Abstract Submitted
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Theoretical investigation of power balance and hysteresis of a miniature microwave ICP-plasmajet MICHAEL KLUTE, Institute of Theoretical Electrical Engineering, Ruhr University Bochum, Germany, HORIA-EUGEN PORTEANU, WOLFGANG HEINRICH, Microwave Department, Ferdinand-Braun-Institut, Germany, PETER AWAKOWICZ, Electrical Engineering and Plasma Technology, Ruhr University Bochum, Germany, RALF PETER BRINKMANN, Institute of Theoretical Electrical Engineering, Ruhr University Bochum, Germany — Microwave-driven plasmas-jets offer attractive properties for various technical applications. They are usually operated in a capacitive mode. However, experimental experience shows a number of disadvantages for capacitive coupling such as high boundary sheath voltage and thus high electrical losses. Due to these characteristics, inductively coupled plasmas are of particular interest for technical applications. Recently *Porteanu et al.*[1] proposed a small scale plasma-jet operated as an inductive discharge. The key characteristic of the suggested plasma-jet is the implementation of an LC-resonance-circuit into a cavity resonator. In this work the proposed plasma-jet is examined theoretically. A global model for the electromagnetic fields and energy balance is presented. Mathematical analysis of the electromagnetic fields leads to a description based on a sum of different modes. It is found that the modes of zero and first order can be identified with inductive and capacitive coupling. In a second step the matching network and its frequency depended characteristic are taken into account. Finally an investigation of possible hysteresis effects is carried out.
[1]Porteanu et al.*Plasma Sources Sci.Technol.***22**, 035016(2013)

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