Department of Electrical and Computer Engineering

TEXAS TECH UNIVERSITY
Edward E. Whitacre Jr.
College *of* Engineering

Spring 2019 Seminar Series

Seminar Title: Advances in Pulsed Power Technology for High Energy Density Science

Time: 3:00-4:00 PM, Friday, March 29, 2019
Location: ECE 101

Speaker:
George Laity
Sandia National Laboratories

Abstract: Sandia National Laboratories has been the leading U.S. laboratory in stewarding fast pulsed power accelerator technology for national security applications for more than 50 years. Large pulsed power accelerators are used for a variety of scientific missions such as inertial confinement fusion, radiation effects science, advanced radiography, dynamic materials compression, high energy density physics, and more. For example, our research center at Sandia stewards the Z Pulsed Power Facility, presently the world's largest laboratory pulsed power device, capable of delivering 25MA of electrical current to a physics load in 100ns. A new generation of pulsed power accelerators will likely be constructed at multiple national security laboratories over the next decade, and a variety of activities are underway to mature technology options for these future machines. Rapid advancements are being made in multiple engineering disciplines ranging from high voltage component development, accelerator prototyping, integrated pulsed power systems demonstration, applied physics studies, and multi-scale modeling code development. For example, Sandia recently demonstrated the world's most advanced MA-class linear transformer driver (LTD) accelerator cavity, innovative multi-pulse accelerator demonstrations, as well as physics-based circuit modeling codes capable of reproducing key accelerator performance criteria of the Z Facility to within 2%. One limiting factor in the design of future, more powerful, pulsed power accelerators is the undesired generation of parasitic electrode plasmas in various locations in the accelerator architecture, which divert current and ultimately limit the amount of electrical power that can be delivered to physics loads. A large effort is underway to develop advanced multi-physics modeling codes to predict the performance of these next-generation pulsed power accelerators, with such codes being validated against ongoing >20MA current coupling experiments at the Z Facility. This presentation will provide an overview of Sandia National Laboratories, as well as highlight key accomplishments in the Pulsed Power Accelerator Science & Technology program over the past 2-5 years.

Speaker Bio:

Dr. George Laity is the R&D Manager of the Advanced Pulsed Power Capabilities Group at Sandia National Laboratories, which is responsible for developing innovative pulsed power concepts for multiple accelerators, plasma diagnostics development, pulsed power codes, and power flow / current coupling research supporting next-generation pulsed power accelerator design. He previously served as principal investigator at the Sandia Z Facility, the world's largest pulsed power device, in the areas of vacuum power flow physics, z-pinch radiation sources, and magneto-inertial fusion experiments. He is an adjunct faculty member with the Center for Pulsed Power and Power Electronics at Texas Tech University, for a brief period served as a visiting scientist with the U.S. Air Force Research Laboratory. He has contributed to a variety of technical topics including: pulsed power accelerator technology, high energy density physics, vacuum insulator flashover, high power electromagnetics, vacuum arc ion sources, plasma code development, and optical/plasma diagnostics. He is a member of the IEEE and the American Physical Society, and was elected to the AdCom of the IEEE Dielectrics and Electrical Insulation Society in 2018. He was General Conference Chair of the 2018 IEEE International Power Modulator and High Voltage Conference, and serves on the technical program committees of multiple international conferences. He received the B.S. degree in physics, and the M.S. / Ph.D. degrees in electrical engineering from Texas Tech University, Lubbock, TX in 2008, 2010, and 2013, respectively.