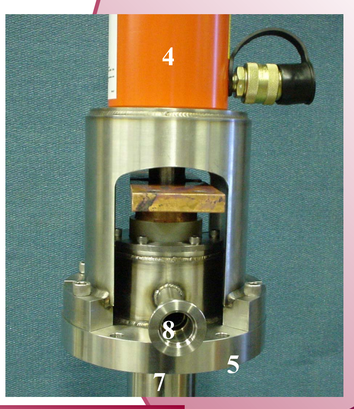
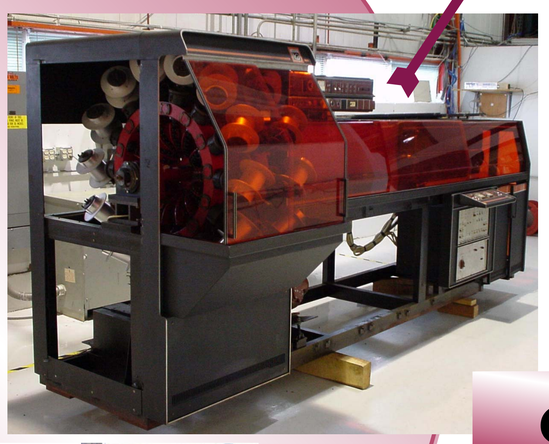
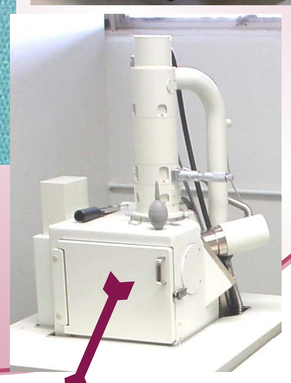
Target Requirements

Parameter	Cos-Theta/
Strand diameter, mm	1.000 / 0.700
J_c(12T, 4.2K), A/mm^2	> 3000
d_{eff}, μm	< 40
Cu, %	45 ± 5
RRR	> 100
Cabling degradation	< 10 %
Bending degradation	- / < 10 %

NEW TOOLS FOR R&D



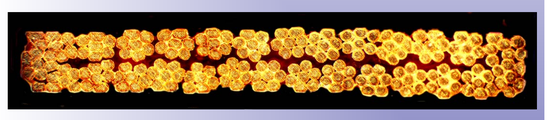




Cables Fabrication

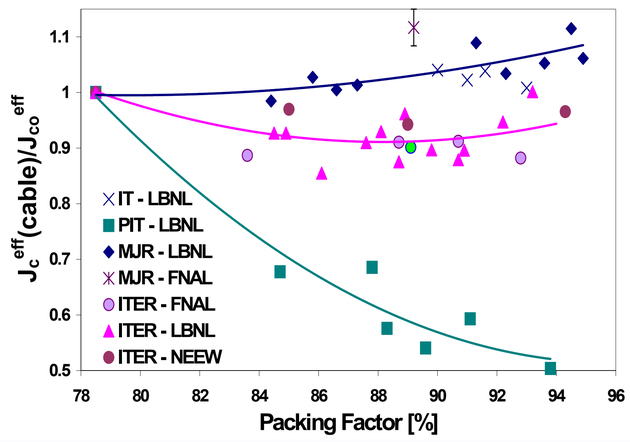
- OST and ITER 28-strand cable with and without core

- ITER 6/1 28-strand cable



- Stabrite NbTi 27-strand cable
- 28-strand Cu cable

Cabling Degradation

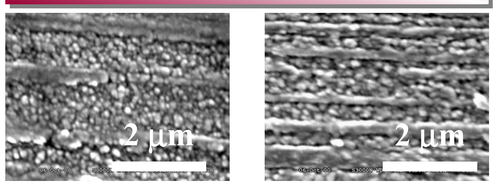


In the packing factor range of interest for magnet design (88-90%), the I_c cabling degradation at 12T is 7-9% for the MJR and IT technologies. However, their effective J_c was found to be nearly flat. Since this study was performed, SMI allegedly produced a new PIT design with a degradation of 5-7% only.

Transverse Pressure Effect

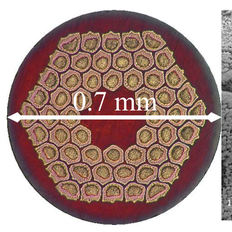
A fixture to assess the superconducting performance of a Nb_3Sn strand within a reacted and impregnated cable under compression is being commissioned. This device was designed to operate in liquid helium at 4.2K and in high magnetic fields. A cable sample is compressed between two plates. A hydraulic cylinder mounted on the top flange allows applying a pressure up to 200 MPa to the cable sample. The copper current leads to the sample were designed to carry 2000 A.

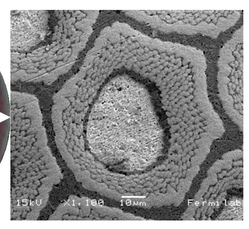
Nb_3Sn Grain Size

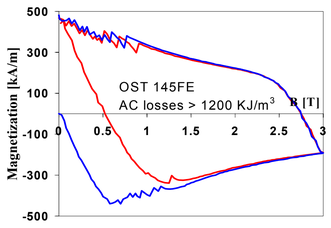


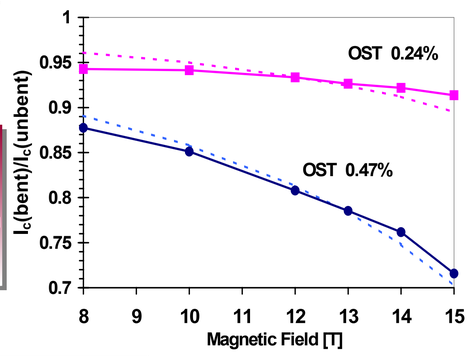
Strands & Cables for High Field Dipole Models

OST

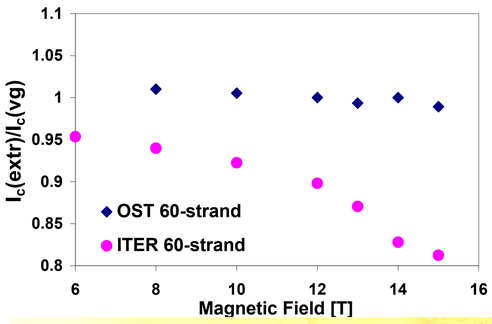




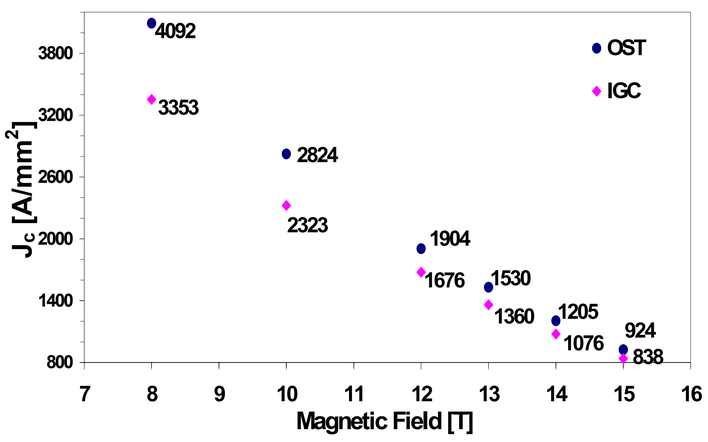


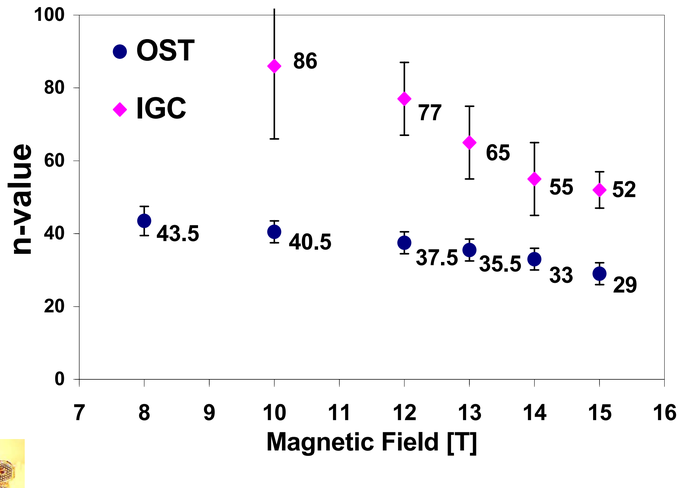


Bending Degradation

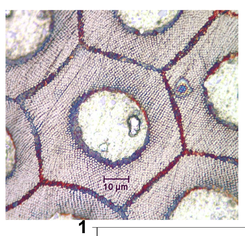


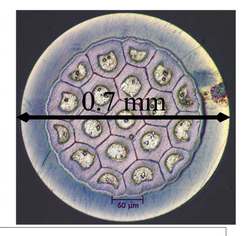
Cabling Degradation

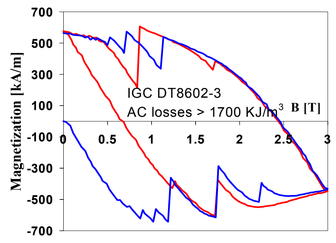


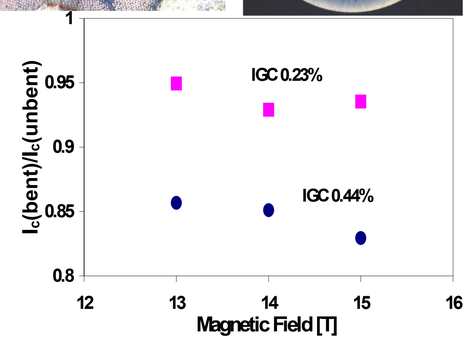


IGC



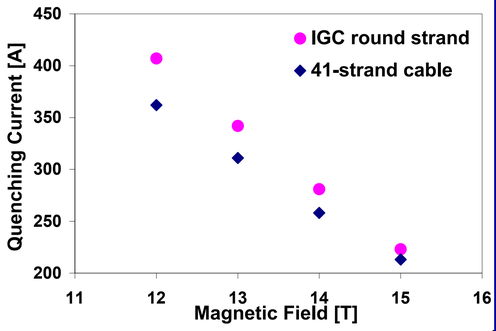


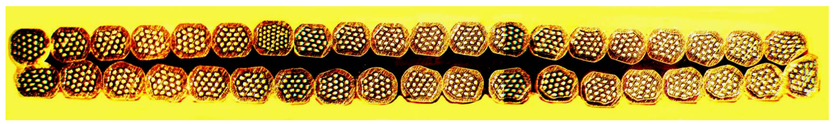




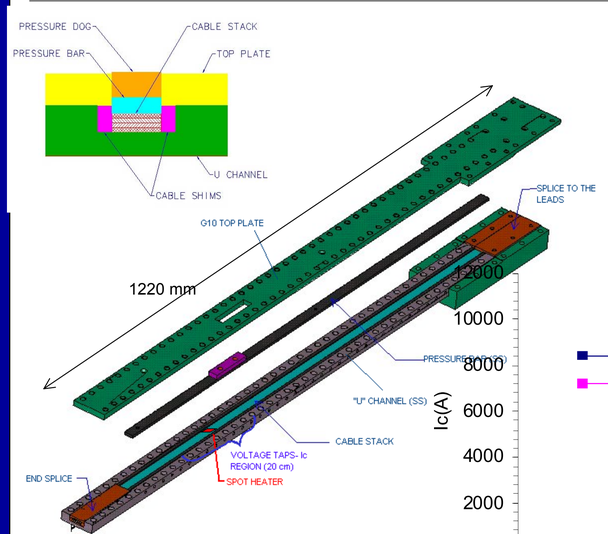
Bending Degradation

Cabing Degradation

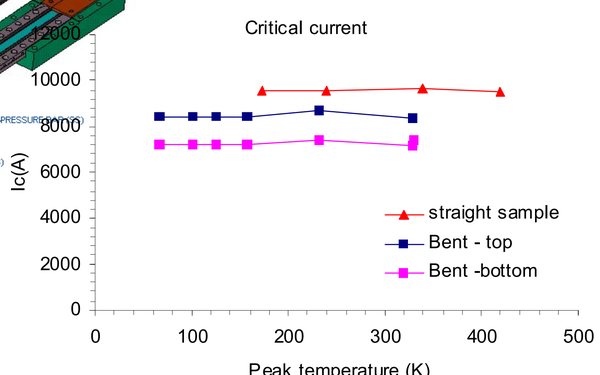




Quench Tests on Nb_3Sn Cables

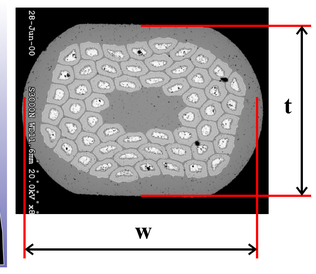


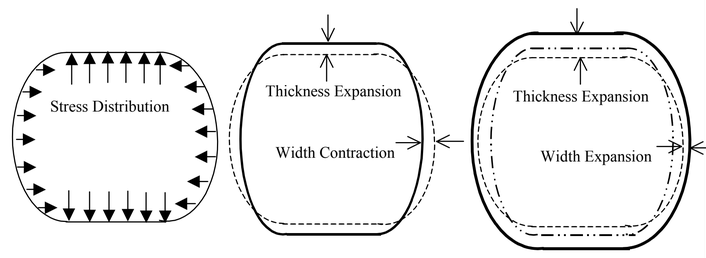
Repeated quenches do not degrade cable Ic performance.

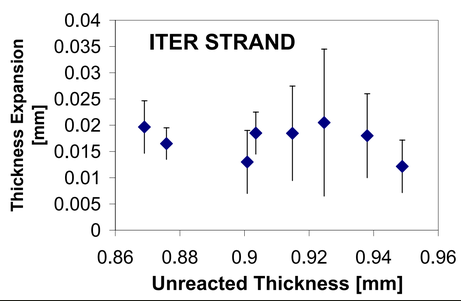


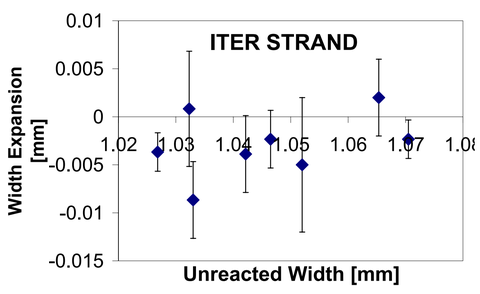
Anisotropic expansion of Nb_3Sn

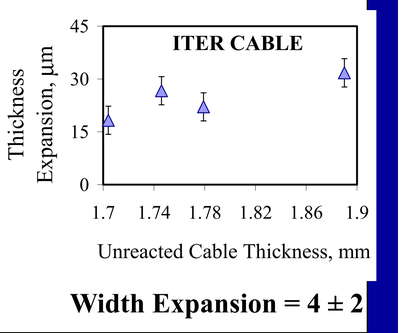
Round strands expand by about 1% (ITER) to 2% (higher Sn). Deformed strands and cables appear to expand the double in thickness and very little in width.











Width Expansion = 4 ± 2