentation of the naming convention for all the HL-LHC underground areas	RB	20-11-2018
Presentation on the installation of SC Link in the tunnel: status of integration studies	AG, RB	20-11-2018
Presentation on the preliminary dimensions/geometry of SC Link spools	AG	20-11-2018
Presentation on the preliminary study of the installation of the DFX in the tunnel	YL, YY	27-11-2018
Presentation on the preliminary study of the installation of the DFM in the tunnel	YL	27-11-2018
Updates on the integration aspects of the DFX	YY	20-11-2018
Update of on-going studies on the location of DFHX, DFHM and current leads in the tunnel	JF,YL	04-12-2018

Documents:**Prepared by:** Iole Falorio, Amalia Ballarino**Date:** 2018-11-13**Distribution List:** All attendees