Contribution ID: **208** Type: **Poster Presentation**

Partial discharge characterization in soft dielectrics using thin film PVDF sensors to detect ultrasonic waves

Tuesday 5 June 2018 13:30 (1h 30m)

Dielectric elastomer actuators (DEA) are designed to actuate under high voltage stress. The voltage required to actuate is typically at the limit of the compliant material, in this case 3M VHB 4910. As a result, repeated electrical stressing of the material will lead to the occurrence of partial discharges (PD) at the voltage required for actuation. Previous work has shown that repeated large magnitude PD's precede breakdown, which will be accompanied by the associated ultrasonic signature generated by the large magnitude PD's. This compliant material also known as a soft dielectric has basis for potential use in novel high voltage applications where traditional solid dielectrics are not a good fit. This paper examines the potential detection of ultrasonic waves and hence PD's in a soft dielectric immersed in castor oil, using multiple thin film PVDF sensors. This proposed detection method will be used combined with a traditional PD Detection scheme for verification, to confirm actual occurrence and magnitude of the PD.

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Session Classification: Poster 2 - High Voltage Design and Power Modulator Components