Fermi National Accelerator Laboratory
LDRD Project Data Sheet - FY17

Project ID: FNAL-LDRD-2017-028
Project title: Increasing the photon detector light efficiency in a liquid argon detector by an order of magnitude
Principal investigator: Gustavo Cancelo

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

This proposal seeks to achieve a photon detection efficiency higher than 1% in LAr scintillating detectors using a novel light trapper and active ganging structure of silicon photo-multiplier devices (SiPMs).

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

The photon detection efficiency is a key parameter that determines the degree of science to be obtained by a liquid argon detector. This R&D will look at a novel option to improve the photon detection light efficiency compared with baseline technologies selected for the DUNE project. If the high efficiency can be demonstrated, there can be improvements in selecting non-beam events for proton decay and supernova.

Previous year's accomplishments: (as applicable)

A down-select was made to a preferred (out of four) vendor for dichroic filters. Two prototypes were installed in a LAr dewer for an April and September run. Wavelength shifter and reflector materials were studied. Optical measurements were made using a calibrated optical sensor. An active electronic circuit to gang SiPMs was designed.

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

The measurements and data from the runs will be analyzed in order to show the potential advantage for the DUNE experiment. The finishing work will be to have a system designed for proto-DUNE and to attract follow-up funding for that next system.

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

Prior year(s) costs	FY17	FY18	FY19	Total
N/A	128,374	200,000	50,000	378,374

Project Start Data: 3/01/2017 Total Approved Project funds: $ 400,000