

## WP4 Hardware Procurement Plan for Pre-series Distribution Feedbox (DFX) Prototypes

Procurement is organised in three stages as below

1. DFX Design
2. Procurement of Materials and Components by Southampton
3. System Assembly and Tests at Southampton

The collaboration between CERN and University of Southampton on the distribution feedbox prototype is a continuation from the Framework design study. The prototype is being jointly designed followed by procurement, assembly and test coordinated by Southampton. The prototype will be used in LH-LHC String2 tests in SM18.

**Design** is the crucial stage of the collaboration and integral of the whole procurement process. The DFX is a new breed of cryomodules to connect NbTi /magnets to a novel dc superconducting dc cable assembly (SC-Link) operating in a temperature gradient. The innovative nature of the SC-Link requires a dynamic collaboration and procurement process. Southampton has previously worked with CERN on the development and procurement of high temperature superconducting current leads in a similar manner. At present, the cable design is undergoing validation of the recommendations by the international review on cold-powering in June 2017. The RA from Southampton is at CERN working as a liaison between the cryostat section and the superconductor section, deploying the unique strength of our combined expertise in both aspects. The evolution of the SC-Link to a final design is being incorporated in parallel in the DFX design. Supporting studies on key aspects, such as the splices, are being carried out simultaneously.

The design process is structured to deliver a detailed concept in March, consolidation in June, full drawing and design review in Aug 2018.

**Materials and Components** will be procured by Southampton following the design review approval. Most of the materials (~£50k) are structural, e.g. stainless steel and copper, and in different sizes, specifications and quantity. However individual items are likely to be below the tender threshold. Southampton has extensive experience in **cryostat material** procurement and will be guided by market research and CERN advices. **Components** will be procured through a combination of external manufacturer and internal workshop. Once again, Southampton are experienced in working with UK manufacturers for custom components. Key components identified jointly through the collaboration will be iterated through a mock-up stage. The selection process will also consider the potential suitability for the possible mini-series. The components to be procured will be around £50k in total and most of the items will be below the tender threshold. For those above the threshold, we are supported by the procurement team of the university. The Agresso system will also automatically trigger the process. The process should finish by June 2019.

**Assembly and Tests** will be carried out in Southampton with external support if necessary. In-house assembly is an important process for debugging the design, identifying potential improvements, and correcting unexpected issues. It is also crucial for informing the mini-series specifications. Full cryogenic tests will be performed and witnessed by CERN before shipping.

**Quality Control** will be an integral part of the procurement process. **Material** will be procured with the necessary certification and will include sample testing if necessary. CERN's HL-LHC QA plan will be adopted and CERN's procurement specification methods for cryostat components will be applied

wherever applicable. Acceptance criteria are defined in the components specifications. Inspection visits to suppliers during the component manufacturing will be made at regular intervals to ensure QA compliance.

#### **Components on loan from and/or supplied by CERN**

No components will be on loan from CERN. The following will be supplied by CERN for integration and acceptance tests

Lambda plate	✓
Heater	✓
Cernoxes	✓
Level gauges	✓
Pressure transducer	✓

**Potential Suppliers:** UK has a good manufacturing base and potential suppliers will be identified via

- Past and present suppliers with established track record
- Visiting industrial exhibitions
- Visiting some of the potential industries to assess the capabilities

#### **Summary of Procurement schedule**

Mar 2018	Design concept issued
Jun 2018	Design concept finalised and dimensions fixed to start the process of shortlisting potential suppliers and initial discussions. Identify materials requires special specifications and their suppliers
Aug 2018	Design review and full drawings
Sept 2018	Start procurement of materials, components
Dec 2018	All materials procured
Mar 2018	All components procured
Jun 2018	All components arrived
July 2019	Assembly, tests and certification