MCBXF series production at CERN
Update June 2024

Juan Carlos Perez, Jose Ferradas and Gonzalo Hernando
on behalf of the full team!

05/06/2024
HL-LHC WP3 Meeting

Outline

- MCBXF general status at CERN
- Summary on initial activities
- MCBXFB05 assembly
- MCBXFA1 assembly
- Summary and outlook

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- **MCBXF general status at CERN**
- Summary on initial activities
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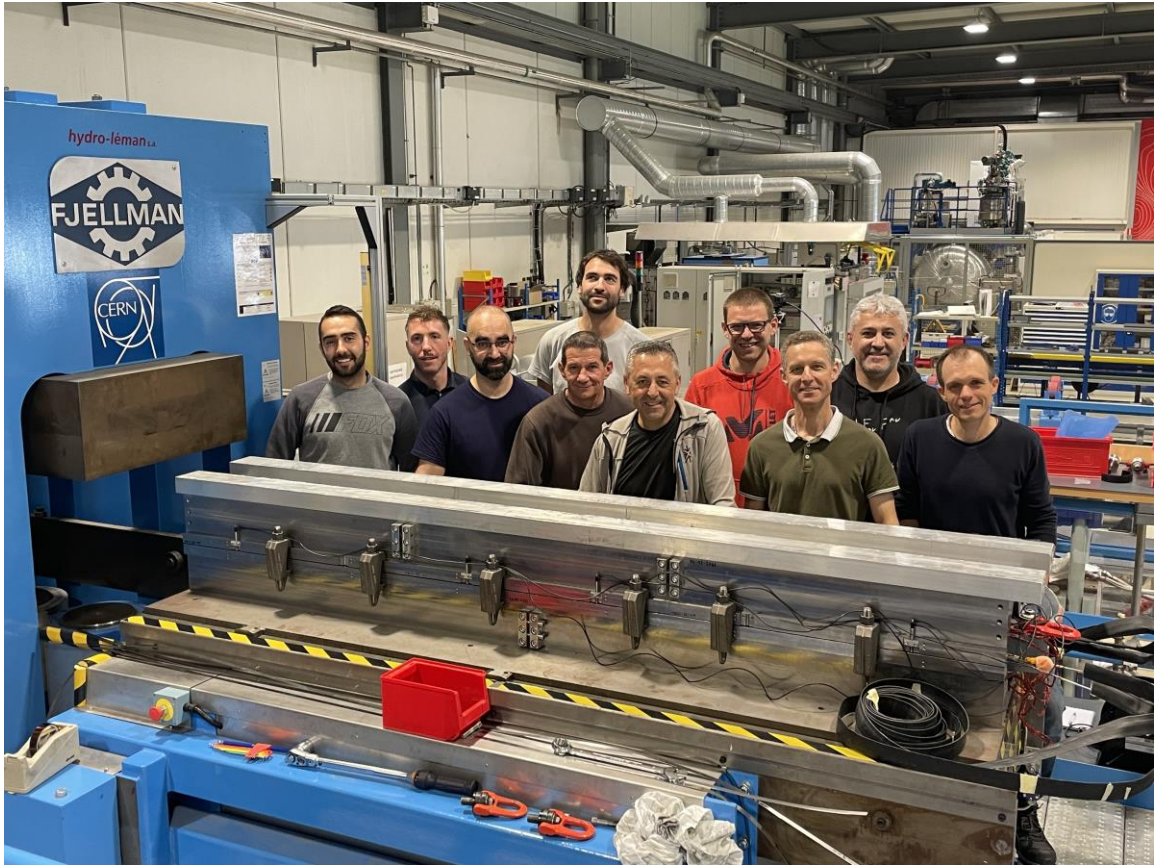
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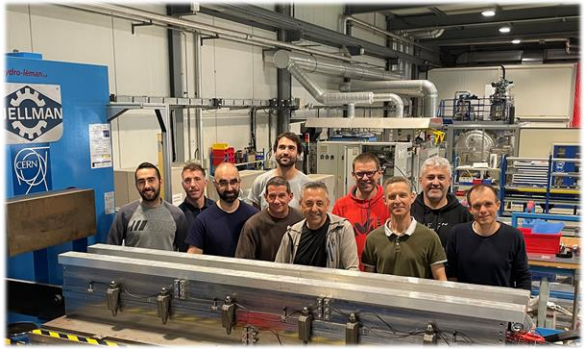
MCBXF status at CERN

- **Organization:**

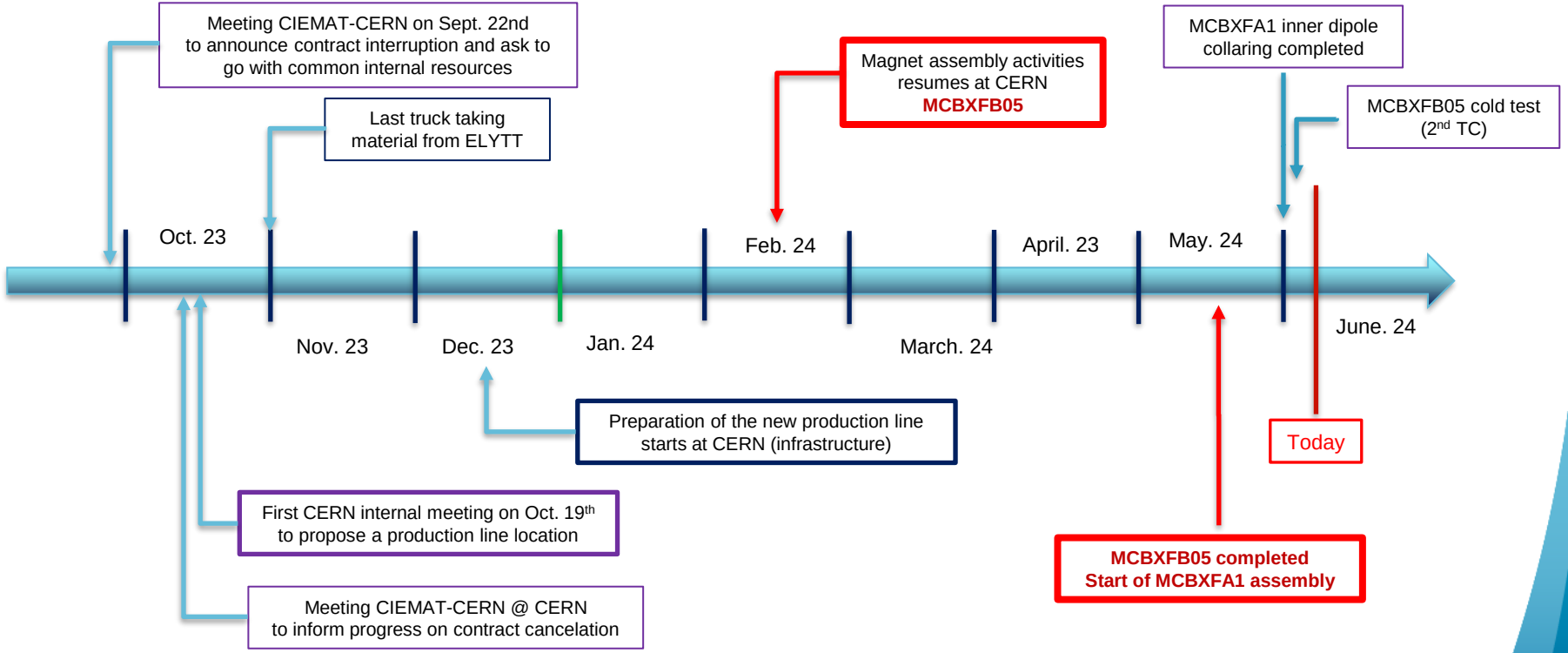


WP3 Project engineer: J.C. Perez

- Magnet assembly activities (including magnetic measurements):
  - Gonzalo Hernando (TE-MSC-SMT)
  - Jose Ferradas (TE-MSC-SMT)
  - Federico Ismail Ben el Caid (TE-MSC-SMT)
  - Sebastien Luzieux (TE-MSC-LMF)
  - Karim Kallat (TE-MSC-LMF)
  - Nicolas Eyraud (TE-MSC-LMF), *in charge of knowledge transfer during MCBXFB05 and MCBXFA1 assembly!*
- Logistics:
  - Steve Becle (TE-MSC-LMF), Laurent (TE-MSC-LMF) and Sylvain Caille (TE-MSC-LMF)
- Mechanical measurements (EN-MME):
  - Sylvain Mugnier and Michael Guinchard
- Additional support from LMF and SMT (machining, electrical and magnetic measurements, etc): Pietro Rizzo, P.A. Contat, Ludovic Grand-Clement, Jeremy Pechiney, Franck Evrard, Piotr Rogacki and Lucio Fiscarelli.

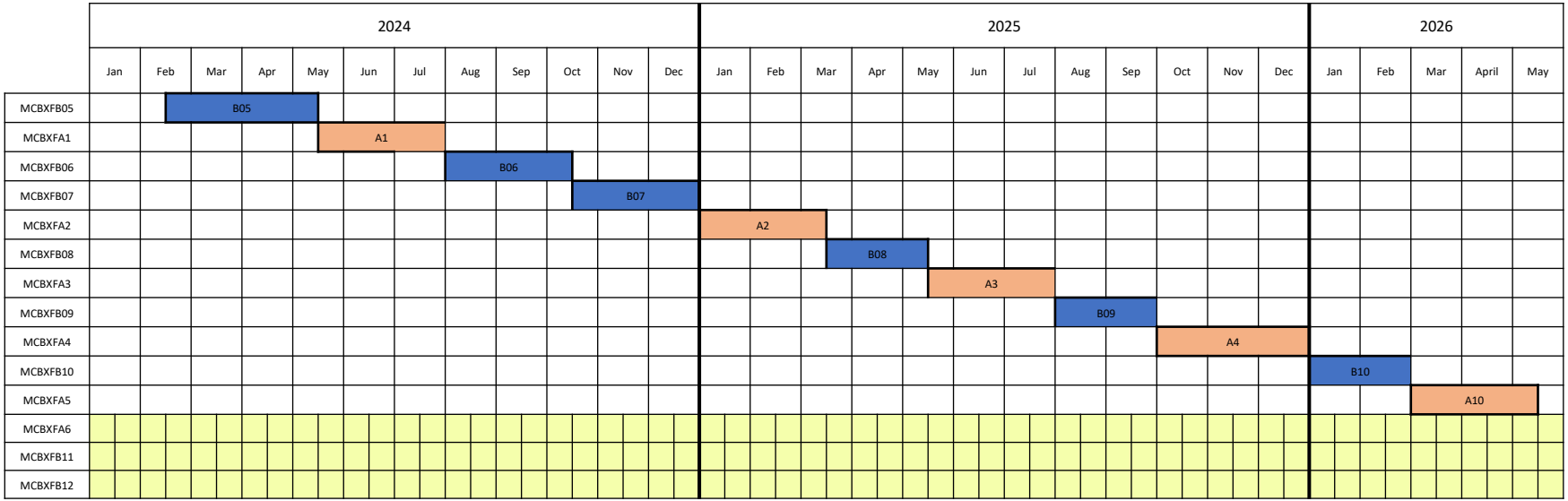
MCBXF status at CERN

- **Timeline:**



MCBXF status at CERN

- **Updated planning:**



Initial planning accounted for a delivery rate of 1 magnet every 2 months (MCBXFB) or 2.5 months (MCBXFA)
Exception for the first magnet (B05), with an assembly time of 3 months (used for knowledge transfer and production line set-up)

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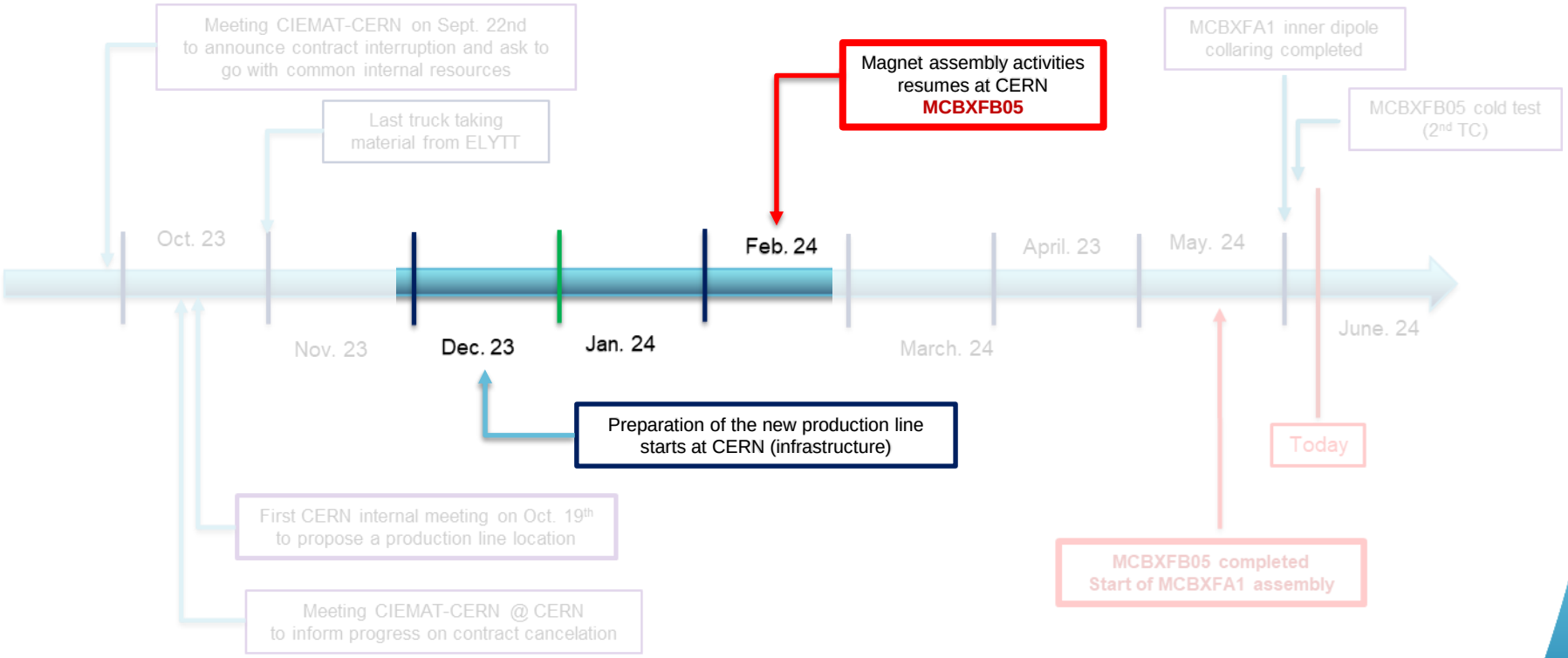
Summary of initial activities

- **A closer look to the first months…**

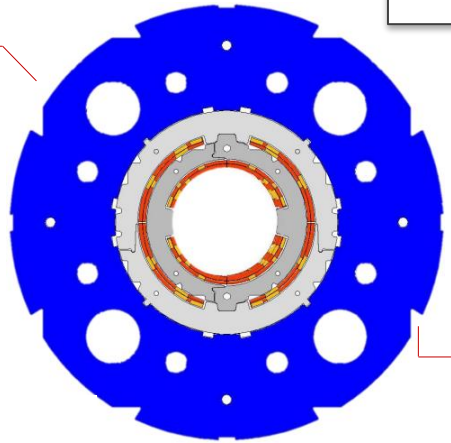


Summary of initial activities

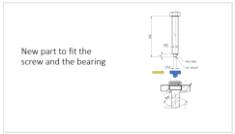
- Initial activities structured in 3 main axes:

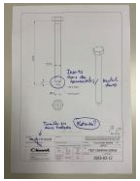
Identification, control and storage of the magnet components. Documentation!

Setup of the required infrastructure in B.180 and B.927. Planning!



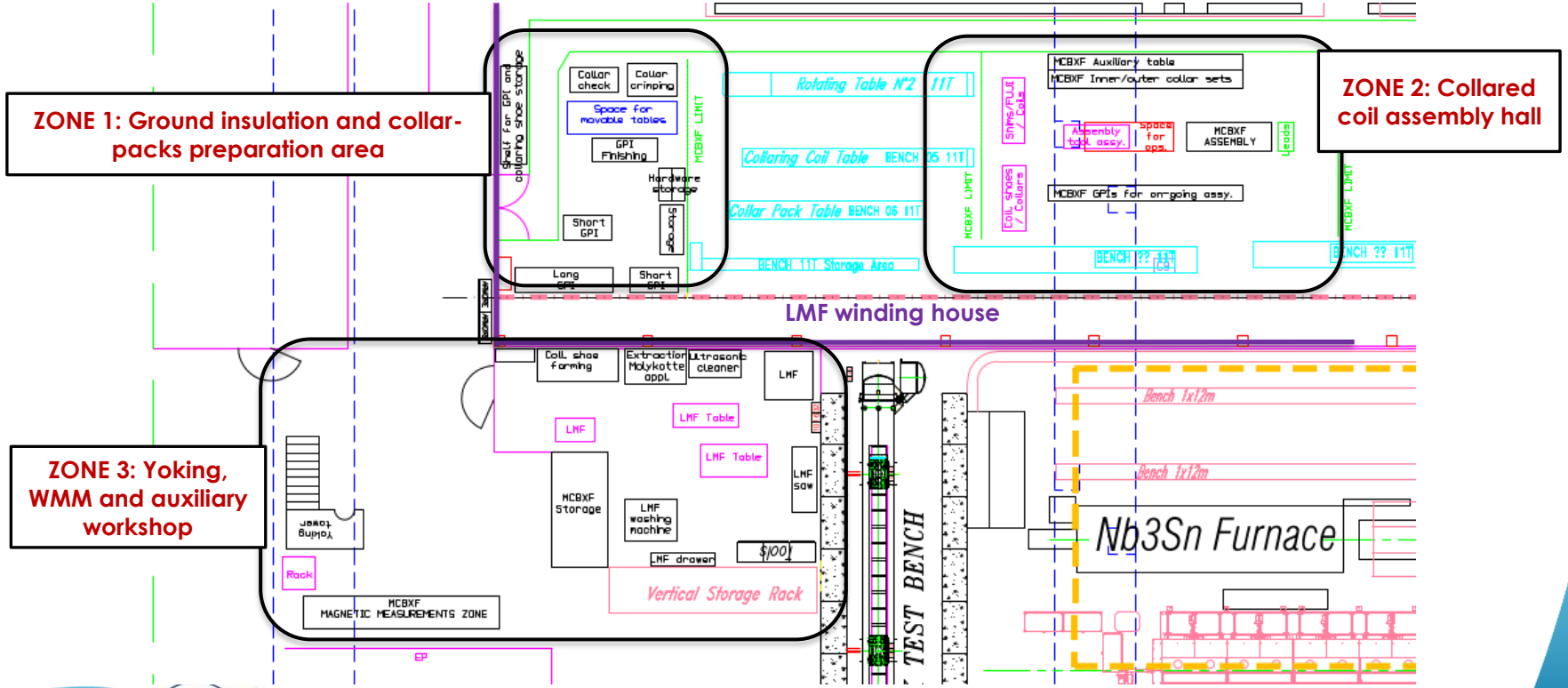
Repairs and modifications on assembly tooling (based on previous exp.). Design of new required tooling.





Setup of the required infrastructure

- All assembly operations but the Collaring are performed in building 180: 3 zones for MCBXF.



Setup of the required infrastructure

ZONE 1: Ground insulation and collar-packs preparation area

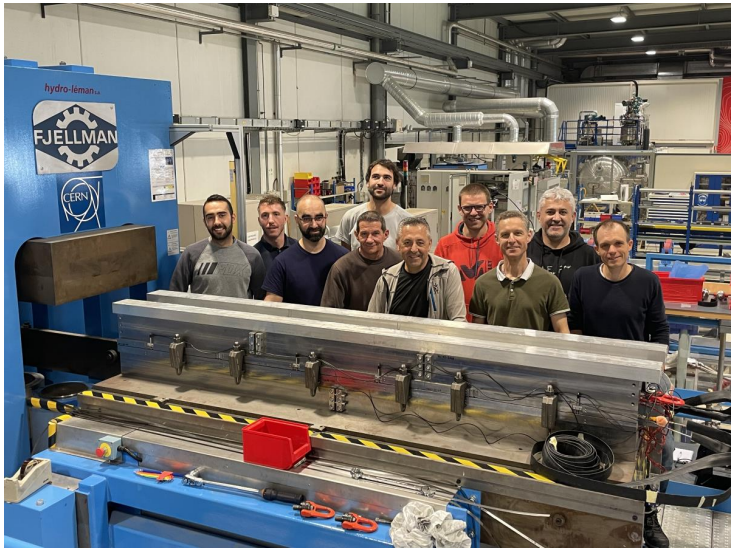
ZONE 2: Collared coil assembly hall

Setup of the required infrastructure

ZONE 3: Yoking, WMM and auxiliary workshop

Setup of the required infrastructure

ZONE 4: Collaring press and assembly area at B.927



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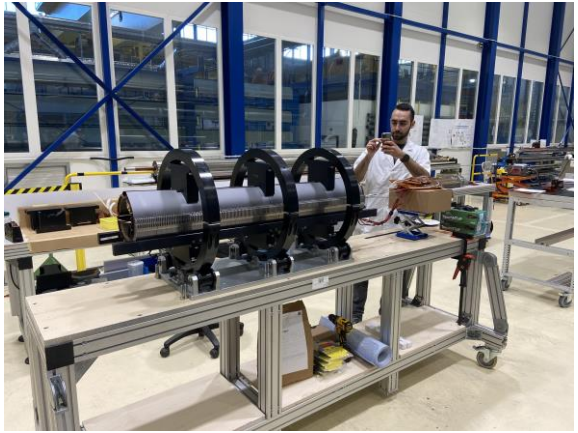
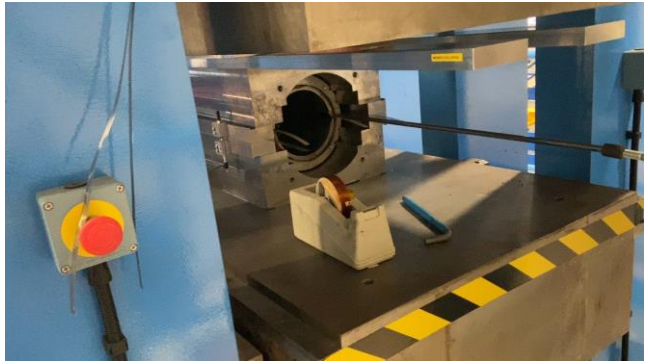
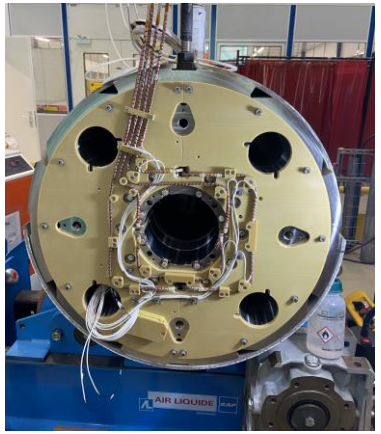
MCBXFB05

- **First magnet for the new production line**
  - Assembly duration: 3 months
    - Used for transferring the know-how to the new team and setting-up the production line
  - Two minor NCR during the assembly process
    - Inner dipole collared twice due to the mispositioning of pole shims: *EDMS 3089268*
    - Minimal damage to one Kapton layer outside the coil (on the ground insulation protruding outside the collars): *EDMS 3088744*
  - Commissioning of the magnetic measurement bench took longer than expected
    - Results cross-checked with TE-MSC-TM using shorter probes
  - Various adjustments in the procedures and tooling according to the new infrastructure and lessons learnt

MCBXFB05







HiLumi HL-LHC PROJECT

CERN

Ciemat Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas

GOBIERNO DE ESPAÑA MINISTERIO DE ECONOMÍA, INDUSTRIA Y COMPETITIVIDAD

MCBXFB05

Mechanical measurements and coil contact homogeneity (FUJI)

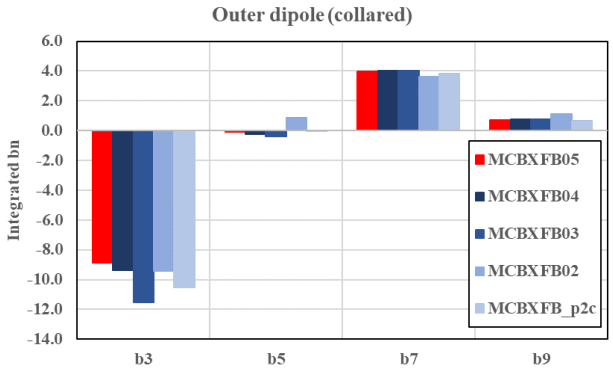
- Consistent with previous magnets

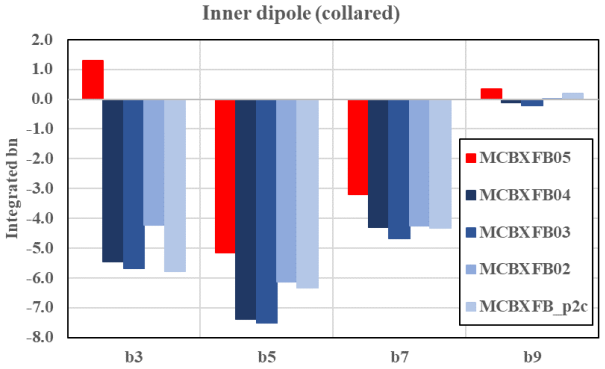
All electrical tests successfully passed

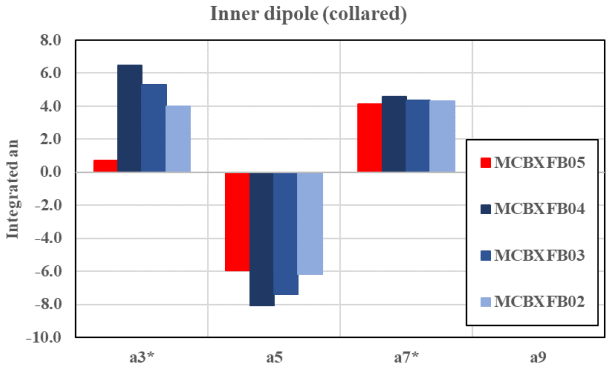
- Consistent with previous magnets

Warm magnetic measurements

- Small difference in b3 and a3 for the inner dipole ~ 5-6 units with respect to previous magnets. **We will carefully check results at cold.**
- Outer dipole in line with previous assemblies





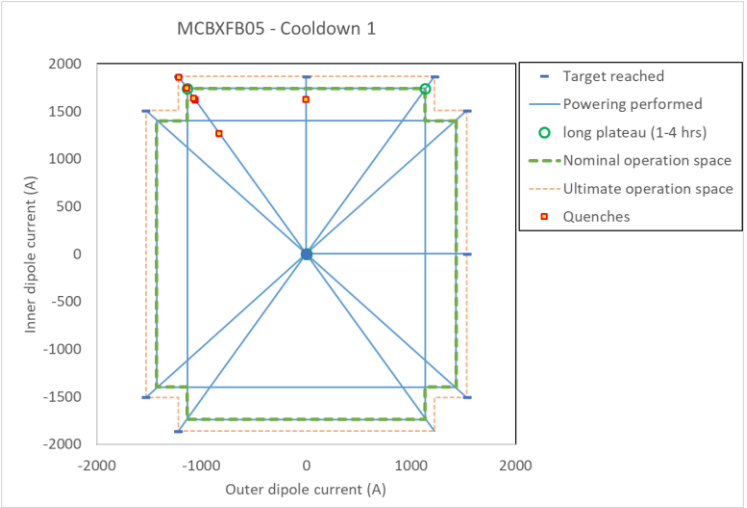


MCBXFB05

✓ Cold test (1st thermal cycle)
- Single powering:
  - 1 quench while powering the inner dipole on standalone configuration
  - No quench for the outer dipole
- Combined powering:
  - No quenches in the first quadrant, but 5 quenches in the second quadrant to reach ultimate.
  - We then went through all quadrants without further quenches (see the five markings in the current vs time plot).

- Cold test (2nd thermal cycle)
  - Single powering:
    - No quench
  - Combined powering:
    - Test on-going
  - Magnetic measurements on-going

✓ Documentation and EDMS status:
- Documentation is up to date. NCRs are closed.



Courtesy of G. Willering et al.

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MCBXFA1

- **Second long MCBXF magnet ever built (no units produced at Elytt Energy)**

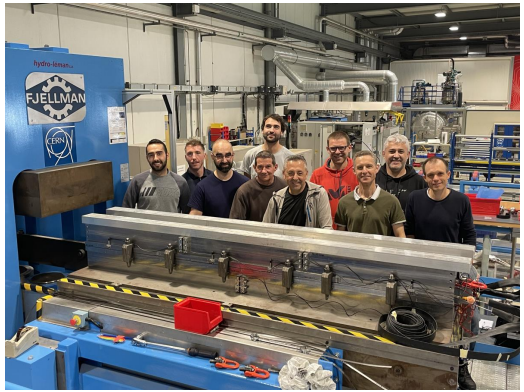
- Target for completion: July 2024

- The inner dipole has been successfully collared this week
  - Two collaring operations due to a broken midplane shim.
    NCR being written
  - Electrical tests passed after the final collaring
  - Magnetic measurements performed and being analyzed

- The assembly of the outer dipole is now on-going

- As for MCBXFB, various adjustments in the procedures and tooling according to the new infrastructure and lessons learnt.
  - For instance: optimized midplane shimming position after the breakage event

MCBXFA1



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Summary and outlook

- Setting the starting date for the new production line on mid-February (instead of the initially considered early-January due to late availability of the assembly area), activities are following the established planning
  - Longer assembly time for the first MCBXFB magnet (transfer of know-how to the new team, adjustment of processes, etc)
  - For next magnets, we want to keep the production rate at 1 magnet every 2 months (MCBXFB) and 1 magnet every 2.5 months (MCBXFA)
  - We are covered in terms of components and coils for the rest of 2024 (see presentation from Fernando Toral)

- Minor Non-Conformities during the inner dipole assembly both for MCBXFB05 and MCBXFA1
  - Corrective actions and improvements have been already implemented

- Continuous communication between the CERN and CIEMAT teams
  - Periodic meetings covering the needs in terms of components
  - Joint analysis of the main magnet results