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Date of the meeting : 25 November 2021

## WP6a Technical follow-up : Meeting Minutes #11

**Project/Activity: HL-LHC – Cold Powering (WP6a)**

**Participants :** F.Di Ciocchis (FdC), F.Pillon (FP), R.Betemps (RB), M.R.Curylo (MRC), P.Schneider (PS), D.Ochoa (DO), J.Fletier (JF), Yann Leclercq (YL), P.Cruikshank (PC)

### Agenda:

Indico event <https://indico.cern.ch/event/1055245/>

1. Action list follow-up
2. DFHX blank assembly progress
3. Planning of new activities
4. AOB

### Discussion & comments:

#### 1. Action list follow-up

##### WP6a Integration & Transport & Logistic

- Action #2: Transport sequence for WP6a devices (MRC)  
MRC presented a first proposal for the installation sequence of WP6a devices. He is in contact with the transport group and they are having regular meeting to progress on this activity. Presentation available [here](#). MRC commented they will get next Monday input from the transport team. MRC commented that the transport team proposed a new tooling for handling the SCLink – a conveyor system. **MRC is preparing a draft of the transport sequence that he will send to YL and AG for validation before sharing it with Michele Modena and the transport group. There is also a proposal from the transport group to weld the DFX interface to the DCM before transporting it down in the tunnel.**

##### DFH

- Action #1: Follow-up weld qualification campaign (FdC, YL, RB)  
Qualification plan on-going.  
AG remarked about the temperature we would reach while performing the lip weld of the DFX's top flange since there is the concrete risk of damaging the cables. He suggested to think about a dedicated mock-up to measure the temperature reached during the welding at this location. The temperature should be less than 100 C (reference value based on the Kapton insulation that from specs may accept up to 100 C before deteriorating its properties).  
**→ RB to follow-up the test to measure the temperature reached while performing the lip welds**



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- Action #2: Finalize feet design ensuring compatibility with installation sequence (RB)  
Activity on-hold.  
Tunnel floor unevenness has been measured. Results presented by Stephane Maridor, available [here](#).
- Action #6: flexible's tests follow-up (YL)  
Performing flexible's tests based on what Jerome Fleiter intends to assess before approving the dedicated reports. YL has proposed to postpone this activity until we get the parts for the test. There has been a long discussion between YL and Jerome JF concerning the test of the CL flexibles. The plan is to insert the 18kA CL flexible in the central vacuum chamber. As a first step we will try to insert the 18kA CL without the cables (only with the flexibles) and then after this first test we will add the copper cables. Alain pointed out as by pushing the flexible we would increase its bending radius on one side while at the same time reducing it on the opposite extremity. He suggested to measure the length of the flexible (that has been corrected on drawing since originally there was an error on the nominal length).
- Action #7: IFS flange design validation (YL, RB, FP)  
PC reminded that the IFS flange of the DFHX is not included in the current manufacturing dossier. YL mentioned that the finalization of the IFS flange would have been taken over by AG but it still needs to be confirmed. YL confirmed the design is converging. YL stated that the design is progressing although is not fully finalized. Mechanical design validation on-hold, waiting for JF feedback for the final electric layout before going any further. YL confirmed that we received all the info and that the design validation is now in JB's hands.
- Action #8: Blank assembly follow-up (YL, FdC, MRC, AJ)  
Some pictures available [here](#).  
AG underling the importance of representing the real assembling conditions also during the blank assembly tests. Specifically, he suggested to install the spacer around the CL helium flexible. YL suggested to prepare the blank assembly for each cryostat of the series. This will make sure that all the parts have been properly machined as well as facilitate the alignment process. YL underlined that the DFHX's drawings have been reviewed to relax the tolerances and the proposed modifications have been circulated – still need to received feedback before officially proceed in modifying them. **YL underlined as there is something to be repaired/re-worked on the helium vessel parts of the DFHX. YL would like to have a dedicated discussion to decide if performing the leak test with or without the helium vessel parts.**

## DFM

- Action #1: Follow-up DSHM-DFM installation study in the LHC tunnel (YL, PS)  
PS showed the main plan and status of the study. The study is progressing. Some feedback to be shared with Amalia. PS will model PC's proposal about the routing and check if it improves the design. PS commented that no further progresses since last time. There are some discussions on-going for modifying the degrees-of-freedom of the SCLink handling tool (reducing the number of DOF). PS will prepare a presentation (in view of the DFM's DDR) with some pictures showing the procedure step-by-step.



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## DFX

- Action #1: Production follow-up (YL)

Production on-going. Found issues with the helium bellows – they have been delivered with damages and, therefore, we need to reorder them. The order has not been placed yet. We don't expect to receive the new bellows before end of October (three months delay). YL commented the bellow's order is done and there is a fatigue strength qualification campaign on-going. He expects to receive the bellows by end of November/ beginning of December. YL stated that the loading test performed on the ribs of the main chamber wasn't successful. It's not a design issue but most probably something related with the manufacturing or with the test set-up.

## DSH (SC Link)

- Action #2: Reel procurement follow-up (MC)

Contract signed. MC is following-up the procurement. Delivery expected by November 2021 and test to be done by Q1 2022.

MC commented that in about two weeks we should know the exact delivery date of the ordered reel. They solved all the technical points, the supplier will deliver the parts in November.

- Action #3: Reel design validation (PC, MC)

PC, MC and Erik Richards agreed to perform a test on the existing spool. The test is foreseen to be performed in early September. MC underlined the need of reducing the spool speed and adding a brake to keep constant the cable's tension. The objective is to test how the spool is performing and to see how the cables behave during the operation.

Dedicated presentation from Erik Richards about the SC Link transport operations, available [here](#). MC commented that there are still some parts to be manufactured for performing the test. According to the current schedule the test is foreseen to be performed in two weeks. RB will help MC with the manufacturing of the parts at the AP. RB reported that the AP will take 8 weeks to manufacture the brake's disc to test the reel. The plan is to ask other machine shops for manufacturing this part trying to negotiate the shortest lead time possible. RB confirmed that MC will take care of the brake's manufacturing. Marc didn't say anything.

The supplier shared some pictures about the production status. RB announced that the company should ship the reel by end of next week. AG underlined that we should check the forces transmitted when the cryostat + reel are hanged. **PC commented that the actual design seems too weak - MC is making an upgrade to stiff and strengthen the design welding some reinforcements.**



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#### DFLH (Current Leads)

- Action #2: Production follow-up (RB, PC)

PC underlined the need of arranging regular meetings with Pierre Moyret (EN-MME, in charge of the CL production planning) to identify any potential stopper/issue in the manufacturing in order to ensure on-time delivery. PC underlined that as baseline they will arrange regular meeting to follow up the progress. PC mentioned that at a certain point would be useful to invite Pierre Moyret to come to SMI2. PC stated that all the CL are foreseen to be manufactured by the end of the year. RB commented - the production is progressing fast. They found few errors on the O-ring dimensions. RB and JF commented there have been technical issue with the O-ring, they don't have leak tightness on the warm flange (the CL's head). The groove seems to be too deep compared to the diameter of the O-ring. PC will try to give some help from the vacuum group. In practise they are waiting for the HTS cables. They first need to solve this issue and then wait for the HTS cables. JF underlined that everything can be ready by the end of the year except for what concerns the readiness of the HTS cables. **JF commented that this point is still under investigation. It seems that the leak was caused by the vacuum grease which was very old. They tried putting a new vacuum grease and the connection was leak tight. Concerning the production, we are aligned with the schedule.**

- Action #4: Review models and integration of CL's transformers boxes (RB, AG)

RB confirmed that the design of the frame has been finalized. The drawings are completed, and they would need to double check them before closing this point.

AG underlined the need of launching the production asap since they already have the transformers to be put on. RB commented that there are small modifications to be done according to the last meeting. AG underlined that the fabrication/order of this frame is urgent now. **RB commented that the design & drawings are completed – the order is not out yet.**

#### Cables & Splices

- Action #1: Splices & tooling design (RB, FP, PS)

FP confirmed that the design activities are still on-hold. FP and RB are waiting for Jerome Fleiter/Julien Hurte feedbacks before finalizing the design. FP confirmed the design activities have been re-started and he is progressing on the DFX. FP stated that the DFX splices have been designed. They are now working on the insulation. They will then move on the DFHX splices. FP mentioned the design for the DFX is in a good shape. They plan to test the current design before triggering the series production. Drawing for the DFX are done and signed. Les plans de moule for the DFX are also done. They have also worked on the insulation housing for the DFX. They had a meeting for the validation of the insulation design but there is still some to be addressed. The next step would be making the same for the DFHX. FP commented - he has now started working on the DFHX splices.



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- Action #2: Design splices anti-pulling system (PC, RB, FP)

A first meeting was held to initiate the discussion. During the meeting Julien Hurte raised uncertainties concerning the actual flexibility of HTS. PC underlined the need of arranging dedicated recurrent meetings to follow-up these activities. As a starting point, a summary table of the HTS cable's requirements is needed. This action is currently on-hold because PC underlined the need of Jerome Fleiter (on holiday) to progress. PC suggested to conceptualize the system by taking advantage of the DFHX blank assembly. **PC suggested to postpone it once we have done the spooling test.**

## 2. AOB

- PC mentioned they are working on a document – “TE-VSC Contribution to WP6a” – concerning the vacuum instrumentation configurations in WP6a, which will also underline the impact of the vacuum barriers on the vacuum instrumentation. PC underlined that the document has been updated so as to include all the related costs. Concerning the vacuum barrier AB wants to keep the VB until the test to decide then if we can modify or not the function of the VB. PC commented this document is in the final check.
- YL commented that in April Amalia Ballarino plans to perform a test in SMI18. We should start by identifying 10/20 main steps in the installation sequence.
- **PC asked about the detailed assembling sequence of the DFX. RB will ask DO to work on this point.**

**Next Meeting:** 9<sup>th</sup> of December 2021

**Prepared by:** F.Di Ciocchis

**Date:** 08-12-2021



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**List of actions:**

N.	Action	Owner	Due date	Status
<b>WP6a Integration &amp; Transport &amp; Logistic</b>				
2	Transport sequence for WP6a devices	MRC		Ongoing
<b>DFH</b>				
1	Follow-up weld qualification campaign	FdC, YL, RB		Ongoing
2	Finalize feet design ensuring compatibility with installation sequence	RB		On-hold
6	Flexible's tests follow-up	YL		Ongoing
7	IFS flange design validation	YL		On-hold
8	Blank assembly follow-up	FdC, YL, MRC, AJ		Ongoing
<b>DFM</b>				
1	Follow-up DSHM-DFM installation study in the LHC tunnel	PS, YL		Ongoing
<b>DFX</b>				
1	Production follow-up	YL		Ongoing
<b>DSH (SC Link)</b>				
2	Reel procurement follow-up	MC		Ongoing
3	Reel design validation	PC, RB, MC		Ongoing
<b>DFLHA/ DFLHB/ DFLHD (Current Leads)</b>				
2	CL production follow-up	PC, RB		Ongoing
4	Review models and integration of CL's transformers boxes	RB, AG		Ongoing
<b>Cables &amp; Splices</b>				
1	Finalize splices & tooling design	RB, FP, PS		Ongoing
2	Design splices anti-pulling system	PC, RB, FP		On-hold

