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Abstract: YO08.00008 : Non-Invasive Laser Triggering for Investigation of Threshold Electrostatic Discharge Physics

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The study of the physics of naturally occurring electrostatic discharges (ESDs) at early times is challenged by the difficulty in overcoming pre-trigger requirements of laser probes. In this work, ultraviolet (UV) pulses from a diode-pumped solid-state, Q-switched laser system are used to trigger ESDs. We use an open-air spark gap with a gap voltage held near threshold. The laser intensity is in the microjoule range so that seed electrons are produced through the photoelectric effect on the cathode. In contrast to laser-triggered spark gaps, the resulting discharges are anticipated to be very similar to those produced by random seed electrons.

The triggering produces ESDs with a yield of >65%. While there is ~10ns jitter, co-recording of the current pulse will allow for time-resolved experimental diagnostics with ns timing resolution. Early results show a relatively short delay between triggering and the arc discharge (~100ns), indicating that collisional UV generation is a more likely source of secondary electrons than ion return current. Our experiment will be compared to our numerical models for plasma temperature and species evolution measurements in ESDs. Future experiments will be completed in a discharge chamber which allows for control of the gas composition and pressure.