

## Fermi National Accelerator Laboratory LDRD Project Data Sheet - FY14

**Project ID:** FNAL-LDRD-2014-012

**Project title:** Development of HTS Based Rapid-Cycling Accelerator Magnets

**Principal investigator:** Henryk Piekarz

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

The goal is design, fabricate, and test a short-sample rapid-cycling superconducting accelerator magnet using a novel combined core and cable design made from high temperature superconductor, HTS. The rapid-cycling magnet will be coupled to a 500 Hz ringing mode power supply and a 20 Hz white circuit power supply to achieve 2000 T/s and 20 T/s ramp capabilities. This unique design will overcome limitations with normal conducting rapid-cycling magnets due to eddy currents and magnetic hysteresis and potentially pave the way for extended capabilities in ramp rate, lower power, and more stable operation of these magnets.

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

Rapid-cycling magnets are a critical component of many particle accelerator systems including fast-cycling synchrotrons such as the Booster, Main Injector, and FAIR. A key limitation in achieving high beam intensities is the high field ramp rate and successful R&D in this area would provide extended capabilities for possible new magnet components at Fermilab and at other facilities within DOE.

**Previous year's accomplishments:** (as applicable)

Engineering designs of the core, power cables, leads and cryostats are complete. Fabrication is in progress and should be complete shortly after the new year. In parallel, the MDB test area has been configured with power and cryogenic connections. This area will be debugged using a previous prototype magnet.

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

The final steps of construction of the magnet will be done. The project should get to the point where an initial set of performance measurements are made to demonstrate the advantages of this novel design.

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

Prior year(s) costs	FY14	FY15	FY16	FY17 budgeted	Total
	12,677	152,869	154,586	345,668	665,800

Project Start Data: 7/15/2014

Total Approved Project funds: \$ 885,020