Department of Electrical and Computer Engineering

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

Fall 2025 Seminar Series

Seminar Title: *4 MV 600kA Marx Generator Design with Closely Coupled sub-Marx*

Time: 3:00-3:50 PM, Monday, Oct. 27, 2025

Location: ECE 101

Speaker:
David Phipps
Fisica, Inc

Abstract:
We have designed Marx Generators equipped with Closely Coupled Marxes (CCMs) for Nuclear Weapons Effects (NWE) simulators at the Defense Threat Reduction Agency (DTRA) West Coast Facility (WCF) operated by Fisica, Inc. (formerly L3Harris) in San Leandro, CA. By closely coupling sub-Marxes, the jitter between sub-Marxes within a single Marx tank becomes a small fraction of the pulse width and does not affect the total Marx output. The CCM design is optimized for a Marx generator of which output voltage exceeds 4 MV with sub-microsecond pulse widths. Various cases have been taken into consideration in the optimization studies and will be presented, e.g., Marx phase variations, negative and positive charging, and pre-fire. Experimental data was collected throughout implementation of multiple Fast Marx designs from single 10 stage Marxes up to four 20 stage CCMs. Circuit simulations using Castle (which is a hybrid modified nodal analysis and a transmission-line code), electro-static analysis using Quick Field and CST Studio Suite e-static solver were used for design studies. CST time domain solver, Particle In Cell (PIC), and Tracking solvers were also used for benchmarking against experimental results and design optimization studies. This presentation summarizes the design studies carried out to achieve a high voltage SF6 free Marx generator with outputs greater than 4 MV and 600 kA.

Speaker Bio:
Mr. Phipps has worked in the pulsed power field for over 20 years and has a broad knowledge base from vacuum system design to diode development and radiation diagnostics. He successfully brought the SPG simulator from a prototype to a reliable customer support simulator. His areas of expertise include: Bremsstrahlung and electron beam source development and testing, data acquisition and analysis, program management experience, scientific and engineering support for radiation simulators. He also has knowledge of optical diagnostic systems that include plasma density measurements and holography. Mr. Phipps is currently the chief scientist for Fisica Applied Technologies Incorporated, helps to lead the DTRA West Coast Facility suite of simulators, and is the technology development lead for the Central Test and Evaluation Investment Program (CTEIP), DTRA XSTENS Program upgrades for the simulators PITHON II and Quad Eagle.