Raytheon RSP2 Cryocooler Low Temperature Testing and Design Enhancements

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ABSTRACT - The High-Capacity Raytheon Stirling / Pulse Tube Hybrid 2-Stage cryocooler (HC-RSP2) was originally developed to provide simultaneous cooling at temperatures of 85 K and 35 K. During testing performed in 2008 it was demonstrated that this stock-configuration cryocooler is capable of providing significant amounts of heat lift at 2nd stage temperatures as low as 12 K, and modeling indicated that minor changes to the 2nd stage inertance tube / surge volume setup could yield improved performance. These changes were implemented and the cooler was successfully retested, producing >350 mW of heat lift at 12 K. A comprehensive redesign of the system has been performed, the result of which is a robust 2-stage cryocooler system that is intended to efficiently produce relatively large amounts of cooling at 2nd stage temperatures <12 K. This cryocooler, called the Low Temperature RSP2 (LT-RSP2) will be fabricated and tested over the next 12 months. This paper reports on the recently-completed test activities, as well as details relating to the system redesign. Expected performance, mass and packaging volume are addressed.

KEYWORDS: pulse tube, Stirling, aerospace, hybrid

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