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Non-Linear Electron Resonance Heating in CCRF Discharges: A Kinetic Interpretation SEBASTIAN WILCZEK, JAN TRIESCHMANN, Ruhr-University Bochum, Germany, JULIAN SCHULZE, EDMUND SCHUENGEL, West Virginia University, Morgantown, USA, DENIS EREMIN, RALF PETER BRINKMANN, Ruhr-University Bochum, Germany, ARANKA DERZSI, IHOR KOROLOV, PETER HARTMANN, ZOLTÁN DONKÓ, Wigner Research Centre for Physics, Budapest, Hungary, THOMAS MUSSENBROCK, Ruhr-University Bochum, Germany — In this work, the physical origin of non-linear electron resonance heating in capacitively coupled radio frequency discharges is investigated using Particle-in-Cell/Monte Carlo Collisions simulations. A detailed kinetic description of the electron dynamics is used to explain the mechanism of the excitation of harmonics in the rf current. It is shown that, especially at low pressures, highly energetic electrons are accelerated by the modulated plasma sheath and leave behind a positive space charge close to the sheath edge. Consequently, cold bulk electrons are attracted back towards this electron depleted zone. After a short time interval (defined by the local plasma frequency), bulk electrons reach the expanding sheath phase, are reflected, and gain energy forming a new energetic electron beam. Since such electron beams represent the major part of the conduction current, this mechanism leads to harmonics in the rf current. Finally, the question "In which way current continuity is ensured at all the times?" is answered.

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