Contribution ID: **1013** Type: **Oral**

VARIABLE-FREQUENCY CAPACITIVELY COUPLED PLASMA AS A TUNABLE RF ELEMENT

Wednesday 26 June 2019 16:45 (15 minutes)

Plasmas are attractive for next-generation reconfigurable RF systems because plasmas can be turned on/off, have their properties varied in a wide range, and handle much higher power than semiconductors can. Tunable capacitors and inductors are key elements of any reconfigurable system. In a capacitively coupled discharge, the impedance of both the sheaths and the plasma can be controlled by the excitation RF frequency and power, resulting in tunable impedance for a weak "probing"RF signal. In this work we studied two different plasma devices. The first one is a benchtop device with 5 cm diameter parallel-plate electrodes separated by 2 cm and operating in air at 1 Torr with an RF amplifier operating at a constant voltage in a very wide range of frequencies. The impedance characteristics and both the sheath and plasma parameters were inferred from the current and voltage measurements supplemented with optical imaging and microwave diagnostics. At very high excitation or probing RF frequencies, the sheath impedance becomes negligible, and due to negative permittivity of the plasma, the overall impedance becomes inductive. The results are in good agreement with a simple theory. The second plasma device is much smaller, about 0.5 cm, and uses a small gas discharge tube with 0.6 mm interelectrode spacing as a plasma cell. Its resistance and reactance were measured for different excitation and probing frequencies and different applied power, and wide tunability from capacitive to inductive behavior was demonstrated

Authors: Dr KHOMENKO, Andrei (Purdue University); Prof. MACHERET, Sergey (Purdue University)

Presenter: Dr KHOMENKO, Andrei (Purdue University)

Session Classification: 2.7 Microwave Plasma Interaction III

Track Classification: 2.7 Microwave Plasma Interaction