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Transport testing of MgB₂ and Nb₃Sn solenoid coils for magnet applications

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Advancements in superconducting wire manufacturing has enabled the design and fabrication of superconducting coils for practical magnet applications. To apply superconducting wire for most commercial applications requiring many kilometers of wire, long-length characterization in coil form is important. This study discussed the transport properties of two different solenoid coil wound with long length of MgB₂ and Nb₃Sn strands by Hyper Tech. The MgB₂ coil was wound on a solenoidal 101 OFE copper former with 18" ID using the react-and-wind method. The stainless steel former with 30" ID was used for Nb₃Sn coil. The strands were insulated with single S-glass braid insulation for both coils. The total lengths of conductor used for MgB₂ and Nb₃Sn coils were ~330 m and ~1.5 km, respectively. Transport I_c measurements were performed at various taps along the coil lengths. Measurements were made at various temperatures by conduction cooling. Homogeneity of response along the coils was investigated and a comparison to the short sample results was made. Temperature gradient of coil was also monitored for transition region between current leads and coil.

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