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M3Or3B-05: DC Performance Testing of MgB2 Samples using Cryocooler-Based Cooling

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To enable turboelectric aircraft that utilize fully superconducting motors and generators, testing of high-current, low-AC-loss superconducting wires and coils must be performed. A preliminary investigation was conducted on the critical current capability of a magnesium diboride sample and on the complications that arise from testing the sample with a cryocooler. While a cryocooler provides the benefit of a wide and continuous operating temperature range, cooling a sample by conduction through solid media without a heat-exchange gas is difficult. This paper outlines the hardware and software used to conduct DC performance tests on magnesium diboride superconducting samples, along with several check-out tests and mitigation steps needed to produce quality superconducting data using a cryocooler rather than a cryogen.

Primary authors: Dr HARTWIG, Jason (NASA Glenn); Mr LLANES, Christian (Embry Riddle University); Dr BROWN, Gerald (NASA Glenn Research Center); Dr CHOI, Ben (NASA Glenn Research Center); Mr VANKEULS, Fred (Vantage Partners)

Presenter: Dr HARTWIG, Jason (NASA Glenn)

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