

Fermi National Accelerator Laboratory LDRD Project Data Sheet - FY16

Project ID: FNAL-LDRD-2016-034

Project title: R&D and Experimental Instrumentation for the Initial Set of Critical Scientific Experiments in IOTA and the FAST Injector

Principal investigator: Swapan Chattopadhyay

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

An experiment with a proton/ion beam will be to understand how such a beam behaves in the Integrable Optics Test Accelerator (IOTA) ring given that it is space-charge dominated. For this experiment to be done, the injection line will be instrumented with diagnostics such as beam position monitors and beam loss monitors that are special purpose to IOTA. A second experiment involves a pencil-like electron beam that tightly controlled in order to understand the optical properties of the IOTA ring. This experiment will require some special-purpose optical elements and very fast photo detectors. The LDRD project is to procure the above special-purpose equipment to enable the first set of experiments to be conducted.

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

The IOTA and FAST accelerators have been chosen as test accelerators to help pave the way to develop much more intense beams than have been done before. Such beams are required for future experimentation in high energy physics including neutrino physics. As such, this LDRD project is tied to the mission and strategic future of Fermilab.

Previous year's accomplishments: (as applicable) Initial expenditures have been made to build unique instrumentation and diagnostics for both the FAST electron beam line and stored electrons in IOTA and also for high current proton beams in IOTA. Lab priorities have resulted in slower work on the design of special purpose magnets for the electron beam. Also slow for the proton beam is an "Allison monitor" which is a non-invasive measurement in storage mode.

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

The majority of the work expected in FY18 will involve a gas jet concept as a beam profile monitor. Design of the operating parameters will be followed by a shakedown of the readout electronics prior to operation with the electron beam in IOTA.

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

Prior year(s) costs	FY17	FY18	FY19	Total
N/A	83,733	145,000	146,267	375,000

Project Start Date: 10/01/2016

Total Approved Project funds: \$ 375,000