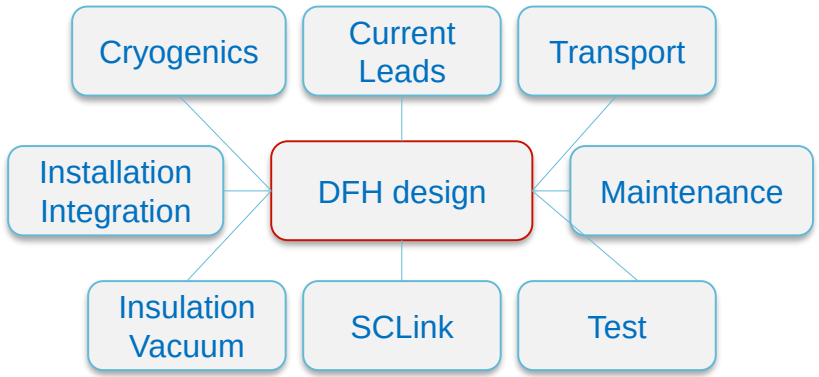
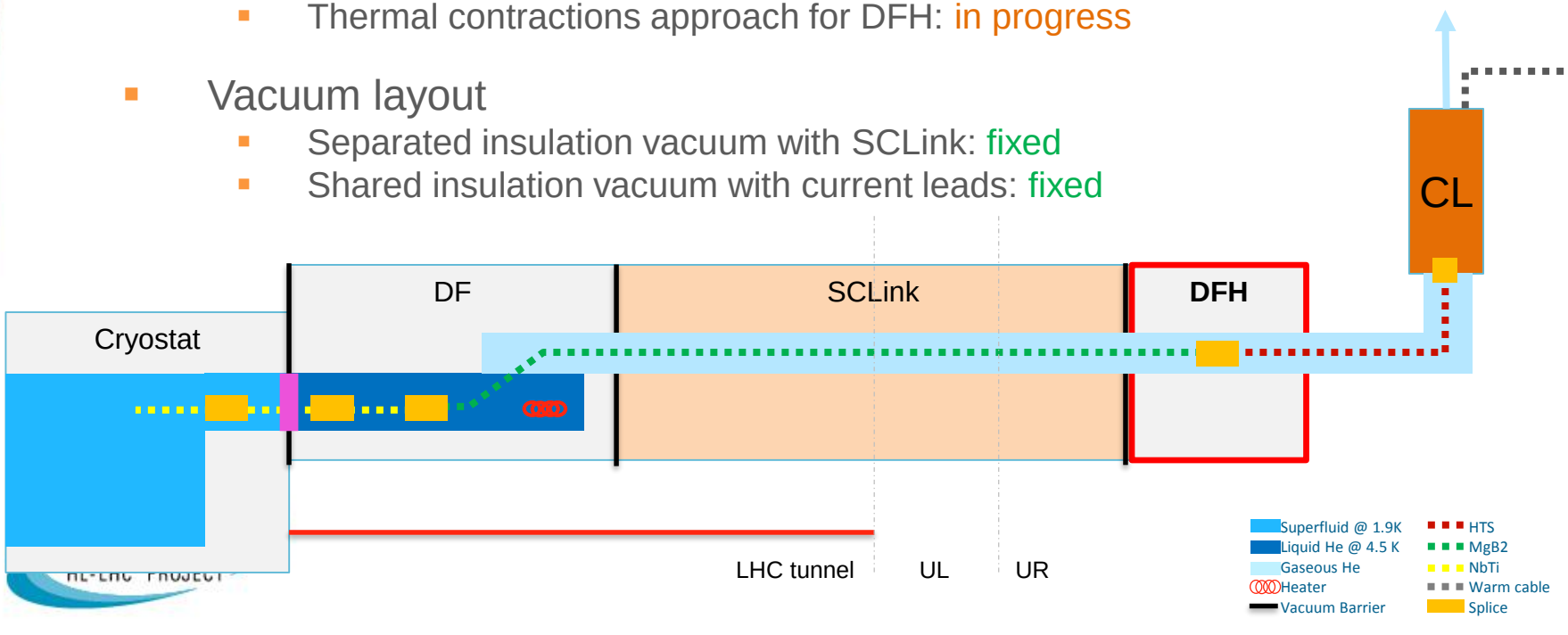
Conceptual Specifications for DFHx and DFHm boxes

Conceptual specifications (influencing DFH)

- Integration: & installation
  - DFHx/m located in the UR on either side of UL: fixed
- Electrical layout :
  - Number of leads : fixed
  - Leads material layout : fixed
  - Splice location (DFH): fixed
- Cryogenic layout
  - Common helium volume with SCLink & Current leads: fixed
  - Generated mass flow to control MgB2-HTS splice and CL temperatures: fixed
  - Thermal contractions approach for DFH: in progress
- Vacuum layout
  - Separated insulation vacuum with SCLink: fixed
  - Shared insulation vacuum with current leads: fixed

DFHx interfaces





	Triplet		Matching section	
Magnet	D1		D2	
DF	DFX		DFM	
SCLink	DSHx		DSHm	
DFH	DFHx		DFHm	
CL	2 x 18 kA 2 x 13 kA 3 x 7 kA 12 x 2 kA	Type 18 kA Type 18 kA Type 2 kA Type 2 kA	2 x 13 kA 8 x 0.6 kA	Type 18 kA Type 0.6 kA

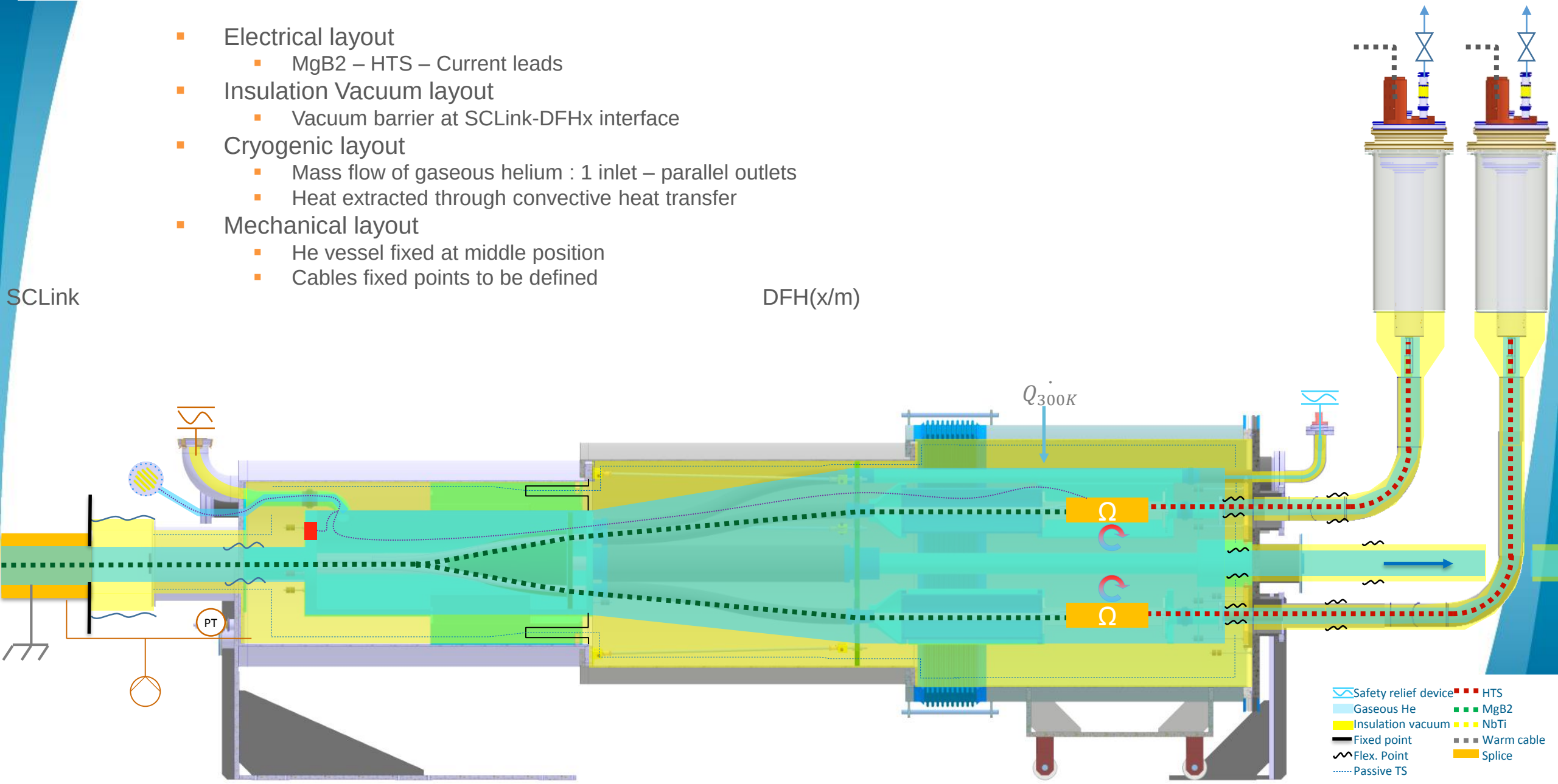
DFH (x/m) Concepts

Current leads

- Electrical layout
  - MgB2 – HTS – Current leads
- Insulation Vacuum layout
  - Vacuum barrier at SCLink-DFHx interface
- Cryogenic layout
  - Mass flow of gaseous helium : 1 inlet – parallel outlets
  - Heat extracted through convective heat transfer
- Mechanical layout
  - He vessel fixed at middle position
  - Cables fixed points to be defined

SCLink

DFH(x/m)



DFH functional specifications

	DFHx	DFHm
Electrical		
▪ *Ensure continuity between MgB2 and HTS leads*	*19 leads*	*10 leads*
▪ *Ensure integrity of cables (transport, installation, thermal cycles)*	*Rmin=1.25m / Fmax=800N*	*Rmin=1.25m / Fmax=400N*
▪ *Provide volume, access and protection for splices MgB2-HTS*	*TBC*	*TBC*
▪ *Ensure instrumentation acquisition (V-taps)*	*TBC*	*TBC*
Cryogenic		
▪ *Ensure max splices temperature*	*< 20 K*	*< 20 K*
▪ *Ensure GHE supply to current leads lines :*	*up to 1 g/s : DFHx: 5 g/s*	*up to 1g/s : DFHm: 2 g/s*
▪ *Adapt to cryogenic layout*	*One line / No active TS*	*One line / No active TS*
▪ *Ensure instrumentation acquisition*	*TBC*	*TBC*
▪ *Ensure no condensation on external surfaces*	*TBDesigned*	*TBDesigned*
▪ *Integrate thermal contractions layout scenario*	*TBD*	*TBD*
▪ *Ensure circuits leak tightness*	*1.10^{-9} mbar.l.s^{-1} tbc*	*1.10^{-9} mbar.l.s^{-1} tbc*
Insulation vacuum		
▪ *Independent insulation vacuum with SCLink*	*see Indico733790*	*see Indico733790*
▪ *Share insulation vacuum with Current leads*	*1.10^{-5}mbar*	*1.10^{-5}mbar*
▪ *Present pumping and instrumentation interfaces*	*//*	*//*
Integration		
▪ *Compatible with UR environment and services*	*30 m^2*	*TBC*
▪ *Interface with SCLink (cryostat & cables), current leads (mechanical & HTS):*	*Dimensions TBC*	*Dimensions TBC*
Installation		
▪ *Compatible with SCLink transport configuration after testing*	*TBD*	*TBD*
▪ *Interface with SCLink geometry (cryostat & cables distribution and orientation)*	*Pitch: 1m*	*Pitch: 0.8m*
▪ *Compatible with allowed manufacturing processes*	*Welding*	*Welding*
Maintenance		
▪ *Allow required access to MgB2-HTS splices*	*TBD*	*TBD*
▪ *Deal with MgB2 end deterioration*	*1 spare splice length*	*1 spare splice length*
▪ *Allow access for inspections and replacement*	*Safety devices, instrumentation*	*Safety devices, instrumentation*
Safety & rules		
▪ *Design, manufacture and test to Norms*	*PED 2014-68-EU & CERN rules*	*PED 2014-68-EU & CERN rules*
▪ *Design safe scenario for pressure relief devices*	*ISO 21013-3*	*ISO 21013-3*
Cost and logistics		
▪ *Minimise length of MgB2 & HTS cables*	*TBD*	*TBD*
▪ *Homogenise manufactured parts & spares ; DFH boxes & CL cryostats*		