UK Proposal for 4 x DQW CM for HiLumi

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Outline

1. Proposal for 4 x DQW Cryomodules
2. Current Status
3. Issues/ Concerns
4. Discussions

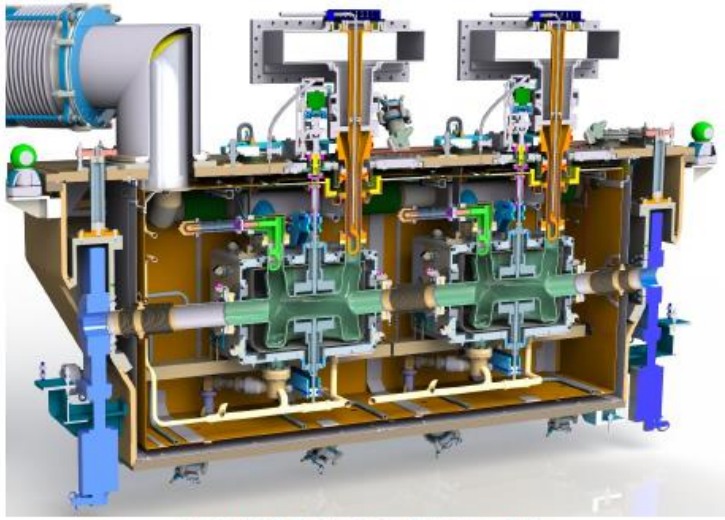
Crab Pre-series Cryomodule and HL-LHC-UK2

Re: Graham Blair (Plenary talk this meeting)

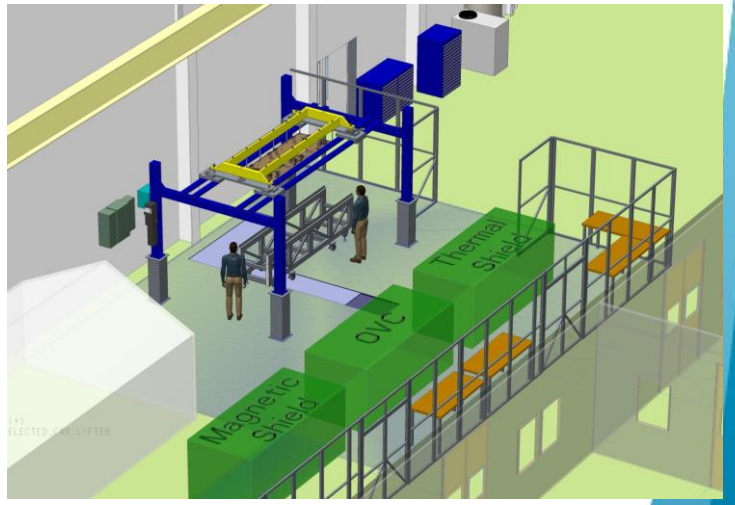
RFD Pre-series Cryomodule to be assembled at DL in 2020. Area for cryostating, lifters, trolleys, tooling and clean rooms are currently being prepared

In HL-LHC-UK2 we propose to build the double quarter wave cryomodules for HL-LHC at Daresbury.

In addition, we propose to provide support to CERN on cavity production, cavity testing, and the SPS tests of the RFD pre-series.



DQW SPS Prototype Cryomodule



UK Strategy for HL-LHC CC

- The UK is about to enter a Spending Review in 2019. The current assumption is approximately flat funding, but other uncertainties may dominate.

- Main UK interests for high energy physics are:
  - Specific grants for **HL-LHC** and AWAKE
  - future colliders (ILC, CLIC, laser plasma wakefield etc.) via institute grants to the accelerator institutes (CI, JAI) and ASTeC.

- **For HL-LHC, the SoI went to our Accelerator Strategy Board that recommended inviting a full proposal to our peer review process. Current grant runs formally to March 2020.**

Collaborators

1. STFC Daresbury Laboratory
2. University of Lancaster

The
UK CC team

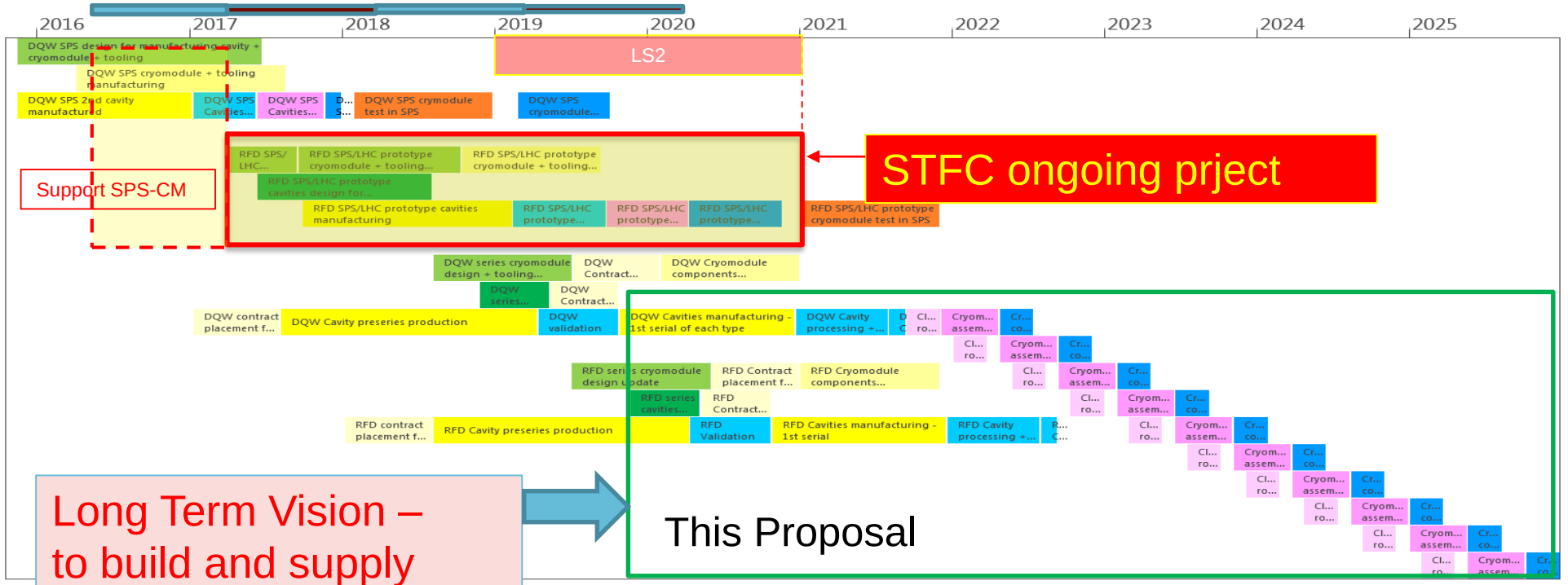
3. CERN
4. US-AUP
5. We welcome TRIUMF to the collaboration

UK & HL-LHC

WP2 UK/ WP4 HL-LHC

- UK CC team has been a key player in the development of Cryomodule for the last 7 years
- Has been working with CERN as a single integrated team
- Sharing of the efforts (and budgets) in design and procurements between CERN and UK have been well drafted for the RFD-CM
- Some tooling and facilities are being modified to suit available infrastructure at Daresbury
- We intend to continue with the same approach in future for the new proposal.

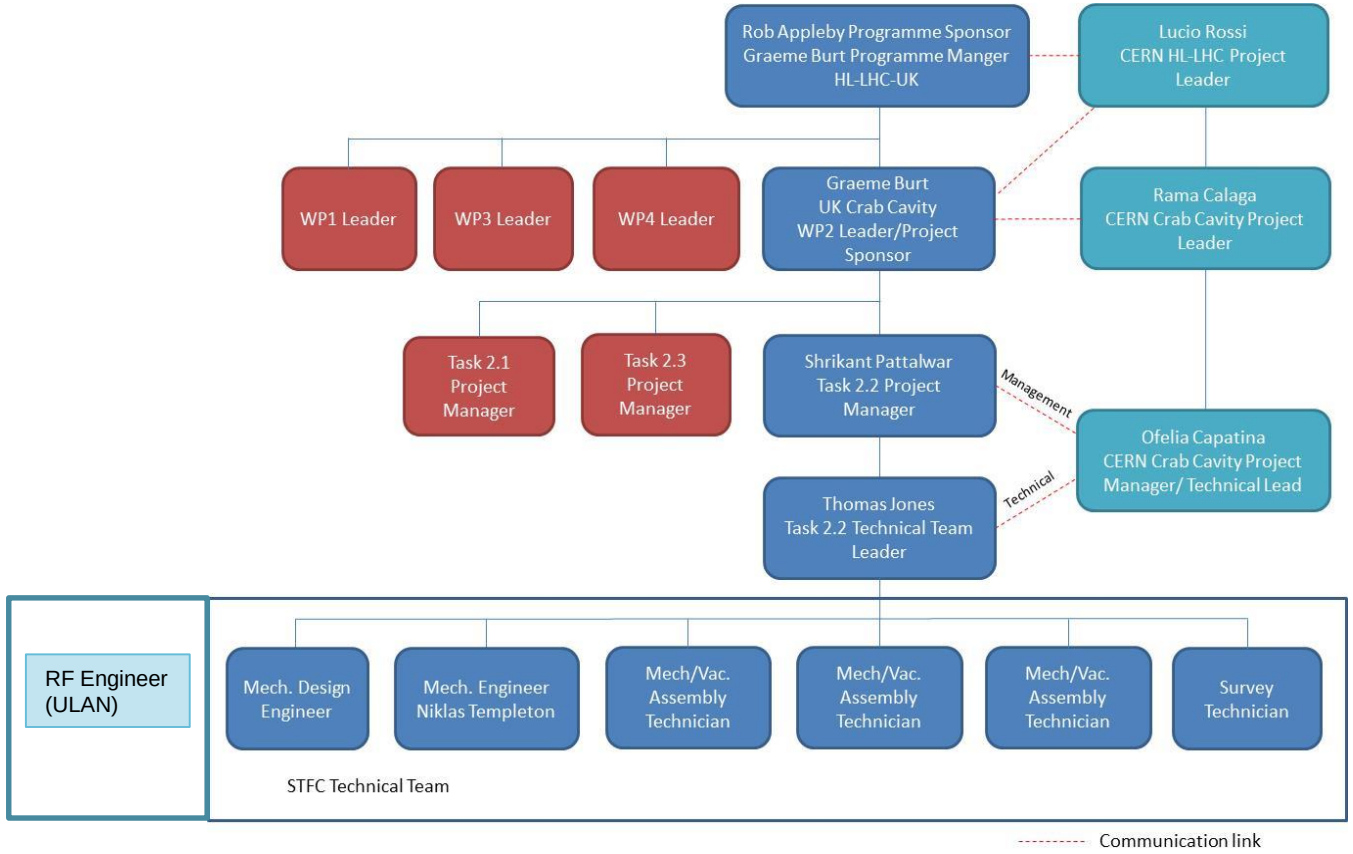
HL-LHC Crab Cavities Global Schedule



Long Term Vision – to build and supply series cryomodule for HL-LHC

Courtesy: M. Garlaschè

Project Organisation (Existing project)



Scope of Work

To design, procure and assemble **4 (DQW) Crab-Cavity-Cryomodules**

Included

- Review the design of pre-series and undertake any design modifications
- The procurement from industry of the required components to produce 4 cryomodules. The design and procurement efforts and costs will be shared with collaborators based on the funding allocations to respective organisations.
- Assembly of cavity/coupler strings and associated ancillaries in ISO-4 clean room
- Assembly of the cryomodules (cryostating)
- Undertake vacuum leak tests after thermal cycling with liquid nitrogen
- Design and fabrication of the transport frame
- Organise shipment of Cryomodules to CERN
- QA management for all the above

This Proposal- The Scope of Work

Excluded

- Design and procurement of cavities, tuners, couplers and beam pipe components (will be supplied by CERN)
- Conducting Cryogenics performance tests at 4K and 2K
- Conducting RF performance tests at 4K and 2K
- The conditioning and testing of the RF input couplers (It is assumed that the conditioning and testing of the RF input couplers will be performed at and by CERN)
- Any-reprocessing of the cavities in case the cavities or beam pipes get contaminated at any stage between arrival and shipment.

Facilities

The project will utilise the infrastructure developed for the RFD-prototype cryomodule located within ETC at Daresbury Laboratory.

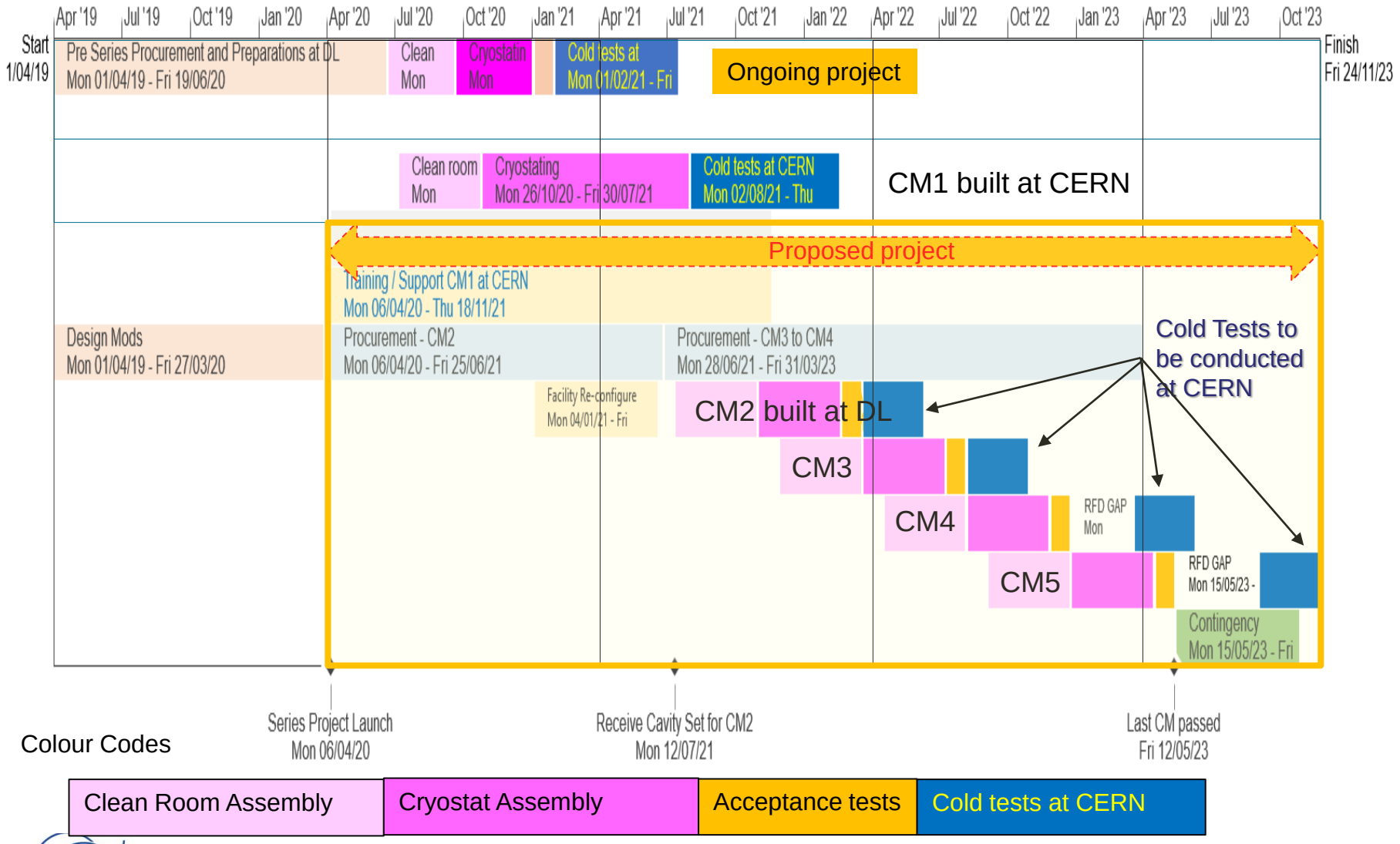
- Modify, Procure and maintain the tools required to perform assembly in clean room
- Modify, Procure and maintain the tools required to perform cryostat assembly
- Modify, Procure and maintain the tools and equipment required for leak checks and thermal cycling (acceptance tests)
- Modify, Procure and maintain the tools required to comply with the relevant safety regulations

This Proposal- The Scope of Work

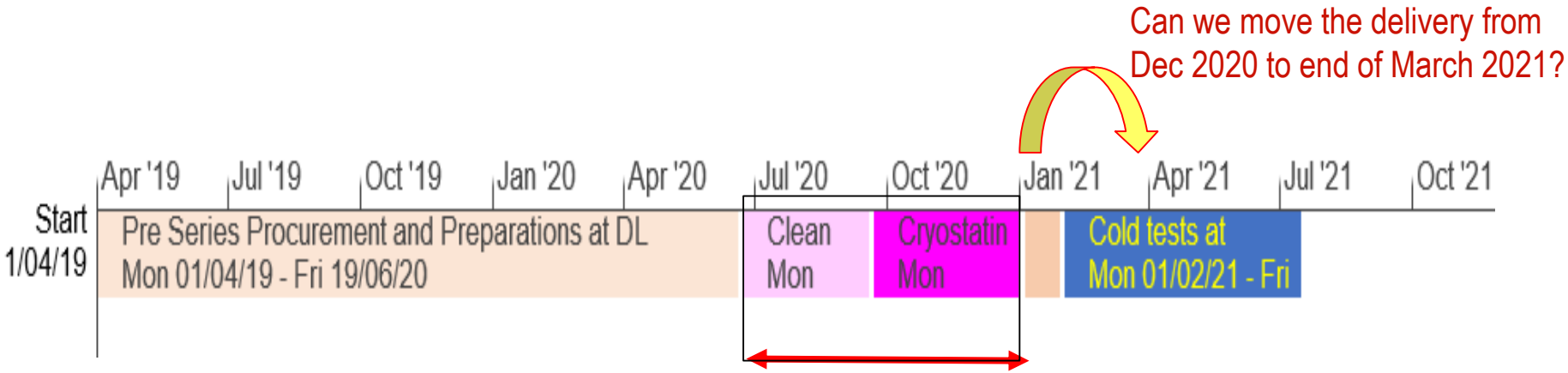
Assumptions

- STFC will share the efforts for design with CERN and University of Lancaster.
- Procurement responsibility will also be shared with the collaborators depending upon respective funding allocations.
- The series cryomodule will be a modified version of the prototype cryomodule and will require minimal efforts for modifications if required..
- The project will utilise the infrastructure developed for the RFD-prototype cryomodule. Only the cost of annual inspection, certification and maintenance is included in the estimates.
- All required cavity/cryomodule drawings and CAD will be delivered by CERN to STFC upon project initiation.
- Assembly procedures for the cryomodule will be shared by CERN at timescales appropriate for the STFC project delivery.
- Drawings and/or CAD models for cryomodule assembly tooling will be made available to STFC by CERN at timescales appropriate for the STFC project delivery.
- Periodical review/progress meetings will be held with the collaborators.
- STFC staff will participate in the construction of CM1 at CERN as a part of training and support.
- CERN staff will provide guidance and supervision during some of the key stages of the assembly steps.

HL-LHC Global Plan

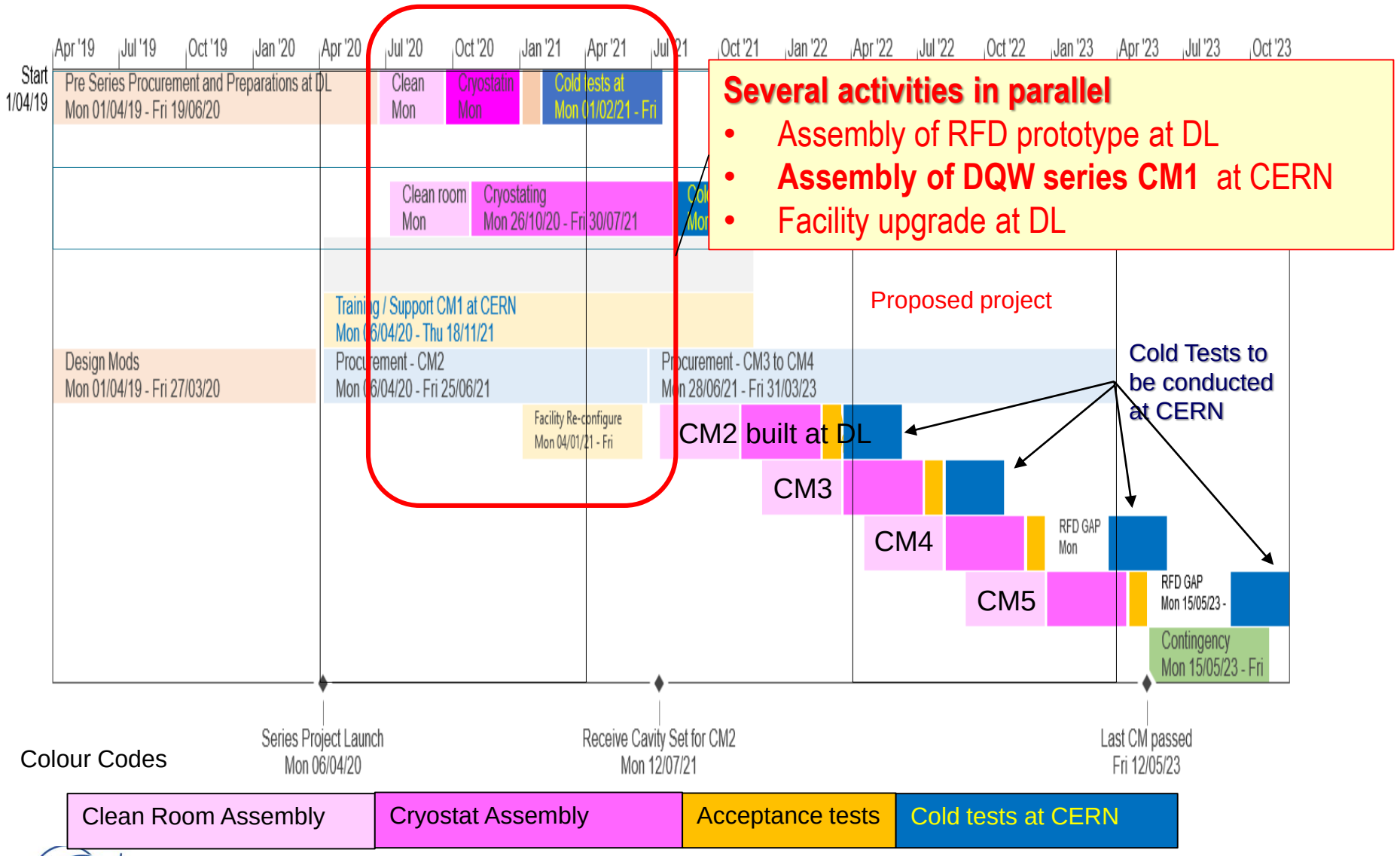


Some Concerns / Issues 1, 2



1. Only 5 months for completing the assembly of the first RFD prototype
2. Acceptance Criteria yet to be defined and agreed.

Some Concerns / Issues (3)



Some Concerns / Issues (4)

4. Transportation from DL *(TRIUMF)* to CERN

Summary

- The UK team has been playing a key role in HL-LHC since 7 years.
- The UK -CERN collaboration has been working successfully as a single integrated team and we intend to work with the same approach in future.
- SOI for the proposal to assemble 4x DQW-CM at DL has been submitted to STFC/ CERN. Detail submission will be made in Q1 2019
- In the mean time, some of the concerns/ issues need to be addressed
- We welcome Bob and his team from TRIUMF to the collaboration

Thank you