

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

Project ID: FNAL-LDRD-2014-016
Project title: HF GaN Driver
Principal investigator: Greg Saewert

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

The project is to develop a new type of electronic switch, for use by accelerator components, using newly available Gallium nitride (GaN) transistors capable of very fast switching transition times (<2ns), operating at relative high (~500V) voltages under moderate loads, and having repetition rates in the range of tens of megahertz. Previous technologies are able to meet individually some of the requirements ... what is new is R&D towards a switch that is able to have all the desired characteristics simultaneously.

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

Very fast, high repetition high voltage switches have use in accelerator components used in high energy physics. The development of this particular new device would have benefits towards powering kicker magnets that would be capable of kicking beam on a bunch-by-bunch basis as desired in a high intensity accelerator facility. Such switches would have other potential uses in driving electrodes, Pockel Cells, or driving Q switches in lasers.

Previous year's accomplishments: (as applicable)

Work on the printed circuit board including design, layout, and procurement has been done. An investigation was made on the use of laser diodes as an alternative to using transformers for trigger signal isolation. Driver boards were assembled to study circuit timing issues. This work achieved 200V operation with 2ns rise and fall times with two stages. A finalized printed circuit board driver design to accommodate newly available GaN FETs has been done and the 500V operation has been demonstrated. It is possible that this scheme will be adopted for PIP-II.

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

This LDRD project is complete. A Final Report will be included in Fermilab FY16 LDRD Annual Report.

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

Prior year(s) costs	FY14 actual	FY15 through 8/15	FY16 budgeted	Total
N/A	10,080	187,365	58,288	255,733

Project Start Data: 7/15/2014

Total Approved Project funds: \$ 356,430