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Harmonic Generation by Microwave-frequency Microplasma¹ STEPHEN PARSONS, ALAN HOSKINSON, JEFFREY HOPWOOD, Tufts University — A microplasma may operate as a nonlinear circuit element and generate power at the harmonics of the drive frequency. As an example, microplasma is sustained using 1 W of power at 1.3 GHz in a small discharge gap formed in a split-ring resonator. A probe extends into the microplasma and extracts the 3rd harmonic power through a tuned resonator at 3.9 GHz. The experimental data show that this non-optimized system produces a +38 dB increase in 3rd harmonic power in the presence of a microplasma. Two origins of nonlinearity are described: the harmonic displacement current due to the voltage-dependent sheath capacitance. PIC-MC simulations suggest that the microplasma nonlinearity may also be exploited at frequencies of 100 GHz.

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