Fermi National Accelerator Laboratory
LDRD Project Data Sheet - FY14

Project ID: FNAL-LDRD-2014-027
Project title: From Magic to Method: Characterizing High Voltage in Liquid Argon TPCs with the Breakdown in liquid argon cryostat for high voltage experiments
Principal investigator: Sarah Lockwitz

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

The project is to measure the liquid argon dielectric strength and the performance of insulators in liquid argon. The measurements and performance characterization will be done systematically over a large range of parameters relevant for current and future neutrino and dark matter experiments. No such set of comprehensive measurements on liquid argon is currently available.

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

High voltage use in liquid argon is important for current and future projects in high energy physics including neutrino and dark matter detectors. Existing measurements of dielectric strength of liquid argon and characteristics of insulators are either unpublished, were made decades ago without control of all the relevant parameters, or are more recent measurements applicable only within limited context. The project will provide essential data that will be used in the design of the next generation liquid argon TPC devices.

Previous year's accomplishments: (as applicable)

A new cryostat with pure liquid argon has been built and a series of tests and measurements have been made. These tests include the performance of various insulators. Significant findings showing the length and grooves do not have a large impact on performance. The largest dependence was on the permittivity of the material. These results using the open cryostat have been written up and published.

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

This LDRD project is complete. A Final Report will be included in Fermilab FY16 LDRD Annual Report.

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

Prior year(s) costs	FY14	FY15	FY16	Total
	20,158	400,349	-5,884	414,623

Project Start Data: 7/15/2014 Total Approved Project funds: $ 470,334