Testing of NCSX Composite Coil Material Properties

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The National Compact Stellarator Experiment (NCSX) is now in design and requires 18 modular coils that are constructed to a highly complex geometry. The modular coil conductors are designed as a composite of a fine gauge stranded copper cable shaped to the required geometry and vacuum impregnated with a resin. These composite conductors exhibit unique material properties that must be determined and verified through testing. The conductor material properties are necessary for design modeling and performance validation. This paper will present the methods used to test and measure the coil conductor material properties, the unique challenges in measuring these complex materials at both room and liquid nitrogen temperatures and the results of those tests.