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## DFX meeting #35

**Date:** 2019/11/8

**Project/Activity:** WP6a

TE-MS: Iole Falorio [IF], Yann Leclercq [YL]

TE-VSC: Paul Cruikshank [PC]

SOTON: Wendell Bailey [WB], Yifeng Yang [YY]

EN-MME: Robin Betemps [RB], Julien Pascal Dequaire [JD]

Excused : Amalia Ballarino [AB], Daniel Dominguez Ochoa [DO], Jerome Fleiter [JF], Antonio Perin [AP], Vittorio Parma [VP], Jorge Pelegrin [JP], Serge Claudet [SC]

**Agenda:** <https://indico.cern.ch/event/862491/>

- Update on calculations;
- Feedback on 3D model horizontal part;
- Update on IFS status;
- Feedback on vacuum barrier bellows dimensions;
- Feedback on horizontal bellow specifications;

### DISCUSSION

#### Update on calculations

A list of the pressure configurations that the DFX will see during its life cycle and the criteria that has to be respected for each case has been presented. When the criteria are exceeded, small changes to the design have to be implemented until solving the problem [YL] ;

CERN does not encourage to simulate the whole system with bellows for several reasons listed in the shared email [YL];

SOTON lists of the on-going calculations and YY stresses on the importance of the analysis of the global model under different pressure scenarios. The bellows are also included into the global system to show that their impact is not negligible [YY];

CERN suggests to work side by side on the simulations to try to complete the 2D drawings by the end of the year [PC];

SOTON analysis on the global system under different pressure configurations and with different mechanical constraints has been presented. Case B3, with additional roller shows a strong reduction in stresses when allowing a small movement of 2-3 mm [YY];

There is not a practical and available solution at the moment to implement the "rolling of the system" [RB];

PC observes that the bending of the system is driven by the contraction of the horizontal rod that should instead have a neutral effect at all pressures. It suggested to find the nominal position at cold and at warm and to try to compensate the movements between these two values. It is suggested to analyze the pure thermal effect by

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checking if the vertical axis of the system is moving under thermal contractions. If this is not the case, than the longitudinal rod has to deal only with the different pressure load [PC];

Concerning the vacuum barrier stability it is suggested to focus on it after a convergence on the global system is achieved [YL];

#### **Feedback on 3D model horizontal part**

It is suggested to use in the calculations a weld joint coefficient smaller than 1 (i.e. 0.7), this choice would reduce the number of welds that need to be checked [RB];

SOTON is confident of the tube sizes chosen according to calculation [YY];

The calculation are based on the minimum requirements. Additional Ansys calculation should be done for more complex geometries that might lead to extra stresses. The dimensions should be fixed after those additional analysis [PC];

The calculation for the thickness of the conical section shows that the thickness needed to be increased from 3 mm to nearer 6 mm mainly in the location of the knuckles. In the specifications drawing the piece will be broken in two parts but we will leave freedom to the company on the choice of the weld prep [WB];

#### **DFX- vacuum barriers**

The bellow proposed from the manufacture requires to move the cage out of about 5 mm, with consequent reduction of the space available for the MLI [WB];

A space of 10 mm is the minimum required for MLI, no possible to go below [JD];

The company will be re-contacted to find other solutions [WB]. The possibility of enlarging the vacuum envelope will also be checked [JD];

The simulation show that the thickness should be increased on the welding ring [WB].

### ***ACTIONS of #34***

34.1 Decision on the responsibilities of the cryo extension line		PC, AB, SC
34.3 Feedback on cold bellows and bellows for vacuum barrier proposed by FlexEJ	7-11-19	YL
34.4 Design adjustment to accommodate the vacuum barrier membrane		RB?
34.5 Add more explanation to vacuum barrier calculation and consider all pressure conditions		WB,YY
34.6 Provide list of changes to the 3D model together with the step file		RB, JD, DO
34.7 Share global models between CERN and SOTON	<b>DONE?</b>	YY,WB,YL
34.9 Definition of the cryo interface in the DFX proximity		CERN



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### **PENDING ACTIONS**

33.1 Share simulation of global stresses of the system	<b>DONE?</b>	WB
33.4 Feedback on number of spare ports required and possible location	<b>DONE?</b>	PC YL,RB,JD
31.2 Proposal of a list of calculations to be performed to validate the design	On-going	WB, JP, YY
31.5 Define the limits of supply of the IFS by CERN (equipment and activities)	22-11-19	CERN
31.6 Ask confirmation to MSC-SCD that the reserved volume for NbTi-NbTi splices is sufficient – check the technical report by YL & JF	On-going	PC, AB
31.7.1 Decision on the circulation list for the functional specification		PC,AB
31.9 Design parts to allow pressure testing with elastomer seals	On-going	JD, DO, RB
31.10 Discuss with LTI Metaltec to get their feedback on CERN intervention for instrumentation installation	On-going	WB
30.4 List of UK companies for 3D forged flanges	<b>DONE?</b>	PC

#### **Documents:**

**Prepared by:** Iole Falorio

**Date:** 2019-11-14

**Distribution List:** All attendees