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Test Apparatus utilizing Gifford–McMahon cryocooler to measure the thermal performance of multilayer insulation

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A vertical cylindrical calorimeter to measure the thermal performance of multilayer insulation (MLI) has been developed. Two concentric OFHC cold drums are fabricated by the sample MLI blankets, and are cooled by two-stage Gifford-McMahon cryocooler. As the cold drums are vertically supported, the layer density of the MLI sample around the drum is free from the gravity. Inner cold drum is cooled by the 2nd stage of the cooler and is maintained around 8K. Outer cold drum is maintained around 80K by connecting to the 1st stage of the cooler. The heat transfer through the blanket is measured by temperature difference across stainless steel thermal resistance tube in the heat meter which is equipped between the cold drum and the cold finger of cryocooler. When the heat meter is calibrated by the calibration heater, the cold drum is disconnected from the heat meter and the top of the drum is connected with the cold finger of cryocooler. The structure of the calorimeter and the calibration results of the heat meter are reported.

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