TRIUMF 2021 EIC Accelerator Partnership Workshop
26 October 2021

CERN Superconducting Magnets Capabilities

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Strategy

When possible, CERN relies on Industry to promote return (financial and technological) to its Member States.

The CERN infrastructure for superconducting magnets is then sized to:

1. perform the required developments in view of a new project, in general together with partner institutes
2. accompany industry (also, often, together with partner institutes) in a series production
3. perform the manufacture of special units or small series which are not of interest for the industry, or would be too disadvantageous (financially, or in terms of time, or in terms of organization) to perform in industry
4. perform all needed qualification and acceptance tests of internally and externally built magnets
5. maintain the installed magnets during their lifetime

In certain cases this infrastructure has been exploited or even enhanced to support external projects (FAIR …)

Superconducting Magnets Facilities

Superconductors and Cabling Facility (building 103 and 163): Superconducting cabling machine for the fabrication of Rutherford type cable having a maximum capacity of 40 wires. Test laboratory for characterization and qualification of superconducting materials, wires and cables.

Magnetic measurement facilities: Equipment to measure magnets with apertures ranging from 8 mm to 120 mm.

Superconducting Magnet Test Facility (building SM18): test stations allowing to test at cryogenic temperature magnets and accelerator components up to 20kA in horizontal position and up to 30 kA in vertical position.

Magnet Laboratory (building 927): design, construction and assembly of SC magnets up to total length of 3 meters.

Large Magnet Facility (building 180 and 181): fabrication of SC magnets 4–16 meters, equipped with cable insulating machines, winding machines, curing press, collaring press, welding press, alignment systems using laser trackers, pressure and leak test equipment, electrical testing equipment, vertical tower for assembly of magnets using inertia tube till 10 meters of length.

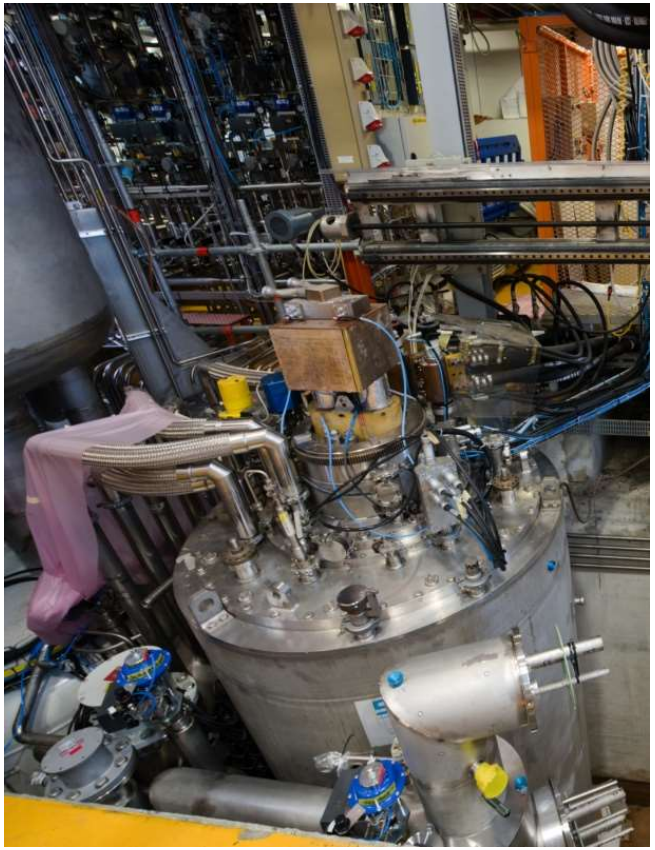
Cryostats Assembly Facility (building SMI2): equipment to develop cryostats and assemble cryomagnets.

In the next slides I am providing a synthetic overview of these facilities.

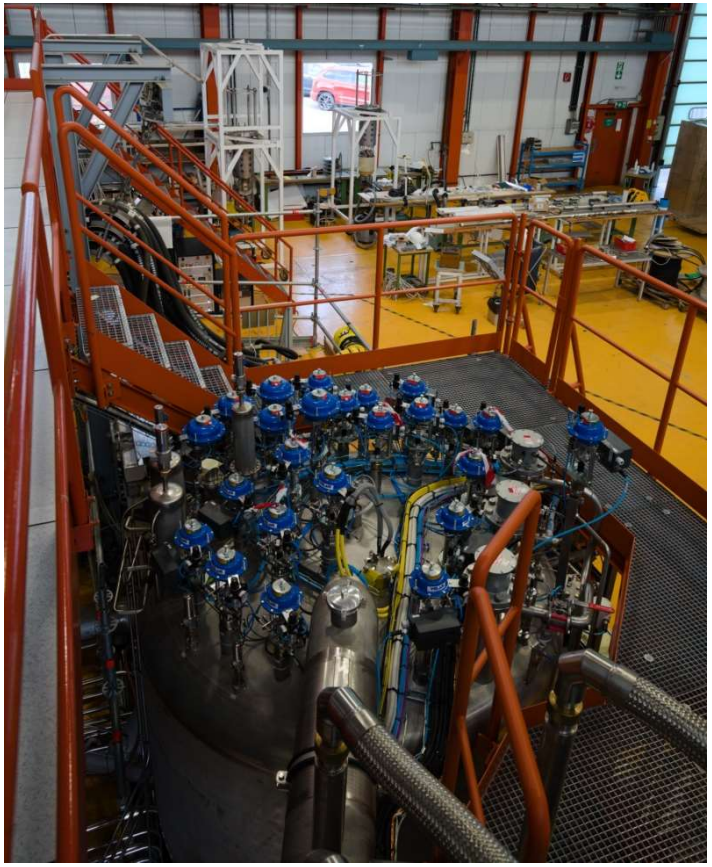
Superconductors : wires

Superconductors : cables

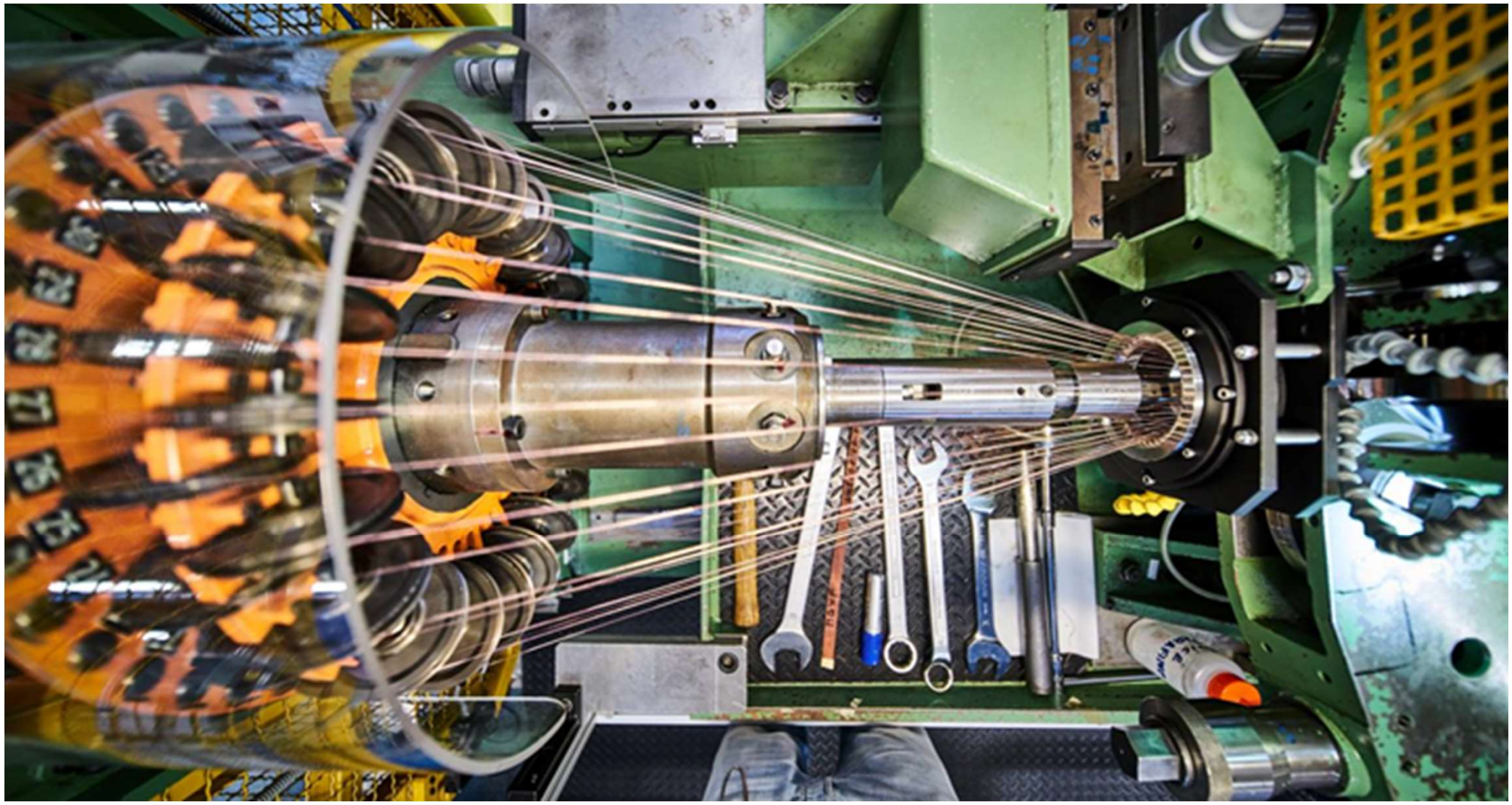
Fresca 1:
9.6 T, 32 kA DC, 45 kA SC Transformer
1.9 K and 4.5 K



Fresca 2:
13 T, 32 kA DC, 45 kA SC Transformer
1.9 K, 4.5 K and variable temperature

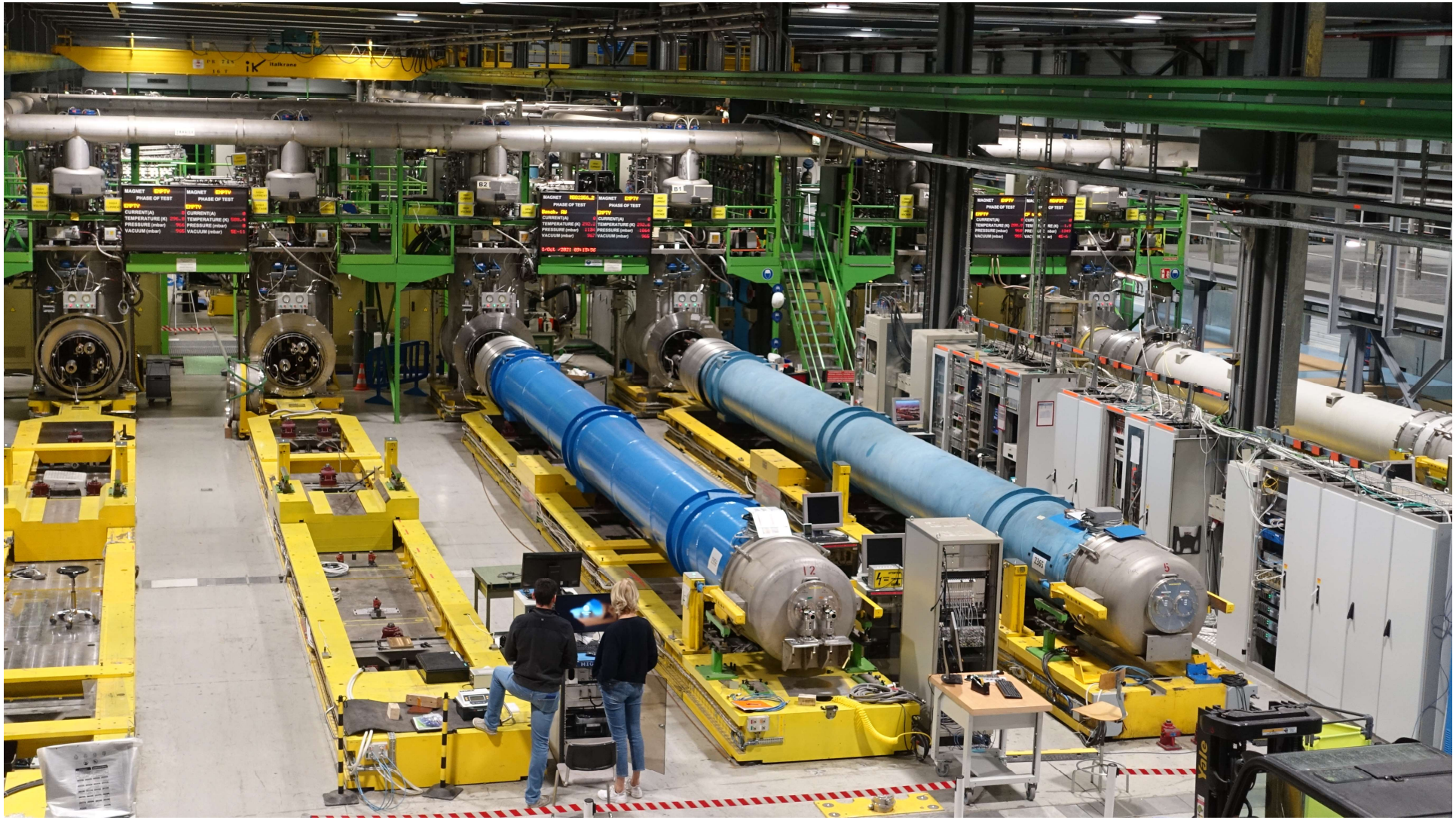


Superconductors : Rutherford cabling machine

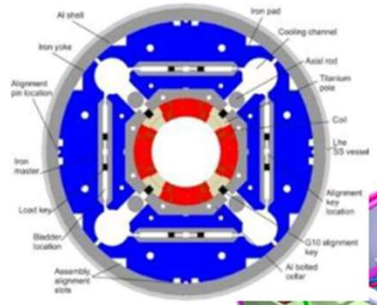


Magnetic measurement facilities

Superconducting Magnet Test Facility



Superconducting Magnet Test Facility: cluster D



MQXF models

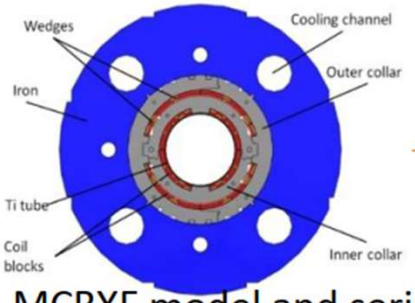
EE based on IGBT with reaction time < 1ms and adjustable dump resistor

200 channels for differential mode with 200 kHz frequency DAQ

2 x 15 kA power converters in parallel circuit to deliver 30 kA

Variable threshold QDS

Cryostat for 800 mm dimeter allowing to test a magnets up to 5 m length at 1.9 K

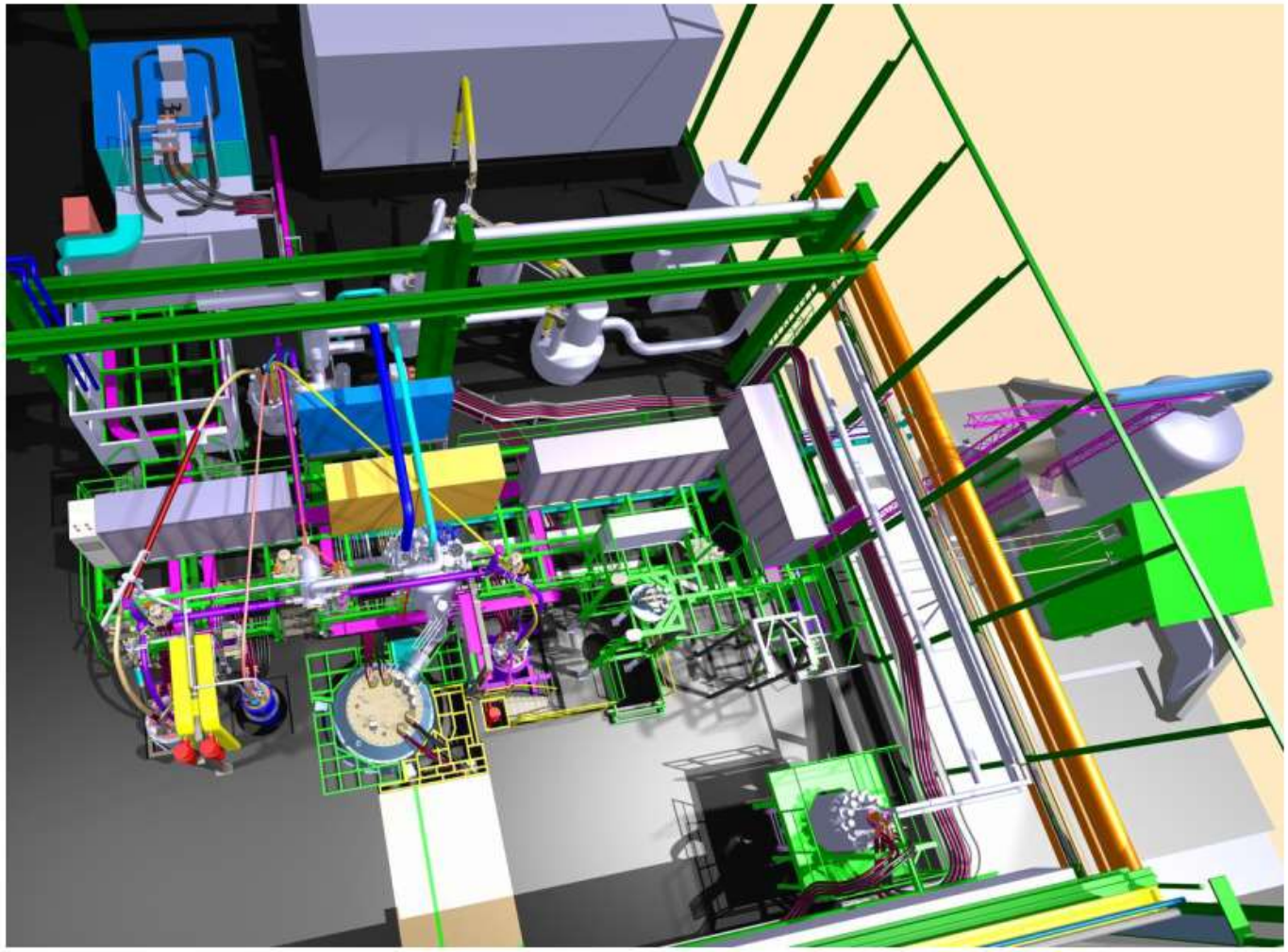


MCBXF model and series

Conventional current leads for 30 kA, 3.5 kV

New overhead crane allows handling 25 t and at -3 m level

Superconducting Magnet Test Facility: cluster G



"HFM" CRYOSTAT ALLOWS TESTING MAGNETS WITH
1500 mm diameter and 2. 5 m length

Magnet Laboratory

Large Magnets Facility (5500 + 1500 m^2)

Finishing benches
Geometrical measurements

15m Welding press

15m Collaring press

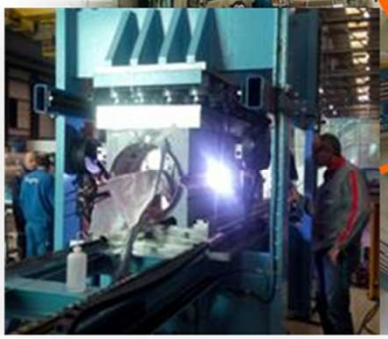
Pressure/leak bench

Nb3Sn
Reaction
furnace

Yoke assembly
bench

"Winding house"

Impregnation
chamber



Welding press for 2m models

Half Yoke
returning
bench

Cold mass
assembly
bench

Collared coil
returning
bench

Collared coil magnetic
measurement bench

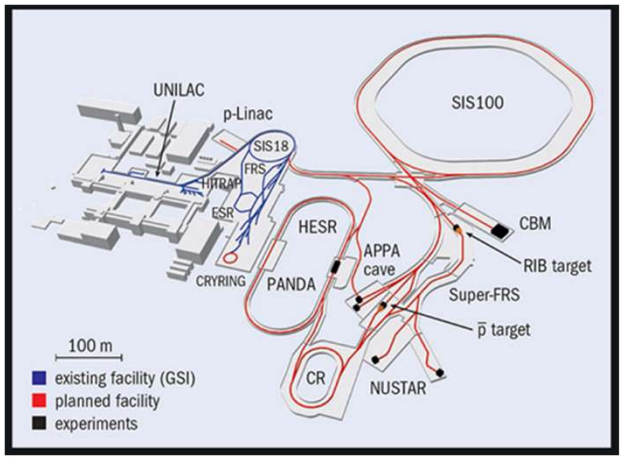
Cold mass magnetic
measurement bench

Large Magnets Facility : winding house

Cryostats Assembly Facility

Test facility for Fair

Compatible with 35 different types of magnets : 11 types of dipoles and 24 types of multiplets

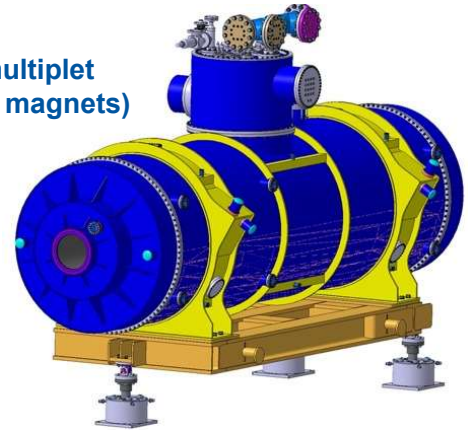


Super-FRS (Fragment Separator), provides the Separation and identification of exotic nuclei before storage in the storage rings

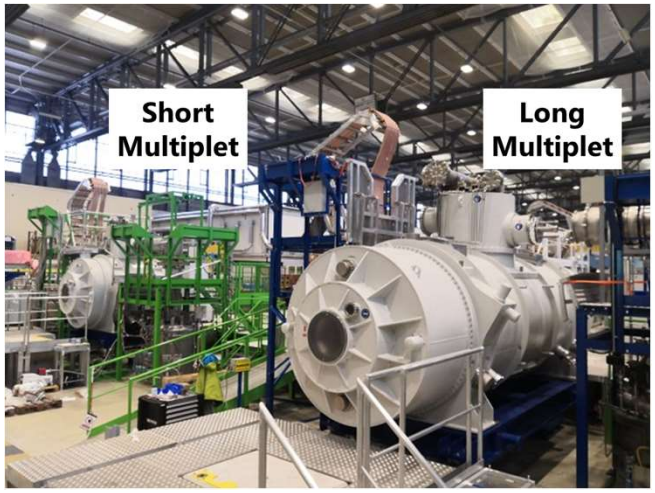
Standard dipole

Forced-flow, warm yoke

Long multiplet (max. 9 magnets)



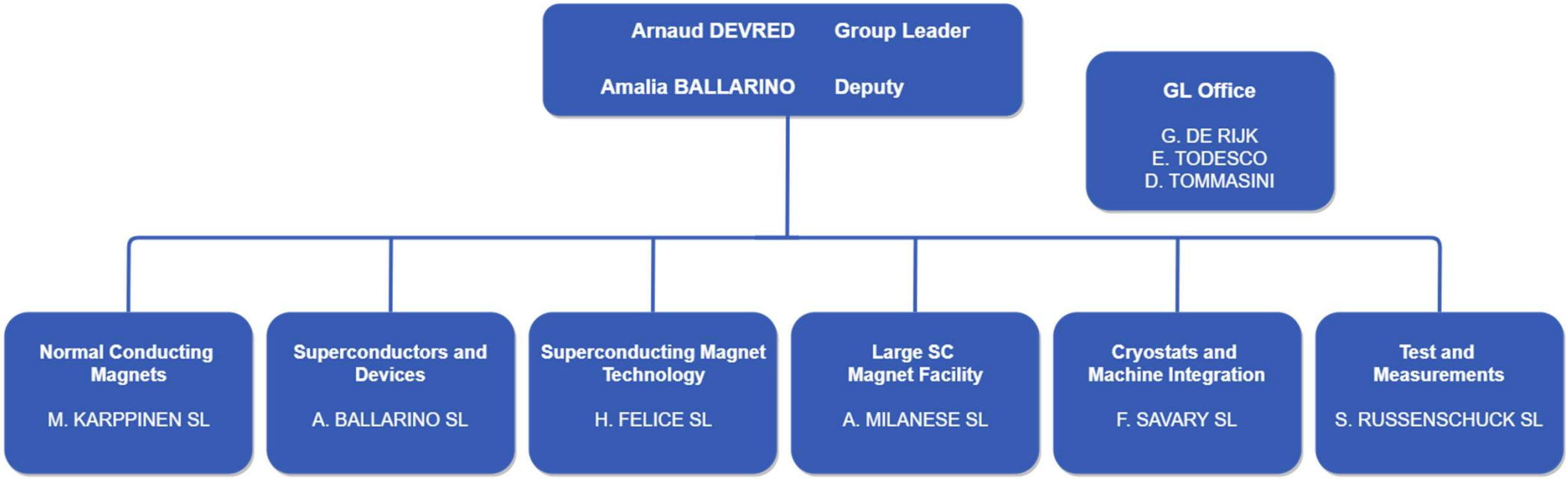
Helium bath, cold yoke



For any further information

TE
Technology Department

MSC
MAGNETS, SUPERCONDUCTORS & CRYOSTATS



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