

Ball Verne Cryocooler System Design, Development, and Initial Qualification

R. Taylor, B. Buchholtz, D. Glaister, and Y. Kim, Ball Aerospace, Boulder, CO; C. Fralick and D. Mansfield, Sunpower, Athens, OH; and K. Frohling, Iris Technology, Irvine, CA

Low-cost proliferated cryogenic space payloads are driving use of tactical cryocoolers to meet SWAP-C requirements. Historically tactical cryocoolers have not been considered for space flight due to short MTTF (0.5-1yr) against typical mission lifetimes on the order of 3-5 years. To mitigate reliability concerns, Ball has worked closely with our partners at Sunpower Inc. to develop a very low-cost, turn-key cryogenic cooling system called Verne that is designed for a 3-year mission life. The Ball Verne Cryocooler System includes a TRL6 Low Exported Vibration Cryocooler Assembly (no launch-locks) mated to a TRL8 Sunpower DS-MINI cryocooler, TRL8 Iris Technology ICE-G2 Cryocooler Control Electronics (CCE) and includes a low-cost thermal strap heat rejection system. The Verne system has successfully passed vibration and Exported Force and Torque qualification and has been baselined for a future spaceflight mission. This paper discusses the design, development, and initial qualification of the Verne Cryocooler System.