High Luminosity LHC

Progress in cryostat design SC Link at LHC P7

Wendell Bailey, Carlo Beduz, Yifeng Yang
University of Southampton
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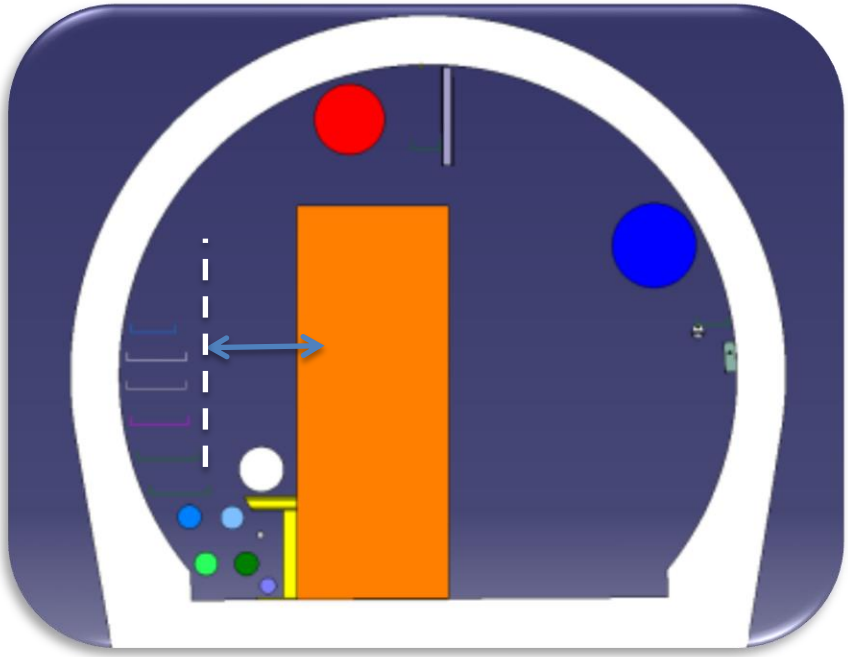
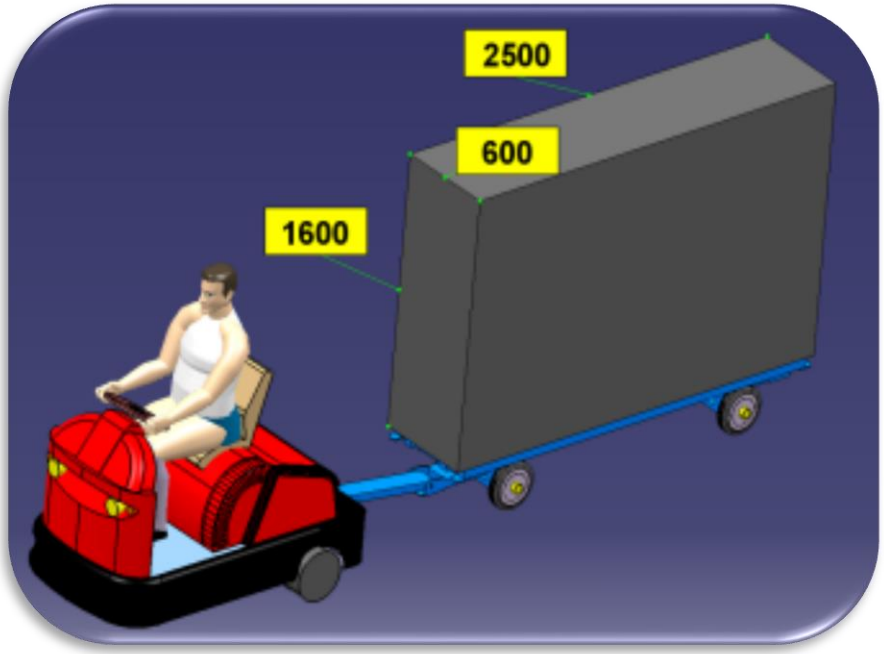
Constraints at LHC P7/TZ76



TZ76 – Gallery constraints

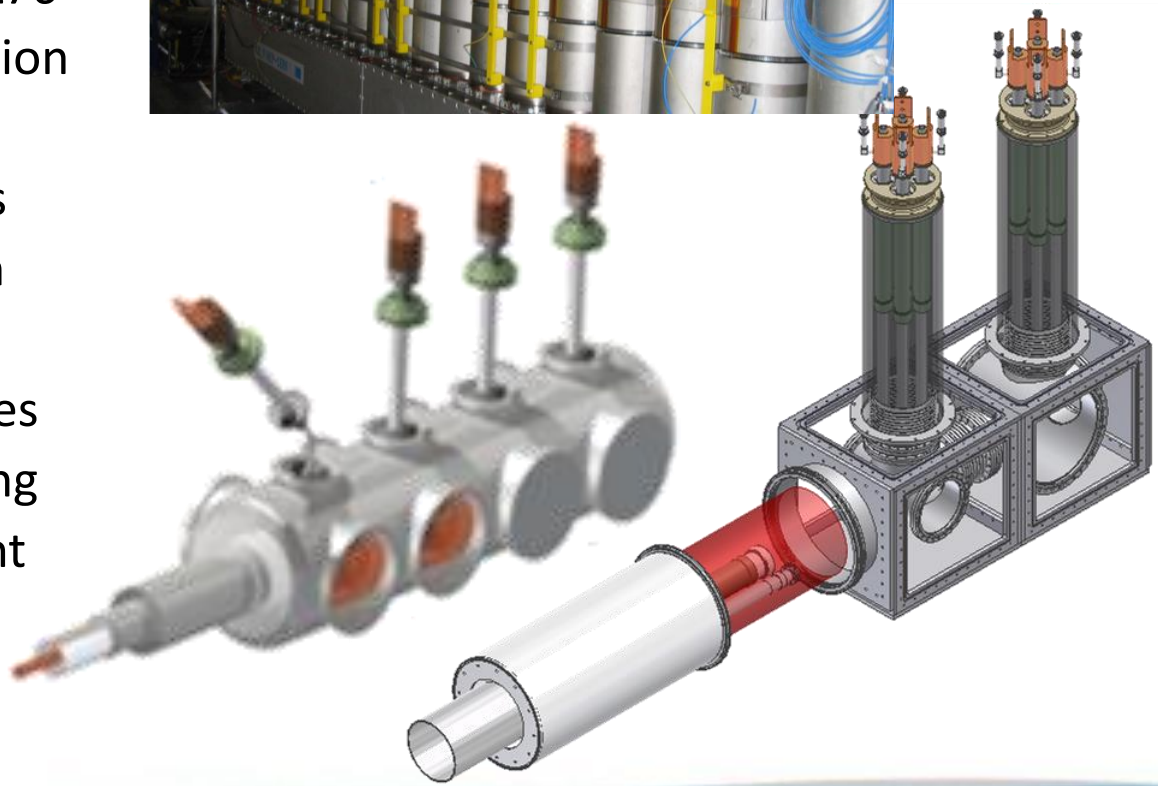


Transportation constraints for moving the assembly into the TZ76 gallery

Problems for a Single DFH with Multiple Chimneys of Current Leads

The chimney assembly of LHC DFC becomes difficult for DHF of SC link:

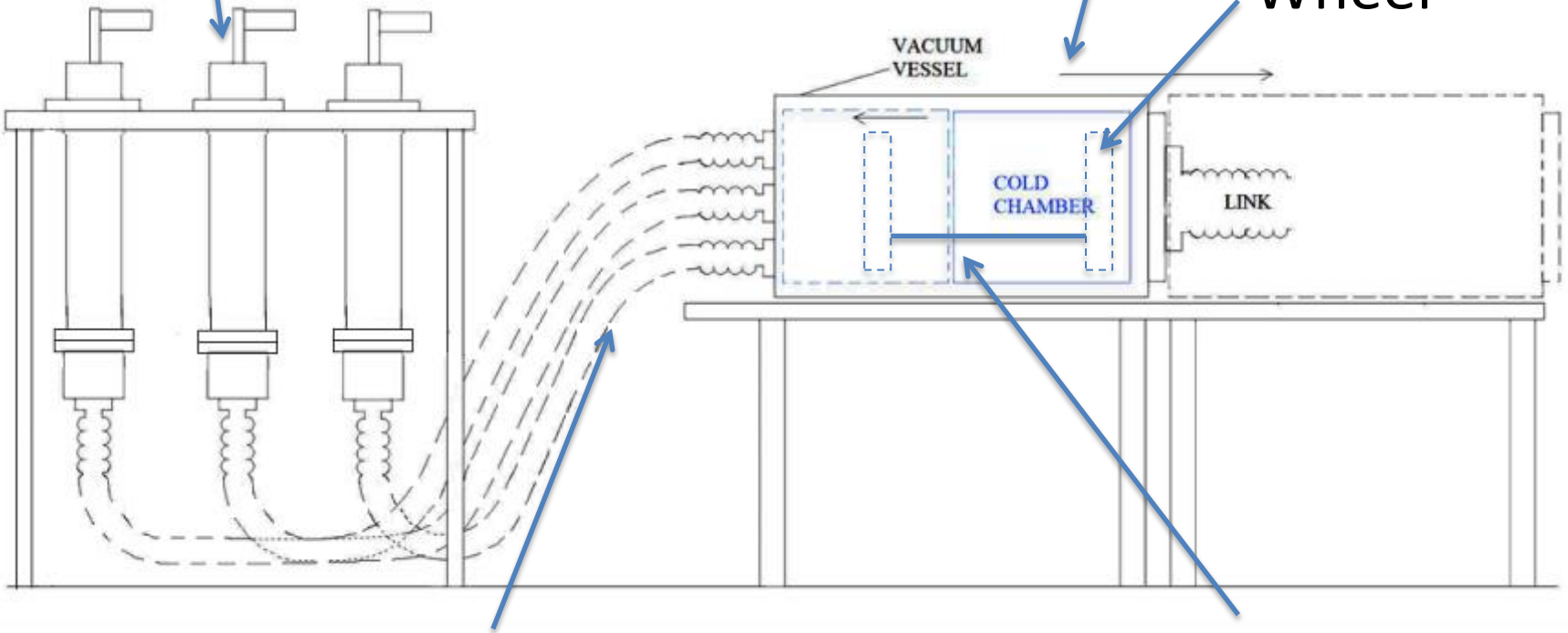
1. Constraints of transport to TZ76 require the in-tunnel integration of current leads.
2. Installation of current leads is tricky due to limited height in TZ76.
3. Splice of SC link in situ requires substantial side access, leading to oversized cryostat, too tight for the TZ75 width.



A New DFH Design with Flexibly Connected Current Leads (1/3)

1. Individual current leads

3. Link termination



2. Flexible transfer line

4. Connection between current lead and the wheel

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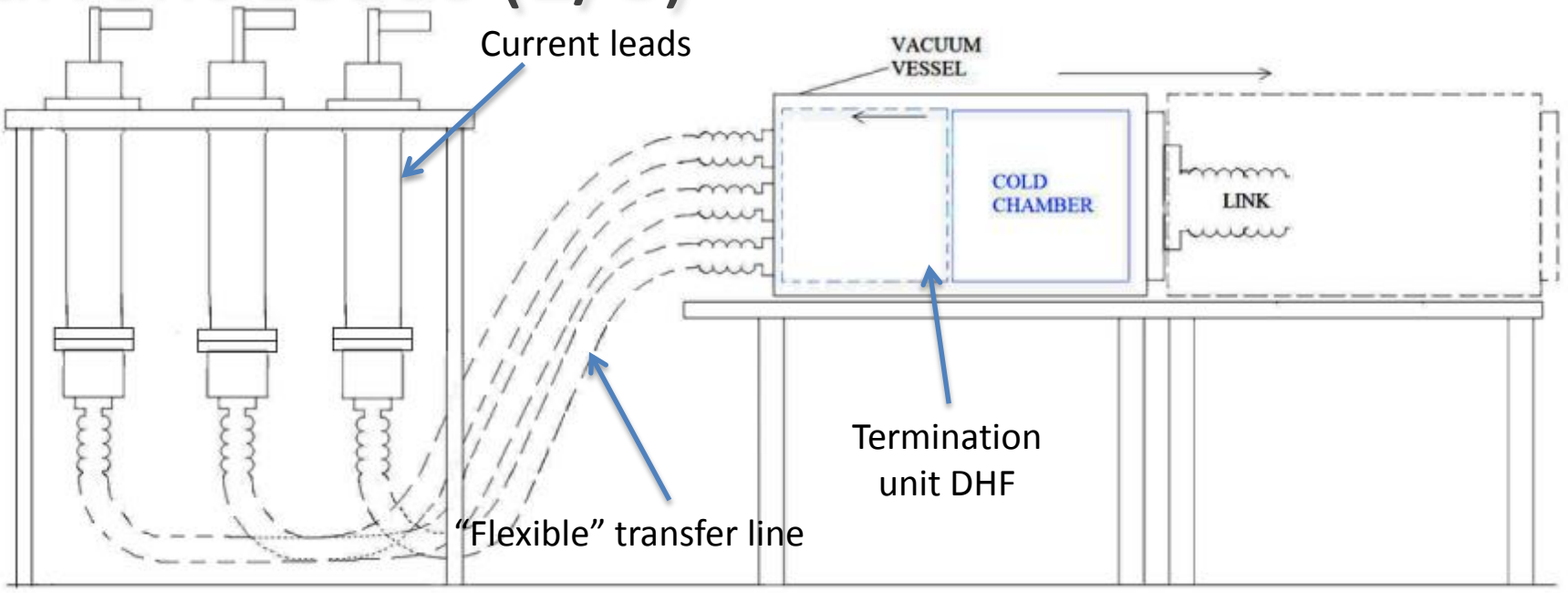
A New DFH Design with Flexibly Connected Current Leads (2/3)

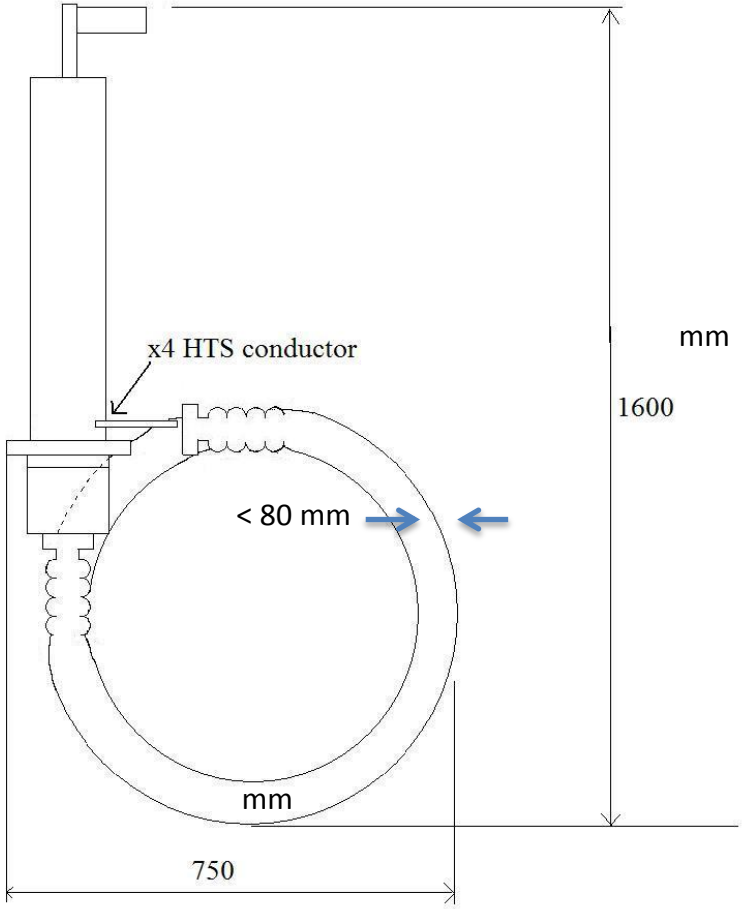


A. The *cylindrical* termination unit DHF consists of a retractable warm *vacuum* envelope and also a retractable *cold* envelope to provide *full access* to the 48 link terminations.

B. The dimensions of DHF satisfy the TZ76 constraints of 0.6 m in width and 1.5 m in length.

C. The connection between the 12 current leads and the termination unit is made with a flexible transfer line, each containing 4 circuits.

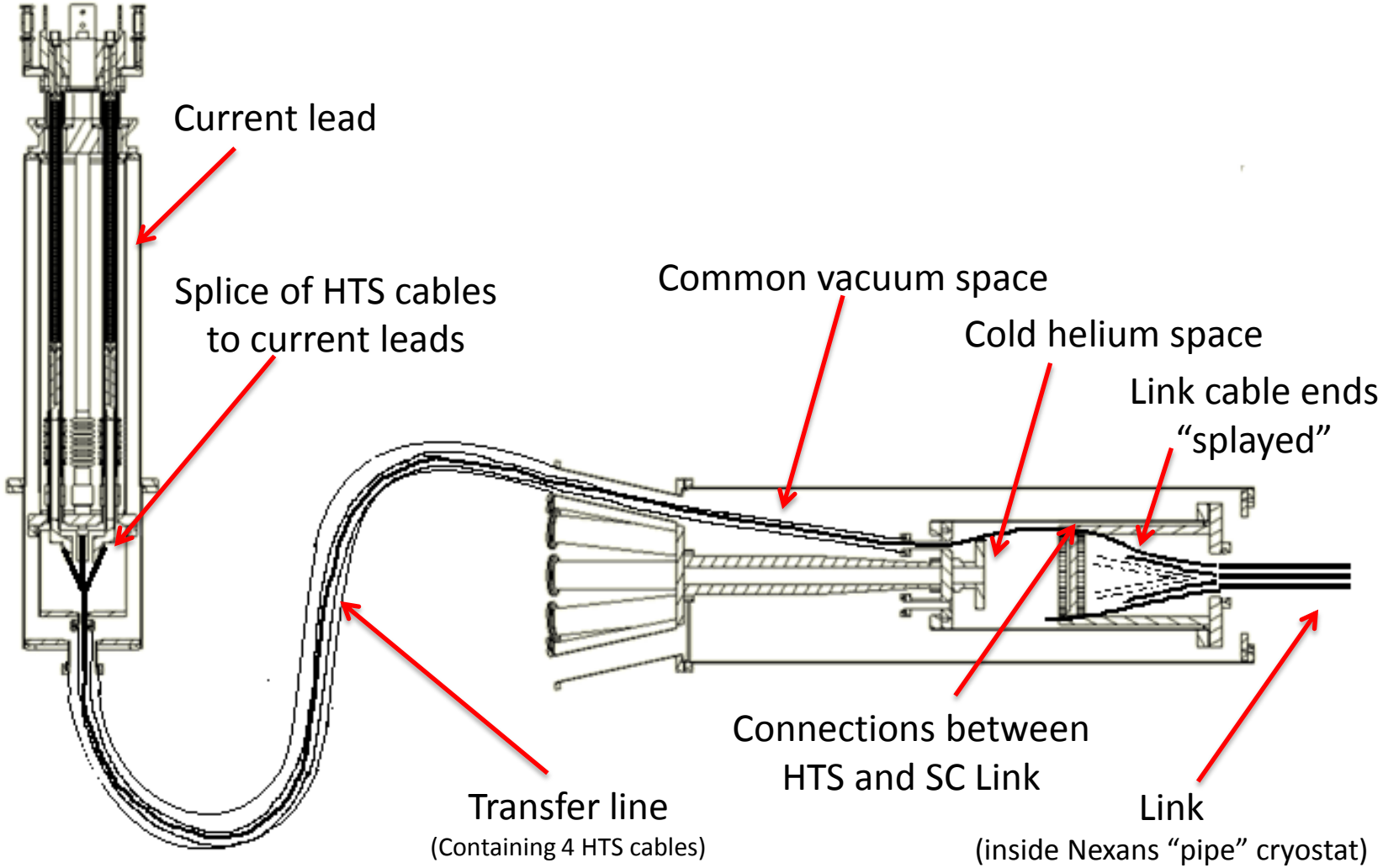
A New DFH Design with Flexibly Connected Current Leads (3/3)



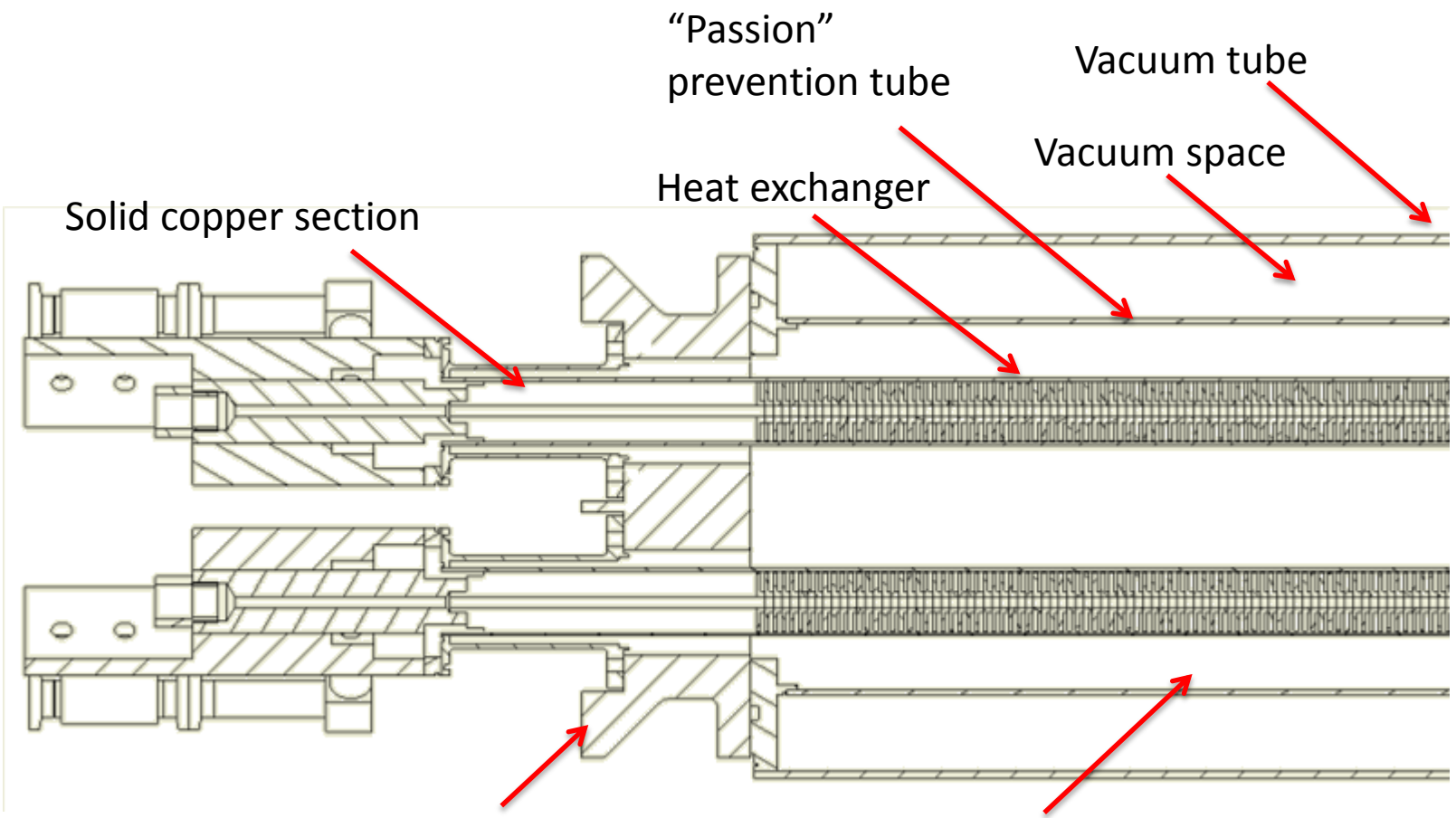
D. The connection between the HTS conductors and the flexible transfer line to the current lead can be performed outside the gallery. The only constraint for transportation of the current lead is the total height which must be less than 1.6 m.

<u>Sub-assembly</u> (current lead + transfer line containing SC cables)

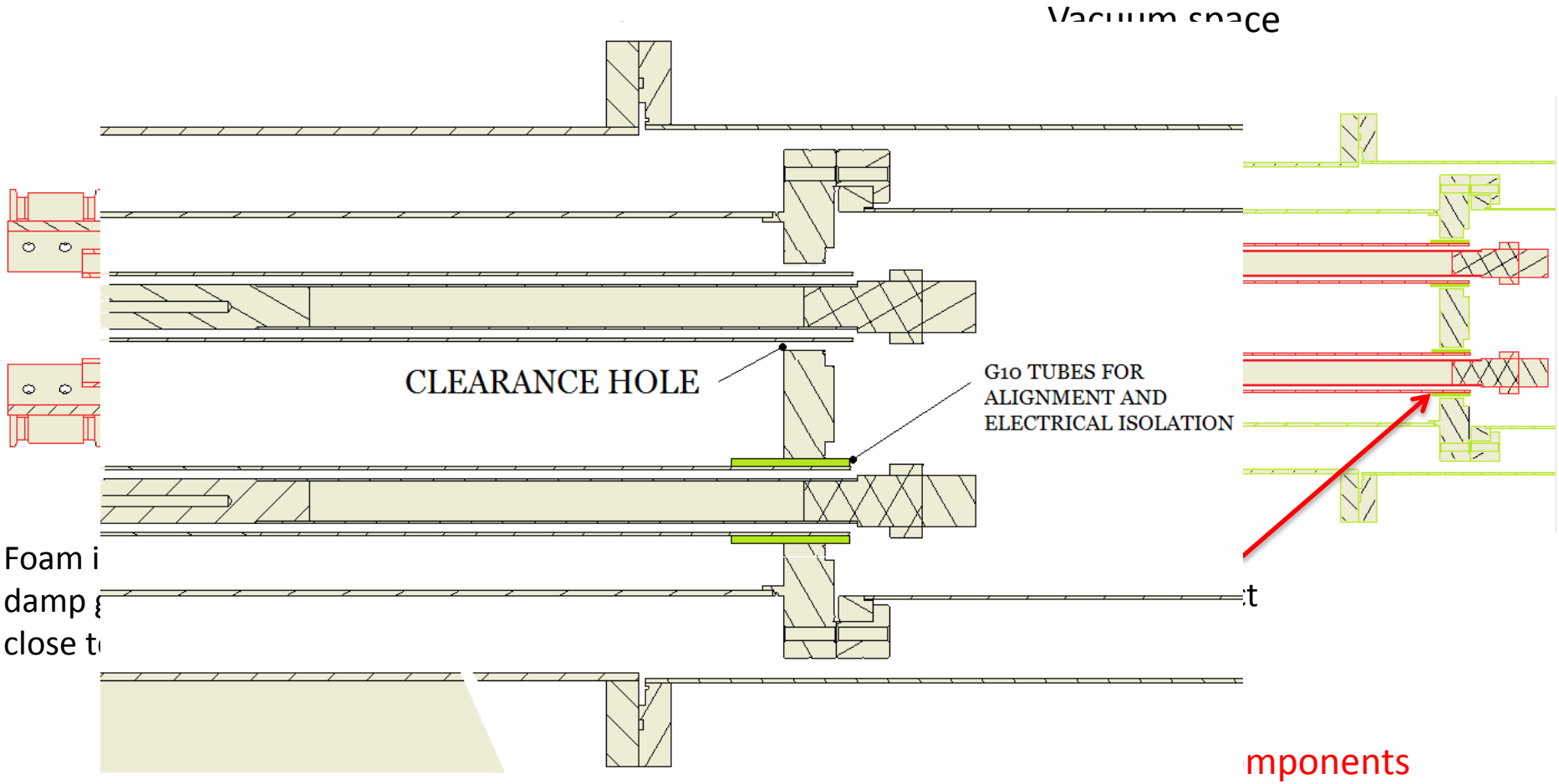
A New DFH Design with Flexibly Connected Current Leads: 2D Overview



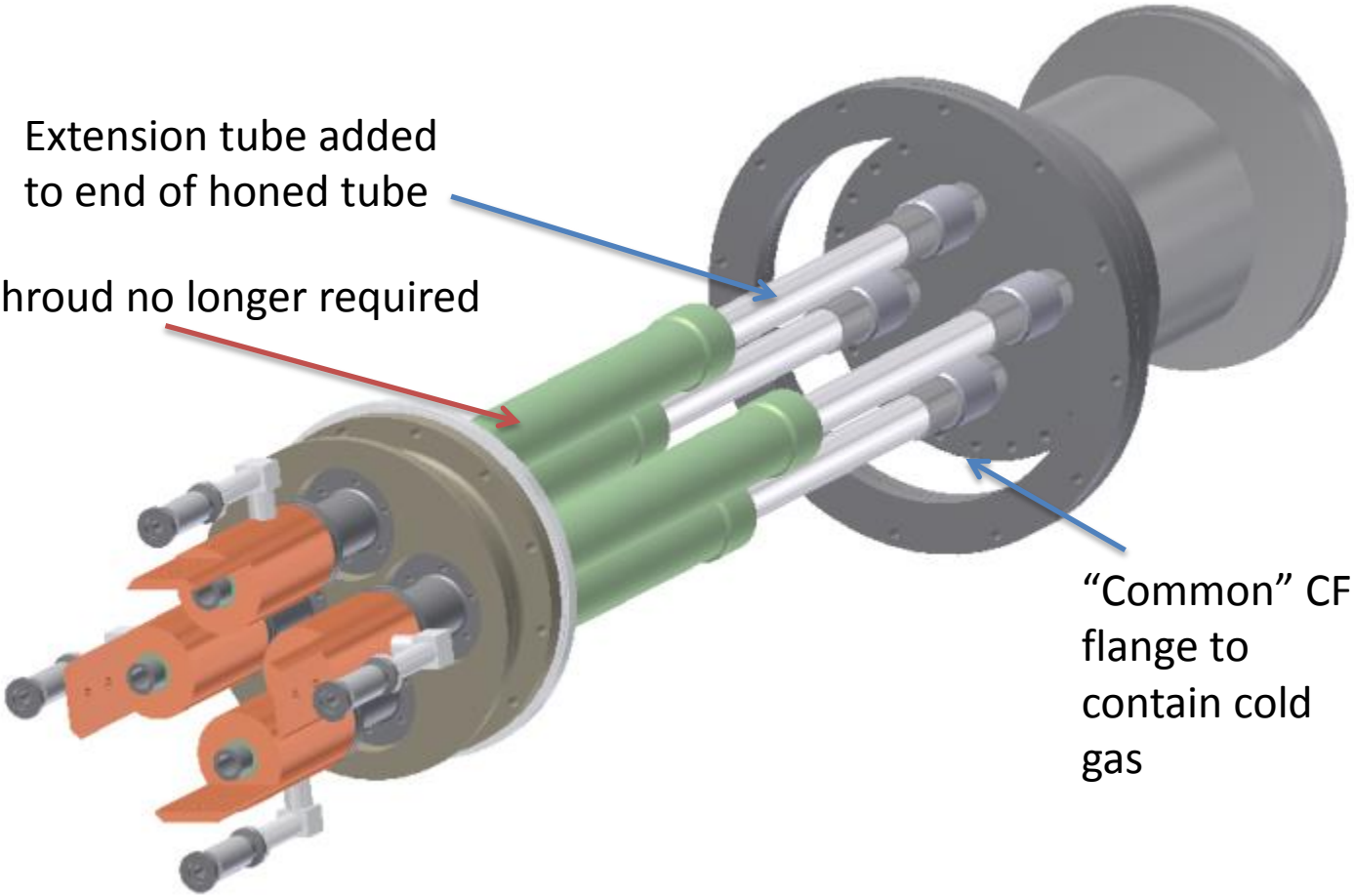
A New DFH Design with Flexibly Connected Current Leads: Same CL Warm End



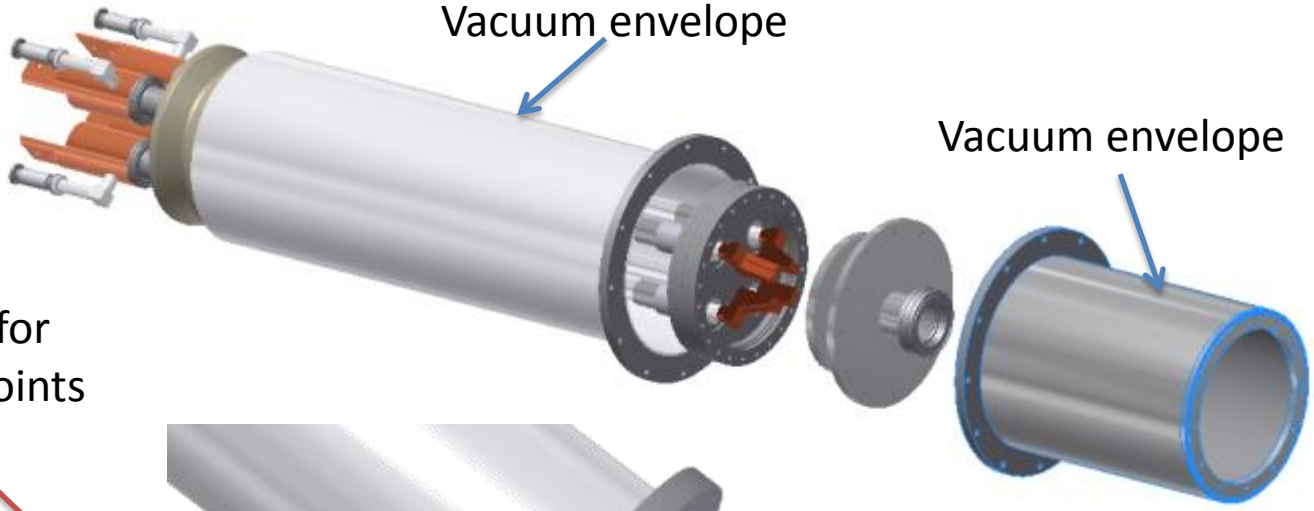
A New DFH Design with Flexibly Connected Current Leads: No Paschen in Vacuum



Components and assembly: 3D Overview



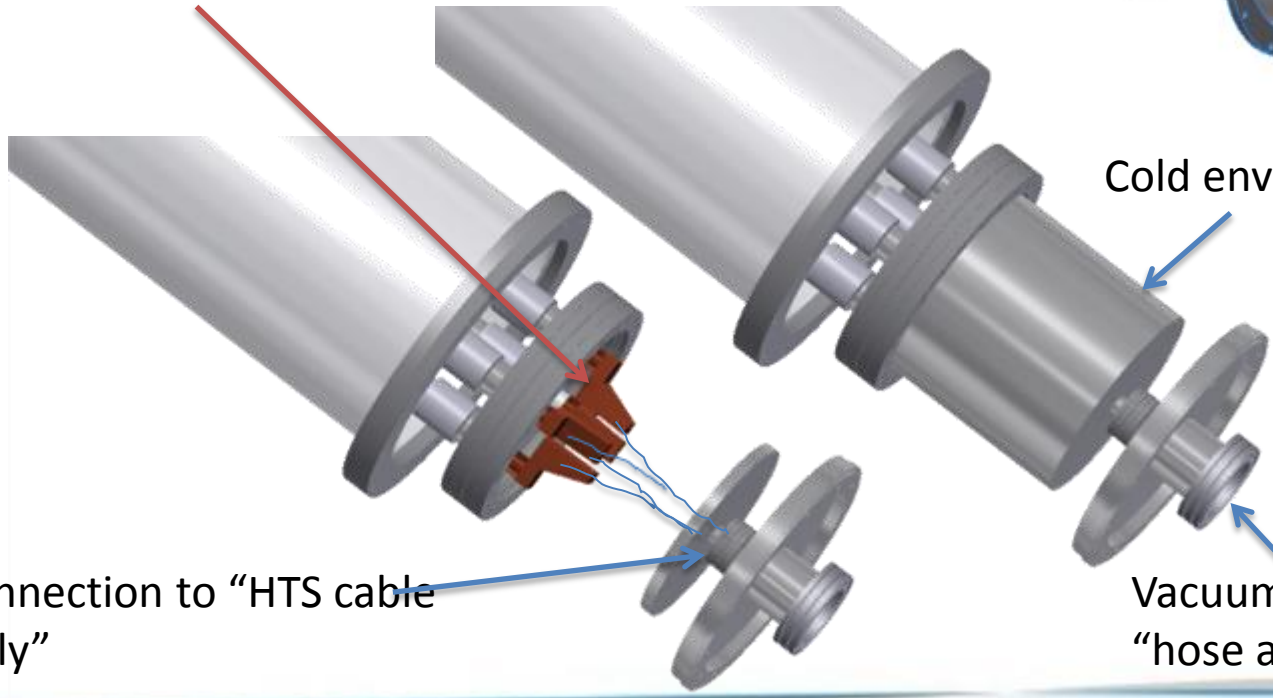
Components and assembly: 3D Overview



Vacuum envelope

Vacuum envelope

Copper blocks for solder BSSCO joints



Cold envelope

Cold connection to “HTS cable assembly”

Vacuum connection to “hose assembly”

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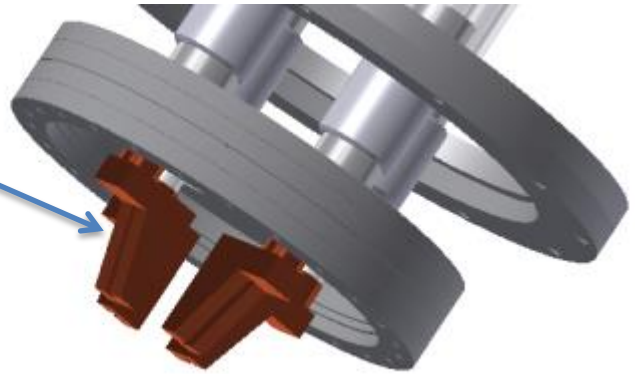
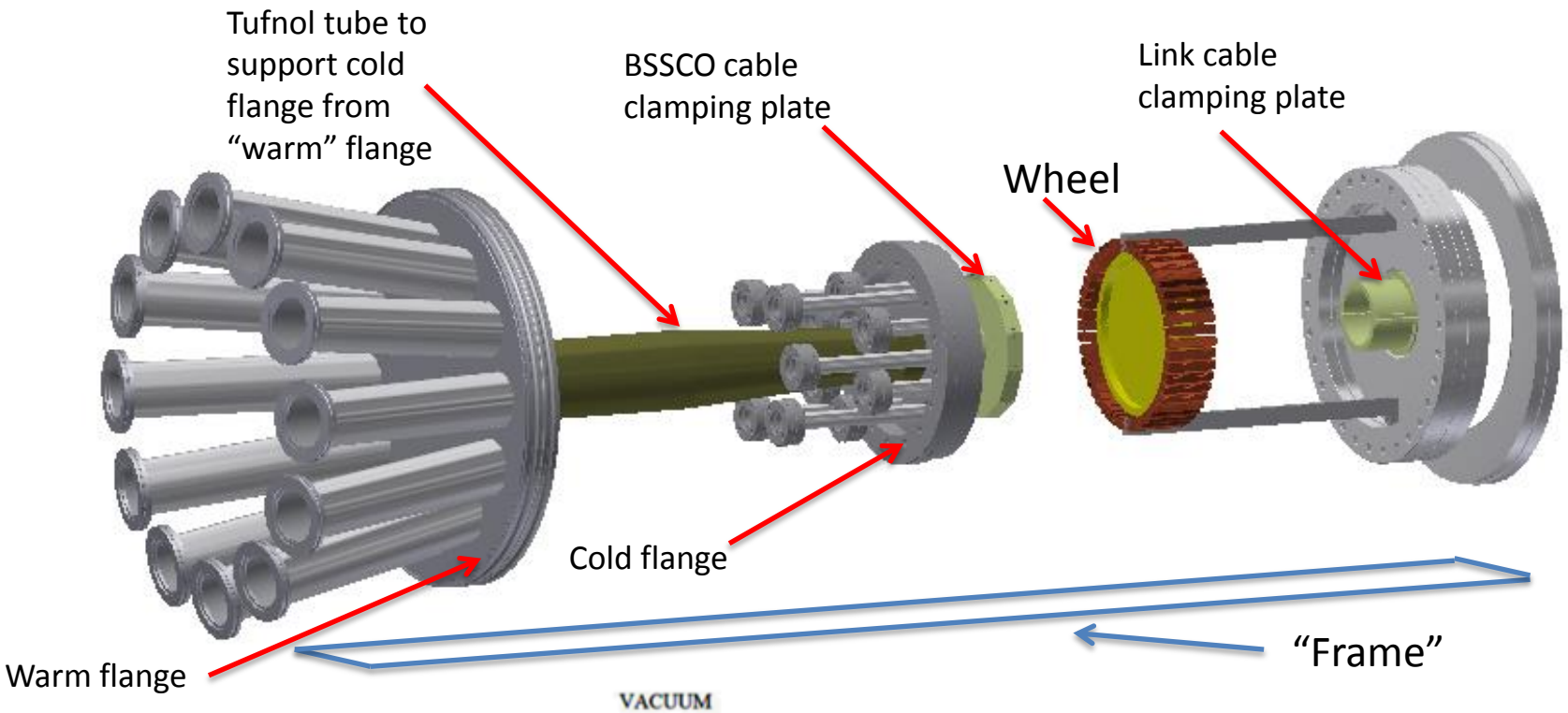
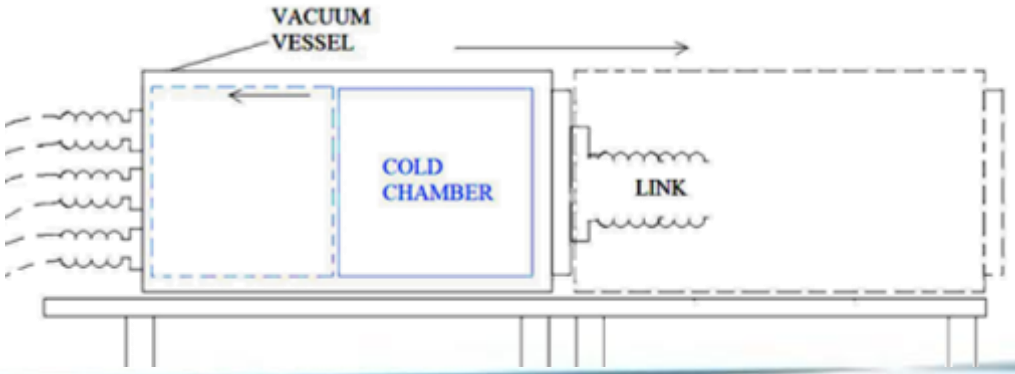
Components and assembly: 3D Overview

Modified copper terminations to accept the ends of the BSSCO cables



DFH Components: 3D Overview





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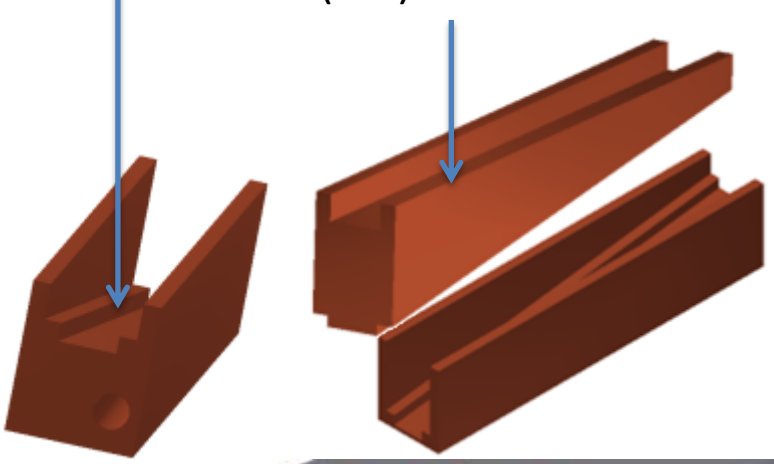
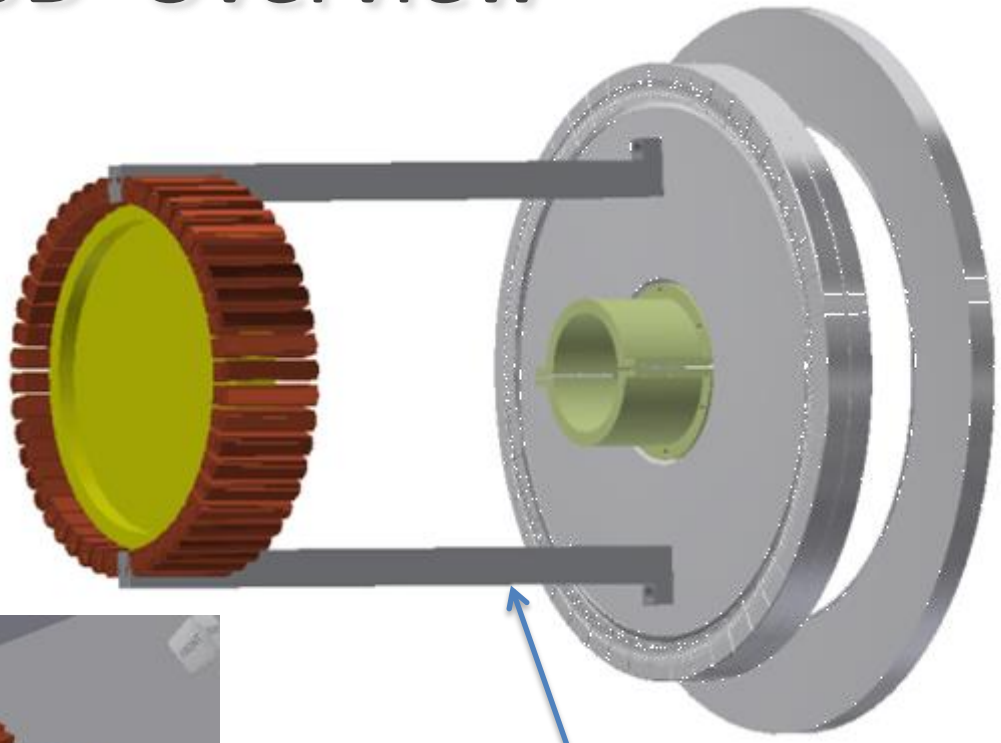
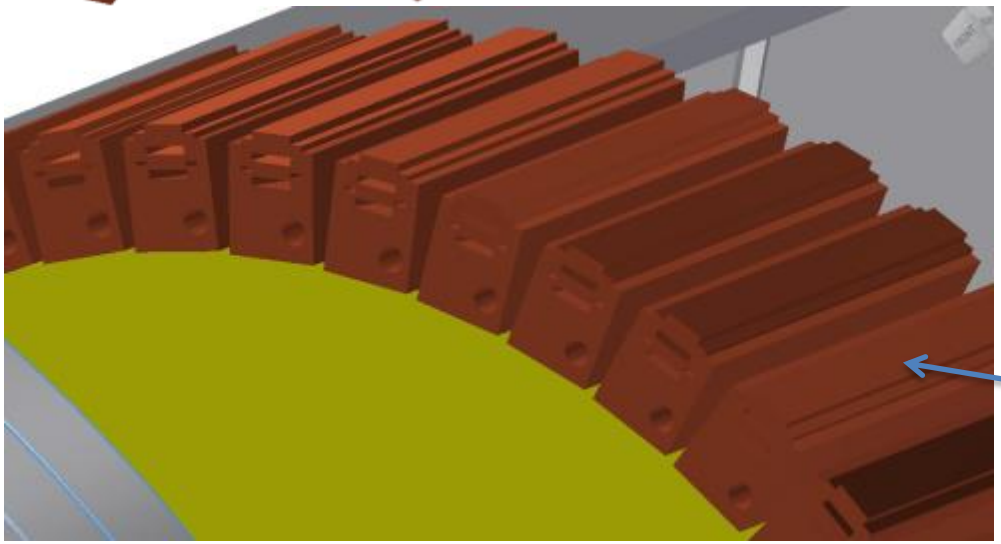
Splicing “Wheel”: 3D Overview

Track 1 (angled) = link cable
Track 2 (flat) = BSCCO cables





Support for the “wheel” to cold flange



48 copper blocks mounted to the “wheel” for the terminations

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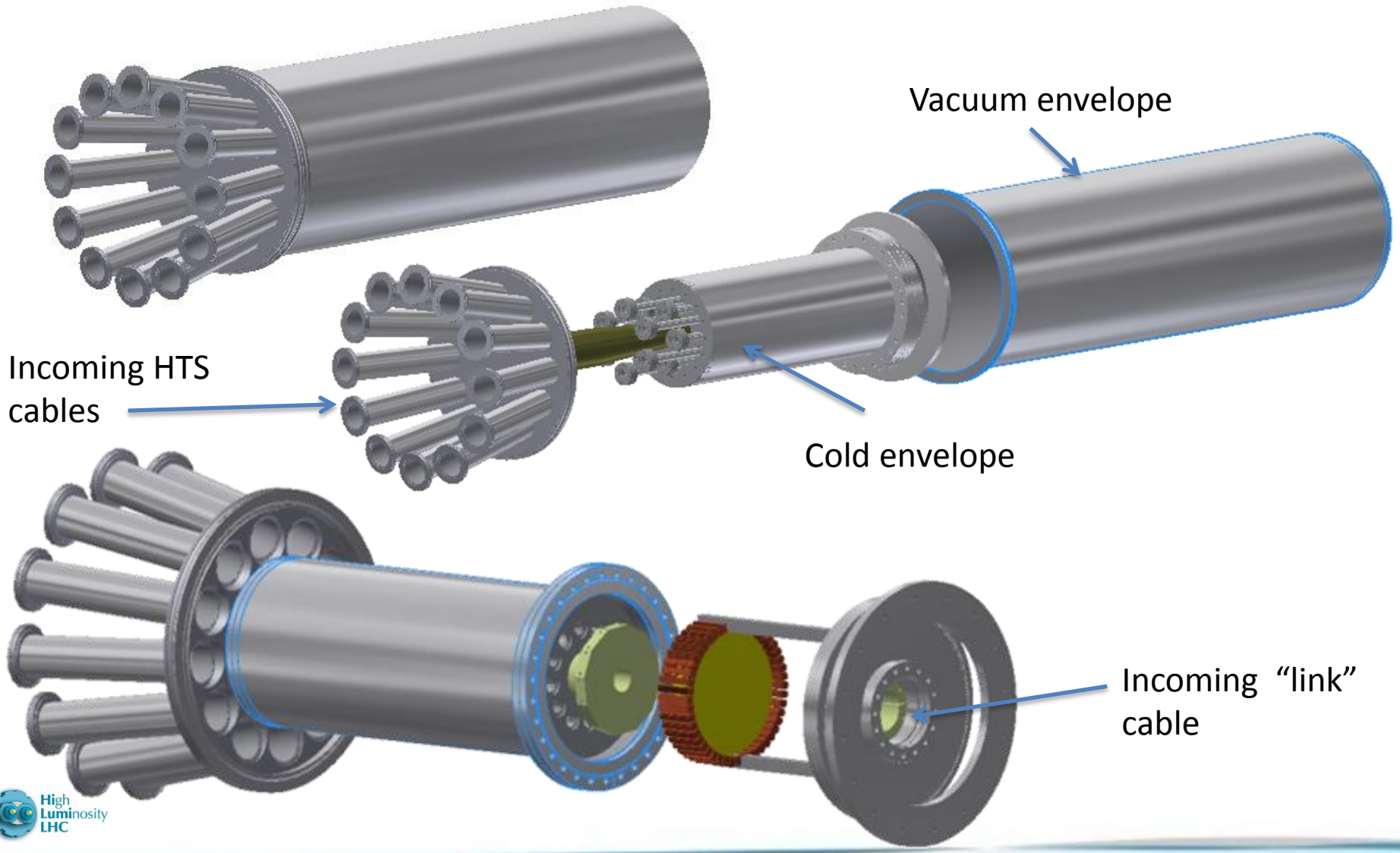
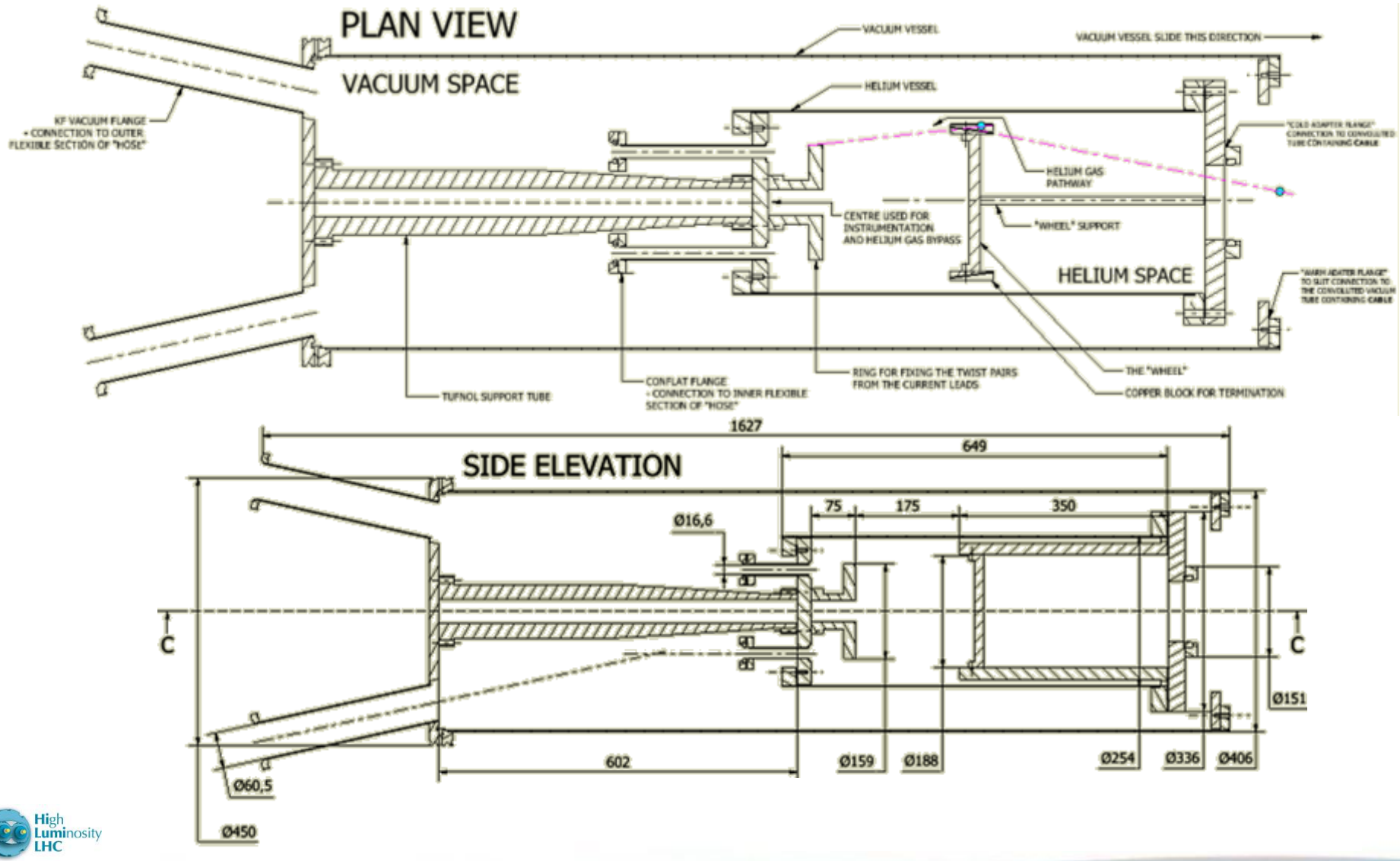
DFH Assembly: 3D Overview



DFB cryostat CONCEPT 3

Termination Box – Vacuum and cold envelopes – Current 2D drawings



What's Next

Collaboration Agreement between CERN and University of Southampton

- Convert the concept into full design (SOTON and CERN)
- Optimise and construct the wheel (SOTON)
- Optimise/Test HTS cables for installation/handling in the "transfer line" cryostat (SOTON)
- Implement temperature control schemes (SOTON)
- Construct DHF and "new" current leads (CERN)
- Test of **Cold Powering System** (new DFH with a set of current leads and 20 m long SC Link) (CERN, SOTON)

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