LDRD@SNL

SAND2015-8983R

SEPTEMBER 2015

Sandia National Laboratories
Laboratory Directed Research and Development

We welcome your questions, comments, and ideas for future LDRD projects to feature! Email your feedback to Marie Arrowsmith, mdarrow@sandia.gov

Predictive Assessment of State of Health and Lifetime of Passive NW Components

Paiboon Tangyunyong (PI), Stefanova Paskaleva, Rachelle Thompson

Sandia researchers are using power spectrum analysis to detect aging effects in non-nuclear weapons components, a technique that demonstrates improved performance over conventional electrical testing methods.

NNSA's stockpile stewardship mission is aimed at ensuring the safety, security, and reliability of weapons in the absence of underground nuclear tests. Understanding how new and existing weapons components will behave throughout the life of the system is critical to maintaining the stockpile. By performing accelerated aging tests on components, researchers can observe device behavior. In the absence of obvious degradation, other techniques must be used to understand and predict aging effects. Researchers are using Sandia-developed power spectrum analysis (PSA) to detect electrical differences in devices and determine whether PSA can detect aging effects when devices, such as commercial off the shelf discrete devices, diodes, and capacitors, are subjected to accelerated life tests at elevated temperatures and voltages.

After each accelerated life testing cycle, researchers made PSA measurements and performed conventional electrical testing on the test devices; they also performed physical analyses on several samples of aged and un-aged devices. By correlating PSA data and the conventional data, they observed promising results---PSA showed good sensitivity to detecting aging effects. In some cases, the aging effects detected by PSA were not detected by conventional electrical testing. Additionally, they also found strong correlations between changes in PSA data and physical changes in the test devices. These initial results suggest that PSA can potentially be used to study aging effects as a standalone technique or as a complementary technique to existing electrical testing methods, providing a useful tool for stockpile assurance.

Career development, expertise gained through early-career LDRD benefits NA-20, CTBTO

Sandia Early Career LDRD researcher Julia Craven Jones, the only American to serve on the CTBTO's External Evaluation Team for the 2014 on-site inspection excercise, credits LDRD as critical to her career development.

The most sophisticated on-site inspection (OSI) exercise conducted to date by the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), the Integrated Field Exercise IFE14, involved four years of preparation, 150 tonnes of specialized equipment and over 200 international experts. One of those experts included Sandia LDRD PI and Early Career LDRD recipient Julia Craven Jones. Jones was the only American on the 12-person External Evaluation Team for IFE14, and was responsible for examining technologies that were used to inform the OSI team's search logic during the exercise.

Her expertise in remote sensing technologies has been enhanced by Sandia's LDRD program: an Early Career LDRD (*Athermal Spectro-Polarimetric ENhancement [ASPEN]*, 2012-2013) solved a critical problem related to spectral/polarization remote sensing instrumentation. It also helped her transition from graduate student to member of technical staff. Jones is the PI on a current LDRD, *Exploitation of Optical Polarimetry for Remote Sensing*, which is helping to improve capabilities in optical remote sensing.

Of LDRD, Jones says, "Leading an [Early Career] LDRD enabled me to pursue research that was aligned with my personal interests, while simultaneously offering new ideas and developments that could benefit [Sandia's] Defense Systems and Assessments mission space. I have in large part LDRD to thank for my early career development."

Jones remains active in the nonproliferation community, and with sponsorship from NA-24, assisted with the IFE14 Evaluation Team's final report presented to States Signatories in August.

Upcoming Events

Oct 22 - NNSA LDRD/SDRD Quarterly Working Group Meeting (LANL)

Oct 29 - Geoscience Continuing LDRD Review

Nov 2 - Academic Alliance LDRD proposal submission deadline

LDRD PROJECTED BUDGET AND STATUS

FY16 Q1 $155 MILLION 303 PROJECTS FUNDED AT $136.3 MILLION

Awards & Recognition

Abraham Ellis was named 2015 HENAAC Award winner by Great Minds in STEM, for Outstanding Technical Achievement.

Steve Slutz was elevated to fellow of the American Physical Society "for innovative design of pulsed power fusion targets including concepts employing direct magnetic compression of pre-magnetized and pre-heated fuel."

Sandia National Laboratories

Sandia National Laboratories is a multiprogram laboratory managed and operated by Sandia, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000

U.S. DEPARTMENT OF ENERGY