

**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 Nb<sub>3</sub>Sn 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)

A borrowed cryostat has been upgraded and new instrumentation installed to show exciting success from early work with indium interposed Nb-Al to have greatly lowered thermal resistance by an order of magnitude compared without the indium. Work has begun to cool a single cell SRF cavity using a cryocooler.

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

Work will continue to cool a single cell SRF cavity using a cryocooler with a next step you use pure Nb rings welded near the equator of the cavity.

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

Prior year(s) costs	FY17	FY18	FY19	Total
N/A	332,793	509,030	331,053	1,172,876

Project Start Data: 3/01/2017

Total Approved Project funds: \$ 1,476,041