Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

In Situ Measurement of Two Dimensional, Two Component Electric Field Dynamics of a ns-SDBD Plasma with Sub-Nanosecond Resolution by Femtosecond EFISH KRISTOFER MEEHAN, ANDREY STARIKOVSKIY, ARTHUR DOGARIU, Princeton University, RICHARD B. MILES, Texas A&M University — Nanosecond pulsed Dielectric Barrier Discharge (DBD) plasmas have gained popularity as an efficient method of producing quasi-uniform plasmas at atmospheric pressure, with uses in fields such as from combustion, aerodynamic flow control, and plasma medicine. In situ measurements of Surface DBD's (SDBD) have traditionally been difficult to achieve due to surface effects, fast timescales, and the sub-millimeter plasma thickness. The recent development of the nonlinear laser diagnostic Electric Field Induced Second Harmonic (EFISH) allows for electric field measurement within the plasma volume that are directionally sensitive and temporally resolved. In this study, we have scanned a cylindrically focused, 200 fs FWHM Ti:Sapphire laser beam to produce two-dimensional maps of sub-nanosecond resolved, two component electric field dynamics in a ns-SDBD plasma. Discharges in Argon and Air are studied at low pressure (<200 Torr). Reduced electric fields of 1000 Td in the ionization wave are suggested by the measurement, which are supported by previous spectroscopic results. Both the incident and reverse ionization wave are apparent, demonstrating fs-EFISH to be a useful tool for studying and developing ns-SDBD actuators.

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Date submitted: 03 Jun 2019 Electronic form version 1.4