MEASUREMENT OF NCSX MODULAR COIL COMPOSITE CONDUCTOR MATERIAL PROPERTIES*

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The National Compact Stellarator Experiment (NCSX) will incorporate 18 modular coils that are constructed to a highly complex geometry. The modular coil conductors are constructed from a composite of fine gauge stranded copper cable shaped to the required geometry and vacuum impregnated with a resin. These highly anisotropic composite conductors exhibit unique material properties that were measured through various material testing methods. The conductor's material properties were necessary for design criteria and performance validation. Since these conductors were designed to operate with liquid nitrogen cooling, testing and measurement at both room and cryogenic temperatures was required. This paper will present the conclusion of the composite conductor properties measurement and performance testing program. The properties that will be addressed include the shear modulus, transverse and longitudinal compression modulus, tensile and yield strengths at both room and liquid nitrogen temperature. Custom fixtures and special methods necessary to perform these measurements will also be presented. Extensive fatigue testing of conductors wound into a "race-track" configuration was also performed during this period.

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