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Publication Date

2004-09-08

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Correlation Between Strand Stability Measurements and Magnet Performance*

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Recently, magnet programs at BNL, LBNL and FNAL have observed instabilities in Nb₃Sn strands and magnets made from these strands. This paper correlates the strand stability determined from a short sample test to the observed magnet performance. In a test where the magnetic field is fixed and the sample current is ramped, it has been observed that strands that carry high currents at high fields (greater than 10T) cannot sustain these same currents at low fields (1-3T) when the sample current is fixed and the magnetic field is ramped. This indicates that the present generation of strand is susceptible to flux jumps in the low field region. To prevent flux jumps from limiting strand performance, one must accommodate the energy released during a flux jump by assuring that the strand has a high residual resistivity ratio (RRR). This will guarantee that the performance (higher currents) can be significantly enhanced for a given sub-element diameter.

*Supported by the U.S. Department of Energy under Contract No. DE-AC03-76SF00098.