

**Fermi National Accelerator Laboratory
LDRD Project Data Sheet - FY17**

Project ID: FNAL-LDRD-2017-019

Project title: First demonstration of conduction cooled superconducting radio frequency cavity

Principal investigator: Jayakar (Charles) Thangaraj

Project description: (short description and explanation of cutting edge, high-risk, high-potential science or engineering)

This project seeks to demonstrate the first ever cooling of a radio-frequency, RF, excited superconducting RF, SRF, cavity using the principle of conduction cooling (i.e. NO Liquid Helium). We will cool a Nb₃Sn coated multi-cell cavity using a cryo-cooler. We will also establish practical and scalable thermal configurations for cooling the cavity. Our project anticipates both developing existing Fermilab intellectual property, IP, and creating additional IP for future SRF-based accelerators around the world.

Tie to Mission: (explain the project's relevance or anticipated benefits to Fermilab's and DOE's missions)

Our work will substantially reduce the cost of future SRF accelerators benefitting both large SRF based science accelerators and creating new opportunities for small affordable SRF based accelerators for both science and industry.

Previous year's accomplishments: (as applicable)

N/A

Work proposed for current fiscal year and anticipated / desired results:

The first year of the project will measure the thermal conductivity and optimize the contact resistance leading to cool down a 1.3 GHz Nb cavity using conduction cooling. The deliverables will be to optimize the way to attach a stud to a cavity, the configuration of thermal strips, and to experimentally demonstrate heat removal from a single-cell pure Nb cavity via conduction cooling.

Project funding profile: (costs, budgets, projected budgets, and total)

Prior year(s) costs	FY17	FY18	FY19	Total
N/A	285,957.49	559,030.18	331,053.25	1,176,040.92

Project Start Data: 3/01/2017

Total Approved Project funds: \$ 1,476,040.92