NASA SBIR/STTR Technologies

S1.06-9362 - Lightweight Superconducting Magnets for Low Temperature Magnetic Coolers

PI: Weibo Chen
Creare, Inc. - Hanover, NH

Identification and Significance of Innovation

A lightweight, reliable, efficient Active Magnetic Regenerative Refrigeration (AMRR) system for space applications
- Cooling temperatures in the range of 2 K

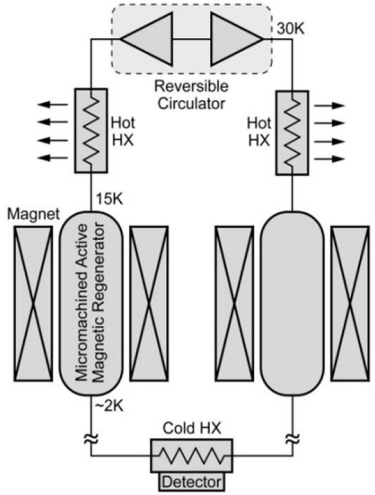
Ability to provide remote/distributed cooling

Propose to develop an advanced high-temperature, lightweight superconducting magnet
- High field, low current

An optimum time-varying field profile for efficient AMRR operation

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

- Technologies for the reversible cryogenic circulator have been developed
- Regenerator technologies are being developed. Key milestones have been achieved.
- Here we propose to fabricate a lightweight superconducting magnet and demonstrate a brassboard AMRR system
- In Phase III we will build a complete AMRR



Technical Objectives and Work Plan

Technical Objectives:
- A lightweight, robust superconducting magnet with low parasitic losses
- High heat rejection temperature
- High AMRR system thermal efficiency

Work Plan:
- Fabricate and qualify superconducting magnet
- Magnet integration design
- Assemble brassboard AMRR system with circulator, regenerator, and superconducting magnet
- Characterize brassboard AMRR system performance

NASA Applications

- Cooling systems for cryogenic detectors for sensing X ray, infrared, and sub-millimeter radiation (bolometers and microcalorimeters)
- Lightweight, low-current, high field superconducting magnets for science instruments

Non-NASA Applications

- Cooling systems for superconducting digital electronics, superconducting RF cavity for accelerators, and MRIs

Firm Contacts

Weibo Chen
Creare, Inc.
P.O. Box 71
Hanover, NH, 03755-3116
PHONE: (603) 643-3800
FAX: (603) 643-4657

NON-PROPRIETARY DATA