Fermilab

Managed by Fermi Research Alliance, LLC for the U.S. Department of Energy Office of Science

Radiation-Hardened, High-Speed Parallel VCSEL Links for High-Energy Physics

Cooperative Research and Development Agreement Final Report

CRADA Number: FRA-2016-0009

Fermilab Technical Contact: Alan Prosser

Summary Report
9/27/2019

NOTICE

In accordance with Requirements set forth in Article X of the CRADA document, this document is the final CRADA report, including a list of Subject Inventions, to be forwarded to the Office of Science and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

CRADA number: FRA-2016-0009

CRADA Title: Radiation-Hardened, High-Speed Parallel VCSEL Links for High-Energy Physics

Parties to the Agreement: Vega Wave Systems and Fermi Research Alliance, LLC

Abstract of CRADA work:

Vega Wave Systems, Inc. has been awarded a Small Business Innovative Research (SBIR) Phase II proposal to the U.S. Department of Energy entitled "Radiation-Hardened, High-Speed Parallel VCSEL Links For High-Energy Physics." The technology proposed under this program is a significant advance (up to 4x) in data rate over current optical link technologies under development. Fermilab supports the technology developed under this proposal as a radiation-hardened, cost-effective solution for optical links for the high-speed data communications in High-Energy Physics and agrees to provide consulting and test engineering in support of this program. Fermilab staff will provide consulting services along with high speed testing of modules before and after radiation testing.

Summary of Research Results:

Vega Wave Systems developed an evaluation / test printed circuit board to facilitate validation and verification of the 480Gbps VCSEL optical transmitter. This test board was designed to exercise all forty-eight VCSEL channels simultaneously on a per-channel basis. The board generates various PRBS patterns as well as a 16-bit user-defined pattern. It can also be put into a repeater mode.

Under the supporting CRADA, Fermilab provided software support to develop the software necessary to communicate with and control the test board. A GUI was developed to provide low level manipulation to access register data in the parts on the board and for configuration of the parts at a higher level. The GUI provides a high-level status of all inputs and clock-data recovery (CDRs) and can be expanded to include each channel's status. A low-level register access window is included to access any devices' registers that includes a buffered history window. It also contains a configuration section to configure the chips at a high level, with the ability to change data rates if desired. Ethernet is the default configuration to run at 10GE rate. A pattern generator section is included, so easy control over patterns can be done. It can also dump registers to a file for debugging purposes.

Related Reports, Publications, and Presentations:

NA

Subject Inventions listing:

NA

Report Date: 9/27/2019

Technical Contact at Fermilab: Alan Prosser

This document contains NO confidential, protectable or proprietary information.

Click here to enter text.