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Self-consistent modeling of atmospheric micro-plasmas produced by a microwave source[1] L.L. ALVES, J. GREGÓRIO, IPFN-LA/IST, Lisboa, Portugal, P. LEPRINCE, C. BOISSE-LAPORTE, LPGP/UPS, Orsay, France —
This paper presents the self-consistent modeling of argon micro-plasmas, produced by a microwave source (2.45 GHz) at atmospheric pressure [1]. Simulations use a 1D, stationary hybrid code that solves the fluid-type transport equations for electrons, positive ions Ar^+ and Ar_2^+, and the electron mean energy; the rate balance equations for the main neutral species; Poisson's equation for the space-charge electrostatic field; Maxwell's equations for the electromagnetic excitation field; the gas energy balance equation for its temperature distribution; and the kinetic electron Boltzmann equation considering several direct and stepwise electron collisions processes. The model uses a kinetic scheme that considers the atomic excited states Ar(4s) and Ar(4p), two excimer states Ar_2* and Ar_2**, and two ionization states associated to the atomic and the molecular ions. The model predicts power densities of 1-5 kW cm^{-3} and gas temperatures of 400-700 K, for electron densities of $\sim 10^{13}$-10^{14} cm^{-3}, in agreement with measurements. Simulations exhibit a strong dependence on the gap-size and the electron density. [1] J. Gregório et al, these proceedings.

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