Superconducting Strand and Cable R&D

STRAND STABILITY STUDIES

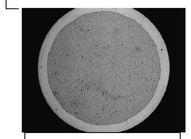
Low field transport measurements.

TO STUDY THE EFFECT ON STRAND STABILITY OF THE EFFECTIVE FILAMENT SIZE, MATRIX RESISTIVITY, RRR AND COOLING.

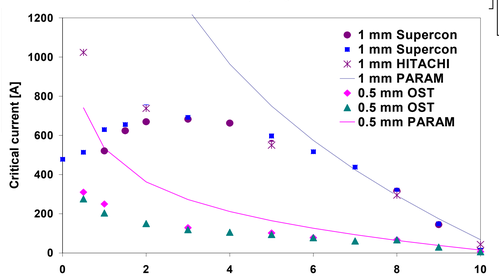
Magnetization measurements.

TO STUDY THE EFFECT ON STRAND STABILITY OF THE EFFECTIVE FILAMENT SIZE, MATRIX RESISTIVITY, RRR AND COOLING.

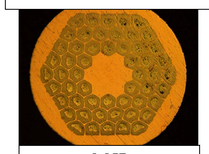
DATA on NbTi - CuNi matrix, 16 to 50 μm filament size



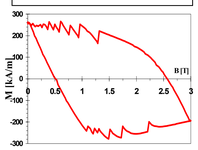
Hitachi

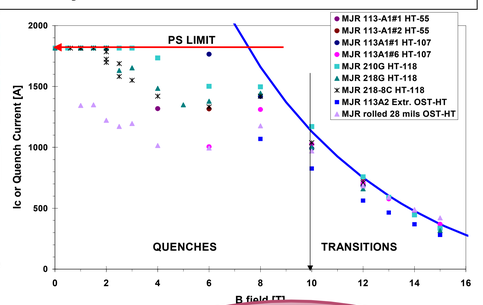


DATA on 1 mm MJR - Contaminated Cu matrix, 110 μm effective filament size

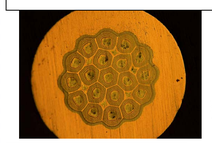


MJR

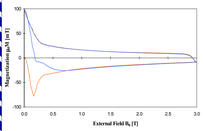


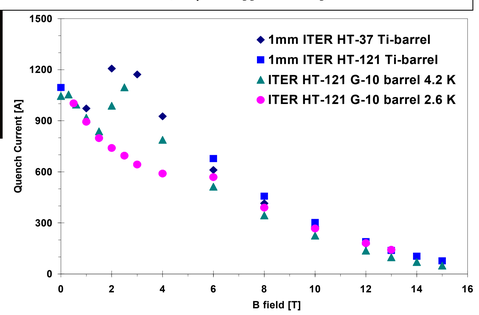


DATA on 1 mm ITER - Bronze matrix, 5 μm effective filament size

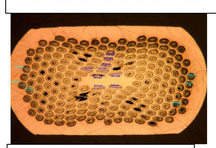


ITER

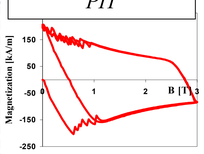


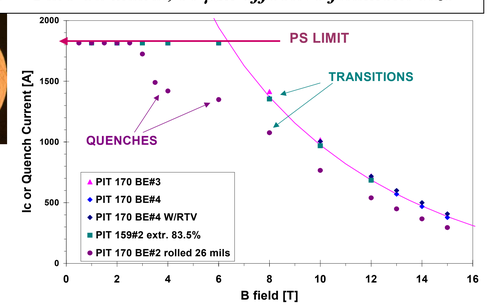


DATA on 1 mm PIT - Pure Cu matrix, 50 μm effective filament size

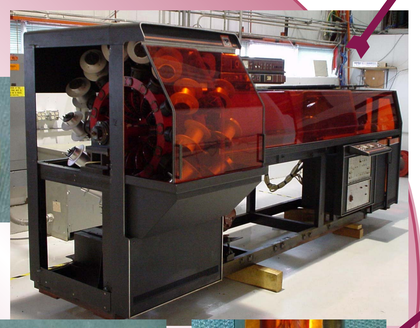


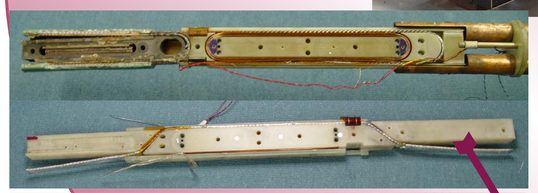
PIT



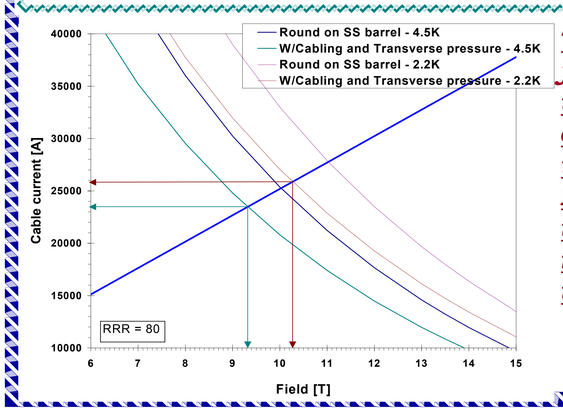


TOOLS FOR R&D



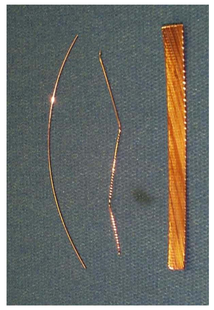


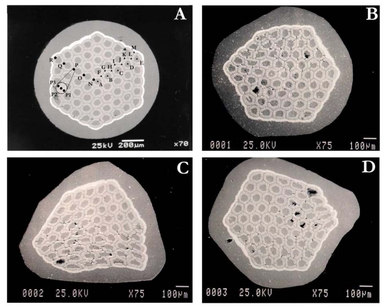
SMALL RACETRACK SHORT SAMPLE LIMITS

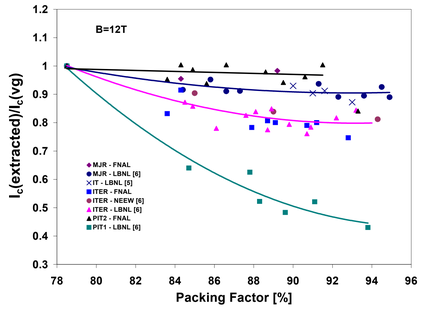


To test Nb_3Sn full-size cables using a compact coil system that implements Nb_3Sn magnet technology and real cable operation conditions.

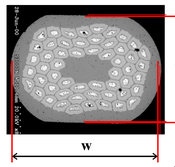
CABLING DEGRADATION AND CABLING SIMULATION

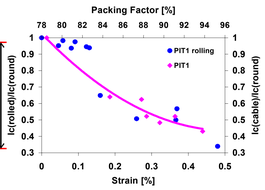


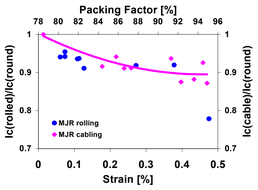




CRITICAL CURRENT DEGRADATION OF VARIOUS NB_3SN STRANDS AFTER CABLING VS. CABLE CROSS SECTION AND PACKING FACTOR.

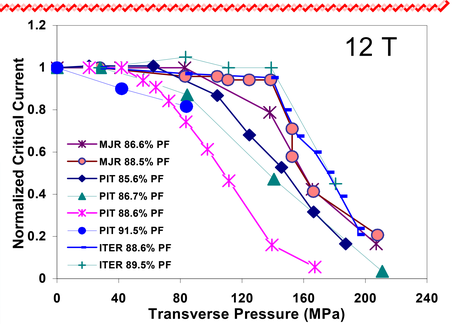






EFFECT ON THE CRITICAL CURRENT OF ROLLING VERSUS CABLING FOR A PIT AND A MJR STRAND.

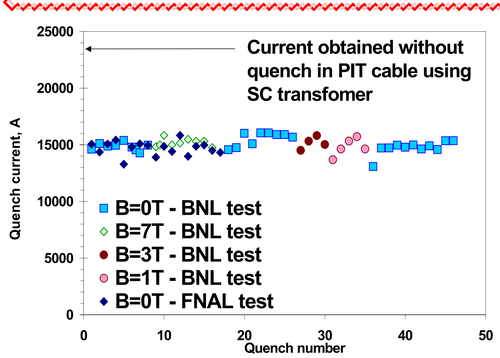
EFFECT OF TRANSVERSE PRESSURE



CONTACT RESISTANCE

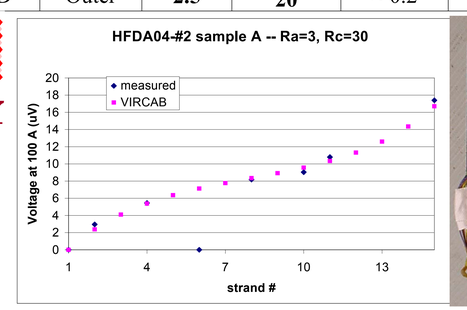
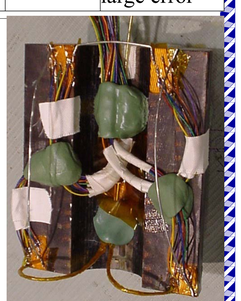
Sample	Coil layer	R_A (μΩ)	R_C (μΩ)	R_{TOT} (μΩ)	Old R_{TOT} (μΩ)	Comments
A	Outer	**3**	**30**	~ 0.2	0.31	
B	Inner	**~3**	**≥ 500**	~ 0.4	0.43	
C	Inner	**2.6-3**	**≥ 500**	0.33	26 ?	Old R_{TOT} had large error
D	Outer	**2.5**	**20**	~ 0.2		

CABLE TESTS



CABLE TESTS USING TEST FACILITY

TO STUDY THE EFFECT ON CABLE STABILITY OF THE EFFECTIVE FILAMENT SIZE, MATRIX RESISTIVITY, RRR AND COOLING WITHIN A FIELD RANGE.
BNL FACILITY: 25 kA POWER SUPPLY, FIELD FROM 0 TO 7 T, TEMPERATURE 4.5 K.

CABLE TESTS USING SC TRANSFORMER

TO STUDY THE EFFECT ON CABLE STABILITY OF THE EFFECTIVE FILAMENT SIZE, MATRIX RESISTIVITY, RRR AND COOLING WITHIN A FIELD RANGE.
FNAL TRANSFORMER: 25 kA POWER SUPPLY, SELF-FIELD, TEMPERATURE FROM 1.8 K TO 4.5 K.