Influence of Cabling on Current Carrying Properties of MgB2 Superconductors

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Objectives.

High-current links based on MgB2 superconductors (SC-Links) are being developed at CERN for the feeding of the superconducting magnets of the LHC High-Luminosity project. The MgB2 superconductors are very sensitive to the strains that naturally happen during cabling. Several studies have been performed recently to evaluate the electromechanical characteristics of MgB2 conductor for both tapes and round wires. The degradation of critical current with applied loading and limited strain values were found for different types of MgB2 wires.

However, it is difficult to find out real deformations that can happen during cable manufacturing with industrial cabling machines. Therefore, the good idea is the experimental “step-by-step” control of the critical current during cabling with subsequent modification of the cabling machine to minimize the Ic degradation of MgB2 wires. We performed the practical study of the model cables using both round and flat MgB2 wires manufactured by real cabling machines. The measured critical currents of the MgB2 wires e at different stages of the fabrication and after modification of cabling machines are compared with the critical currents of the virgin MgB2 wire. The comparisons are presented as temperature dependences of critical currents from 10 to 30 K.

EXPERIMENTAL: take wires from the machine at different cabling stages and measure Ic(T).

Compare and make modification of the machine. Compare again...

12 strand Ni matrix MgB2 was used instead of Monel matrix wire that is softer than suggested to use for SC-Links

Some conclusions

Experimental study has been performed to find out how the cabling on industrial cabling machines affects critical currents MgB2 wires. Proper upgrading of cabling machine allows to minimize current degradation Ic in the cable, in spite of a sensitivity of the MgB2 wires to strain. Sometimes a compromise is required to simultaneously provide acceptable flexibility and the demanded Ic of the MgB2 cable.