



MT 26
International Conference
on Magnet Technology
Vancouver, Canada | 2019

Contribution ID: 1501

Type: **Poster Presentation**

Wed-Af-Po3.24-09 [103]: Composite Mechanical Properties of Coils Made With Nickel-Alloy Laminated Bi-2223 Conductors

Wednesday, 25 September 2019 14:00 (2 hours)

High-temperature superconducting magnet coils made with Sumitomo Type HT-NX are complex composite structures composed of Bi-2223 conductor filaments, silver matrix, solder, nickel-alloy laminations, polymer insulation, and epoxy or wax. The mechanical properties of these composites are required inputs to a correct stress analysis. Mechanical test specimens composed of several layers of insulated conductor are prepared by cutting to length, stacking and epoxy impregnation. Mechanical tests are performed in liquid nitrogen and liquid helium. Orthotropic elastic properties are found from tensile strain measurements in the conductor longitudinal, or coil hoop, direction and from compressive strain measurements in the conductor transverse, or coil radial and axial directions. Thermal contraction measurements are made as the specimens are cooled down. Test results are compared with rule-of-mixtures and finite element models.

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Session Classification: Wed-Af-Po3.24 - Small Test Model Coil