MCBXF Production Status

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MCBXF meeting – 12th November 2020

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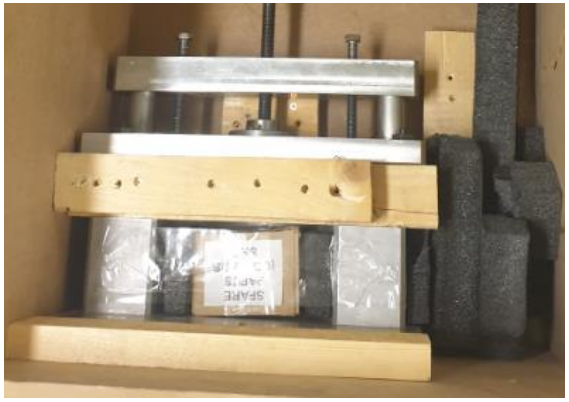
Production Strategy

Two MCBXFBP2 re-assemblies are planned to better understand the behaviour of the magnet and the powering test results of the first assembly (MCBXFBP2a).

- MCBXFBP2b:
  - New Shimming Plan will be implemented to target 60 MPa azimuthal compression at cold on inner dipole coils
  - Instrumented collars to measure the level of preload (in the straight part) at 1.9 K
  - Same coils both dipoles (IC4-IC5 & OC3-OC4)
- MCBXFBP2c:
  - Assessment of coil fabrication quality influence on performance (ID coils with the right length and resin volume).
  - New coils for the inner dipole (IC6-IC7), same coils for the outer (OC3-OC4)
- MCBXFB01 & MCBXFAP1:
  - 118mm shorter ID coils, equal lengths for both dipole pole window (828 vs 946 mm)
  - End spacers with longer legs to increase the rigidity at coil extremities

MCBXFBP2b: First reassembly

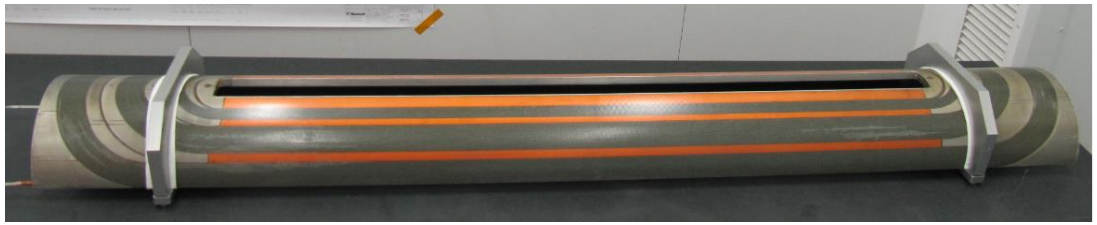
- Components and tools sent from CIEMAT to CERN last week:
  - Collars crimping tool: needed to replace the collars sets with the instrumented ones
  - Inner Dipole Collaring Shoes

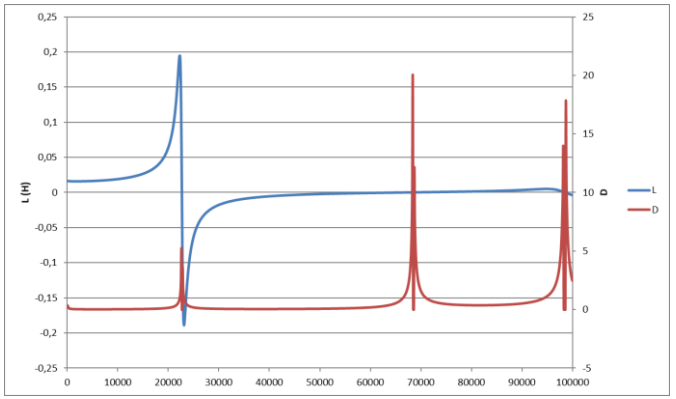


- The rest of the components that will be required are already at CERN (stock from previous assemblies):
  - Ground Insulation (for Inner and Outer Dipole)
  - Outer Dipole Collaring Shoes

MCBXFBP2c: Second reassembly

- Inner Dipole Coils:
  - IC6 already manufactured. Electrical Measurements completed. Only dimensional measurements (with CMM) are pending.





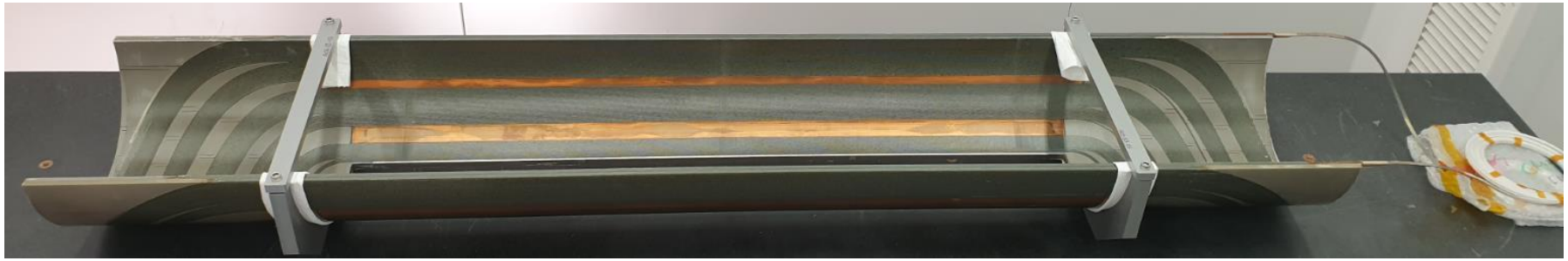
  - IC7 already impregnated:

The winding tension is being controlled and the coil length measurements are consistent with the expected values

- Ground Insulation: already produced.
- Collaring Shoes: laser cut in progress.

MCBXFB01: First short magnet of the series (I)

- The production of the outer coils started using extruded wedges and the latest version of end spacers:
  - First outer dipole coil is finished. Electrical Measurements and dimensional measurements pending:



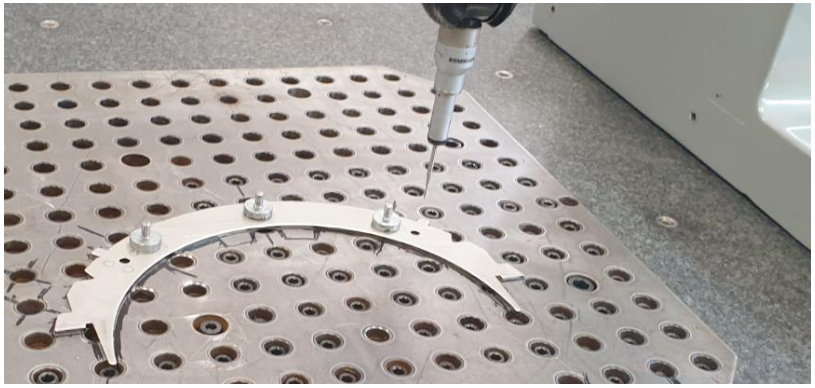
  - Winding of the second outer dipole coil outer layer in progress:

MCBXFB01: First short magnet of the series (II)

- The design of the tooling for the manufacturing of the new shorter inner coils has finished, and all the new parts are under fabrication:
  - Winding tooling: 16th November
    - 2005-12 INNER WINDING MANDREL.PDF
    - 2005-12-01 MANDREL.PDF
    - 2005-12-05 INNER CENTRAL WINDING POLE.PDF
    - 2005-12-07 OUTER CENTRAL WINDING POLE.PDF
    - 2005-12-10 MANDREL PROTECTIVE SHEET.PDF
    - 2005-14 INNER WINDING TOOLING.PDF
    - 2005-14-04 UPPER SUPPORT PROFILE.PDF
    - 2005-14-45 LONG CLAMPING PLATE.PDF
    - 2005-14-52 PROTECTIVE SHEET INNER LAYER.PDF
    - 2005-14-53 PROTECTIVE SHEET OUTER LAYER.PDF
  - Binding tooling: 23rd November
    - 2005-16 INNER BINDER TOOLING.PDF
    - 2005-16-01 CENTRAL MOULD TILE.PDF
    - 2005-16-03 CENTRAL PROTECIVE SHEET I. L. NCS.PDF
    - 2005-16-05 OUTER LAYER CENTRAL SPACER.PDF
    - 2005-16-14 LOWER CENTRAL PLATE.PDF
    - 2005-16-16 CENTRAL PROTECIVE SHEET O. L. NCS.PDF
    - 2005-16-23 CENTRAL PROTECIVE SHEET I. L. CS.PDF
    - 2005-16-24 CENTRAL PROTECIVE SHEET O. L. CS.PDF
    - 2005-16-25 LOWER PLATE.PDF
    - 2005-16-27 LOWER PLATE SUPPORT.PDF
  - Impregnation tooling: 30th November
    - 2005-18 INNER IMPREGNATION MOULD.PDF
    - 2005-18-01 INNER END POLE.PDF
    - 2005-18-50 LEAD END REFILLER v1.PDF
    - 2005-18-51 RETURN END REFILLER v1.PDF

MCBXFB01: First short magnet of the series (III)

- The new end spacers with longer legs have already been 3D-printed. Heat treatment ongoing. End of production expected by the third week of November.
- With regards to the rest of magnet components:
  - Contract for fine blanked collars manufacturing signed in May (CIEMAT-INECFI). Produced with Nippon Steel material. Die-cut tests are taking place, some tool parts adjustments are necessary. End of production expected by February 2021.



  - Iron Yoke laminations: laser cut is finished. EDM wire cut in progress.
  - Connection Plate and End Plates under fabrication.
  - Collaring Shoes: laser cut in progress.
  - Outer Dipole Ground Insulation: bending in progress.

MCBXFAP1: Long magnet prototype

- The drawings for the new shorter inner coils tooling are in process. Most of the manufactured parts for the previous tooling are compatible with the new configuration.








MCBXFB & MCBXFA Schedule

COILS (Current Conf.)	End by
First ID coil (IC6)	17/07/2020
First OD coil (OC5)	29/09/2020
Second ID coil (IC7)	13/11/2020
Second OD coil (OC6)	15/12/2020

MCBXFBP2b	End by
Magnet components	03/11/2020
Assembly at CERN	18/12/2020
Powering test	29/01/2021

MCBXFBP2c	End by
Magnet components	08/01/2021
Assembly at CERN (IC6&IC7)	19/03/2021*
Powering test	09/04/2021*

MCBXFB01 (Short ID)	End by
First ID short coil (ICs1)	29/01/2021
Second ID short coil (ICs2)	24/02/2021
Magnet components	15/03/2021**
Assembly at CERN (OC5&OC6)	31/03/2021*
Powering test	30/04/2021*

MCBXFAP1 (Short ID)	End by
First ID coil	13/04/2021
First OD coil	26/05/2021
Second ID coil	23/06/2021
Second OD coil	21/07/2021
Magnet components	16/06/2021
Assembly at CERN	06/08/2021
Powering test	06/09/2021

* In case of overlapping, MCBXFB01 assembly will have priority over MCBXFBP2c assembly

** Fine blanked collars are in the critical path for assembly

MCBXFAP1 Inner Dipole assembly can start by the end of June

B-type & A-type Series

- Administrative documents are approved by CIEMAT and Finance Ministry.
- Documents to be agreed with CERN:
  - Released: Exchange of parts, electrical measurements, acceptance criteria and quality plan, MIP.
  - Under elaboration at CIEMAT: technical specifications will be finished this week.
- Contract will be signed by February (the first short magnet is not part of this contract, is being produced at CIEMAT).
- CERN will supply the insulated superconducting cable, the steel for the collars, the iron for the yokes, the Keys for the outer dipole collars and the instrumentation of the collars.
- CIEMAT will supply the copper wedges, the end spacers and the collars (fine blanking).
- CIEMAT will make a new Call for Tender for the supply of the end spacers, which are also needed for the long prototype.

Conclusions (I)

- Manpower:
  - There are four technicians now in the workshop (the fourth one started Oct 1st).
  - A fifth technician is going to join us on November 23rd.
  - A sixth technician will join us by mid December.
- Shifts:
  - Regular shift is from 7:30 to 14:30, working in parallel with 2 different coils.
  - Some winding tasks are taking place in a shift from 14:00 to 21:00.
- Tooling for shorter ID coils:
  - Inner B-type winding tooling expected by next week, binding and impregnation tooling before the end of November.
  - Inner A-type winding tooling needed by the end of January 2021.
- Components:
  - Fine blanked collars are in the critical path for assembly.
- Risks:
  - No time for contingency: supplier delays, COVID.

Conclusions (II)

- MCBXFBP2b, with instrumented collars and a new shimming layout in the inner dipole (outer dipole as in MCBXFBP2a), will be tested in January.

- MCBXFBP2c, with nominal length inner dipole coils and new end spacers, will be tested in April.

- MCBXFB01, with shorter inner dipole coils and end spacers with longer legs, will be assembled at CERN in March and tested in April.

- MCBXFAP1, also with shorter inner dipole coils and end spacers with longer legs, will be assembled at CERN in July, and tested in August.

Thanks for your attention