Fermi National Accelerator Laboratory
LDRD Project Data Sheet - FY17

Project ID: FNAL-LDRD-2017-003
Project title: Optical Magnetic Kinetic Inductance Devices for Future Cosmic Surveys
Principal investigator: Juan Estrada

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

To realize the potential of these sensors in cosmic surveys the energy resolution of the detectors needs to improve from the currently achievable $R=E/\Delta E=15$, to the theoretical limit for the technology R~100. The work proposed here will form a Chicagoland team (ANL-FNAL-UC) to study the current issues limiting the resolution of the sensors, and develop prototype sensors overcoming some of these issues

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

The work will rely on expertise developed over the past few at FNAL for the characterization and readout electronics of these sensors, together with the expertise at ANL and UC for the design and fabrication of MKIDs. The work on optical and near-IR MKIDs has a significant synergy with the current effort at U of Chicago for developing MKIDs as the detectors for CMB-S4 project. The potential of a low resolution survey has been recently recognized with the Cosmic Vision - Dark Energy group as expressed in the recent publication: "There is another possibility for a project to extend the Stage IV program: obtaining low resolution spectra for a substantial fraction of LSST objects. A number of possible technologies are under consideration, including MKIDs, narrow band filters, or even photometric redshift improvement by shifting the LSST filters."

Previous year's accomplishments: (as applicable)

N/A

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

During Phase 1 we will fabricate a series of small arrays of MKID detectors at ANL, starting with designs drawn from existing UCSB arrays. This initial step will not only verify the optical response and noise properties of locally-grown films, but will address resonator parameter scatter which is believed to be due to interactions between resonators in densely packed arrays.

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

Prior year(s) costs	FY17	FY18	FY19	Total
N/A	83,000	157,000	109,000	349,000

Project Start Data: 3/01/2017 Total Approved Project funds: $ 349,000