Abstract Submitted
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An electromagnetic approach to a small-scale microwave ICP-plasmajet MICHAEL KLUTE, 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, 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, known as E-Mode. Experimental experience however show a number of disadvantages for capacitive coupling such as high boundary sheath voltage and thus high electrical losses. Therefore in large scale plasmas inductive coupling, known as H-mode, is attractive. Recently *Porteanu et al.*[1] proposed a small scale plasma-jet operated as an inductive discharge. The key characteristic of the proposed 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. Consequent 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 stable working points and possible hysteresis effects is done.
[1]H. E. Porteanu et al. *Plasma Sources Sci.Technol.***22**, 035016(2013)

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