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Excitation dynamics in electrically asymmetric capacitively coupled radio frequency discharges[1] JULIAN SCHULZE, ZOLTAN DONKO, Hungarian Academy of Science, EDMUND SCHUENGEL, UWE CZARNETZKI, Ruhr-University Bochum — The symmetry of capacitively coupled radio frequency discharges can be controlled electrically by applying a fundamental frequency and its second harmonic with adjustable phase shift θ between the driving voltages to one electrode. A variable DC self bias η is generated as a function of θ via the Electrical Asymmetry Effect. Here excitation dynamics in electrically asymmetric geom. symmetric dual frequency discharges operated in argon at 13.56 + 27.12 MHz is investigated experimentally, by a PIC simulation, and by an analytical model. At low pressures (collisionless sheaths) the excitation dynamics works similar to classical discharges: The maxima of the time modulated excitation at the powered and grounded electrode within one low frequency period will be different (asymmetric excitation), if η is strong at $\theta \approx 0^\circ$ 90° and similar (symmetric excitation), if $\eta \approx 0$ V at $\theta \approx 45^\circ$. At high pressures (collisional sheaths) the excitation dynamics is found to work differently. The excitation will be symmetric, if η is strong, and asymmetric, if $\eta \approx 0$ V. These phenomena are understood by an analytical model.

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Julian Schulze
Hungarian Academy of Science

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