Mid-Term Review
10 December 2018, Brussels

Mattia, DONATO

ESR7, WP3

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EASITrain – European Advanced Superconductivity Innovation and Training. This Marie Sklodowska-Curie Action (MSCA) Innovative Training Networks (ITN) has received funding from the European Union's H2020 Framework Programme under Grant Agreement no. 764879

ESR7, WP3 - Background

- Background:
  - 2006 – 2010: Bachelor in Physics (*Laurea Triennale*) at University of Genova (Italy)
  - 2010 – 2013: Master in Physics (*Laurea Magistrale*) at University of Genova (Italy)

    10 months: ERASMUS Student Mobility for Study at Uppsala University (Sweden)

    8 months: ERASMUS Student Mobility for Placement at Applied Nuclear Division of Department of Physics and Astronomy - Uppsala University (Sweden) – Master Thesis

  - 19.08.2013 – 18.08.2017: European XFEL GmbH (Detector Group), Hamburg as Doctoral Candidate
  - Enrolled at University of Hamburg

  - 11.12.2018 **(Tomorrow afternoon 2pm in Hamburg):** Oral Doctoral Defence - "*Commissioning and Characterization of the first DSSC Ladder X-ray Camera Prototype for the European XFEL*"
    - PhD University: Universität Hamburg
    - PhD Supervisor: prof. Erika Garutti

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ESR7, WP3 - Background

Contract start date: 1st June 2018
EASITrain Supervisor(s): Dr. Matteo Tropeano
Company: **Columbus Superconductors SRL**
(Small enterprise, about 25 employee)

Columbus Superconductors
ASG Superconductors
PARAmed MEDICAL SYSTEMS

→ ASG SUPERCONDUCTORS

The 1st November 2018 the **three** companies **merged** into **ASG Superconductors SpA**
(Industry, about 150 employee)

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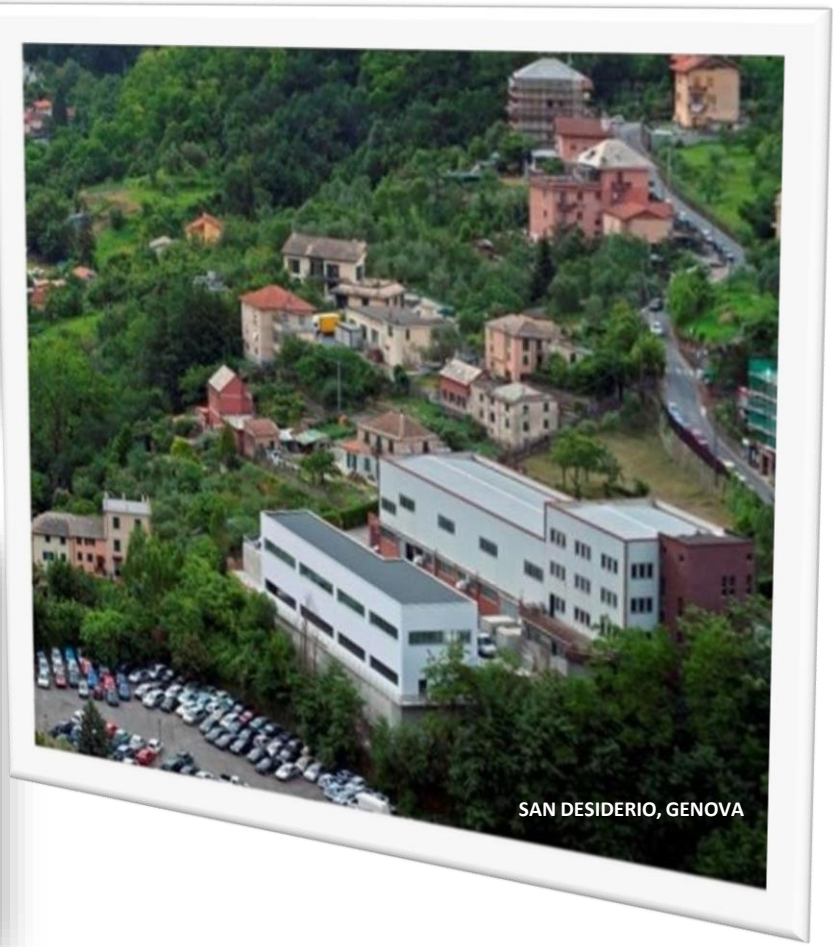
Columbus Superconductors

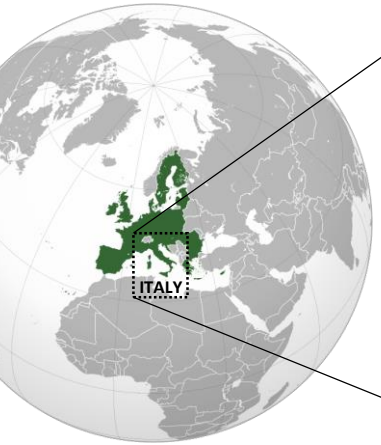
The actual plant is fully operational for

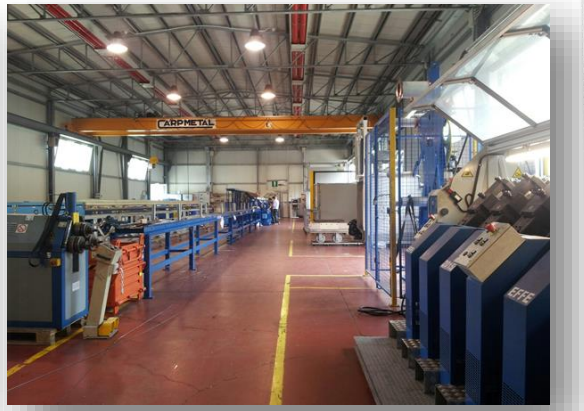
MgB_2 wire production

MgB_2 chemical synthesis

Wire unit length today up to **2- 4 Km in a single-piece length**







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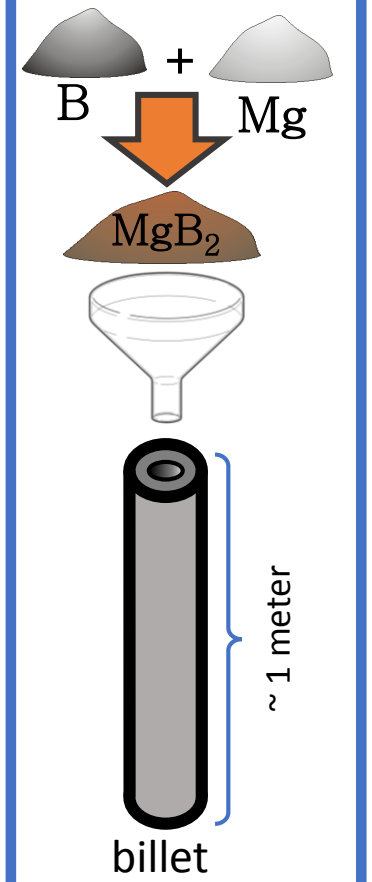
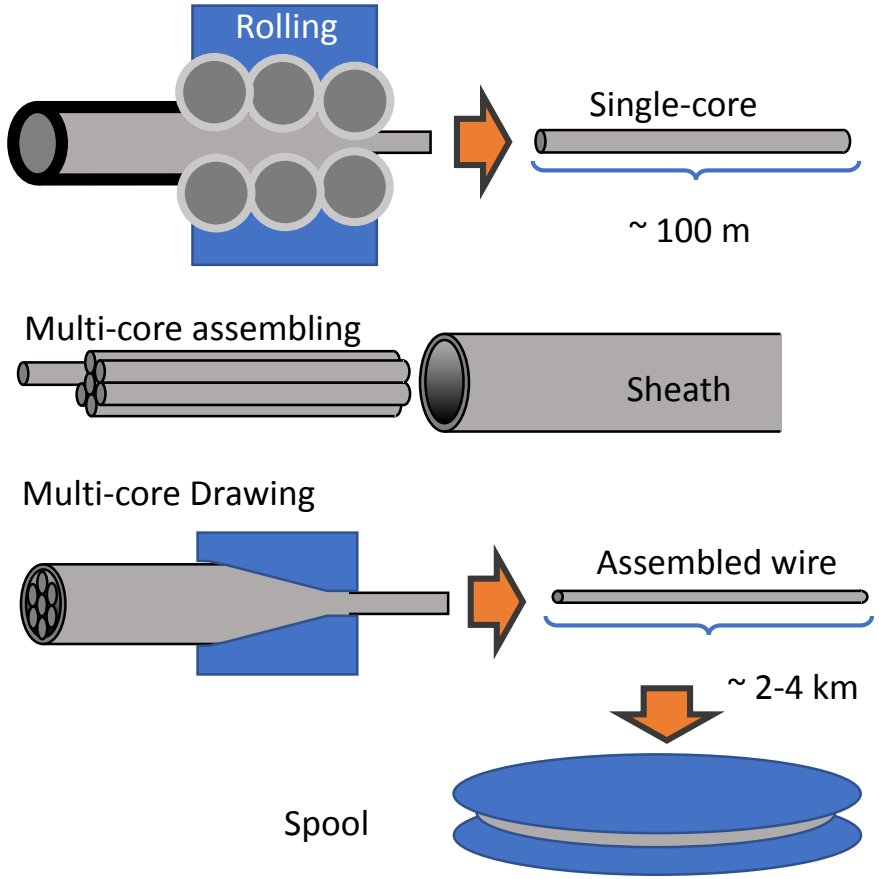
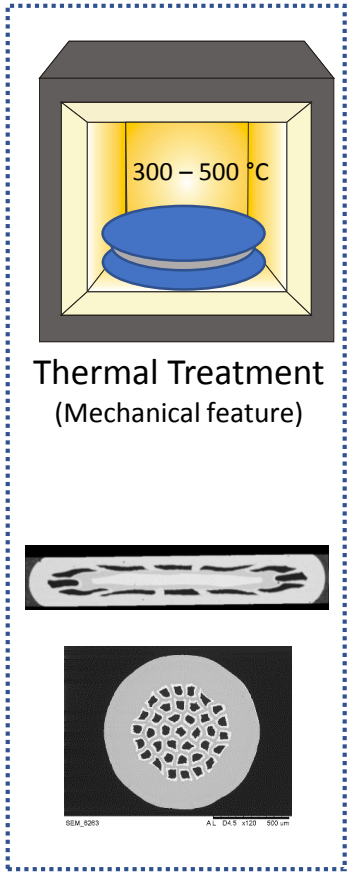
Production

I phase

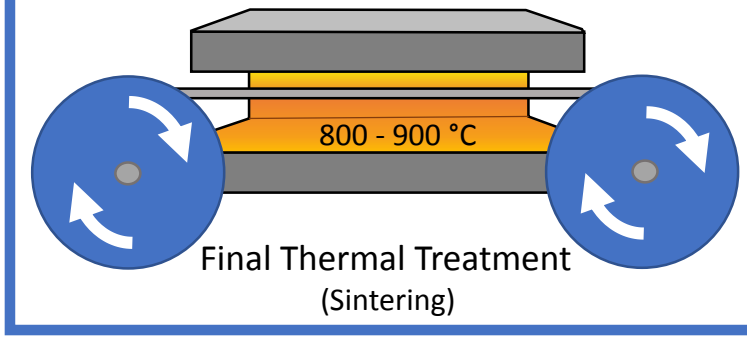


II phase

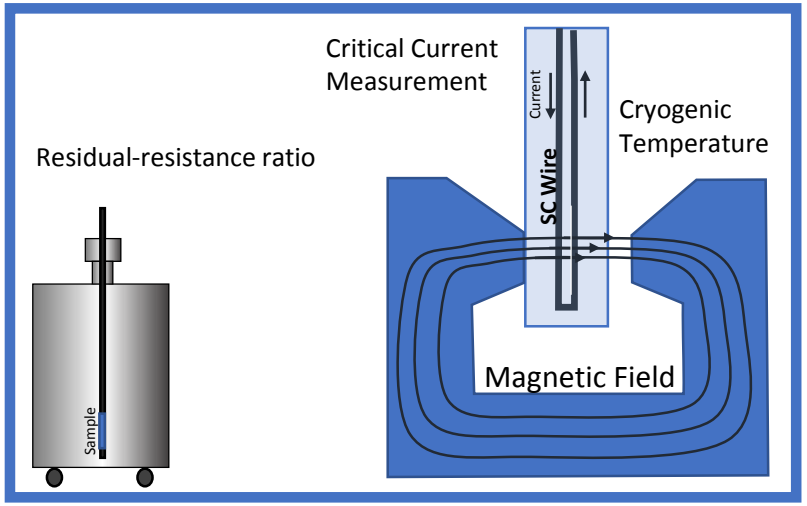




III phase



Quality Assurance



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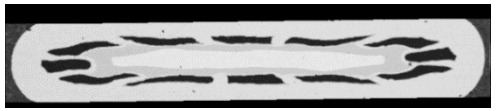
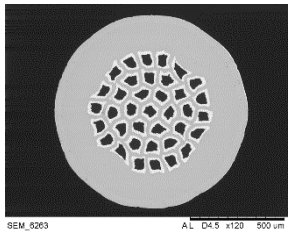
Role in the Project & Objectives

Main Objective: Development of MgB2 wire for high-field magnet application.

MgB_2 tape 3.6mm x 0.6mm



MgB_2 round wire diameter 1mm

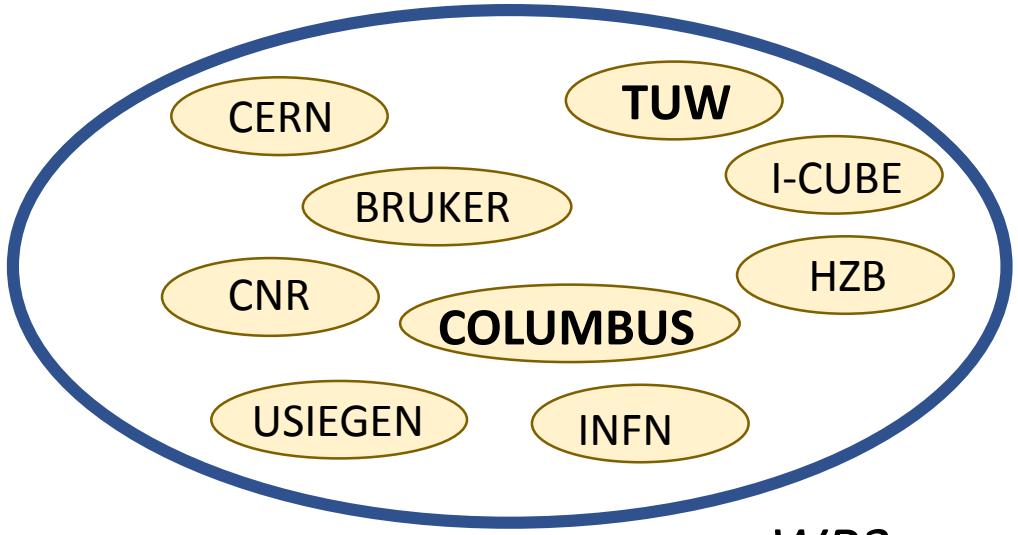


WP3 (Manufacturing workpackage),
The goal is oriented to the optimization of the superconductors production processes.

- Develop and define procedures to control **and improve the manufacturing process** of MgB2 wires, in particular of the wires suitable for use in **high field** magnets.

- **Improve the critical current** testing capabilities of the production plant improving **cooling efficiency** and introducing **automatic measurements**.

- Enhance automatization and **control** of the **manufacturing process** parameter



WP3

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Research, Methodology, Results & Next Steps

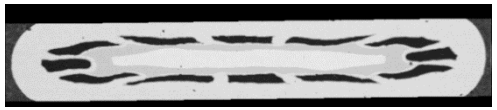
TUW, both ATI and USTEM, are key collaboration partner

- 1. TUW (ATI), Vienna:
  Evaluation of superconducting **properties** of MgB2
  wires to understand **mechanism** and enhance **in-field performance**

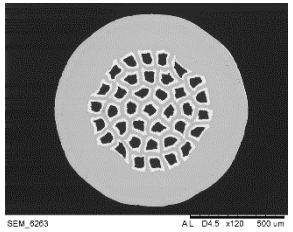
- 2. TUW (USTEM), Vienna:
  Microscopy on MgB2 **powder** and wire for characterization and
  study of the impact of the **wire design** and the production process on its performance

- Planned secondments:
  - TUW, ATI 04.03.2019 – 17.03.2019
  - TUW, USTEM 14.10.2019 – 27.10.2019:

MgB_2 tape 3.6mm x 0.6mm



MgB_2 round wire diameter 1mm



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Research, Methodology, Results & Next Steps

Activities and training topics:	1 – 6	6 – 12	12 – 18	18 – 24	24 – 30	30 – 36
Superconductivity and application (introduction)						
Materials characterization (powder, X-ray diffraction, XRF, Granulometry, Micro-Hardness, Stress-strain)						
Critical Current tests – Cryogen coolant free (Cryogenics system, principle of measurement techniques, LabView ACQ system, improvement test, post-processsing data analysis)						
Manufacturing process – phase I (introduction to PIT technique and related critical issues)						
Critical Current tests – Liq. Helium (defining the technical specification of a new test facility; commissioning and test)						
Manufacturing process – phase II (Relationship between PIT aspect and Jc enhancement; process control; wires parameters control; automatization; in-line quality assurance)						
EASI Schools						
Secondments at TUW ATI and TUW USTEM						
Project Management						

1st June 2018

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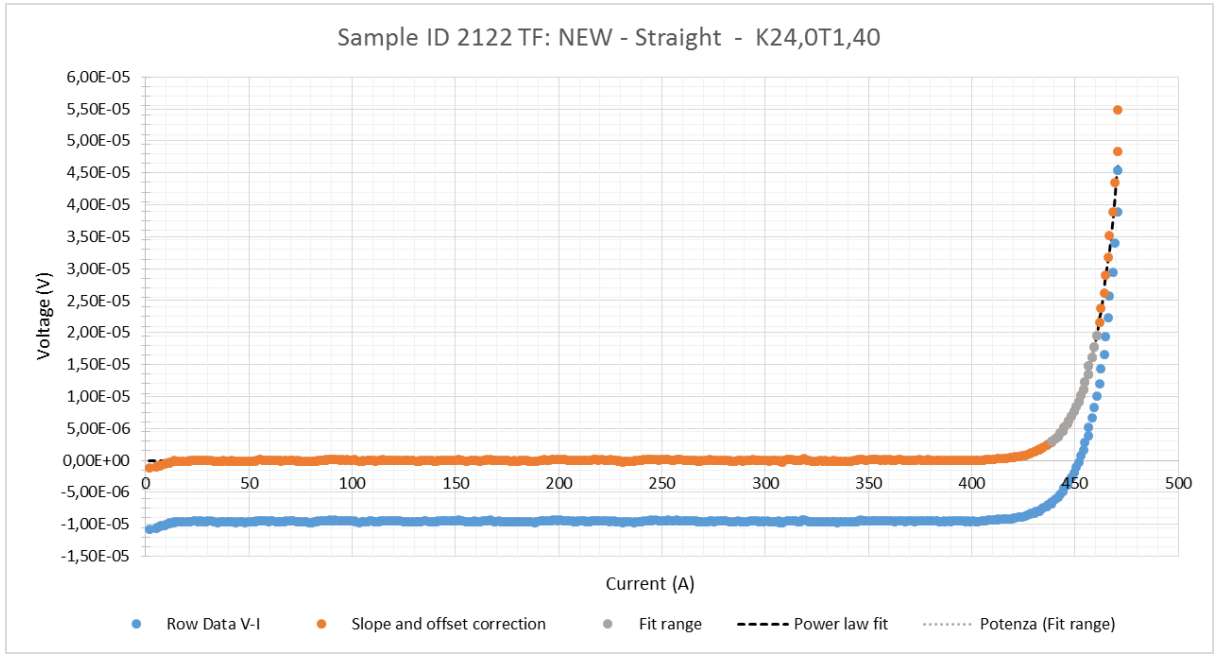
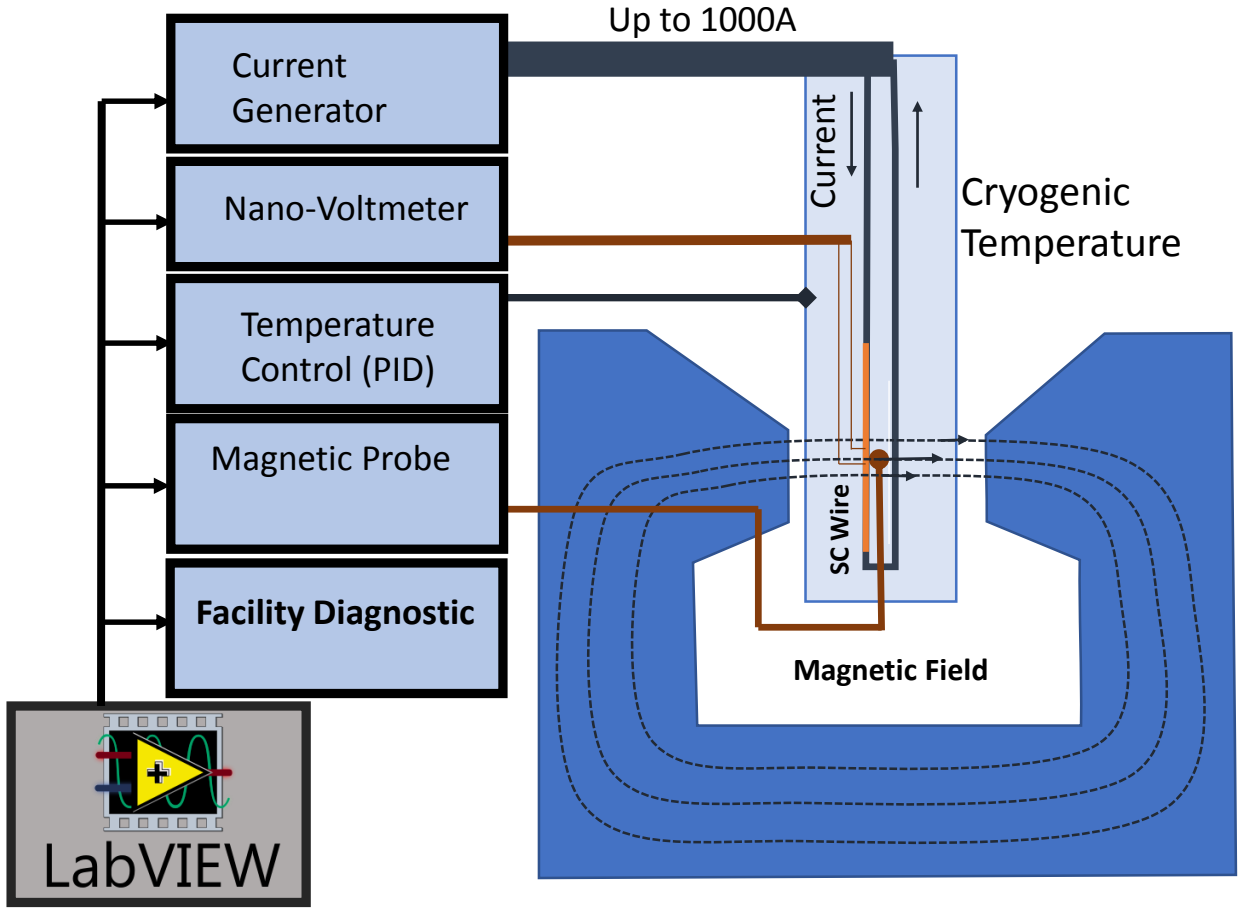
Research, Methodology, Results & Next Steps

- Critical Current Test Facility:
  - Improvements Control Software
    - Introducing facility diagnostic measurments
    - (current leads, voltage meas)
  - Improvements Data Analysis Scripts/Macros





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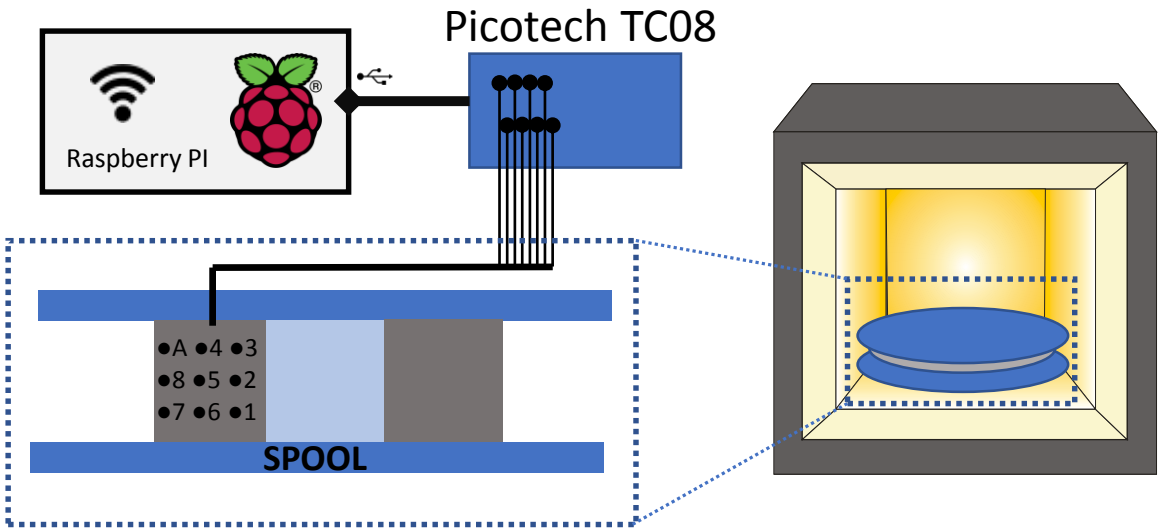
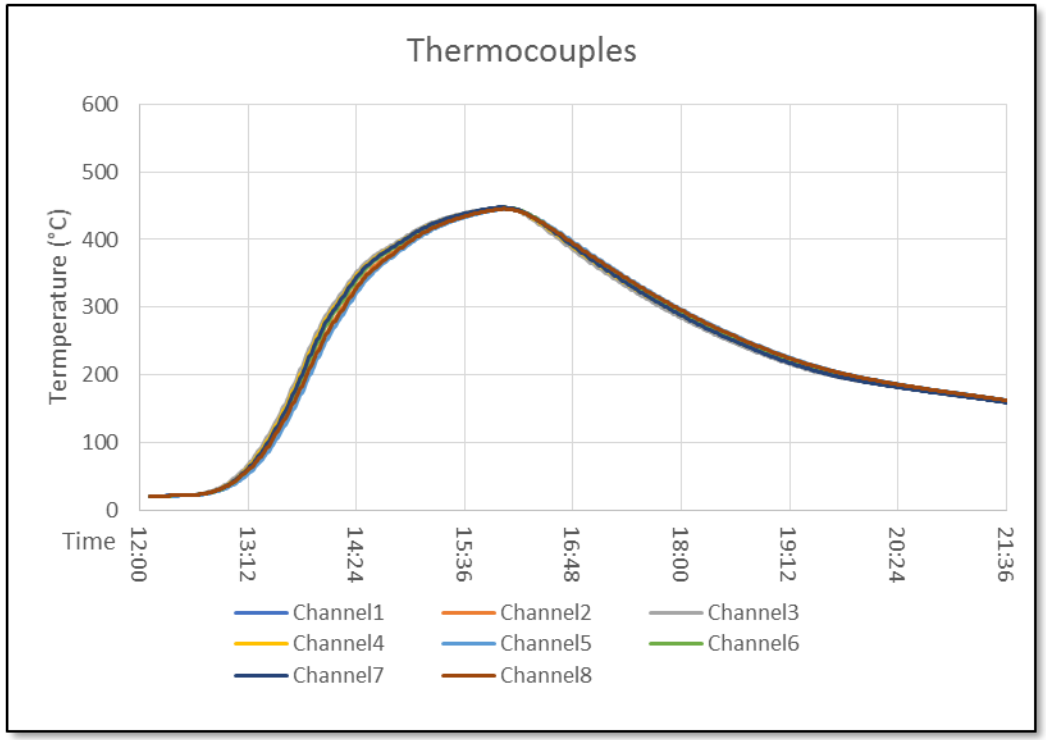
Research, Methodology, Results & Next Steps

- Control of process:
  - Heat Treatments, Temperature Real-time Monitoring





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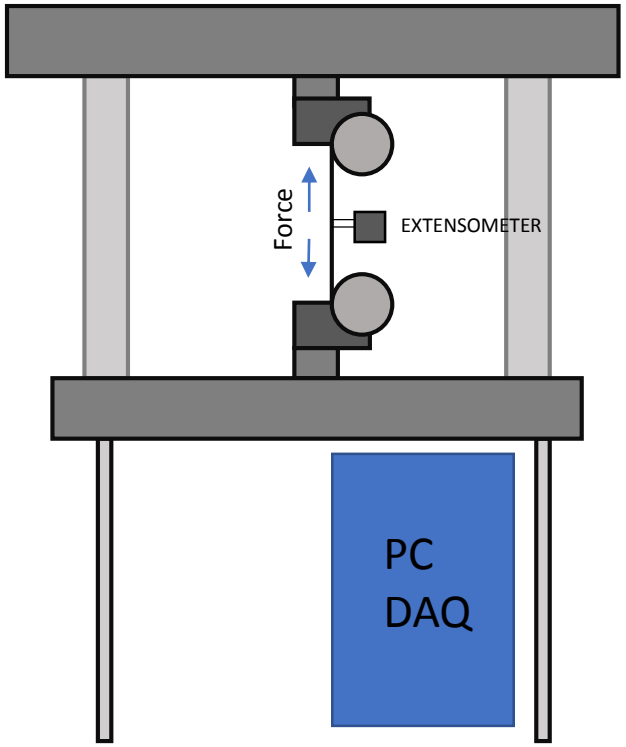
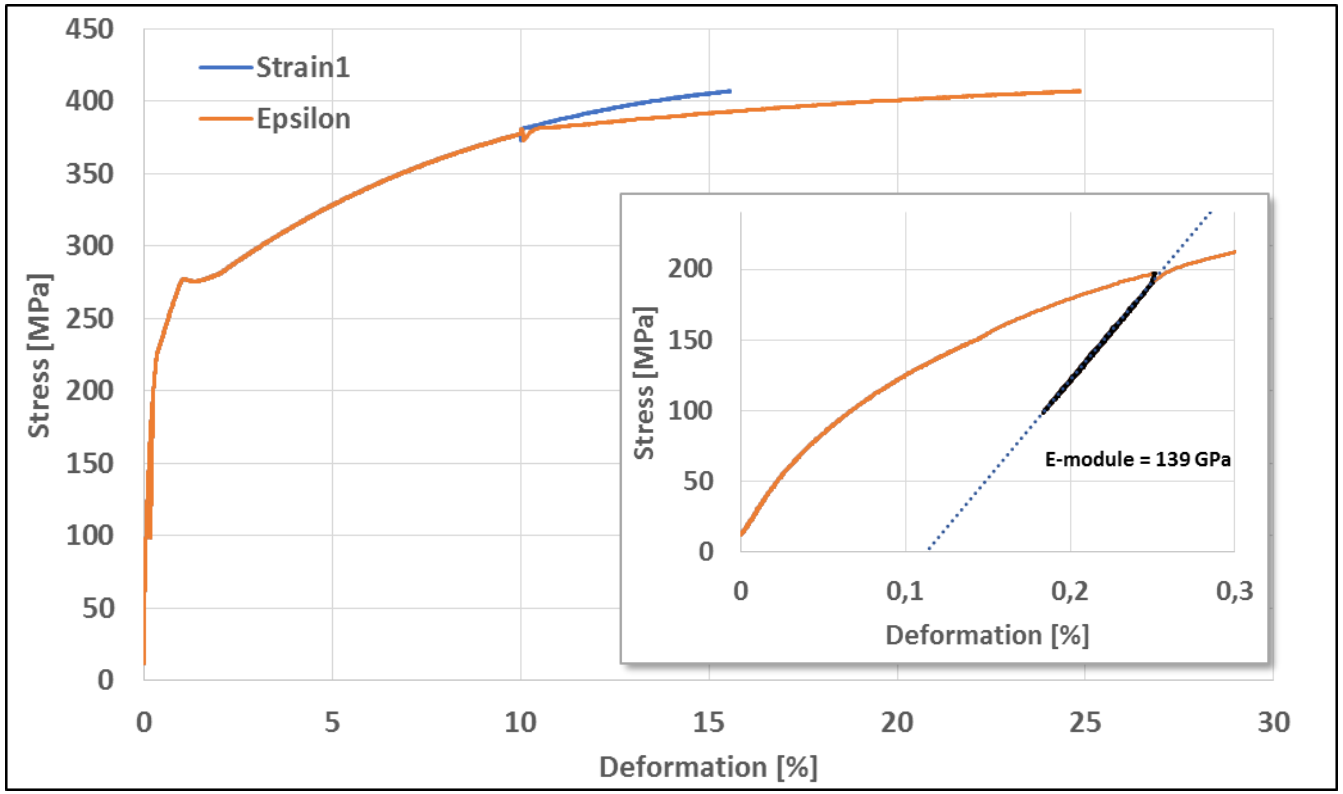
Research, Methodology, Results & Next Steps

- Tensile testing machine





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Training, Conferences & Workshops

- **Attended EASITrain events:**
  - ✓ EASISCHOOL 1 Vienna 2018 :
    - ✓ EASITRAIN/ESAS SUMMER SCHOOL on Applied Superconductivity (2 ECTS)
    - ✓ EASITRAIN Training Course on Project Management (2 ECTS)
    - ✓ Terra Mater EASITRAIN Media Training
- **Training**
  - ✓ Safety Training: general risks and specific high risks (16h)
  - ✓ Privacy and Security Awareness
  - ✓ Tensile testing machine Training
- **Conferences & Workshops**
  - ✓ For the first year the participation to conferences or workshop is not expected.
  - ✓ Planned conference:
    - ✓ EUCAS 2019 and ICEC-ICMC International Cryogenics Engineering Conference)

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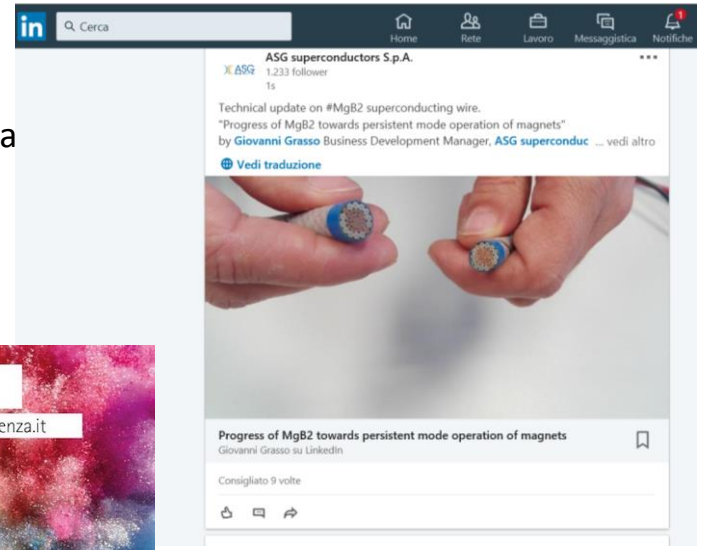
Outreach, Dissemination & Networking

- **Outreach activities**
  - ✓ The work in EASITrain will be described through the ASG Superconductors official page on several social media
  - ✓ Every year in Genova there is **Festival of Science**, an event which involves whole town and scholar, students and adults come to visit the scientific expositions, the lectures or public debate.
    I would like to organize one event or stand.



- **Dissemination activities**
  - ✓ For the next year the participation to the EUCAS 2019 is planned

- **Networking activities:**
  - ✓ EASISchool week
  - ✓ Seminar “Thermomagnetic Mechanism for Self-Cooling Cables” meeting scientists and visiting to CNR-SPIN laboratory 20.11.2018
  - ✓ Meetings with providers of cryogenic systems and electronic equipments for building new test facility

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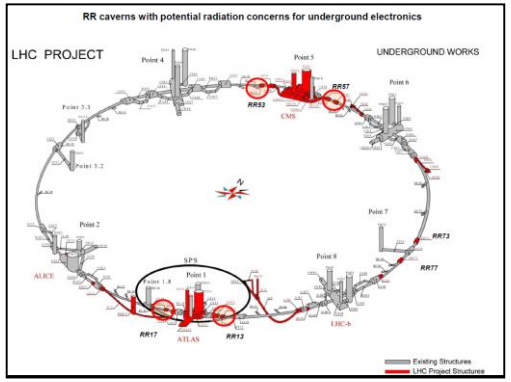
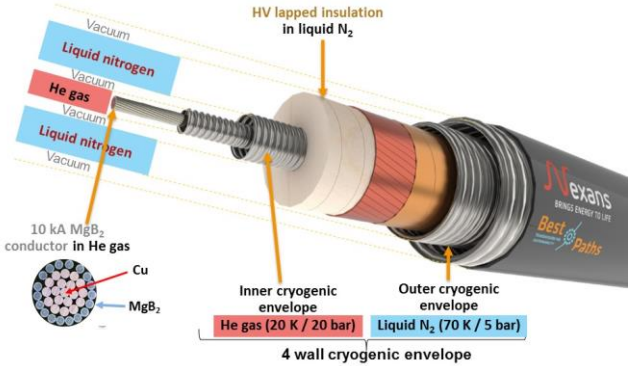
Impact

The improvement of MgB2 superconducting wire performance and quality will extend the market possibilities

The core business of the MgB2 wire is now related to cable for electricity transport (superconducting link project at CERN-HVDC line)

and for low field MRI magnet (Paramed MRI magnets).





➡ Wires with improved characteristic will extend the market to **medium-high field MRI** and to **magnets for scientific experiment** (FCC).

This is really a big opportunity for me, it's giving me the possibility to:

- Work in high-technology field industry
- Have a training and learning
- Local and International networking
- Open new possibilities for future employement (companies or reasearch institutes)

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Thank you for your attention!

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