NASA SBIR/STTR Technologies

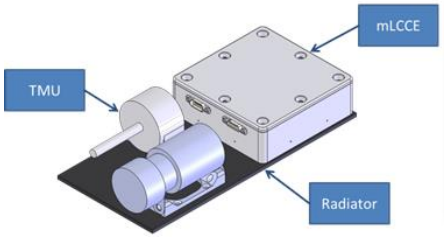
S1.09-7978 - Deep Space Cryocooler System (DSCS)

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Identification and Significance of Innovation

During this Phase 1 effort, Iris Technology's subcontractor, Lockheed Martin Space Systems Company (LMSSC), has performed the trades to determine which of three different off-the-shelf Microcryocooler designs could be modified to meet the above constraints and be built within the cost scope of a Phase 2 SBIR. Performance projections for this Phase 2 Engineering Model delivery meet the goals of the SBIR Topic (35K coldtip, 150K heat rejection, <400g mass) and provide twice the cooling power desired. Iris Technology has designed a circuit board performs the function of the mLCCE (miniature Low Cost Control Electronics) in a smaller, lower power configuration (µLCCE). This design is optimized to the LMSSC cryocooler and also is adaptable to a radiation hardened environment for deep space exploration.





Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)

Technical Objectives and Work Plan

Technical Objective 1 (TO1) – DSCS Design Specification
Technical Objective 2 (TO2) –µLCCE Electrical Design Cleanup
Technical Objective 3 (TO3) – µLCCE Packaging Design
Technical Objective 4 (TO4) – Cryocooler Detailed Design
Technical Objective 5 (TO5) – Pass Critical Design Review
Technical Objective 6 (TO6) –Engineering Model Electronics Development
Technical Objective7 (TO7) –Engineering Model TMU Development
Technical Objective 8 (TO8) – Successful CCE and TMU Integration Testing
DSCS Phase II provides:
Flight-design Engineering Model µLCCE
Enhanced Microcryocooler detailed design
µLCCE electrical design updates
Chassis physical/mechanical updates
Build and test µLCCE board/system and preliminary supporting analyses
TRL 4 – DSCS EM level product environmentally screen tested

NASA Applications

LM microcryocooler compressor rejects heat as low as 130K
- Uses cryogenic heat rejection temperature
- Currently cools JPL's Europa mission MISE spectrometer

DSCS improves cooler efficiency
- Reduces required electrical power and rejected heat
- Reduces the cryocooler size and mass
- Enables cooling at lower cold tip temperatures.
- Provides greater system efficiency, independently optimize two coolers

Non-NASA Applications

Similar path to commercialization as LM/Iris team GeoCARB mission
Size, mass, power reductions attractive to commercial partners
Enables Cryo-pumps for semiconductor manufacturing
Supports SQUID magnetometers for heart & brain studies
Usable for HTS filters
Usable for superconducting magnets for MRI and other electronics

Firm Contacts

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NON-PROPRIETARY DATA