Contribution ID: **1181** Type: **Oral**

Power Consumption in a Miniature Microwave Inductively Coupled Plasma Source

Monday 24 June 2019 17:00 (15 minutes)

Miniature Microwave Inductively Coupled Plasma (MMWICP) source is a novel and versatile non-thermal plasma source, which profit of high electron density and high power efficiency. In its compact version a single MMWICP source comprises a quartz tube of 5 mm inner diameter enclosed by a copper resonator of 8 mm thickness. This basic unit can be combined in an array of two (double), four (Quadriga) or more sources. Here, the single source is characterized by Optical Emission Spectroscopy (OES). A continuous stream of nitrogen gas is running through the glass cylinder at a pressure of 2000 Pa. This specific pressure is chosen to satisfy the Local Field Approximation (LFA), which is used in the latter data analysis. For the OES measurements nitrogen as a test gas is selected for its well-known population kinetics. In particularly, the second positive system of neutral nitrogen (380 nm line) and first positive system of nitrogen molecular ion (391 nm) are monitored, for which the population kinetics can be described by a simple collision radiative model. The OES measuring unit consists of a macro objective, CCD camera and two narrow band-pass filters, which isolate the corresponding emission lines. With previously absolutely calibrated OES unit, the radially resolved absolute line intensities are collected with a 28 micrometer resolution. Simultaneously, an absolutely calibrated high resolution Echelle spectrometer monitors the rotational lines distribution form respective emissions. Using the rate equations of collision-radiative model and BOLSIG+ for solving a Boltzmann equation under the assumption of LFA, it is possible to measure the spatially resolved electron density and electric field. Moreover, the spatially resolved deposited power density is calculated. In the presentation we will discussed the power dissipation in CCP, ICP and hybrid mode of operation. In respect to power efficiency MMWICP will be compared to other microwave plasma sources.

Authors: STEFANOVIĆ, Ilija (Ruhr-University Bochum); KLUTE, Michael (Ruhr University Bochum); Prof. BRINKMANN, Ralf-Peter (Ruhr-Universität Bochum, Faculty of Electrical Engineering and Information Technology, Institute for Theoretical Electrical Engineering, Germany); Dr BIBINOV, Nikita (Ruhr University); Prof. HEINRICH, Wolfgang (Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany); PORTEANU, Horia-Eugen (Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenzte); Prof. AWAKOWICZ, Peter (Ruhr-Universität Bochum, Faculty of Electrical Engineering and Information Technology, Institute for Electrical Engineering and Plasma Technology, Germany)

Presenter: STEFANOVIĆ, Ilija (Ruhr-University Bochum)

Session Classification: 3.1 Plasma, Ion, and Electron Sources I

Track Classification: 3.1 Plasma, Ion and Electron Sources