



Contribution ID: 31

Type: Oral Presentation

## Compact Very High Voltage Capacitor Development Based on Advanced Machinable, NanoDielectric Materials

*Monday, 4 June 2018 10:45 (15 minutes)*

For several years the University of Missouri has been developing compact capacitors for use in high voltage pulsed power/directed energy applications. The dielectric employed in this development is a proprietary nanocomposite, nanodielectric material, MU100. The material was originally developed for use in dielectric loaded antennas, however, due to various material properties, the nanocomposite has shown promise in development of compact high voltage capacitors. Prior work has shown small scale samples of the high permittivity nanocomposite dielectric material to have an average dielectric strength of 225 kV/cm with peak breakdown fields in excess of 325 kV/cm. When scaling up to accommodate application specific voltages, failure modes become more pronounced due to volume effects of the nanocomposite and field enhancement factors at the electrode dielectric interfaces. This paper will present how the material was scaled from small scale samples up to compact capacitor prototypes capable of repeatable performance at 250 kV with lifetimes greater than 104 shots.

Keywords: Nanodielectrics, Dielectric, Capacitors, High Voltage, Nanocomposites, Pulsed Power System

Distribution A: Approved for Public Release

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**Session Classification:** Oral 1 - Dielectrics

**Track Classification:** Dielectrics, Insulation, and Breakdown