



U.S. MAGNET
DEVELOPMENT
PROGRAM

ReBCO – Upcoming Tape Coil Tests

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U.S. DEPARTMENT OF
ENERGY

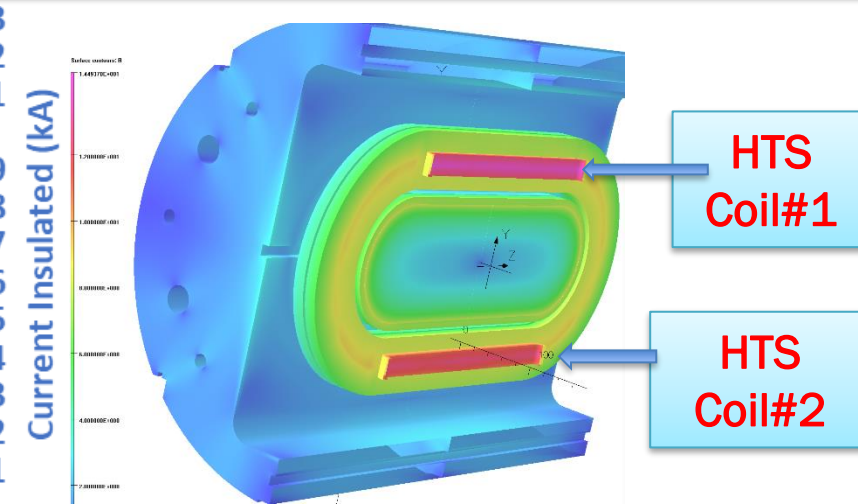
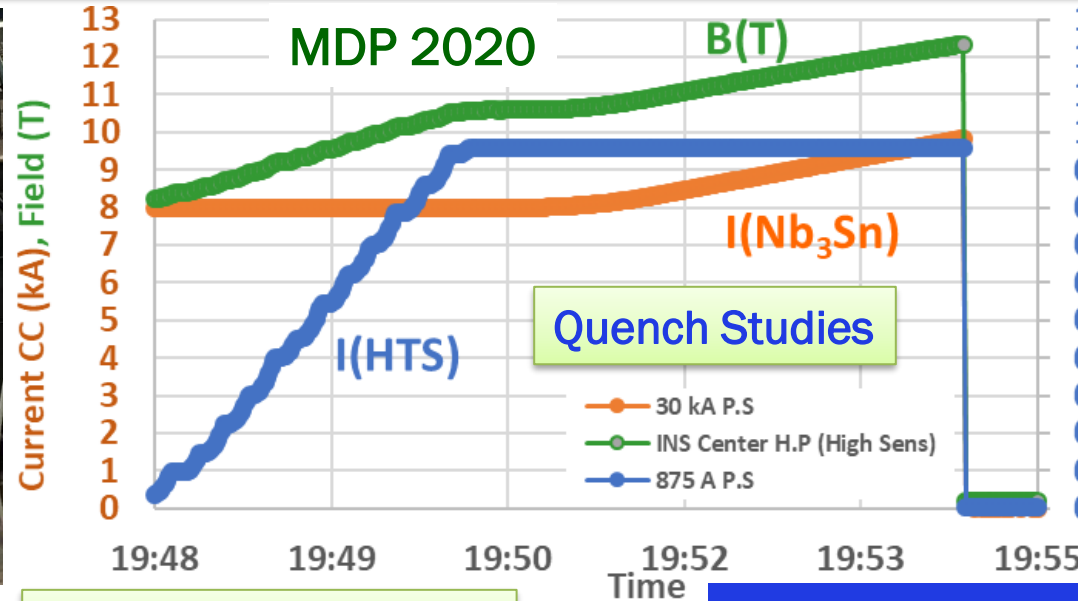
Office of
Science



Room for Progress Over the Previous MDP Test of 12.3 T HTS/LTS Dipole

USMDP
"Record"
HTS/LTS
12.3 T
Hybrid
Dipole
(2020)

PBL/BNL
STTR



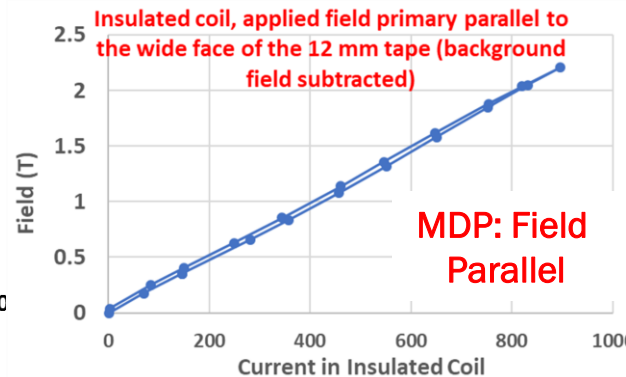
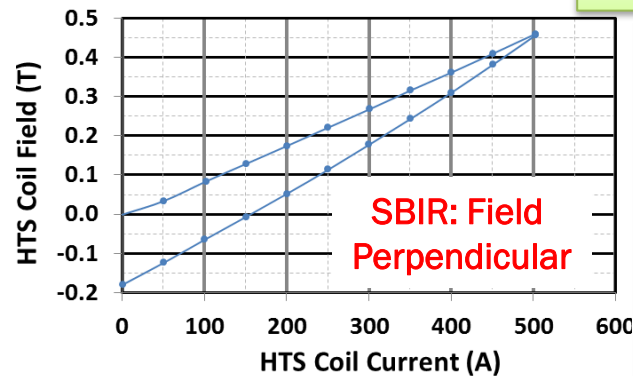
Magnetization Studies

Task 1:

- Maximum field was not limited by HTS coils but by LTS coils
- Theory: HTS coils pinching on the Nb_3Sn making it quench
- Next test: Intermediate structure to minimize local strain

Task 2:

- Magnetization studies were not made over the full hysteresis loop (positive and negative current cycles).
- Field parallel & perpendicular studies on different coils.
- Next : Identical coils to be used for the full hysteresis loop.



Upcoming Tests with ReBCO Tape

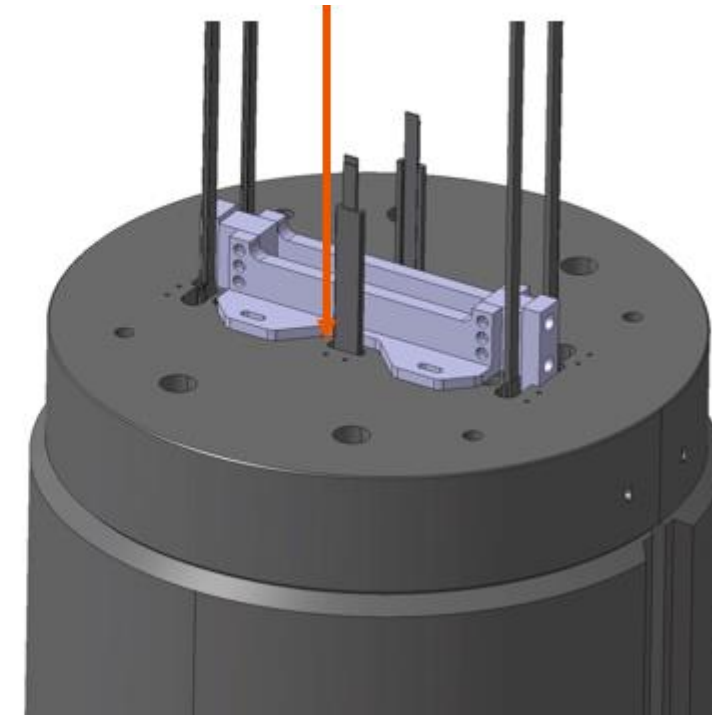
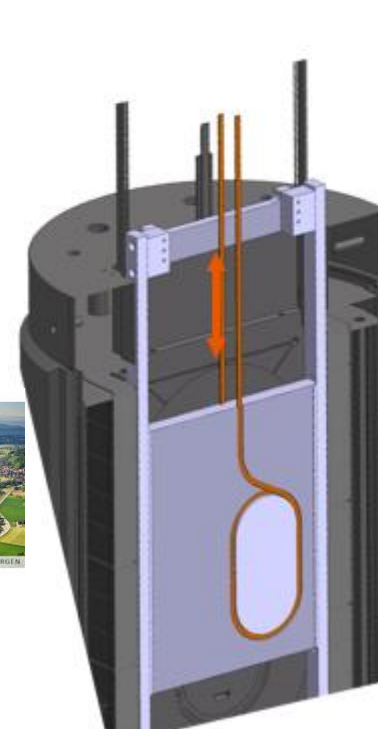
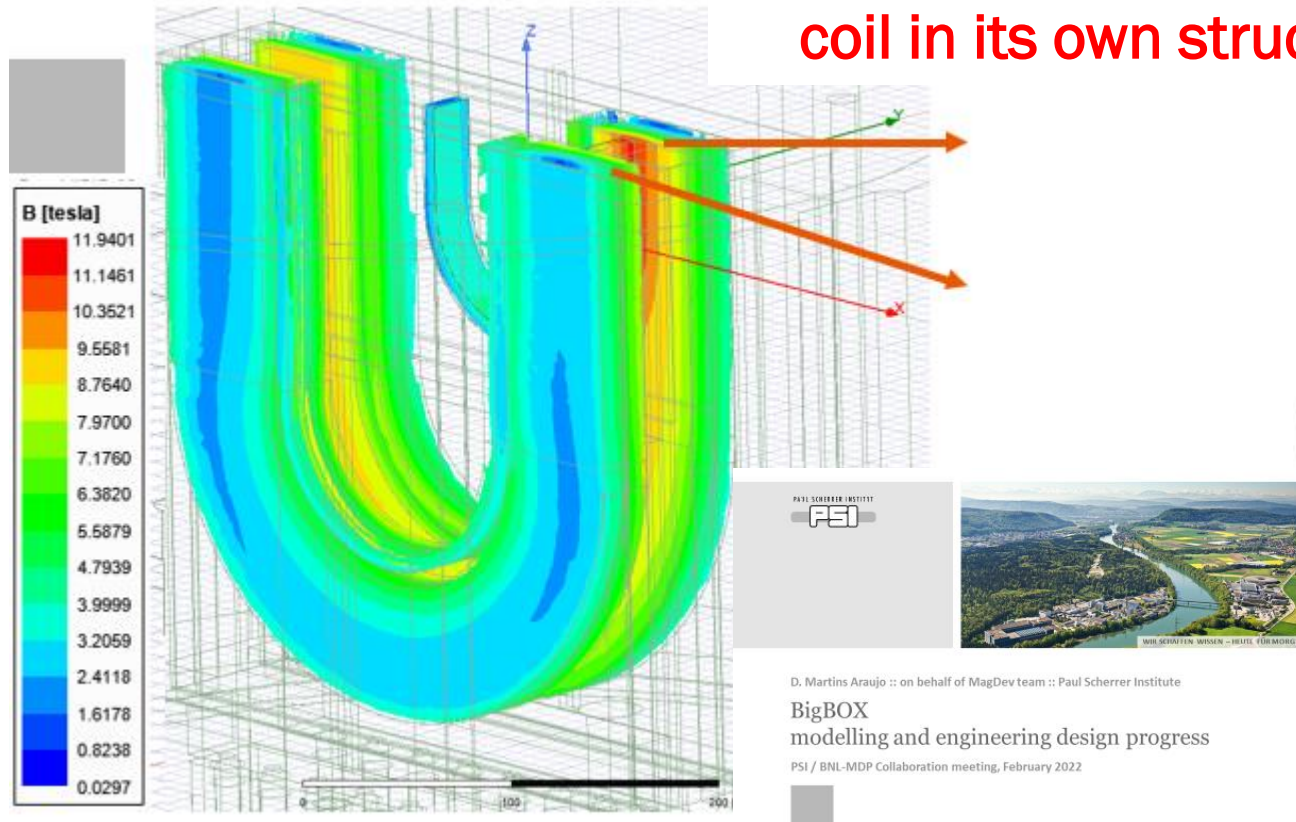
- **Test 1:** This test will be dedicated to answering the hypothesis that the local strain on Nb_3Sn coils created by the Lorentz forces from the HTS coils, was the limiting factor in the performance.
- **Test 2:** This test is a part of the US-Japan collaboration where two identical HTS tape coils, wound with the mineral insulation, will be inserted in the two aperture of the common coil dipole. One coil will be aligned primarily to field parallel to the wide face of the tape, and another coil aligned primarily to field perpendicular to the wide face.

Test 1: PSI BigBoX Nb₃Sn Coil Test (MDP)

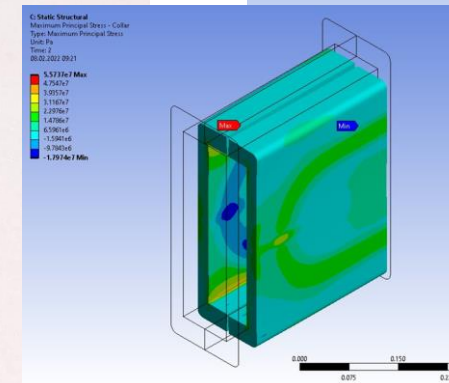
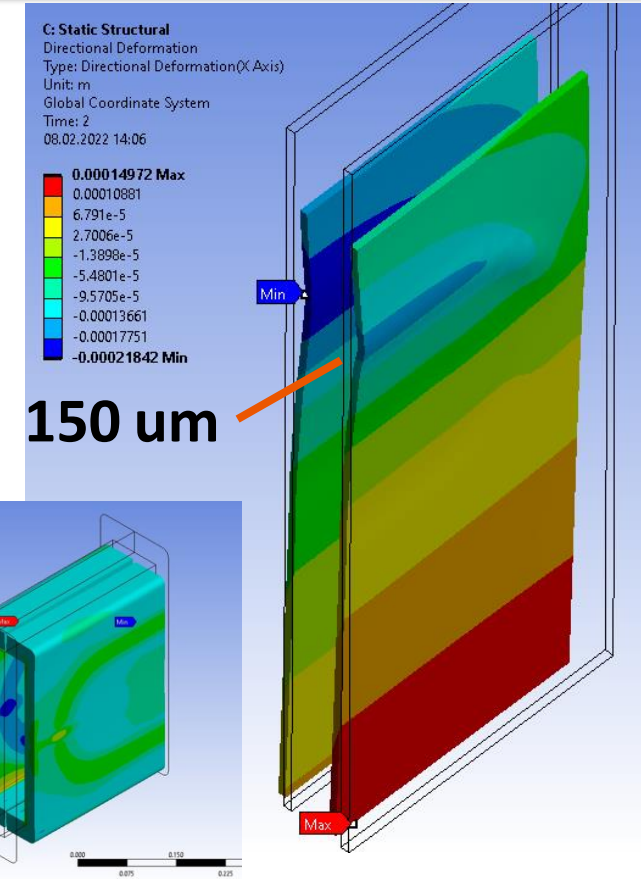
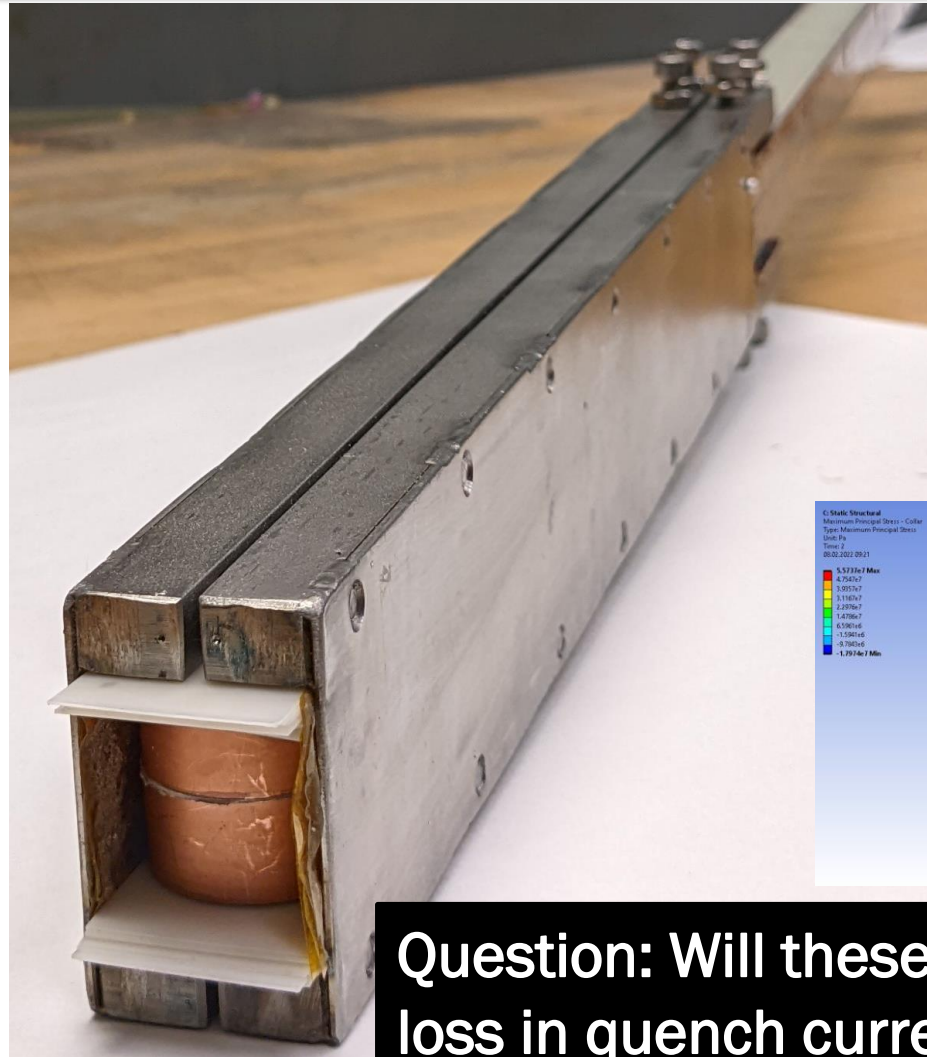
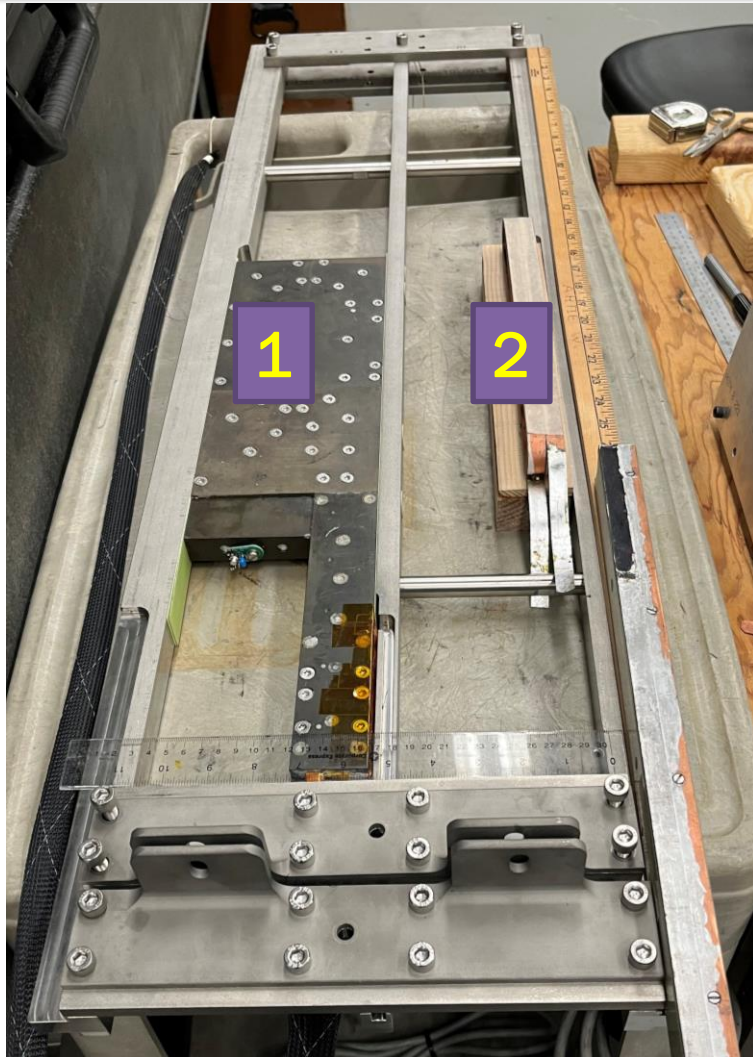
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- Coil in a structure to be inserted in the common coil dipole received from PSI. Test scheduled for early next year.
- PSI test uses only one aperture. Taking advantage of that HTS coil in its own structure will be tested in the second aperture.



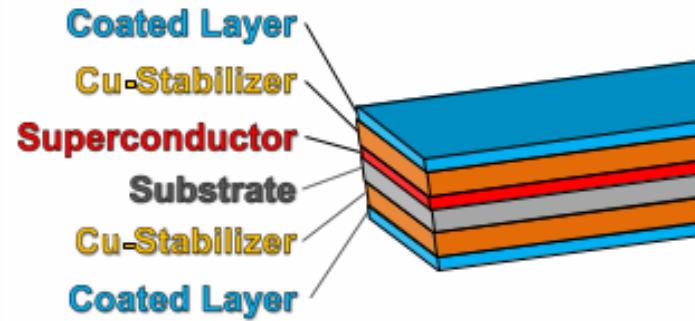
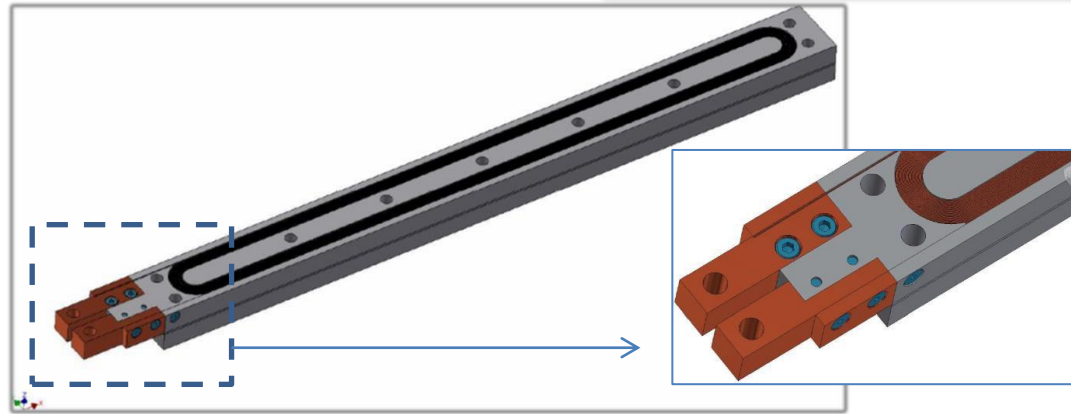
Bore 1: PSI Nb_3Sn Coil, Bore 2: BNL HTS Coil (both coils will be in their own structure)



Question: Will these support structures reduce loss in quench current in the main Nb_3Sn coils

Test 2: HTS/LTS Hybrid Technology (US-Japan)

Scheduled for late Summer



Goals: New insulation, HTS/LTS high field hybrid technology, quench protection, and magnetization studies

Two Tests in One Go:

Two HTS insert coils in two apertures of the common coil dipole:

- Upper Bore: field primarily parallel
- Lower bore: field primarily perpendicular

Three collaborators from KEK spent several days at BNL recently to work out the details.
A very useful visit.

