

Fermi National Accelerator Laboratory

LDRD Project Data Sheet - FY15

Project ID: FNAL-LDRD-2015-031

Project title: A comprehensive investigation of a transformational integrable optics storage ring as a “smart” rapid cycling synchrotron for high-intensity beams

Principal investigator: Alexander Valishev

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

This proposal seeks to enhance Fermilab’s strategic vision via engaging in a comprehensive feasibility study and investigation of an integrable optics “smart” rapid cycling synchrotron (RCS) as an essential component of a potential future multi-megawatt (MW) facility to advance neutrino science. The high-level project objective over a 3-year period is a full analytical, computational and technical evaluation of a scenario for multi-MW neutrino facility based on an innovative high intensity RCS.

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

A future multi-MW accelerator would be an enabling new device for research at the forefront of the intensity frontier with possible application to high luminosity hadron machines at the energy frontier. If successful, the study will result in significant cost reduction for a planned new RCS aimed to attain the beam power in excess of 2 MW for the future long baseline neutrino program.

Previous year’s accomplishments: (as applicable)

The project start date is Feb 2016 when a postdoctoral researcher became involved. A number of Year 1 objectives have started and are partially complete. In particular, “integrable optics” RCS or iRCS lattice design work has begun.

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

In the first year, tools and procedures for modeling the particle dynamics in a RCS will be developed along with identifying the limiting factors and technical issues associated with a multi-MW facility. If successful, the studies will continue to evaluate space charge effects and to design validation experiments that can be carried out at the Fermilab IOTA ring. The final year of funding will support the development of an integrated plan for a facility based upon the concepts developed.

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

Prior year(s) costs	FY16	FY17	FY18	FY19 (4 mo.)	Total
N/A	110171	245K	258K	62K	675,171

Project Start Data: 2/01/2016 Total Approved Project funds: \$ 935,600