



Contribution ID: 1100

Type: Poster

5P19 - Advanced NanoDielectric Material Scaling for Further Size Reduction of Ultra-High Voltage, 500 kV Capacitor Prototypes

Friday 28 June 2019 13:30 (1h 30m)

Compact capacitors for use in high voltage, pulsed power and directed energy applications that have a much higher voltage hold off than current commercial ceramic capacitors and are much more thermally stable have been developed. These 130 pF capacitors use a proprietary nanocomposite dielectric material named MU100 and were designed for 500 kV operation with 55% reversal. This material was initially developed to reduce the size of high frequency, high voltage dielectric loaded antennas. However, due to its unique material characteristics, the nanocomposite has shown promise in development of very compact, high voltage capacitors that can operate over the temperature range of -40°C to 120°C. The material was successfully used to fabricate capacitor prototypes capable of repeatable performance at 500 kV with lifetimes greater than 104 shots. The capacitors used for this design had a diameter of 3.4 cm and a height of 8 cm based on application requirements. This work covers scaling the MU100 material substrates to a diameter of 6.35 cm to allow for further size reduction of the final capacitor. With a 6.35 cm diameter design, a volume reduction of over 4 times, relative to commercial capacitors is achieved while maintaining the breakdown strength performance. The results of the scaling tests will be reported, and the implications discussed.

*Work supported by the JNLWD under contract number W15QKN-14-9-1001

Author: CURRY, Randy (University of Missouri)

Co-authors: BROWN, Luke (University of Missouri, Center for Physical and Power Electronics); DICKERSON, Samuel (University of Missouri); MOUNTER, Sarah (University of Missouri); MADDY, Aaron (University of Missouri, Center for Physical and Power Electronics); SCHWINN, Madison (University of Missouri, Center for Physical and Power Electronics)

Presenter: CURRY, Randy (University of Missouri)

Session Classification: Poster - Compact and Explosive Pulsed Power and Pulsed Power Systems

Track Classification: 7.3 Compact Pulsed Power