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A global model of a microwave driven inductively coupled small-scale plasma jet MICHAEL KLUTE, Ruhr University Bochum, Germany, HORIA EUGEN PORTEANU, WOLFGANG HEINRICH, Ferdinand-Braun-Institut, Germany, PETER AWAKOWICZ, RALF PETER BRINKMANN, Ruhr University Bochum, Germany — Microwave driven plasmas-jets play an important role in many technical applications. These plasma jets are usually excited in the capacitive mode, also called E-mode. This mode, however, couples considerable power to ions which limits the jet efficiency and gives rise to negative side effects. The inductive coupling, known as H-mode, eliminates these disadvantages and is attractive for large scale plasmas. To realize the H-mode also for a plasma jet source of much smaller size, Porteanu et al. [1] proposed an inductive coupling via a specially designed resonator. This work presents a global model of the new device based on the volume-integrated balances of particle number and electron density, and a series representation of the electromagnetic field in the cavity. Therefore an infinite number of modes can be found ordered by the azimuthal wave number m. These modes essentially determine the electromagnetic behavior of the plasma and differ from ordinary cavity modes. The mode m=0 can be identified with the inductive mode and will be called H-mode, the mode m=1 is the capacitive mode and will be called E-mode. For a given microwave power, several equilibrium points exist and a hysteresis in the E to H transition is observed. [1]Porteanu et al. Plasma Sources Sci.Technol.22, 2013

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