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Nonlinear lumped circuit modeling of an atmospheric pressure rf discharge M. LAPKE, D. ZIEGLER, T. MUSSENBROCK, T. GANS, V. SCHULZ-VON DER GATHEN, Center for Plasma Science and Technology CPST, Ruhr University Bochum, D-44780 Bochum, Germany — The subject of our modeling approach is a specifically modified version of the atmospheric pressure plasma jet (APPJ, originally proposed by Selwyn and coworkers[1]) with reduced discharge volume, the *micro* atmospheric pressure plasma jet (μ-APPJ). The μ-APPJ is a homogeneous nonequilibrium discharge operated with Argon or Helium as the feedstock gas and a percentage volume admixture of a molecular gas (O_2, H_2, N_2). The efficiency of the discharge is mainly due to the dissociated and activated molecules in the effluent that can be selected depending on the application. A variety of applications in surface treatment have already been demonstrated, e.g., in semiconductor technology, restoration and bio-medicine. In this contribution we present and analyze a nonlinear lumped circuit model of the μ-APPJ. We apply a two-scale formalism. The bulk is modeled by a generalized Ohm's law, whereas the sheath is described on a considerably higher level of mathematical sophistication. The main focus lies on the spectrum of the discharge current in order to support the characterization of the discharge via model-based diagnostics, i.e., the estimation of the spatially averaged electron density from the frequency of certain self-excitated collective resonance modes.

J. Park et al., Appl. Phy. Lett. **76**, 288 (2000)

Thomas Mussenbrock
Ruhr University Bochum, D-44780 Bochum

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