

Air Force Research Laboratory Spacecraft Cryocooler Endurance Evaluation Facility Closing Report



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The Air Force Research Laboratory (AFRL) Spacecraft Component Thermal Research Group has been devoted to evaluating lifetime performance of space cryocooler technology for over twenty years. Long-life data is essential for confirming design lifetimes for space cryocoolers. Continuous operation in a simulated space environment is the only accepted method to test for degradation. AFRL has provided raw data and detailed evaluations to cryocooler developers for advancing the technology, correcting discovered deficiencies, and improving cryocooler designs. At AFRL, units of varying design and refrigeration cycles were instrumented in state-of-the-art experiment stands to provide space-like conditions and were equipped with software data acquisition to track critical cryocooler operating parameters. This data allowed an assessment of the technology's ability to meet the desired lifetime and documented any long-term changes in performance. The data summarized includes the seven cryocoolers tested during 2014-2015. These seven coolers have a combined total of 433,326 hours (49.5 years) of operation.

Cooler	Cold end (K)	Heat Load W	Reject (K)	Lifetime Hours (3/12/15)
NGAS HEC	95	10	300	80,128
NGAS MPT	150	1.0	300	82,858
NGAS HCC	35/85	2.0/17.0	300	34,120
NGAS 6020	60	2.0	300	103,421
Ball 35/60	35/60	0.4/0.6	300	87,216
Sunpower CT	77	4	300	6,603
L3 B1500	110	2	300	38,980

Almost 50 years of combined operating hours

