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Final Technical Report:

DOE Grant Number: DE-SC0023031

Grant Recipient: Texas A&M University

Title: Travel for SuperCDMS SNOLAB Operations

Principle Investigator: Prof. David Toback

Reporting Period: 08/01/2022 - 12/31/2024

Date of Report: 3/31/2024

1. Abstract

The grant supported SuperCDMS SNOLAB experimental research to address the nature and composition of the dark matter. SuperCDMS SNOLAB is a generation-2 dark matter search experiment that is designed to have vastly improved sensitivity to low-mass weakly interacting massive particles (WIMPs). SuperCDMS SNOLAB unique capabilities also enable sensitivity to a broader range of science beyond WIMPs. The SuperCDMS SNOLAB experiment is being installed and integrated at SNOLAB, near Sudbury, Ontario in Canada. The scope of this grant was support of SuperCDMS members to travel to the experiment location to engage in installation, integration and operations of the SuperCDMS experiment.

2. Technical Description

This grant enabled a portion of the DOE-provided travel funds to be directly provided to Texas A&M University (TAMU), instead of being provided to operations management at SLAC, to support travel for SuperCDMS operations, installation and integration (I&I) by members of multiple DOE-funded university groups. The grant was in alignment with DOE rebaseline IPR review for the construction project that recommended that operations move quickly to finalize, approve, and follow through on all Project Handoff to Operations Plan documents. This grant provided several key advantages that helped operations and I&I move forward. It allowed travel by university personnel whose citizenship prevented them from arranging travel through SLAC, it provided increased flexibility in arranging travel, and it increased the cost-effectiveness of SuperCDMS research by enabling a lower overhead rate. During the funded period, this grant supported 17 collaboration members from DOE-funded universities to travel to SNOLAB. It also supported for three trips to Fermi National Laboratory, one trip to SLAC and one trip to TRIUMF in support of integration planning of cryogenics and other systems. Members of the five following DOE-funded universities utilized the funds for travel: the California Institute of Technology, Texas A&M University, the South Dakota School of Mines & Technology, the University of Minnesota, and the University of South Dakota. Activities supported include:

- Planning of cryogenic system I&I,
- Knowledge transfer of the data quality monitoring system,
- SNOLAB on-site shifts to support
 - Commissioning of the radon filter system and low-radon cleanroom
 - Copper cleaning, passivation and etching
 - Shield assembly including shield base, walls and mu-metal
 - Receipt and acceptance testing of the four production detector-towers at SNOLAB
 - Installation of the xyz stage lifting fixture in the low-radon cleanroom
 - Multiple aspects of early operation of a high-voltage production in the CUTE SNOLAB test facility

- Receipt and installation of the dilution refrigerator including installation of thermometry
- Test operation of the dilution refrigerator validating its performance

3. Presentations and Venues

The intent of this grant was to support members engaged in activities in support of I&I and operation of the SuperCDMS experiment at SNOLAB. Therefore, no presentations were given.

4. Personnel Involvement

This grant solely supported SuperCDMS travel and as such did not provide support for faculty, postdocs, engineers or students. No funds were allocated for support travel administration

5. Unexpended Funds

The total unexpended funds are \$3,023.81.

6. Products

No peer-reviewed publications have resulted from this grant. The supported operation of a production high-voltage detector-tower in the CUTE SNOLAB test facility is expected to result in one or more peer-reviewed publications over the next two years. I&I of the SuperCDMS SNOLAB experiment is currently anticipated to complete in July 2025. Once I&I and commissioning complete, the resulting science data obtained from the SuperCDMS SNOLAB experiment is anticipated to result in a broad range of peer-reviewed publications.