

DESIGN AND TEST OF A PERIODIC 10 K SORPTION CRYOCOOLER,\* P. Karlmann, J. J. Wu, C. Mirate and S. Bard, Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109- The development and performance of a small, closed-cycle, periodic 10 K sorption cryocooler laboratory system is described. The cooler is designed to provide cooldown from 60 to < 10 K in under 2 minutes, maintain a simulated detector heat load of 100 mW below 10 K for over 10 minutes, and have the ability to be recycled in under 6 hours. A  $\text{LaNi}_{4.8}\text{Sn}_{0.2}$  hydride sorbent bed is used to compress and circulate hydrogen refrigerant in the 25-30 K Joule-Thomson intermediate refrigeration stage. A ZrNi hydride sorbent bed is used to provide the low vacuum pressure (< 2 torr) needed to solidify and cool the hydrogen to 10 K. Thermally cycling the sorbent beds between 290 and 550 K produces a compression ratio of nearly  $10^6$ . A vacuum-pumped liquid nitrogen loop is used to simulate a mechanical cooler or radiator for the upper 60-80 K stage, Performance characterization test data is presented, results are compared with ground test data from the flight-qualified Brilliant Eyes Ten-Kelvin Sorption Cryocooler Experiment (BETSCE), and plans for using the cooler as a test bed for future reliability physics experiments are described. Performance and reliability test results, combined with BETSCE flight validation data, will enable early insertion of this long-life (> 10 years), low-vibration refrigeration technology into precision-pointing military surveillance, earth-observation, and astrophysics space satellite applications.

● Research carried out by the Jet Propulsion laboratory (JPL), California Institute of Technology under contract with the National Aeronautics and Space Administration and sponsored by the USAF Space and Missiles Systems Center.

1. CEC
2. Category number 2 (Cryogenic Techniques and Systems)
3. Bard, s.
4. Jet Propulsion Laboratory
5. MS 157-316
6. 4800 Oak Grove Drive
7. Pasadena, CA 91109
8. USA
9. Telephone# 818/354-4487
10. FAX# 818/393-4206
11. E-mail address: Steven Bard@ccmail.jpl.nasa.gov
12. Karlmann, P., Wu, J. J., Mirate, C., and Bard, S.
13. Keywords: cryocoolers, space cryocoolers, sorption, hydride
14. Oral Session