

Fermi National Accelerator Laboratory

LDRD Project Data Sheet - FY15

Project ID: FNAL-LDRD-2015-010

Project title: Dark Energy Survey and Gravitational Waves

Principal investigator: Marcelle Soares-Santos

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

The project is to perform a feasibility study of using the Dark Energy Survey (DES) to make an optical identification of a source of gravitational waves triggered by upcoming gravitational wave (GW) detectors that are planned to start taking data by the end of 2015. GW detectors are able to locate only with moderate precision the location of a source of gravitational waves. A dedicated search by DES which has a wide field of view and sensitivity in the near infrared optical bands may result in a pinpoint precision of the source of the gravitational waves allowing for much improved measurements of the source that would otherwise be lacking.

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

Gravitational waves from coalescing neutron star binaries or black hole-neutron star pairs are potential new probes for dark energy and the physics of spacetime – areas of study directly related to the mission of Fermilab. This project will leverage existing DOE investment in the Dark Energy Survey Camera (DECam) and, if successful, be a demonstration of a new kind of probe relevant for high energy particle astrophysics

Previous year's accomplishments: (as applicable)

A proposal was written and was well-received and resulted in the award of three nights of observation by the Dark Energy Camera. Collaboration with interested parties from the Dark Energy Survey, LIGO, and other members of the community has been strengthened. The image-processing pipeline has been developed including a creative solution to avoid discontinuity problems. Initial tests on the GRID have been successful. Code successfully runs that interfaces with gravitational wave output from LIGO.

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

The basic system will be improved in preparation for the 2015 campaign of the awarded three nights. A search campaign will be done and data will be analyzed towards a first publication shortly after the beginning of the calendar year. The analysis will also help make improvements for the 2016 campaign which will be done with improvements at advanced LIGO including the distance of a GW burst and the ability to localize the candidate region on the sky of such a signal.

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

Prior year(s) costs	FY15 through 8/15	FY16 budgeted	FY17 budgeted	Total
N/A	37103	161236	0	198,339

Project Start Data: 2/1/2015 (est) Total Approved Project funds: \$ 280,103