

Magnet Engineering & Applied Superconductivity at Alma Mater Studiorum - Università di Bologna

Marco Breschi
Massimo Fabbri
Antonio Morandi
Pier Luigi Ribani



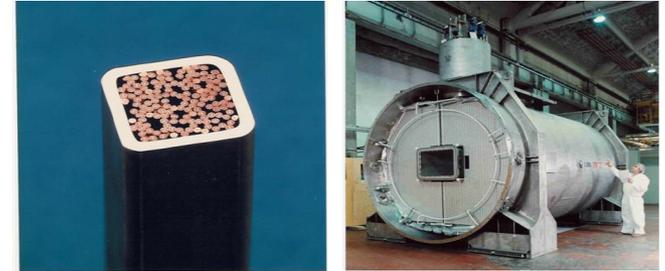
DEI – Guglielmo Marconi
Dep. of Electrical, Electronic and Information Engineering
Alma Mater Studiorum – Università di Bologna, Italy

FuSuMaTech Annual Meeting, April 21st, 2021

LIMSA – Laboratory of Magnet Engineering and Applied Superconductivity

Founded in 1977 by Prof. Francesco Negrini

- **Resistive 4.5 T MHD magnet in operation until 1990**
- **National project on MHD (1989-1993): Development of a LTS saddle magnet 62 MJ - 5 T field, warm bore**



Started a new in 2004

Permanent staff

- **Prof. Marco Breschi**
- **Prof. Massimo Fabbri**
- **Prof. Antonio Morandi**
- **Prof. Pier Luigi Ribani**
- **2 Post-Doc researchers**
- **3 PhD students**
- **8-10 Graduate students per year**
- **6 Undergraduate students per year**

LIMSA research today



Magnet technology

- Accelerator magnets: field harmonics, quench, current distribution
- Fusion magnets: conductors, joints
- MRI magnets: field quality



Power applications of superconductors

- Fault current Limiters, SMES
- DC transmission and distribution
- Grid integration and modeling
- Magnetic Levitation



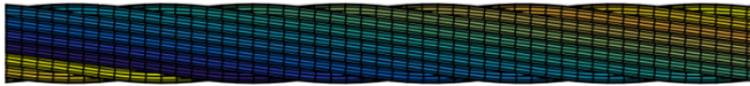
Other (non superconducting)

- Energy Storage
- Induction heating

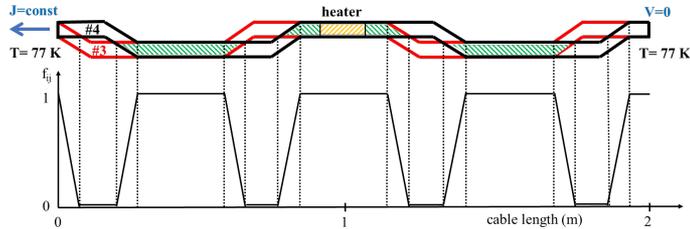
Modeling at LIMSA

Accelerator magnets

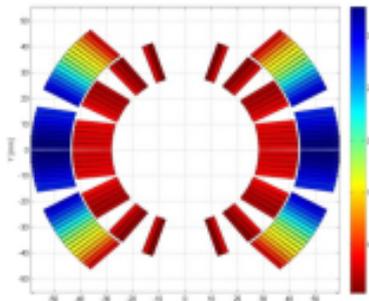
Rutherford cable



REBCO cable



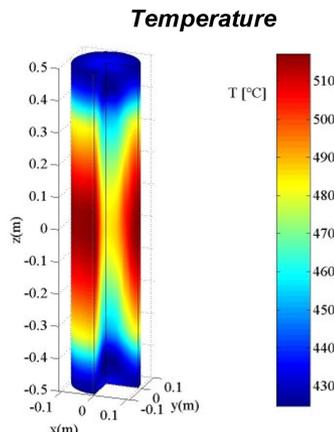
CERN - PSI
Stability, quench,
AC losses in
accelerator cables
magnets



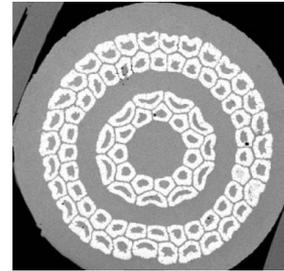
LHC dipole

HTS bulks

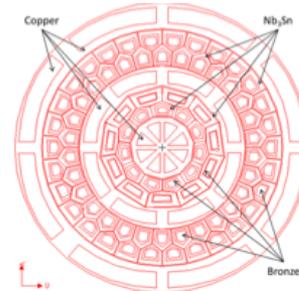
3D models of
bulk HTS
magnets and
conductors



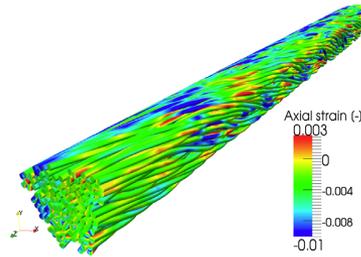
Fusion magnets



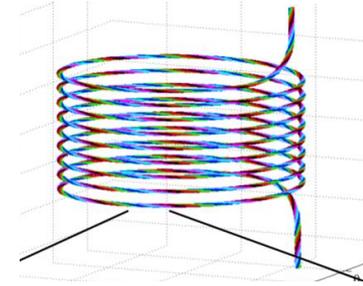
OCSI wire



Strand



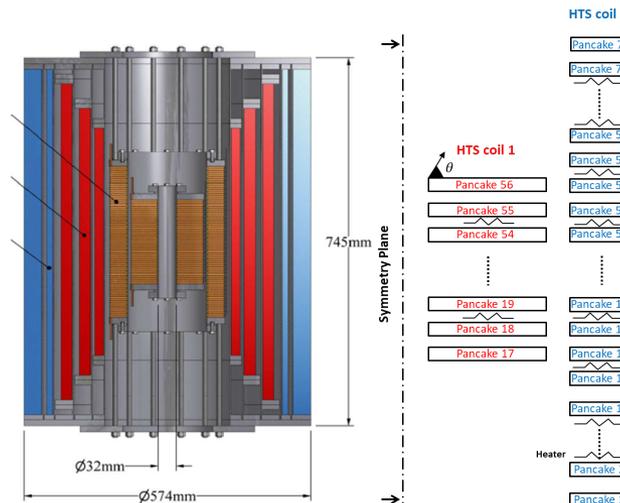
Cable



Coil - Magnet

ITER - ENEA
AC losses and current distribution in
strands, CICCs and full size magnets

High Field magnets



NHMFL (USA)

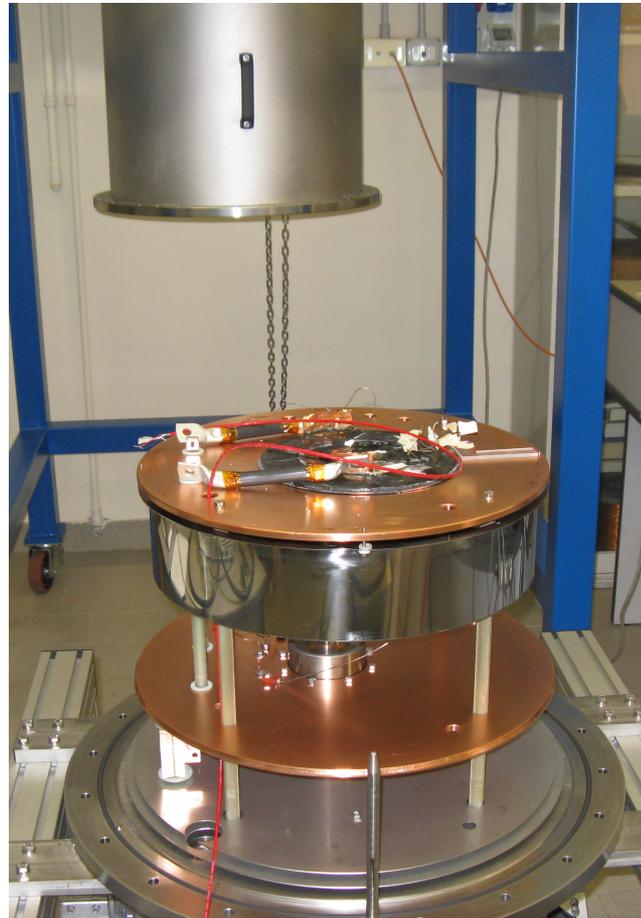
Full HTS magnet
model to study
quench in the 32 T
fully
superconducting
magnet



Experiments at LIMSA

**Cryo Cooler
Sumitomo RDK-
408D**

**Operating
temperature
10 K – 300 K**



**Biaxial handling (PM) and
levitation force measurement
system, 500 N max**

***Characterization of MgB₂ and
YBCO bulks or composite***

***AC loss and quench analysis of HTS tapes
Quench analysis on MgB₂ pancakes
Test of small Coils down to 10 K
Test of small NI coils***

Tests in atmospheric pressure liquid nitrogen

Characterization of HTS tapes at 77 K

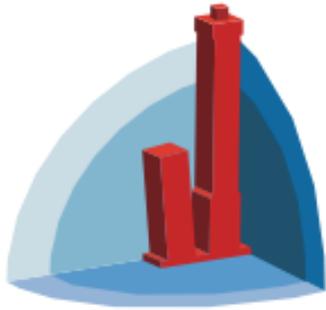
Workshops, summer schools and conference

2015
Chats



Applied Superconductivity

International School on Modeling for Applied Superconductivity



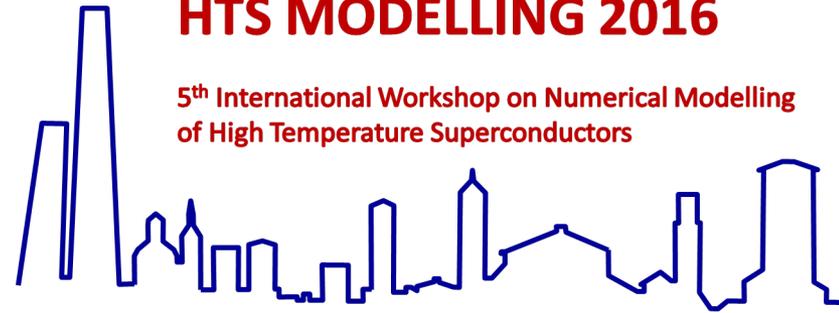
EUCAS2023

Bologna, Italy
3rd-7th September



HTS MODELLING 2016

5th International Workshop on Numerical Modelling of High Temperature Superconductors



June 15-17, 2016 Bologna – Italy

<https://events.unibo.it/htsmodelling2016>

ESAS Summer School on High Temperature Superconductors Technology for Sustainable Energy and Transport Systems

June 8 - 14 2016, Bologna – Italy

<https://events.unibo.it/esas-summer-school-2016>

