Dealing with thermal contractions within the WP6a system

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Design strategy (1/4)

- The **SC Link** (MgB_2 cable inside cryostat) takes care of its thermal contraction/expansion **by itself**.

  The cryostat is flexible by design (two concentric corrugated pipes). The contraction of the cable inside the cryostat is dealt via a **continuous snaking of the SC link along the path**. This configuration is being tested with Demo 1 (and it will be further validated with Demo 2) and preliminary results analysis confirms the expected performance. Cryogenic measurements of last week – in the SM-18 - proves that the static heat load of the cryostat (1.5 W/m) is not affected by the selected geometry.

  The snaking is “modest” – supports every 4 m, offset of 20 cm.

Design strategy (2/4)

- Two **fixed points** are defined in the system:
  - **Splices between MgB_2 and HTS** in DFH;

  The shape of the HTS cable and the that of the SC link - before entering the DFH act as compensators for thermal contraction.

  - **Splices between Nb-Ti and Nb-Ti** inside the DFX. Flexibility on both sides of the splices has to be assured by the Nb-Ti cables (routing, geometry and type of cables).

- The **splices between MgB_2 and Nb-Ti** are inside the SC link termination – and supported against it. The thermal contraction of the MgB_2 cable is taken care in the loop at the top of the shaft for the DFX-Triplets. For the Matching Section, the geometry of the the SC Link has to be defined in agreement with integration requirements – but the principle is the same.

Design strategy (3/4)

- The geometry of the **SC link entering the DFH** will assure the compensation of the thermal contraction inside the box –as well as the compensation for the short length before the DFX. The same applies for the MgB_2 cable connecting the presently two DFH boxes.

- The **geometry of the SC Link** is being finalized – choice of SC link cryostats and Demo 1 results were essential for moving ahead. We have now input to be shared with the integration study – and to be used for the DHH design.

Design strategy (4/4)

- The concept of the DFH exists since the time when the MgB_2 Cold Powering System was proposed. It a splice box, proposed as a volume were splices are distributed and cooled by the forced flow of He gas. Instrumentation also is defined. Splice geometry/size and MgB_2 cable geometry/installation drive the DFH design. This information is now available and being elaborated.

- The proposal of having two DFH boxes for the Triplets is driven by an optimization of the splices location/cooling and current leads routing.

  DFH1: four exits (the four 18 kA leads), i.e. four flexible pipes.

  DFH2: four exits (three each with four 2 kA leads and one with the three 7 kA leads). The HTS of each of the four exists is in one single flexible pipe. Also the DFH2 has in total four flexible pipes.