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Power dissipation in electrically asymmetric dual frequency capacitively coupled radio frequency discharges EDMUND SCHUENGEL, JULIAN SCHULZE, ZOLTAN DONKO, UWE CZARNETZKI — For many applications of capacitively coupled radio frequency discharges, separate control of ion energy and ion flux towards a processed surface is of paramount importance. This separate control is not possible in single frequency discharges and is limited in classical dual frequency discharges operated at substantially different frequencies due to the frequency coupling. Using the new concept of the Electrical Asymmetry Effect a fundamental frequency and its second harmonic are applied to the powered electrode of a geometrically symmetric discharge. The ion energy is controlled via the phase angle θ between the frequencies, while the ion flux remains almost constant. The independence of the flux on θ is the result of the power dissipation investigated experimentally and by means of a PIC simulation. An analytical model shows why the ion flux is constant at high pressures as well as at low pressures, where the plasma series resonance is self-excited leading to additional electron heating. Funded by the Ruhr-University Research Department Plasma, the A. von Humboldt Foundation, and the Hungarian Fund for Scientific Research (OTKA K77653).

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