

# Measurement of critical current irreversibility limits on ReBCO tapes for mechanical axial tensile and compressive strain

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High magnetic fields of up to 20 T in tokamak-type fusion devices, such as in Central Solenoids of European DEMO and the Chinese BEST fusion reactors, require High-Temperature Superconductors (HTS) and a promising candidate is ReBCO tape. The large Lorentz forces occurring under these operating conditions may locally generate high mechanical stresses, which can irreversibly degrade the critical current of the superconductor. For the design of these cables, knowledge is required about the mechanical limits of the tapes. Detailed structural finite element analysis (FEA) based on accurate material electromagnetic and mechanical properties under relevant electromagnetic load levels is needed for reliable and optimal operation. Knowledge of the axial tensile and compressive strain irreversibility limits for the critical current of ReBCO tapes is imperative.

For this purpose, the existing TARSIS facility at the University of Twente for axial tensile stress-strain measurements, has been upgraded for testing of ReBCO tapes with critical current measurements at 77 K. In addition, a method has been utilized to test the effect of compressive strain imposed by winding tapes on different core diameters with different angles. The evolution of the critical current and  $n$ -value were measured at 77 K in self field for various loading conditions on some first results are presented.

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