Durham Shitty-conductor Experiments

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Introduction

- Superconducting magnets are essential for generating strong magnetic fields to confine plasma in fusion reactors.
- Made from superconducting materials like Nb3Sn and high-temperature superconductors (HTS) such as YBCO.
- Investigation the performance of superconductor REBCO, with varying angle of attack, applied magnetic field strength at low temperatures.

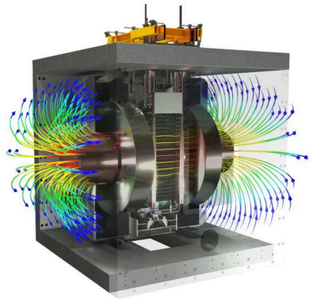


Fig 1: Magnetic field lines for CHIMERA rig [1]

Experimental Apparatus and Methods

Apparatus:

1. Ic Probe: Holds the sample, delivers current, and measures voltage.
2. Brass Sample Holder: Secures the HTS tape during soldering and testing.
3. HTS Tape: 80 mm REBCO sample for testing.
4. Hot Plate: Heats the sample holder for soldering.
5. Soldering Iron & Flux: Used for soldering the tape to the holder and attaching voltage taps.
6. Polyimide Copper Wire & Pins: For voltage tap connections.
7. Cryogenic Setup (Dewar): Holds the sample in liquid nitrogen.
8. LabView Program: Controls the power supply and records measurements.

Fig 2: Preparing rig by pouring in liquid nitrogen

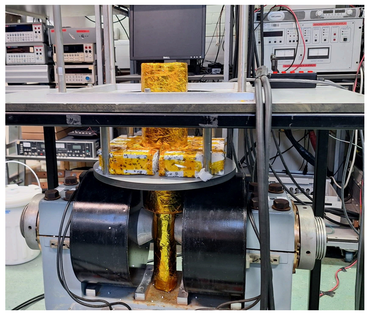
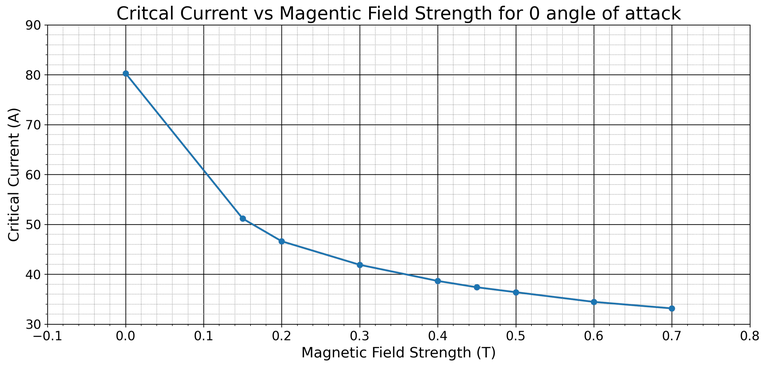


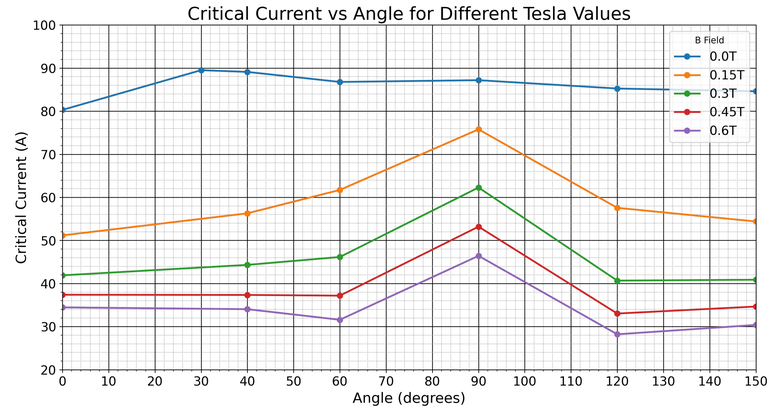
Fig 3: 0.7T Magnets (bottom of the rig)

Methods:

1. Soldering:
   - Pre-tin the sample holder and HTS tape using soldering flux and lead-tin solder.
   - Attach the HTS tape to the sample holder by heating the pre-tinned areas.
   - Solder voltage tap wires to the sample.
2. Setup:
   - Mount the sample holder on the Ic probe and connect voltage tap wires to the data system.
   - Place the probe in the Dewar with liquid nitrogen and attach the current leads.
3. Ic Measurement:
   - Use LabView software to control the measurement, adjust the magnetic field, and monitor voltage and current in real-time.

Results





Conclusion

Future Works

References