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Spectroscopic investigations of plasma in the range of very high frequencies

Employing frequencies high than 13.56 MHz in capacitively coupled plasma reactors may result in a greatly improved performance in industrial plasma applications. For plasma diagnostic at such frequencies the method of emission spectroscopy is mostly preferable, since it is insensitive to discharge frequency (in contrast to Langmuir probe measurements). In this work we perform spectroscopic measurements of plasma emission at the discharge frequency which is varied between 13.56 and 260 MHz. The experimental chamber consists of two parallel plate electrodes of 3.8 cm diameter with the distance between the electrodes of 3 cm. The walls and the lower electrode of the chamber are grounded and the upper electrode is radio-frequency driven. The frequency is specified by the function generator, whose signal is amplified and applied to the plasma chamber. Using the power meter it is possible to measure forward and backward power and keep it fixed for the whole frequency range by matching the system with the phase shifter. The experiments are performed in argon gas at pressures of 20, 50 and 80 Pa. The light from the chamber is collected by small lens and guided to a spectrometer by an optic fiber cable. The results are analyzed using the collisional-radiative model.

Primary author: Dr ANTONOVA, Tetyana (Max-Planck-Institut fuer Extraterrestrische Physik)

Co-authors: Mr DU, C.-R. (Max-Planck-Institut fuer Extraterrestrische Physik); Prof. MORFILL, G.E. (Max-Planck-Institut fuer Extraterrestrische Physik); Dr THOMAS, H.M. (Max-Planck-Institut fuer Extraterrestrische Physik); Dr PUSTYLNICK, M. (Max-Planck-Institut fuer Extraterrestrische Physik); Dr KHRAPAK, S. (Max-Planck-Institut fuer Extraterrestrische Physik); Dr MITIC, S. (Max-Planck-Institut fuer Extraterrestrische Physik)

Presenter: Dr ANTONOVA, Tetyana (Max-Planck-Institut fuer Extraterrestrische Physik)