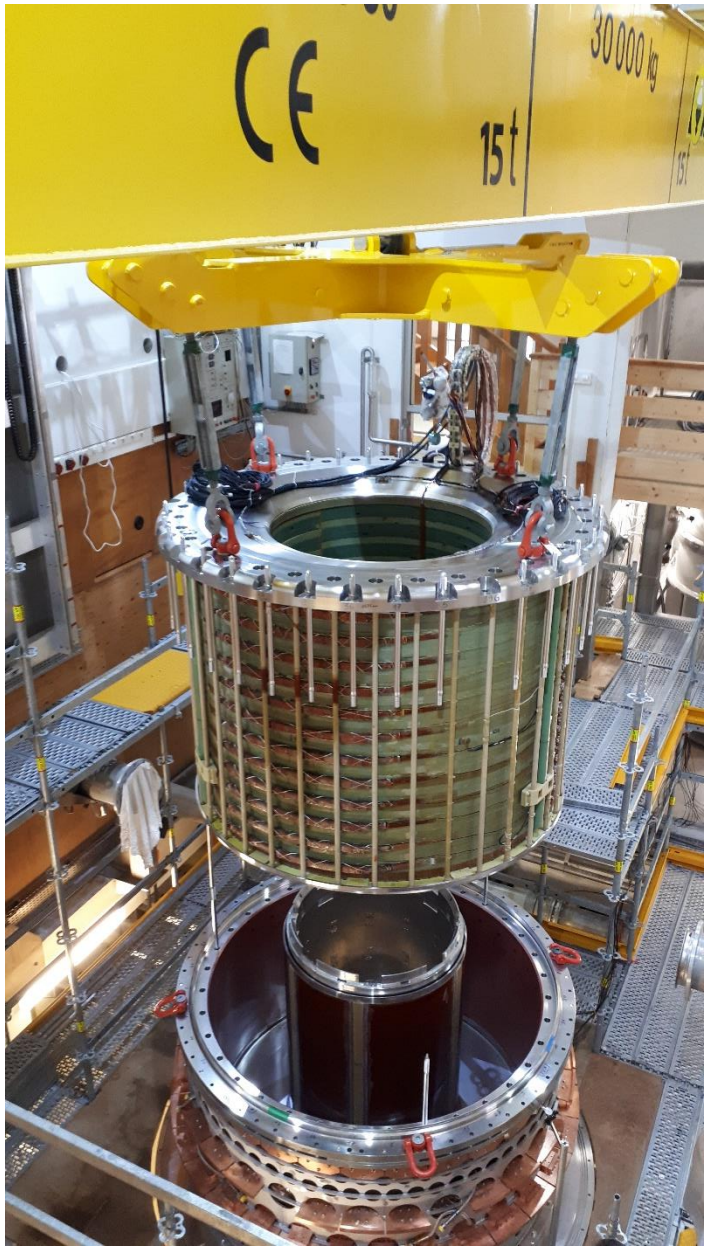
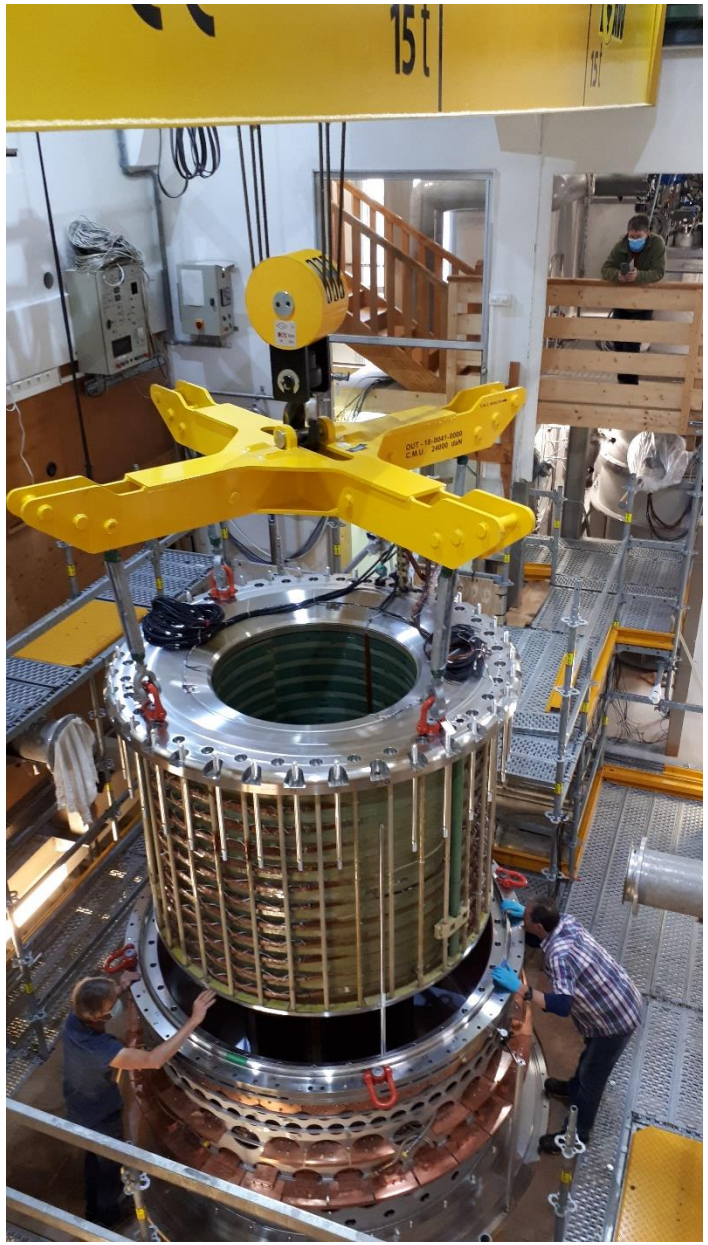
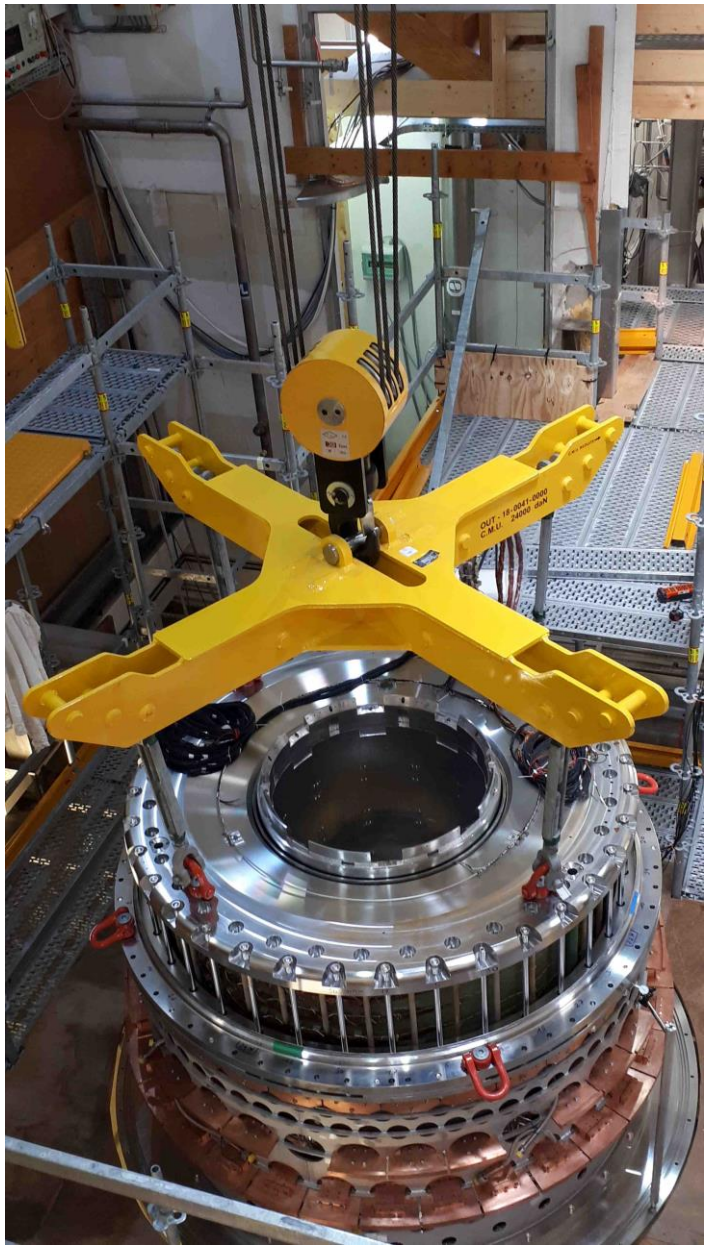
News from CNRS-LNCMI

Charles Simon

43+T Grenoble Hybrid : Successful insertion of the superconducting coil* (May 5, 2021)







** Minimum clearance of 0.3 mm/radius*

43+T Hybrid : End of the Magnet Cryostat Assembling (7 Dec. 2021)

40 K thermal shield

100 K thermal shield

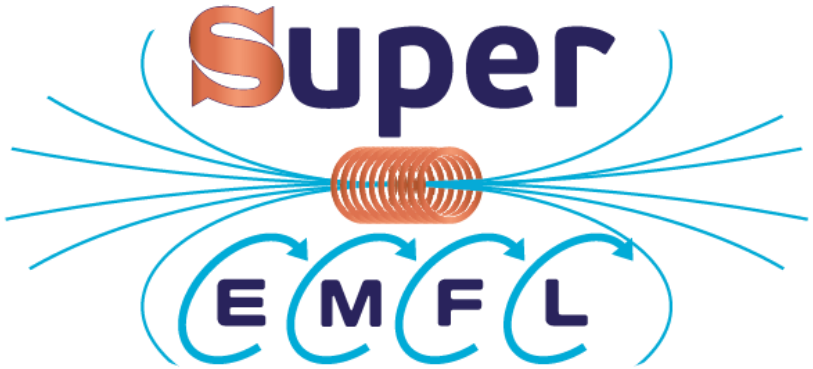
Outer Vacuum Chamber

The 43T hybrid magnet enters in the commissionning phase

Increase of the power of Grenoble high field facility

- UpAlim enters in phase 2 : from 24 MW (today) towards 30MW in 2023. In parallel : Energy efficency (20% savings for the same science).

- Phase 3 : 40 MW .



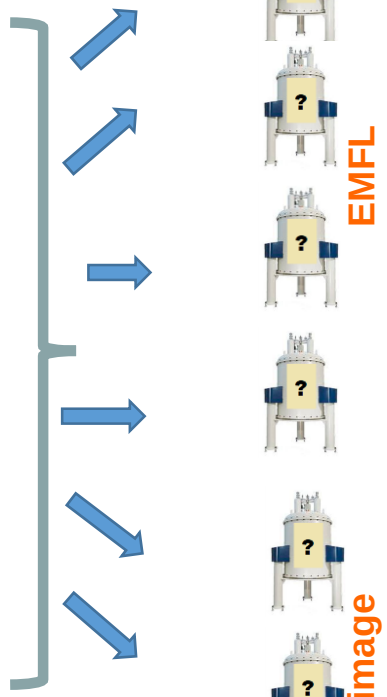
11 partners / Budget 2.9 M€ / 4 years
Started January 2021

The SuperEMFL-project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 951714.

SuperEMFL concept

A serie of LTS + HTS superconducting magnets as new tools integrated within EMFL

LTS outsert + HTS insert



Dresden

Toulouse

Grenoble

Njijmegen

ILL / ESRF

ESS

Max field
Bore size

Geometry
Homogeneity

Compatibility with local instruments

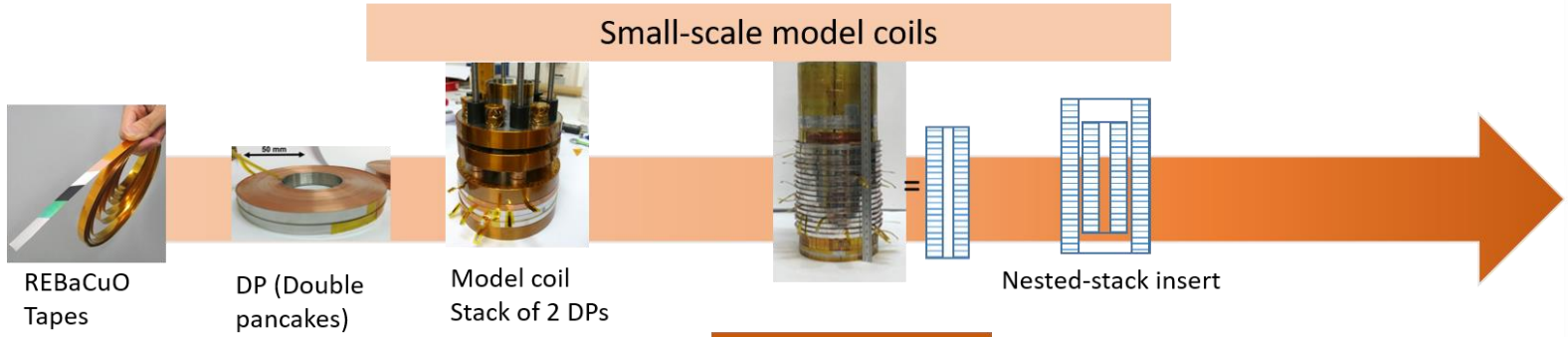
- DC 50 mm
- Pulse 25 mm
- Beam line

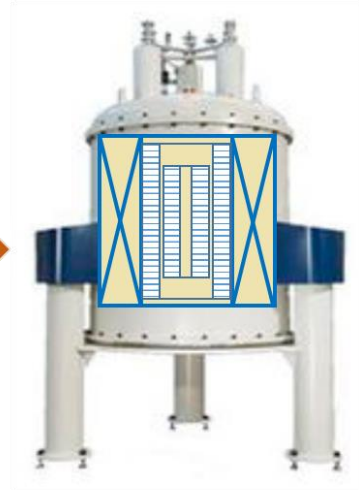
Opportunities with local equipment

- Helium recovery
- Helium liquefier

HTS Roadmap

From tapes to a 40+ T all-superconducting magnet chart





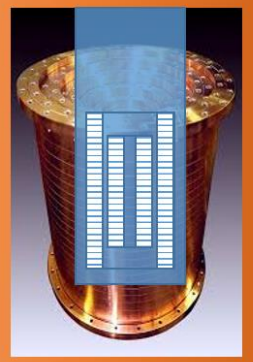
Target : Conceptual design of a 40+ T all-SC user magnet

Byproducts : Dedicated intermediate field magnets of which a 32+ T all-SC user magnet

Proof-of-concept

- Cycling fatigue test
- LTS/ HTS coupling

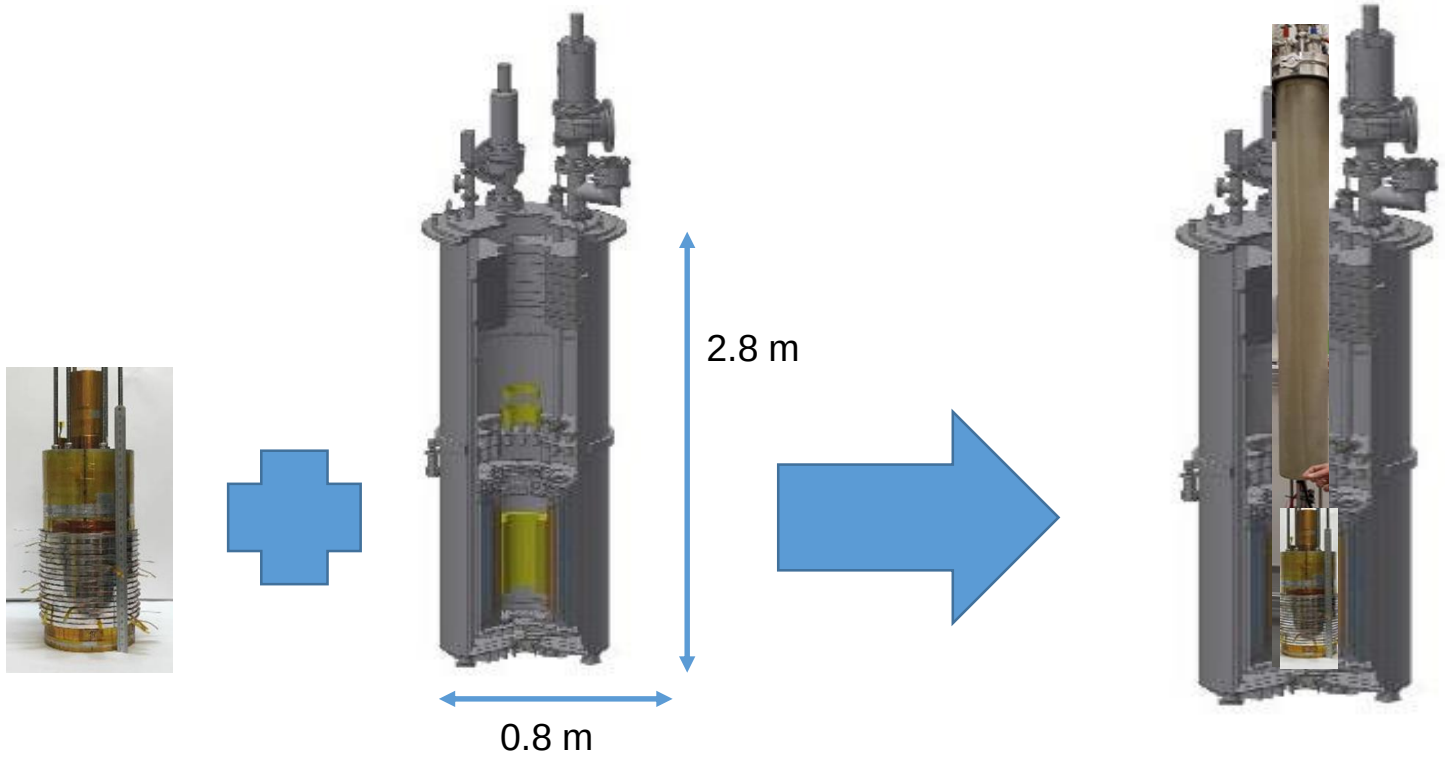
- Concept of user magnet



- Electro-magnetic and mechanical behavior of a nested-stack insert

FASUM
Forty Tesla All Superconducting User Magnet

(French research agency – Université Grenoble Alpes, CNRS, CEA – Started December 2021)



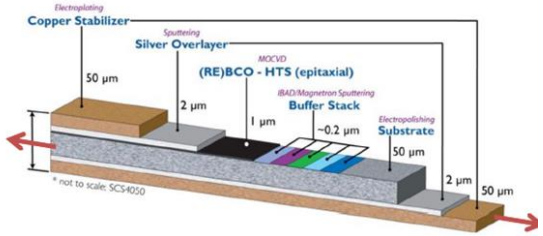
Custom HTS insert

« Commercial » LTS 19 T magnet

40 T class magnet for LNCMI users
25 to 50 mm TBD diameter available for experiments

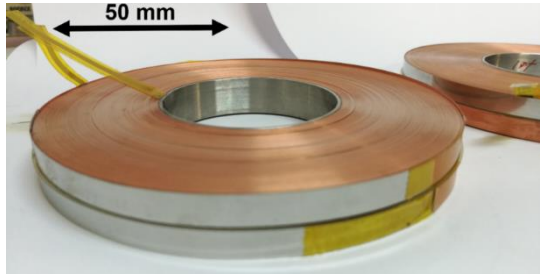
The 10 T Nougat HTS insert as starting point

- REBaCuO coated conductor



☺ High transport current under high magnetic field
☺ High mechanical strength due to Hastelloy

- Pancake coils



☺ Affordable for 100-200 m pieces

- Metal-as-insulation winding

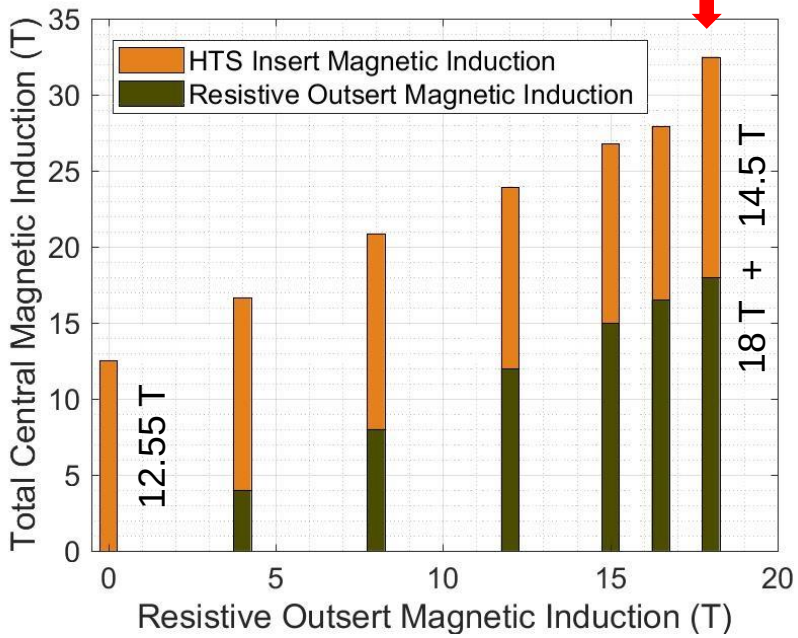
☺ Best protection against quench

- Strained limited at 0.4 %

9 HTS MI DP stack

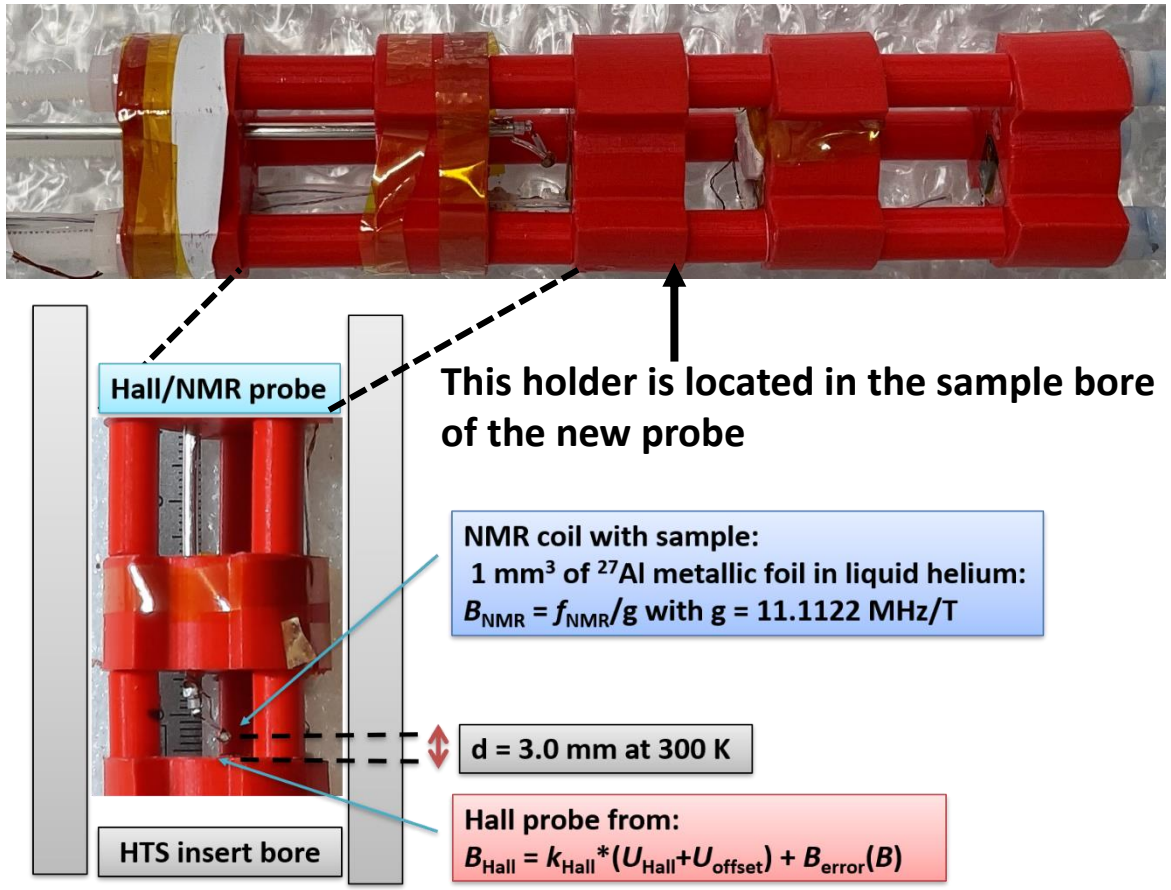
32.5 T
26th of March 2019

Total field vs resistive background



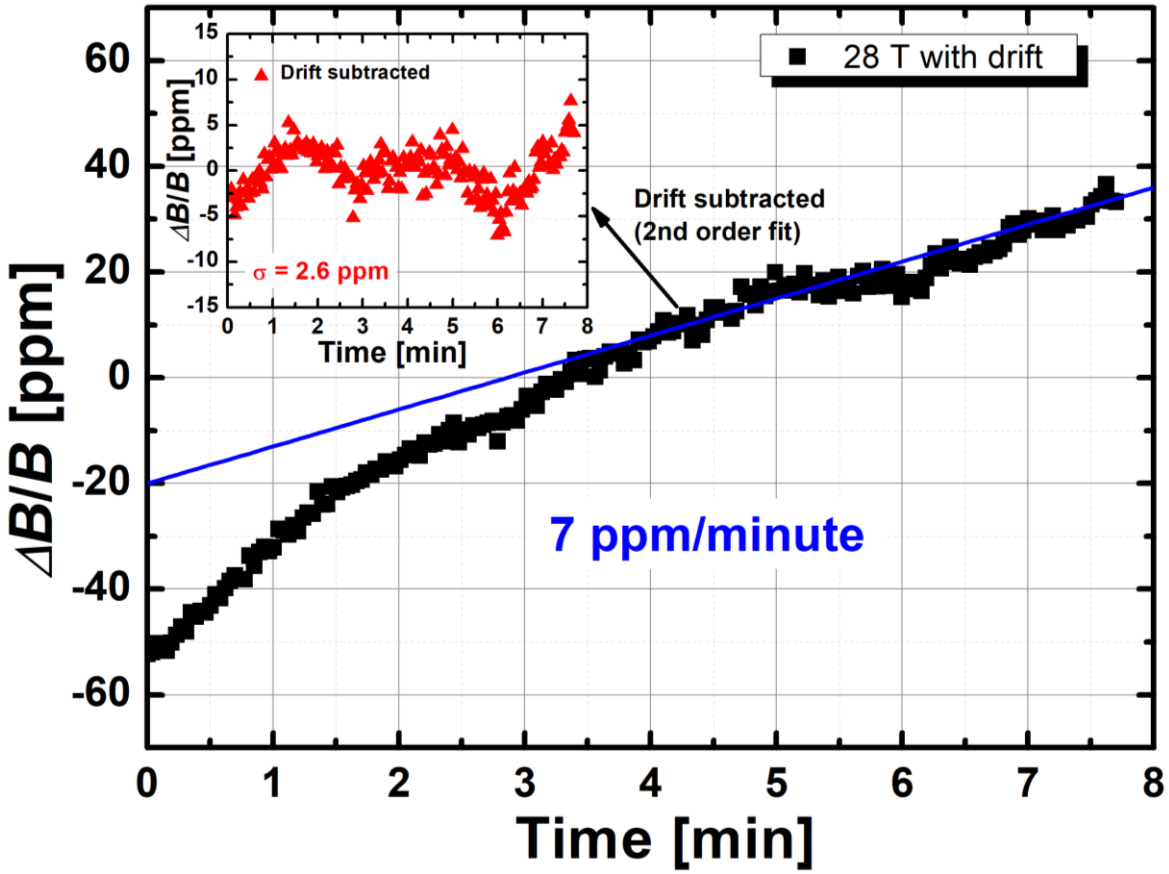
P. Fazilleau et al., Cryogenics **106** (2020) 103053
DOI: 10.1016/j.cryogenics.2020.103053

New experimental set-up

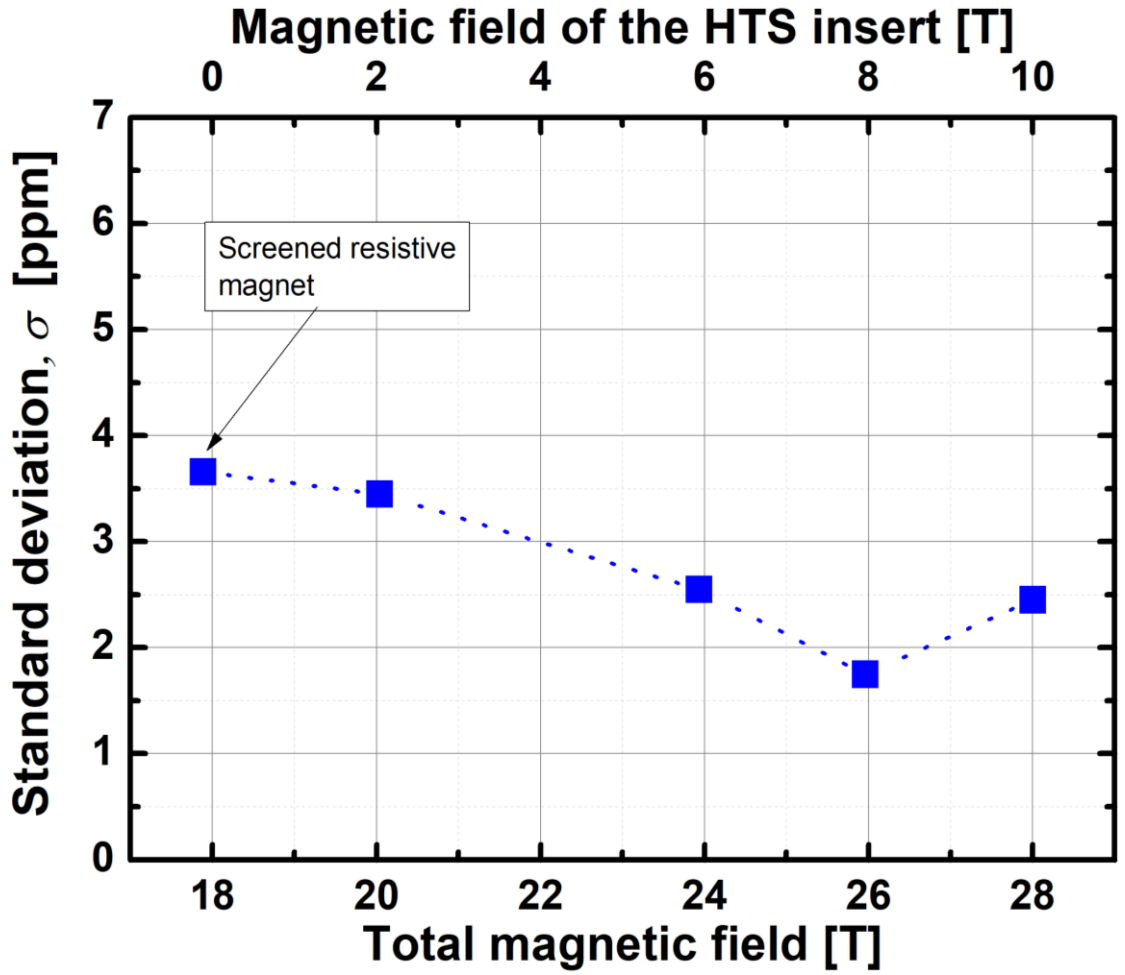


The new probe provides an open access (∅ 34 mm) to the insert bore and is equipped with a NMR probe.

Estimation field draft and fluctuation via NMR



Δ*B*/*B* measured NMR as function of time at B_{tot}= 28 T at 4.2 K



σ values of field fluctuation subtracted from 2nd order fit of results as function of B_{tot}