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C4Or1A-01: Characterization of thermal properties of OFHC copper at cryogenic temperature

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Advancements in electronic technology with cryogenic operational temperature requirements call for the study of thermal properties of the materials used to connect the heat source and cooling system. A test facility was developed to investigate thermal properties important to these applications–bulk conductivity and contact resistance–for a temperature range of 4K - 40K. Bulk conductivity tests were conducted on OFHC copper sourced from three different commercial vendors to determine any variation between both the commercial sources themselves and to the values found in literature. Preliminary analysis found RRR values within the range of 50 to 75 for all sources examined. These results are in line with previous studies and confirm the consistency of conductivity regardless of the source. The contact resistance tests focus on the variation of applied force; a uniform force ranging from 90N - 245N was applied to gold-plated OFHC copper samples with surface roughnesses between 1-2 micrometers. Results from these tests will highlight the significance of force variation. The results from both tests will help guide the design of heat paths in future cryogenic electronic technology.

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