

BNL REBCO activities

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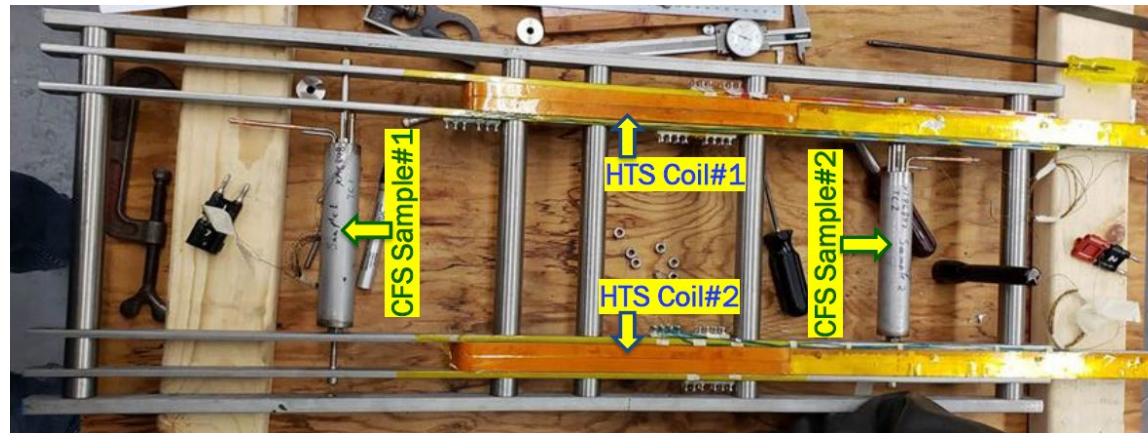
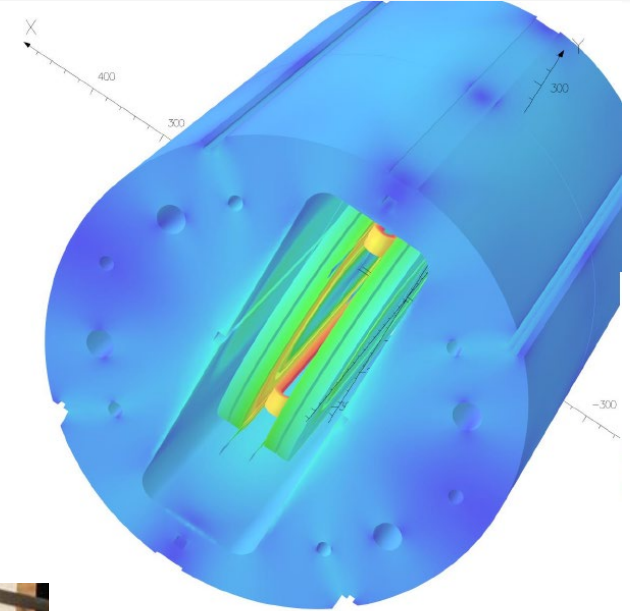
11/2/2023

Outline

- **Highlights from 2020-2023**
 - MDP Hybrid Dipole Test –2000
 - Defect-Tolerant Second-Generation Cable, BTG – SBIR –2020
 - CFS cable tests – Infuse –2021
 - MDP-CORC insert – 2023
- **Facility and opportunities**

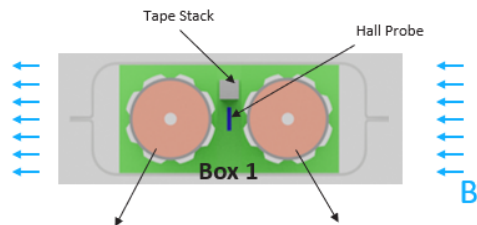
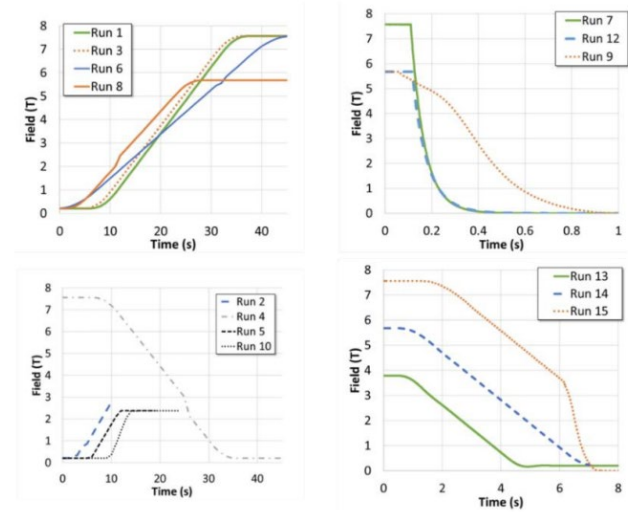
Hybrid Dipole Test

- Two racetrack coils (NI/insulated).
- Background field provided by the CC.
- Tape parallel to field.
- Magnetization measurements using Hall probes.
- Field : **12.3 T (combined)**.



CFS cable tests

- AC losses measurement via calorimetry.
- Test the ability of acoustic and fiber-optic systems to measure temperature rise.
- Ramp rates of interest: 4 T/s.

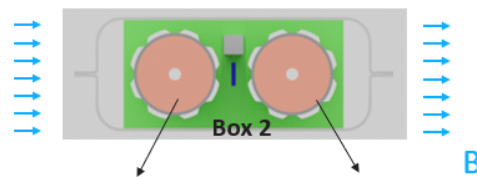


PIT VIPER

- Cernox sensors only

PIT VIPER QF
(quench detection system: fibers)

- Three fibers
- Heaters inside cable
- All copper tapes



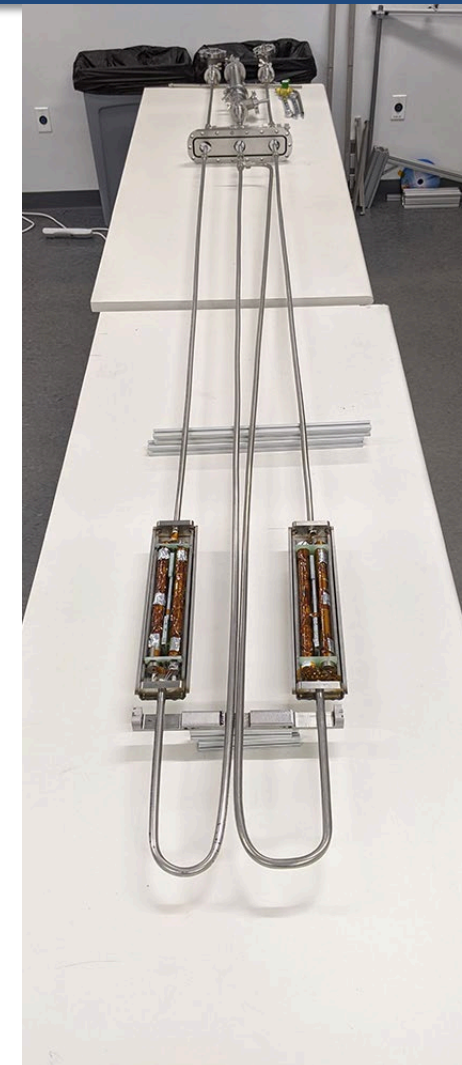
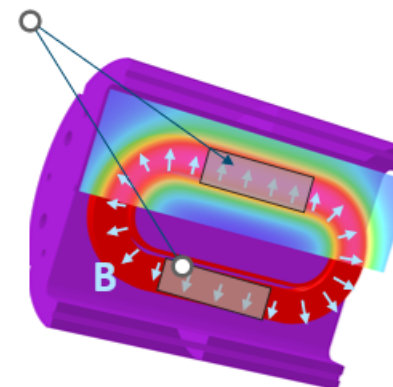
PIT VIPER QA
(quench detection system: acoustic)

- Acoustic pulser and sensor
- Heaters on jacket

VIPER

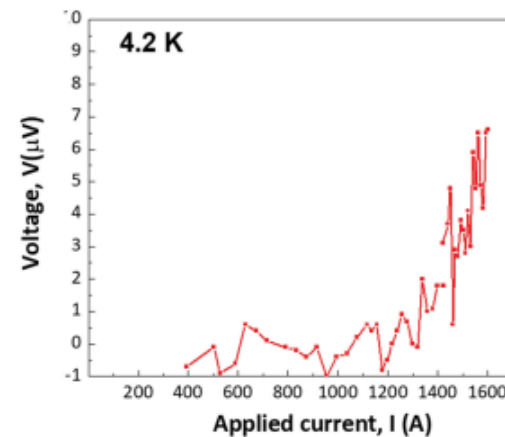
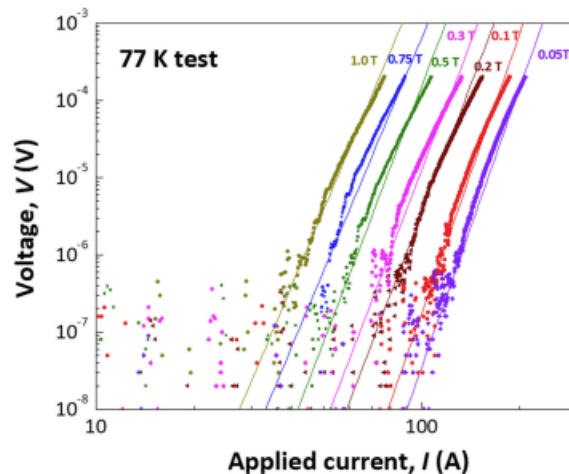
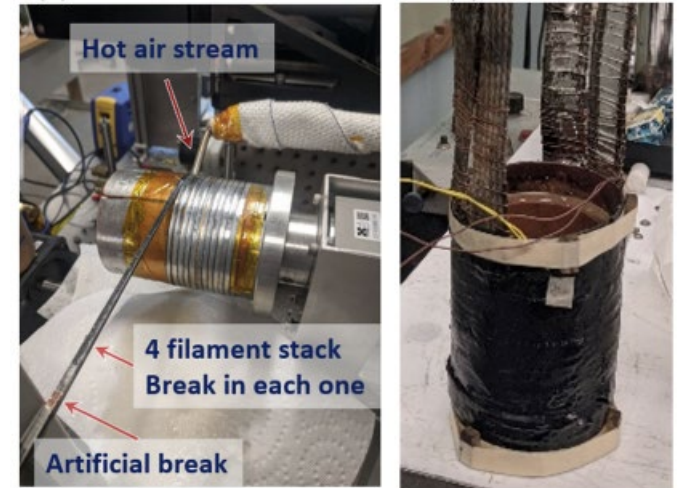
- Cernox sensors only

Two locations for samples:
roughly 300 mm x 60 mm x 31 mm



Defect-Tolerant Second-Generation Cable

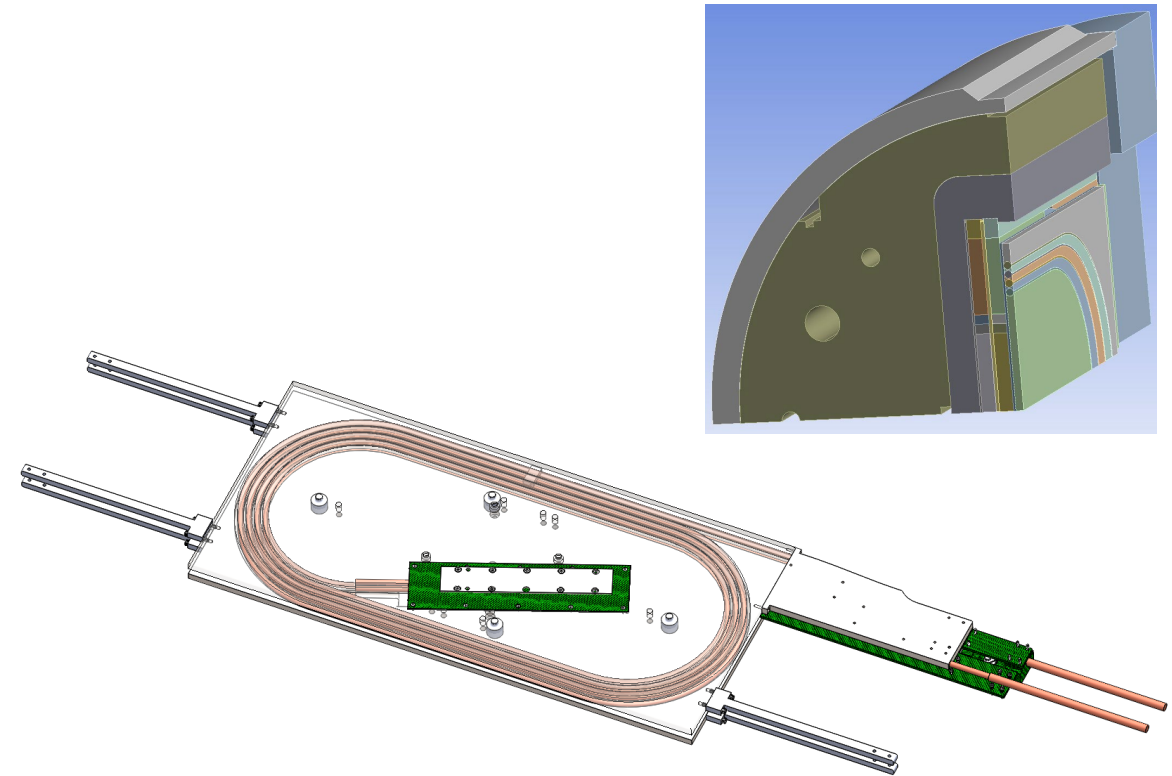
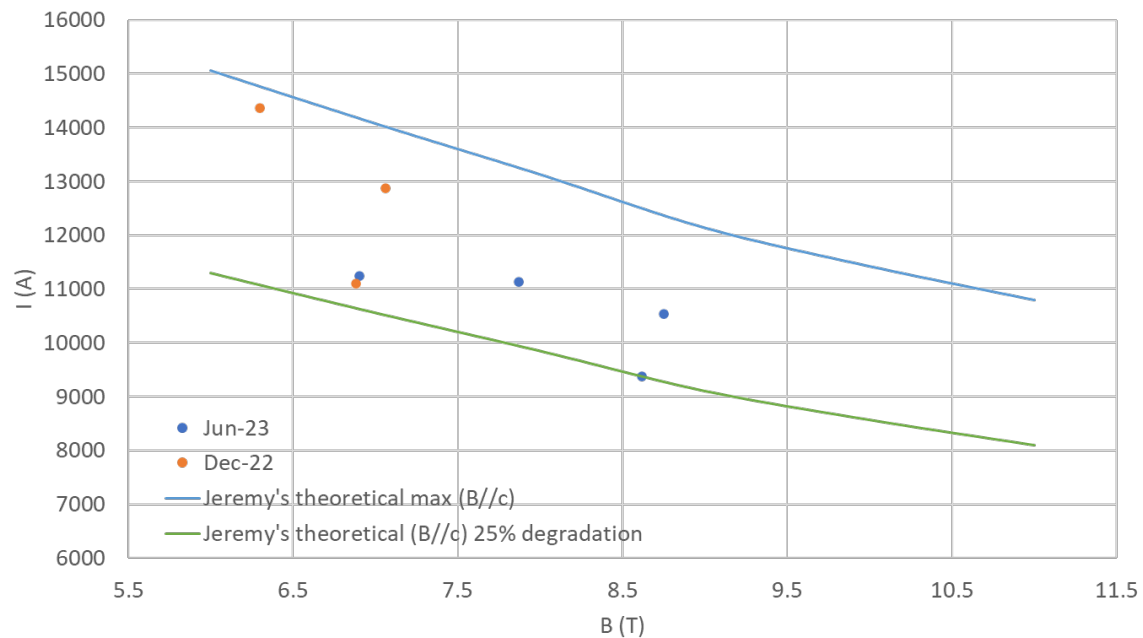
- Test the performance of a coil wound from a defect-tolerant superconducting cable.
- Artificial breakage introduced every 1.2 meters.
- The coil was tested in a magnetic field up to 1 T at 77 K, and at 4.2 K.



Solovyov, Vyacheslav, et al. "Performance of a Test Coil Wound From Defect-Tolerant Second-Generation Cable."

MDP-CORC insert

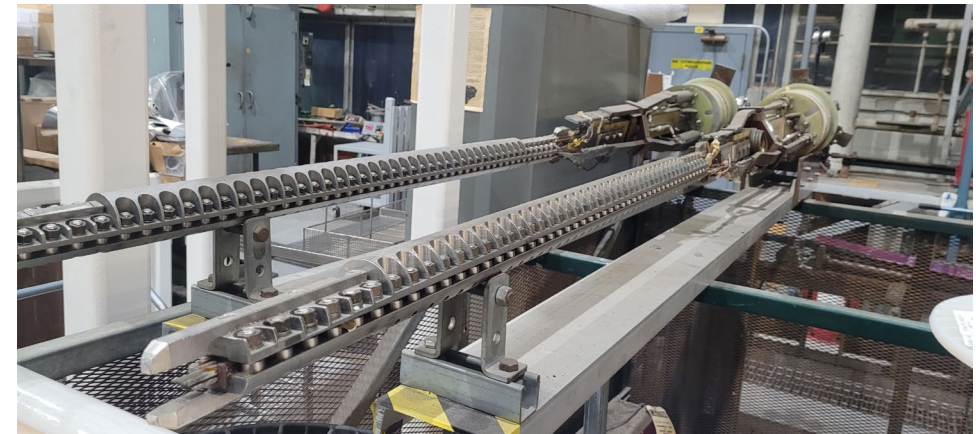
- Quench performance of a CORC insert in the background field of common coil dipole.



Facility and opportunities

- **Common coil:**
 - Free aperture: rectangular 29 x 335 mm.
 - Background field up to 8.5 T.
 - Sample current up to 15 kA.

- **Short sample test magnets:**
 - 6 T at 4.2 K.
 - Uniform field region: 600 mm
 - Max current ~24 kA
 - Magnet ramp-up time 15 minutes
 - Bore diameter: 3 inches.
 - Cable sample holder diameter: 2.5 inches.

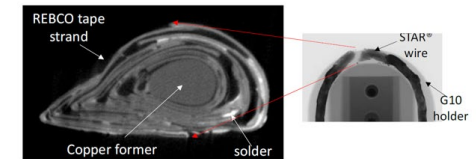


Facility and opportunities

- **Conductor characterization:**
 - Test/validate design choice for the subscale programs.
 - Feedback for conductor development.
- **Examples:**
 - Mechanical strength.
 - V-I characterization with additional diagnostic tools.
 - Terminal design.
 - Interfaces with test facilities.

U.S. MAGNET DEVELOPMENT PROGRAM Use high background field to develop high-field magnet conductors

Wire deformed under $I \times B$ force, transverse to the wire axis, 2.5 kA, 30 T, 75 kN/m
Recent [paper](#) from AMPeers



- Need to support the entire wire and the individual tapes inside the wire → impregnation?
- Should be a sanity check before testing as insert?