Abstract Submitted
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Argon Plasma Generated By High Repetition Rate, Nanosecond Pulses: Time-Resolved Measurements of Voltage, Current, and Electron Number Density[1] VLADLEN PODOLSKY, ANDREI KHOMENKO, SERGEY MACHERET, Purdue University — Weakly ionized plasmas sustained by high repetition rate nanosecond pulses have shown promise for a number of applications due to the low power budget, efficient ionization, and enhanced production of excited species. To study the dynamics of such plasmas, time-resolved probe measurements of voltage and current as well as microwave interferometry measurements of the spatially-averaged electron density were conducted in argon at a pressure of several Torr and parallel-plate electrode spacing of several centimeters. From the measured electron density decay between the pulses, the recombination rate coefficients were inferred. This provided an insight into the recombination mechanisms. In particular, the dimer ions Ar2+ were found to be dominant, so the recombination was primarily dissociative. The relaxation time of the electron temperature was also determined and found to be much shorter than the recombination time. Since the time interval between the pulses is much longer than the pulse duration and the electron temperature relaxation time, most of the time the plasma has a relatively high electron density but low electron temperature and hence low Johnson-Nyquist noise. Such plasmas could thus be useful in radio-frequency electronics.

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