

Fermi National Accelerator Laboratory LDRD Project Data Sheet - FY18

Project ID: FNAL-LDRD-2018-019

Project title: Broadband spectral sensitive graphene photodetector

Principal investigator: Vadim Rusu

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

The main objective of this proposal is clear: manufacture a bilayer graphene on a substrate, develop a suitable way to apply a transverse electric field for gating, instrument the device with amplification and measure its response in order to fully characterize it in terms of efficiency, broad-band sensitivity and speed. Graphene has the promise to exceed various metrics compared with other photosensitive material.

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

Using graphene as a photo-sensor is a novel detector technique. If successful, this can have wide ranging applications in the field of particle physics. For instance, having a color sensitive photo-sensor, can enable new techniques for separating Cherenkov light and scintillation light in future neutrino detectors. The compatibility between graphene and silicon can open new paths for monolithic sensors where the front-end electronics is directly integrated with the sensor. In general, having an early start on this novel technology, will greatly benefit our field in the long run.

Previous year's accomplishments: (as applicable)

N/A

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

The first challenge will be to manufacture such a device. Fortunately, there are several graphene companies that offer graphene mono-layers and bi-layers on different substrates. There will likely be several development cycles to obtain a high quality bi layer graphene.

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

Prior year(s) costs	FY18 ½	FY19	FY20	FY21 ½	Total
N/A	60,000	250,000	214,273		524,273

Project Start Data: 3/15/2018

Total Approved Project funds: \$ 524,273