

Sandia National Laboratories FY21 Progress Report

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The Energetic Neutrons campaign led by Sandia National Laboratories (SNL) had a successful year testing electronic devices and printed circuit boards (PCBs) under 14 MeV neutron irradiation at OMEGA. During FY21 Sandia's Neutron Effects Diagnostics (NEDs) and data acquisition systems were upgraded to test novel commercial off-the-shelf and Sandia-fabricated electronic components that support SNL's National Security mission. The upgrades to the Sandia platform consisted of new cable chains, sample mount fixtures and a new fiber optics platform for testing optoelectronic devices.

The new cable chains improved data quality and reduced the time required by LLE and Sandia to identify and solve issues with the electronic circuits under test. A variety of sample fixtures were designed and fabricated to mount new shapes and sizes of PCBs closer to the neutron source without interfering with other components fielded simultaneously. PCBs fielded in FY21 contained a variety of components ranging from low to high voltage and from discrete devices to small integrated circuits as shown in figure 1 a) and b).

The new fiber optics platform consisted of fiber optic cables, sample mount fixtures and data acquisition systems that allowed Sandia to measure high quality optical signals for the first time at OMEGA. Optical data will be used to calculate carrier lifetime degradation in semiconductor devices exposed to 14 MeV neutron irradiation using light output decay and frequency response measurements as shown in Figure 1 c).

A SNL graduate student intern participated for the first time in one of the experiments at OMEGA performing in-situ testing of optoelectronic devices. The student developed software, connected hardware, acquired data, and performed data analysis during one of the energetic neutrons campaign in FY21 and he will be participating again in FY22.

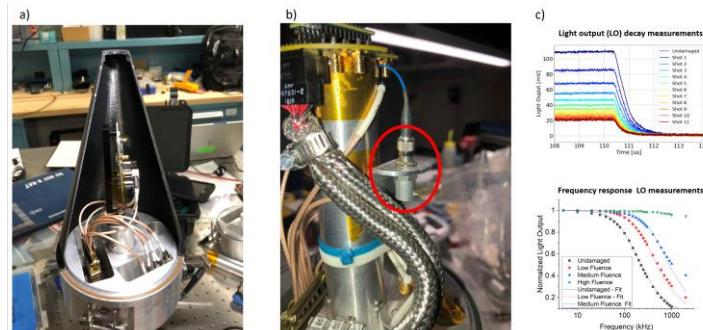


Figure 1 shows a) a PCB mounted in one of the Sandia NEDs used to study single event effects (SEE), b) an example of the setup used to test optoelectronic device in the Sandia NEDs and c) an example of the light output data measure after each shot during one of the energetic neutrons campaigns

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