DFH electrical splices

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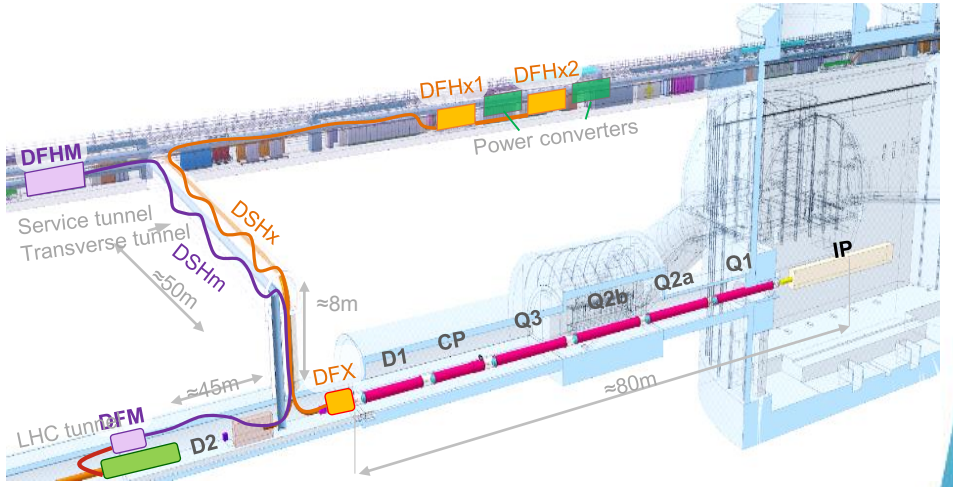
Electrical splices

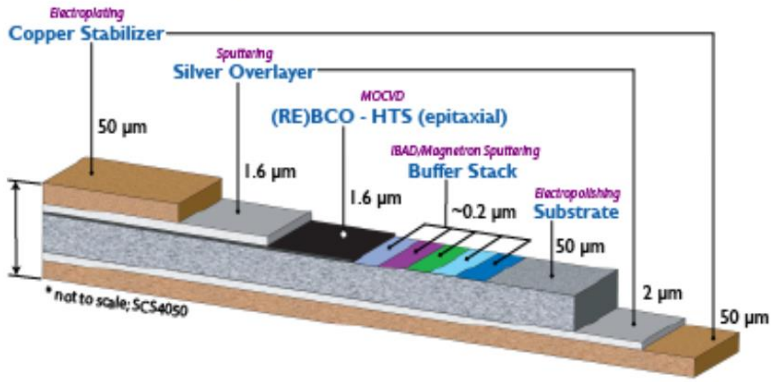
- The Sc-Link is made from MgB_2 cable spliced:
  - to NbTi bus bars at cold terminal (4 K)
  - to HTS (REBCO) cables of the leads at warm terminal (~20 K)
- The different splices of the Sc-Link must satisfy:
  - Mechanical robustness
  - Low electrical resistance
  - Reproducible low contact resistance
  - Sufficient heat transfer to fluid to avoid over heat
  - Continuity of copper stabilization
  - No degradation of the Ic of the Sc material



- The MgB_2/REBCO splices will be located in the DFHx and DFHm boxes

REBCO material

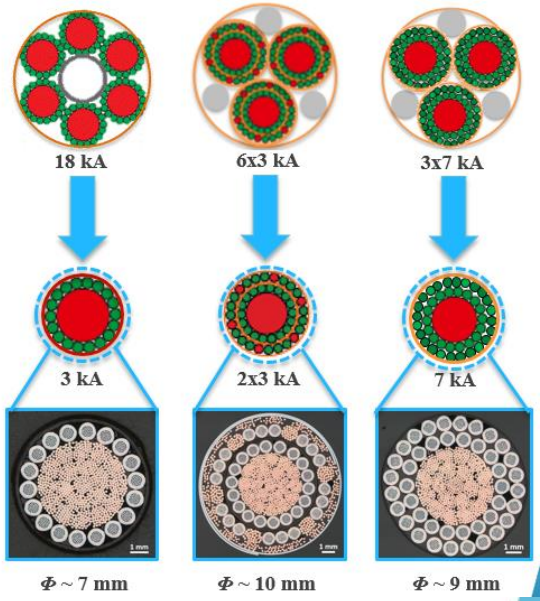
- REBCO material is an high Tc conductor in the shape of tape 4 mm x 0.1 mm thick.
- The HTS cable of the leads will consists of a bundle (plus additional copper stabilizer) of REBCO tapes
- The HTS cable will operate in the range 20-50 K
- Cable geometry is under finalization
- Tape is asymmetric: contact resistance is much lower when current is injected from the HTS side.



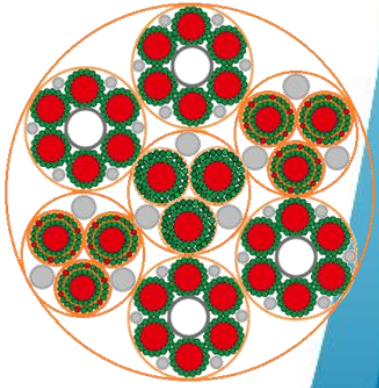
Splice resistance

- REBCO splice resistance in the direct facing is dominated by the internal resistance (oxide layer between Ag and HTS).
- At 20 K one can expect 20 nOhm.cm^2 per tape.
- The major contribution of the MgB_2 splice resistance is from the Monel.
- In order to achieve low splice resistance with sufficient heat transfer to the GHe, the DFH splice needs to be about 300 mm long. The length could be slightly increased (75 mm) based on the properties of the REBCO tape received for the proto.
- The splice will be performed by **soldering** (Sn-Pb or Sn-In)

Splice dimensions



- In this slide the first estimate of the splice dimensions for the different circuits of DSHx are given:
  - **18 kA (per splice): 70 x 60 x 300 mm**
  - **2 kA coaxial cable 20 x 30 x 650 mm**
  - **7 kA (per splice) 20 x 45 x 300 mm**
- The splice will be performed in situ:
  - Space around the splice must be available for the splicing process (mold, heaters, handling)



- The volume dedicated to the splice should include a provisional length of MgB_2 cable (equivalent to splice length) in case it is damaged due to incident (e.g. heavy part falling down on the MgB_2 during the splicing process…)