



WP6a: DFH Detailed Design Review

Overview & Production Schedule

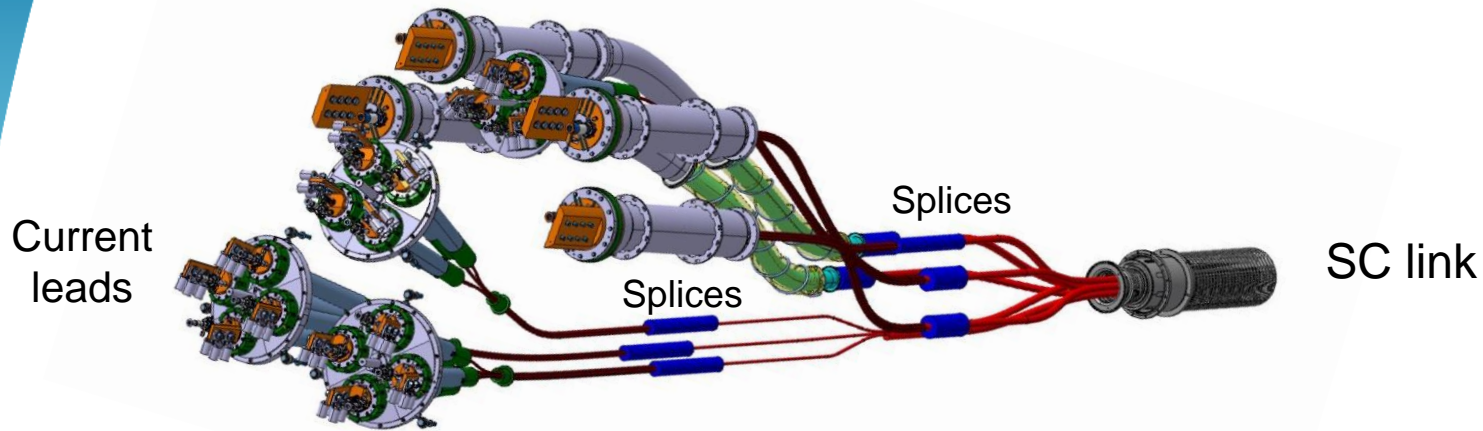
Paul Cruikshank on behalf WP6a contributors

CERN, 16 June 2020

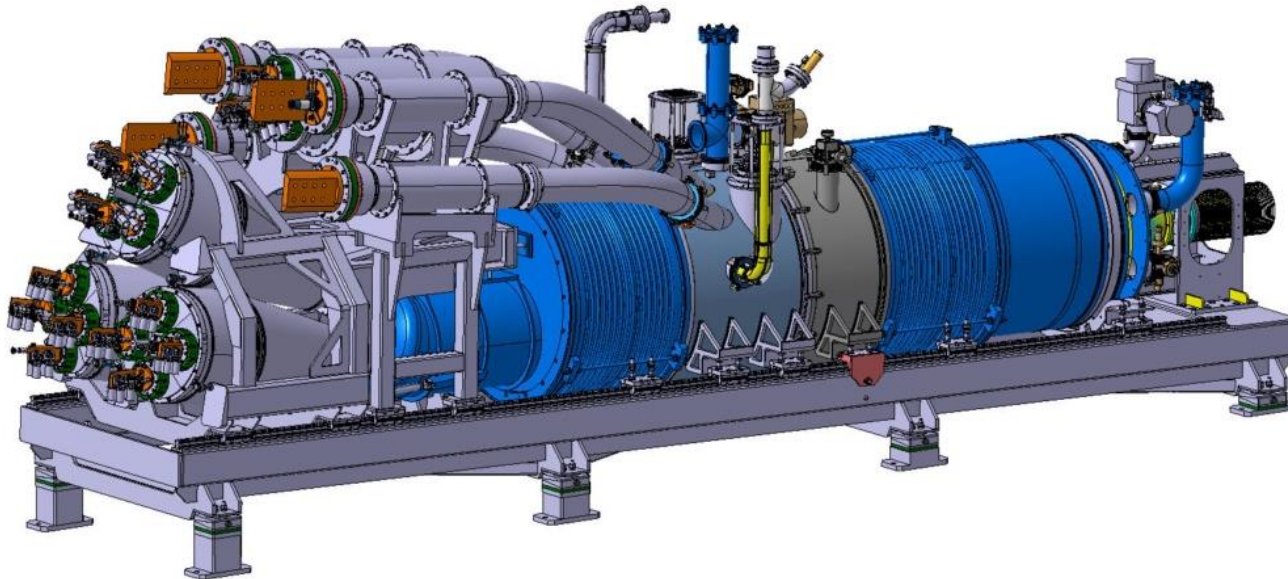
Overview: What happened since CDR ?

- 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

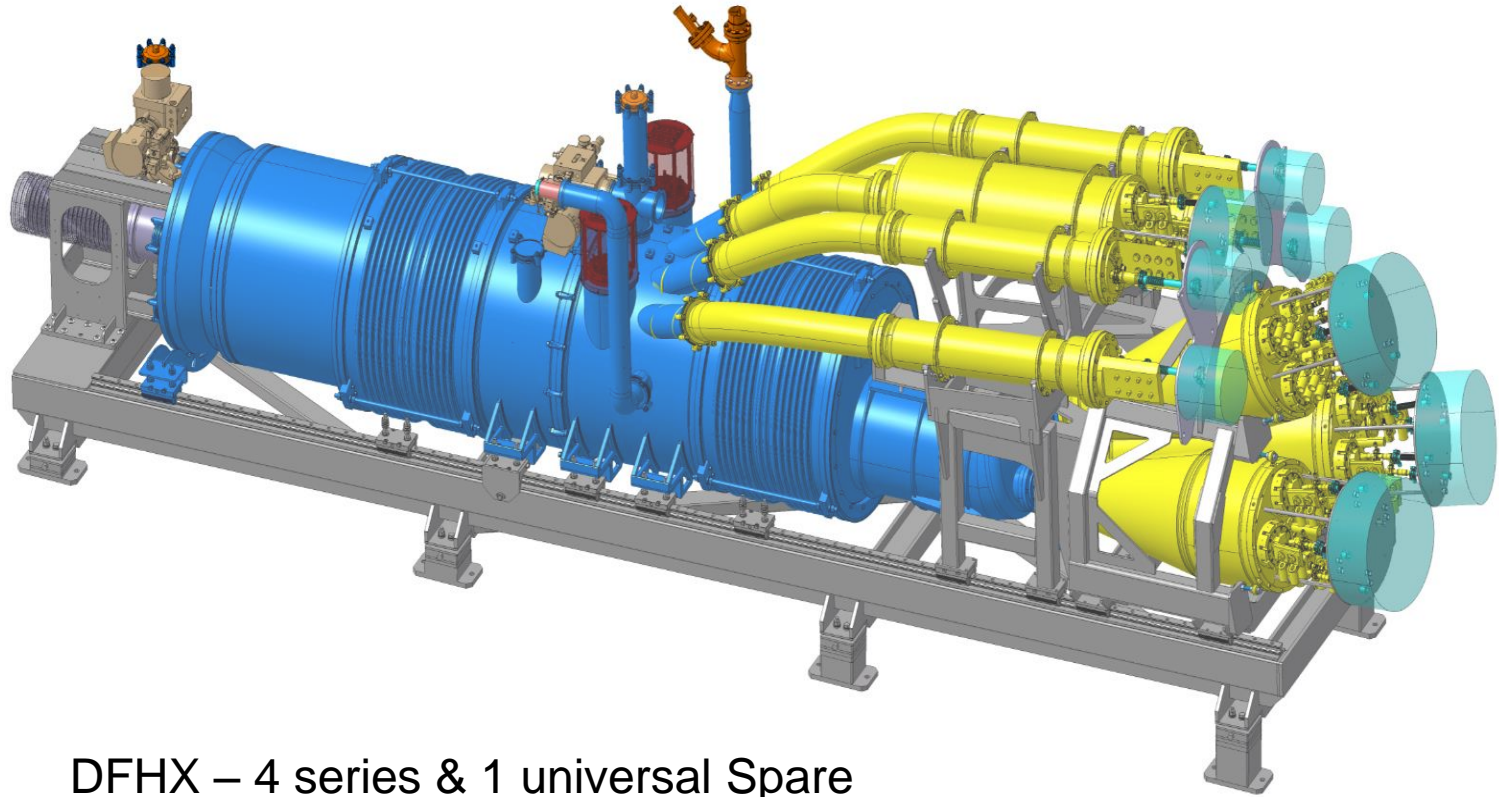
DFH Overview



DFH principal function:
host conductors & splices uniting HTS CL to MgB₂ SC link

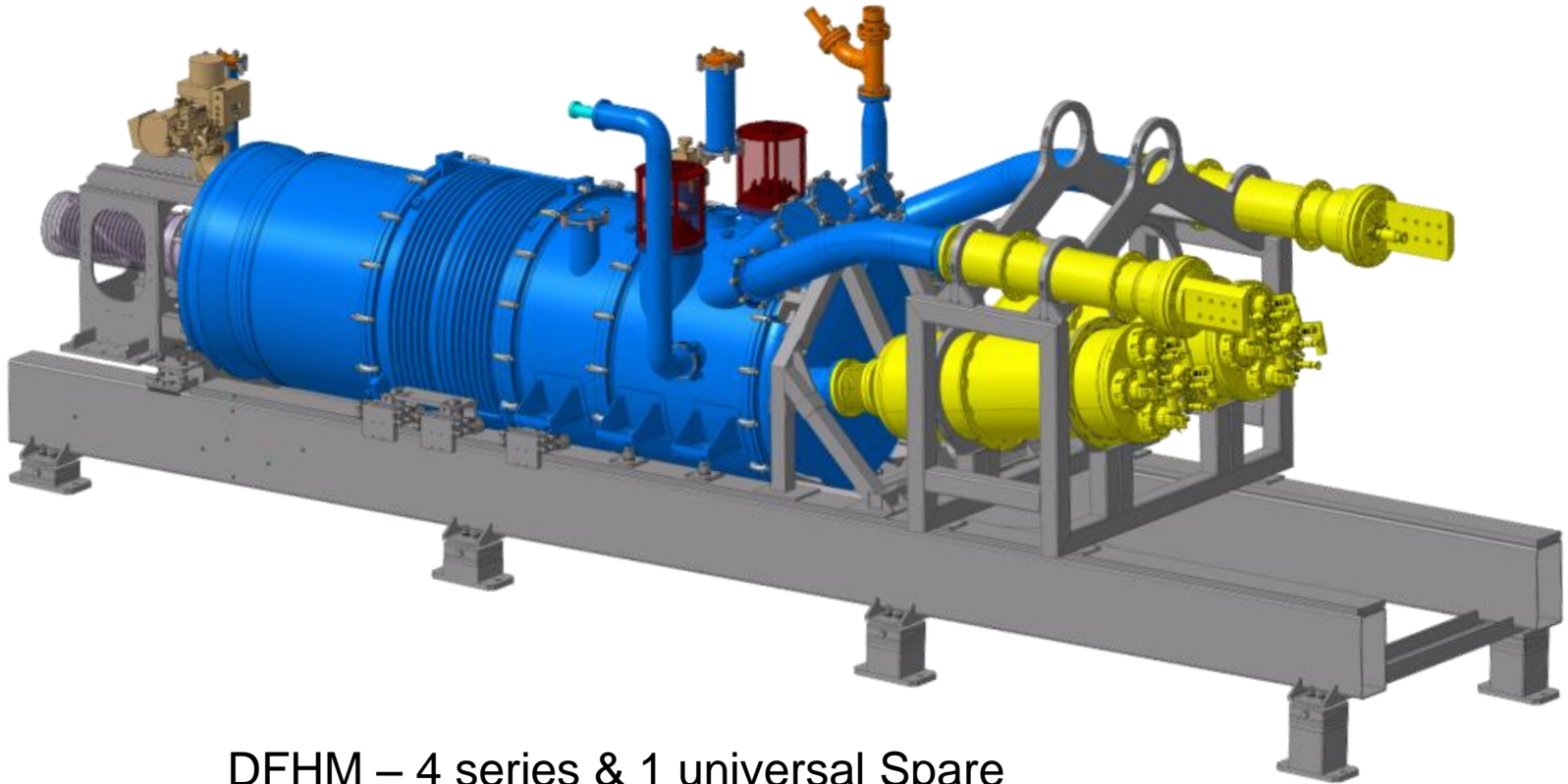


DFHX



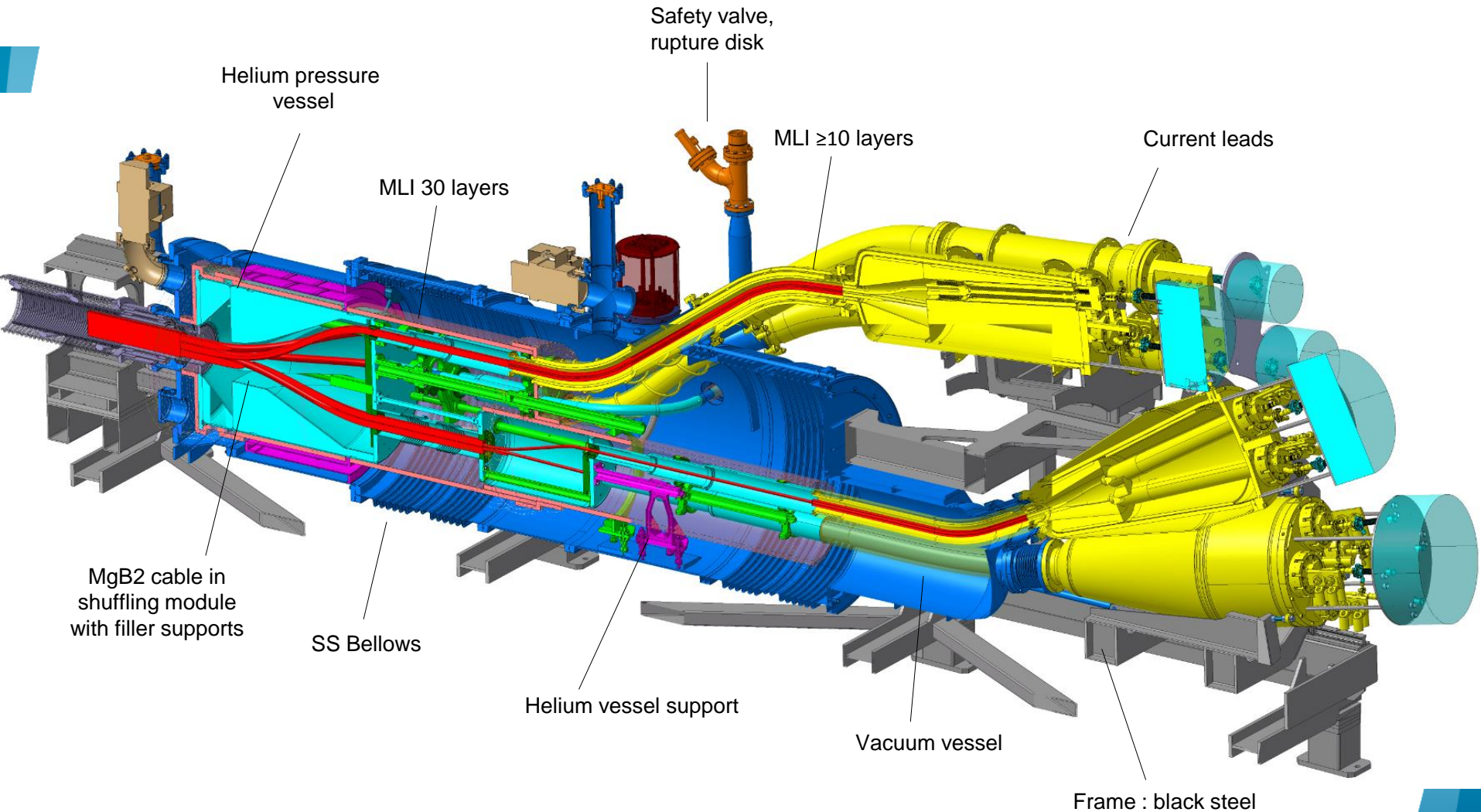
DFHX – 4 series & 1 universal Spare

DFHM



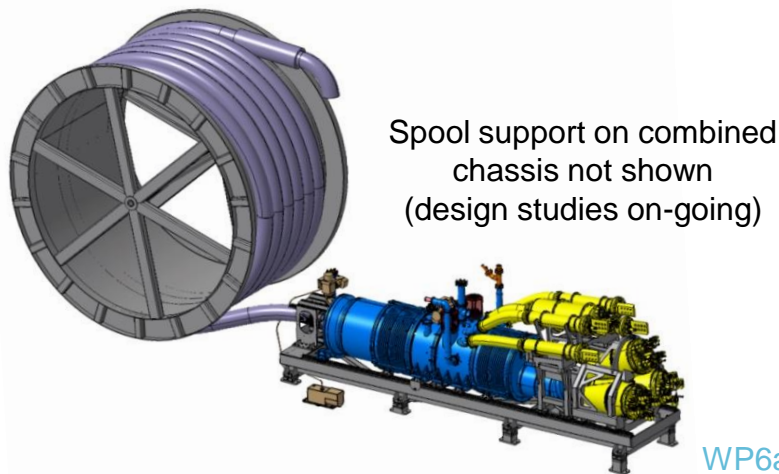
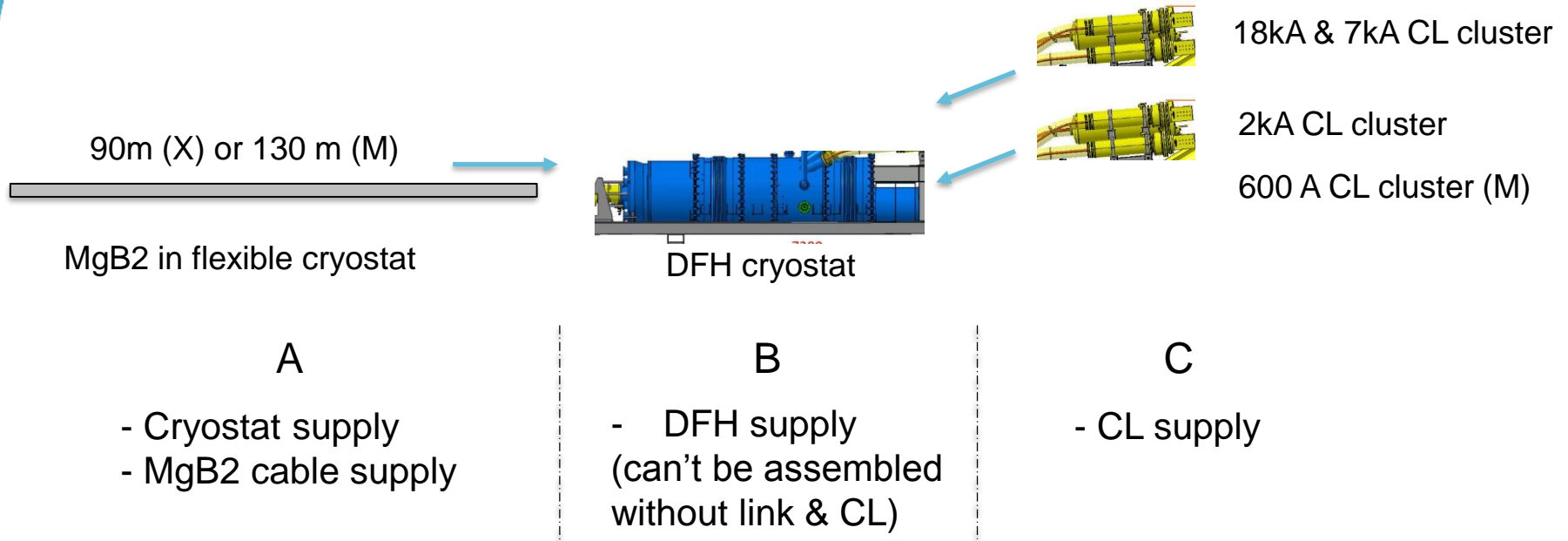
DFHM – 4 series & 1 universal Spare

DFHX overview - internals

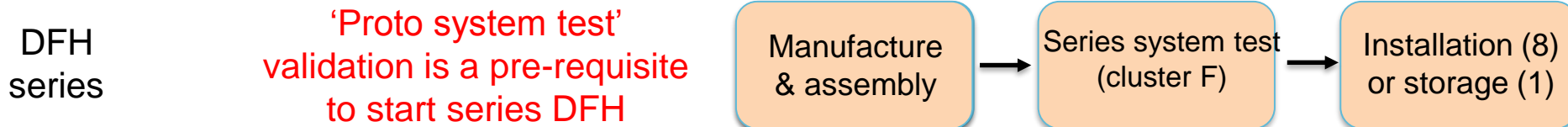
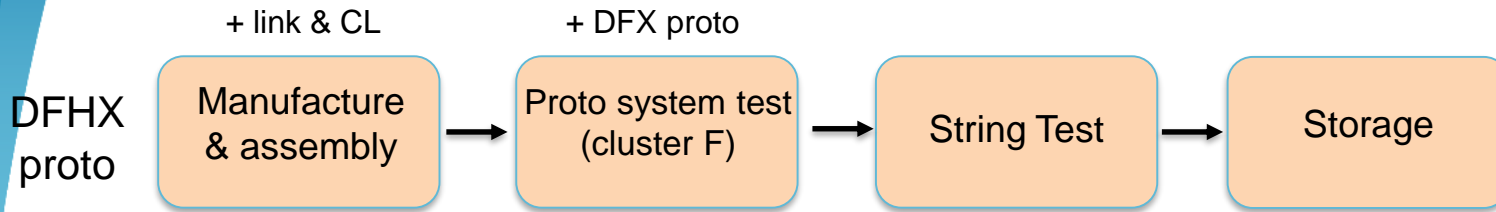


DFH(X) Assembly

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

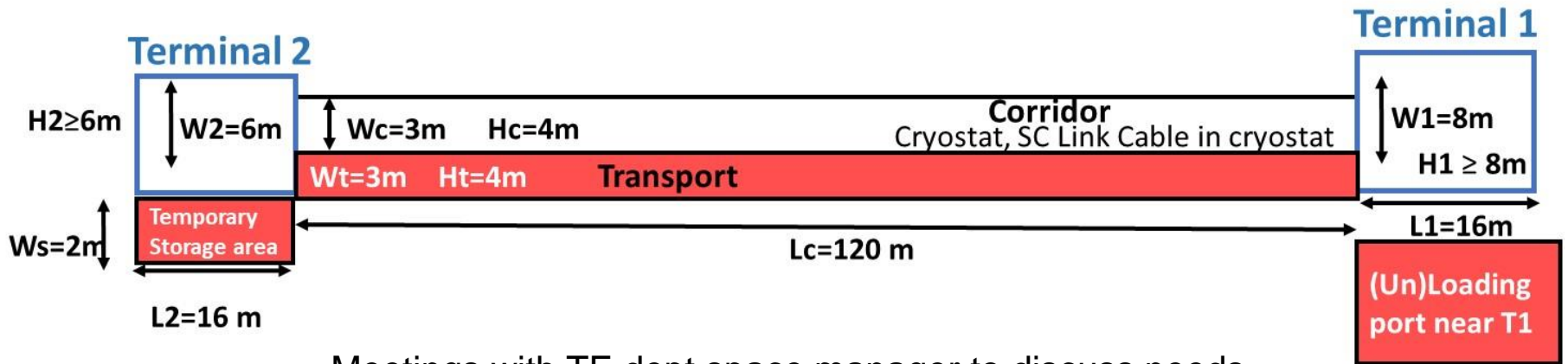


DFHX proto to DFH series



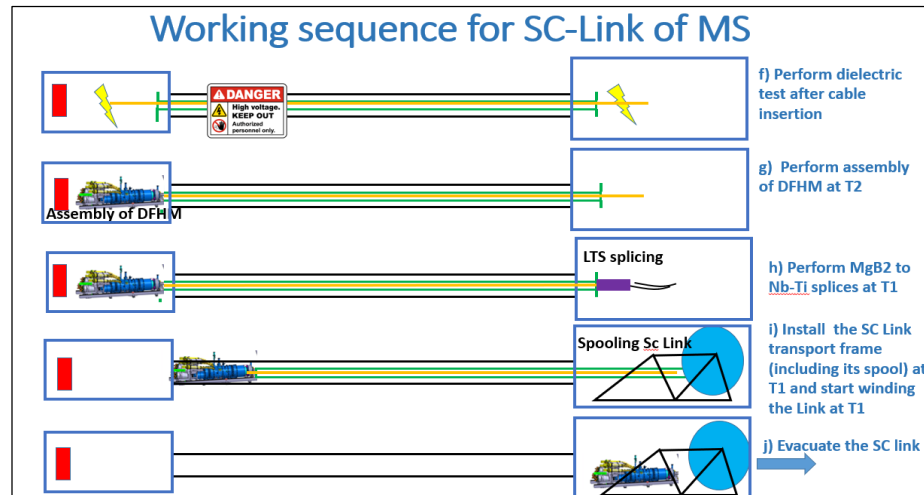
| DFH unit | Qty | Assemble with SC link + CL (building tbd) | Cluster F cold test (SM18) | HL String (SM18) | Installation (UR gallery) | Storage (building tbd) |
|-------------|-----|---|----------------------------|------------------|---------------------------|------------------------|
| DFHX proto | 1 | ✓ | ✓ (proto system test) | ✓ | | ✓ |
| DFHX series | 4 | ✓ | ✓ | | ✓ | |
| DFHM proto | 1 | ✓ | ✓ | | | ✓ |
| DFHM series | 4 | ✓ | ✓ | | ✓ | |

Space for DFH assembly with link & CL



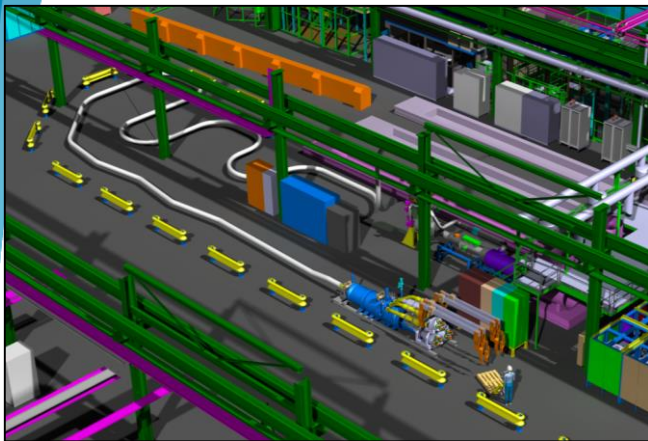
Meetings with TE dept space manager to discuss needs
 - a functional specification is in preparation.

WP6a team have developed a working sequence for the assembly.



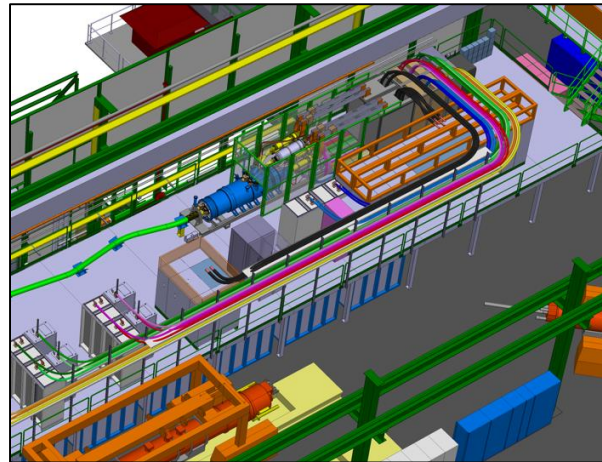
Cluster F, SM18
Proto system test (x1)
Series system tests (x9)

DFH steps toward the tunnel



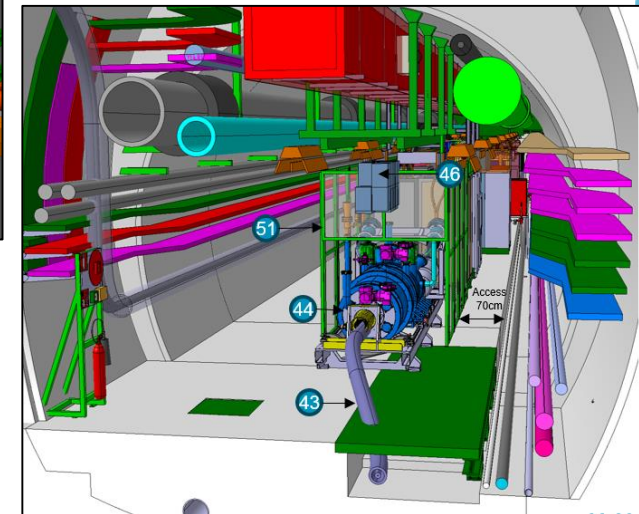
Cryogenic interfaces
to develop
(Q3, 2020)

HL String Test, SM18
DFHX proto only



Integration advanced
(installation challenges !)

UR Gallery
DFHX & DFHM series



Integration mature

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

| | 2020 | | | 2021 | | | | 2022 | | | | 2023 | | | | 2024 | | | Comments | | | | | | | | | | | | |
|--------------------------|------|---|---|------|---|----|---|------|---|----|---|------|---|----|---|------|---|----|----------|---|---|---|---|---|---|---|---|---|---|---|------------------------|
| | Q4 | | | Q1 | | Q2 | | Q3 | | Q4 | | Q1 | | Q2 | | Q3 | | Q4 | | | | | | | | | | | | | |
| | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | | A | M | J | J | A | S | O | N | D | J | F | M |
| CL prototypes (MME) | | | | | | #P | | | | | | | | | | | | | | | | | | | | | | | | | |
| DFX delivery (UK1 & 2) | | | | #P | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DFHX parts delivery (UU) | | | | | | #P | | | | | | | | | | | | | | | | | | | | | | | | | Proposed series dates |
| Proto system assy @cern | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Proto system test (SM18) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DFHX transfer to String | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DFM delivery (UK2) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | #P 1 year after DFX #P |
| DFHM parts delivery (UU) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Proposed dates |

| |
|--------------------------|
| Legend |
| #P - prototype/preseries |
| #1,2,3,4 - Series units |
| Rp - UK progress report |

- Start **DFHX proto** assembly mid-2021
 - Proto System Test complete end Q1 2022
 - Transfer to String Q2 2022
- Feedback from DFHX proto before starting next DFH(X or M)

| | 2020 | | | 2021 | | | | | | | | | | | | | | |
|--------------------------|------|---|---|------|---|----|---|--|----|---|----|---|---|---|---|---|---|---|
| | Q4 | | | Q1 | | Q2 | | | Q3 | | Q4 | | | | | | | |
| | O | N | D | J | F | M | A | | M | J | J | A | S | O | N | D | J | F |
| DFHX parts delivery (UU) | | | | | | | | | #P | | | | | | | | | |
| Proto system assy @cern | | | | | | | | | | | | | | | | | | |
| Proto system test (SM18) | | | | | | | | | | | | | | | | | | |
| DFHX transfer to String | | | | | | | | | | | | | | | | | | |

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 | May-20 | | | 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