

Continuous 350 mK Stage ADR Cooling for Space and Ground Application

J.M. Duval, J.L. Durand, and T. Prouvé, University Grenoble Alpes, CEA, IRIG-DSBT; C. Marin, University Grenoble Alpes, CEA, IRIG-PHELIQS; and J. André and L. Marelli, CNES, Toulouse, France

LiteBIRD is a planned JAXA-led mission aimed at the measurements of the polarization of cosmic microwave background. To reach the desired sensitivity, its detectors must be cooled to 100 mK. The proposed cooler, based on a succession of Adiabatic Demagnetization Refrigerator (ADR) stages, includes a 350 mK continuous stage driving the overall mass. Experimental demonstration of 350 mK cooling have been achieved based on a 2.7 K interface from a laboratory pulse tube. Optimization using the 1.7 K available interface is on-going including a reduced size stage. In addition to experimental results, numerical modelling helps emphasize some main driving design parameters. This type of cooler operation is also well suited for ground applications and benefit from space optimization: the mass and size reduction necessary for space design can translate to cost reduction for a dedicated ground design.