

WP6a: DFH Detailed Design Review

Overview & Production Schedule

Paul Cruikshank on behalf WP6a contributors

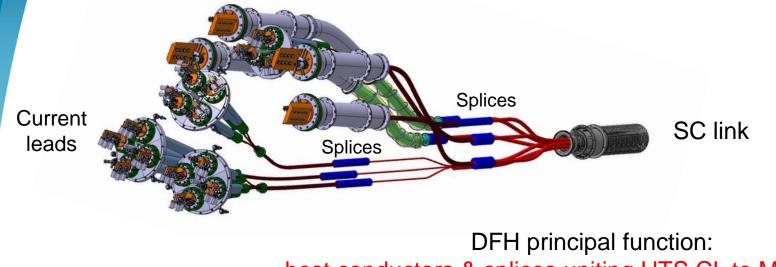
CERN, 16 June 2020

Overview: What happened since CDR ?

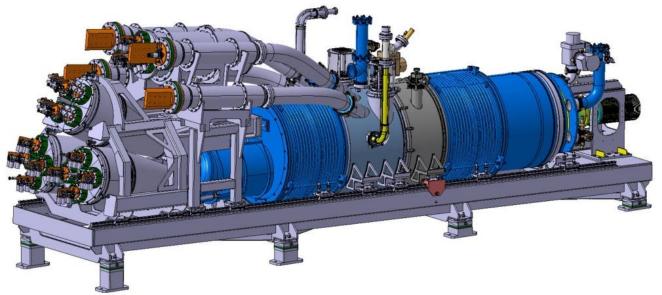
- Evolution (not revolution) of the DFH design
- Emphasis on:
 - Ensuring all concerned technology groups are part of the DFH team
 - Reviewing safety aspects of the DFH (including overall cold powering system).
 - Intensive integration studies
 - 3D and 2D engineering design, including addition of the DFHM version
 - Keeping Uppsala University and their industrial partner aware of the progress.
- All progress details are within upcoming DDR presentations
 - CDR follow-up
 - Integration
 - Functional & tech requirements
 - Cables splices & Integration
 - Mech design
 - Assembly sequence
 - Drawing status
 - Maintenance & repair
 - Safety aspects
 - Acceptance tests & QA



DFH Overview

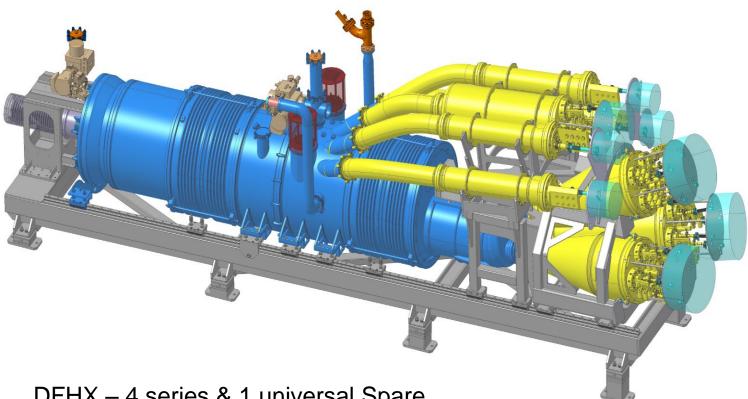


host conductors & splices uniting HTS CL to MgB₂ SC link





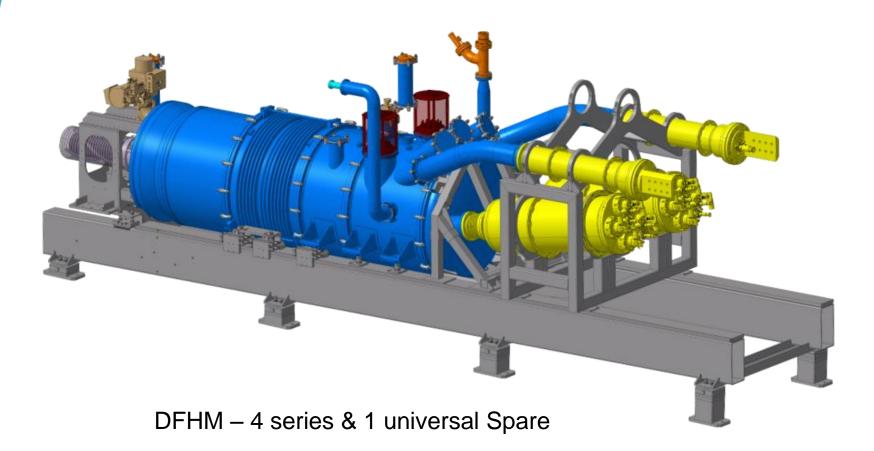
DFHX



DFHX – 4 series & 1 universal Spare

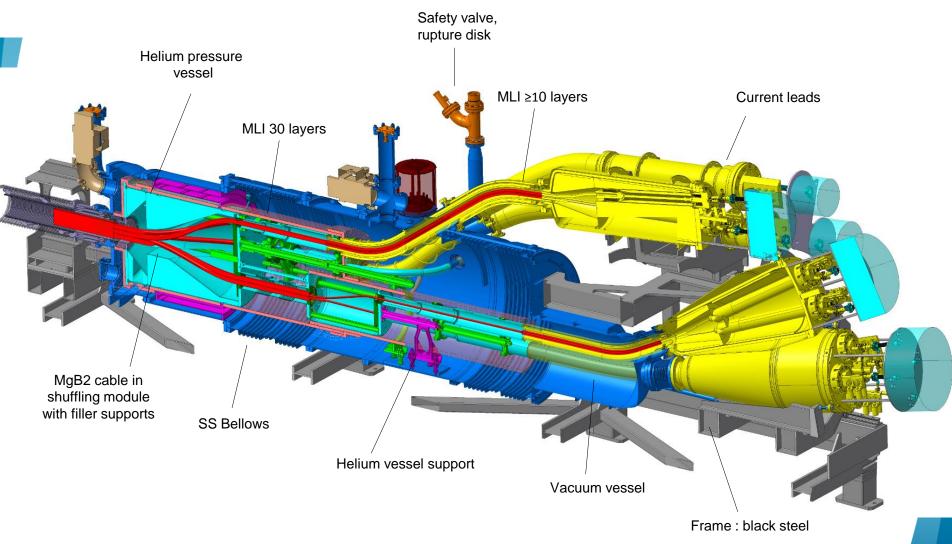








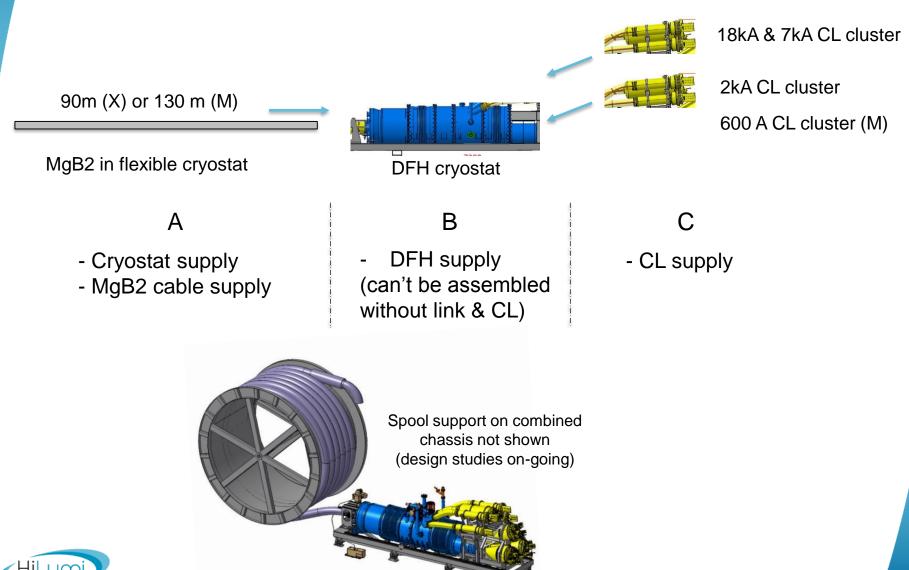
DFHX overview - internals





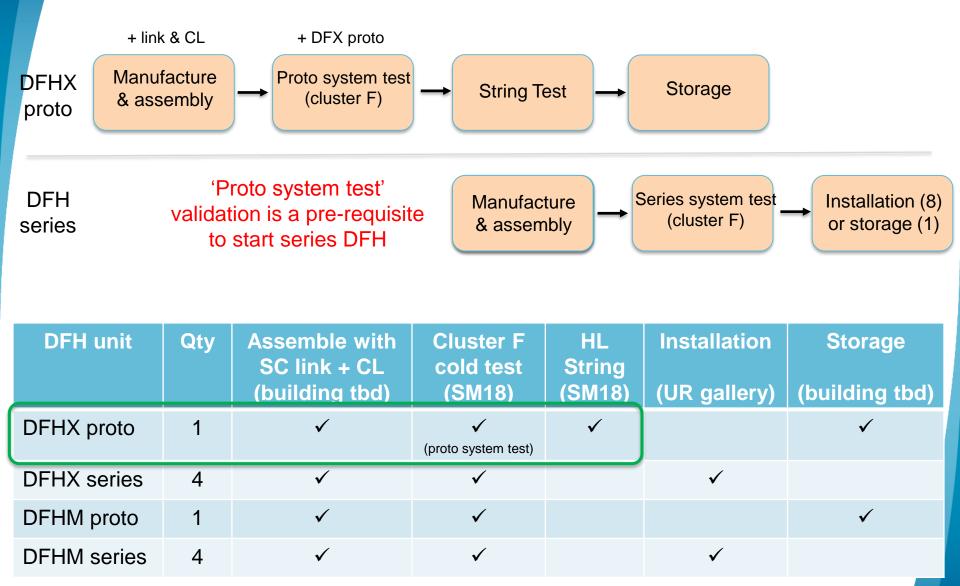
DFH(X) Assembly

(detailed assembly sequence to be presented by R. Betemps)



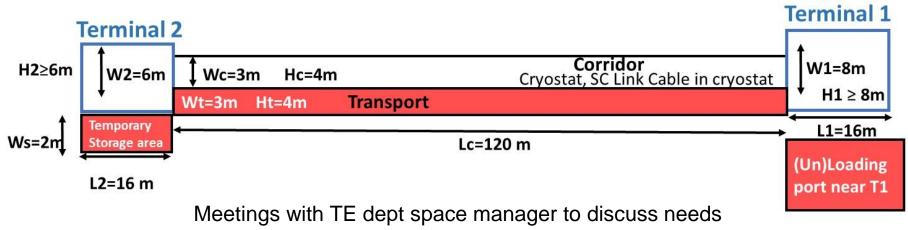


DFHX proto to DFH series



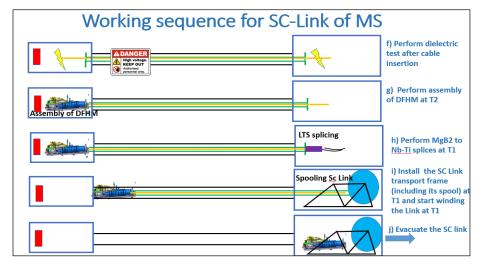


Space for DFH assembly with link & CL



- a functional specification is in preparation.

WP6a team have developed a working sequence for the assembly.



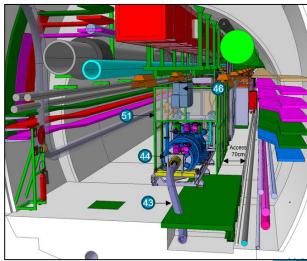


HL String Test, SM18 DFHX proto only

Integration advanced

(installation challenges !)

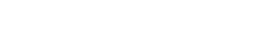




Integration mature

10





Cryogenic interfaces to develop

Series system tests (x9)

(Q3, 2020)

DFH steps toward the tunnel Cluster F, SM18 Proto system test (x1)

DFH (& DF) Delivery Dates: overview of prototypes and series

| 2020 Q4 N D |)] | Q1 F | | Q | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | 20 | 24 | |
|-------------------|------------------|----------|----|----|----------|----|----------------|----------------|----------------|--|--|---|--|--|--|---|--|---|--|---|---|---|--|---|---|--|--|---|--|---|---|---|---|
| · · · |)] | <u> </u> | | Q | 12 | | | 20 2021 | | | | | | 2022 | | | | | | | | | 2023 | | | | | | | | 20 | 24 | Comments |
| NC |)] | F | | | <u>(</u> | | Q3 | | Q | 4 | (| Q1 | | Qź | 2 Q3 | | | Q4 | | Q1 | | | Q2 | | Q3 | | | Q4 | | Q1 | | | |
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| | <mark>#</mark> P | | | | 0 | | | | R | p | | | | | | #1 | # | ‡ <mark>2</mark> | #3 | | #4 | | | | | F | ۲p | | | | | | |
| | | | | | #P | | | | | | | | | | | | | | #1 | | #2 | # | 3 | #4 | ŧ. | | | | | | | | Proposed series date |
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| | | | | | | | | | | | | | | | | | # | ŧP | | | | | | | | #1 | # | 2 | # | 3 | #4 | | Proposed dates |
| | | | | | | | | | | | | | | | | | | | _ | | | | | | | | | | | | | | |
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- Feedback from DFHX proto before starting next DFH(X or M)

| 2 | 2020 | | | 2021 | | | | | | | | | | | | | | |
|---|------|----|----|------|-------|-------|-------|----------|----------|----------|-------------|-------------|-------------|----------------|----------------|----------------|-------------------|--|
| | Q4 | | | Q1 | | | Q2 | | | Q3 | | | Q4 | | | Q1 | | |
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DFHX prototype planning: Cern/UU/RFR meeting 13/5/2020

Cern constraint – DFHX parts required by July 2021 latest RFR constraint – require 12 months from contract signature

| | | | Plannir | ng pr | ropo | oposal for DFHX prototype - 12/5/2020 v1 | | | | | | | | | | | | | | | | | | | | | |
|---|----|----|---------|-------|------|--|----|-----|----|----|----|---|---|---|---|---|----|-----|---|---|----|----|----|---|------|---|-------------|
| | | | | | | | 20 | 020 | | | | | | | | | 20 |)21 | | | | | | | 2022 | 2 | Comments |
| Activity / Period YYMM | | UU | Cern | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | |
| Plan | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Final Design/Drawings/Specifications | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Contract | | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| Preparations (Procurement & Manufacturing) | х | | | 1 | | | | | | | | | | | | | | | | | | | | | | | from UU/RFF |
| Manufacturing | х | | | | | | | | | | | | | | | | | | | | | | | | | | from UU/RFF |
| Documentation | х | X | | | | | | | | | | | | | | | | | | | | | | | | | from UU/RFF |
| Release for Delivery | | X | X | | | | | | | | | | | | | | | | | | | | | | | | from UU/RFF |
| Reception at Cern | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Trial assembly with dummy link & CL | х? | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Final assembly with preseries link & proto CL | х | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Installation on SM18 test bench | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Cold test on SM18 test bench* | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Disconnect & transfer to HL String Test | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| *Validation of DFHX, CL, DFX, MgB2 link - gr | | | | | | | | | | | | | | | | | | | | | | | | | | | |



DFHX prototype documentation planning:

- Short term planning to complete DDR and DFHX 2D dossier
- Despite the solid engagement of all engineers and designer, the Covid interruption has impacted the availability of personnel and efficiency of communication.

| Cern tasks | Ν | ∕lay-2 | 0 | | Jun | -20 | | | | Jul-20 | | |
|--------------------|----|--------|----|----|-----|-----|----|----|----|--------|----|----|
| | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| Func Spec | | | | | | | | | | | | |
| Safety analysis | | | | | | | | | | | | |
| DDR (DFH) | | | | | | | | | | | | |
| DDR actions | | | | | | | | | | | | |
| 2D drg (DFHX) | | | | | | | | | | | | |
| Tech spec | | | | | | | | | | | | |
| Safety file | | | | | | | | | | | | |
| Doc release | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Sharing drg UU/RFR | | | | | | | | | | | | |



....DFH next steps in 2020 & beyond

- Get the DFHX proto into production (plus CL and link)
- Refine the DFH assembly method
 - Document the assembly workflow
 - Document the space & infrastructure requirements
- Transport studies & trials
 - Create functional specification
 - Continue design of combined chassis
 - Needs of mockups and handling trials
- SM18 cold tests
 - Cluster F test configuration and interfaces
 - String Test DFHX installation studies.

⇒ Intensive period for WP6a !





Thanks for your attention

WP6a DFH DDR, 16 June 2020, P. Cruikshank