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Electron Heating in Capacitively Coupled RF Discharges Investigated with the Smooth Step Model[1] RALF PETER BRINKMANN, Ruhr University Bochum, Institute for Theoretical Electrical Engineering — Electron heating in radio-frequency driven capacitively coupled plasmas is studied on the basis of the recently proposed *Smooth Step Model* [R.P. Brinkmann, *Plasma Sources Sci. Technol.* (2015)]. This algebraic model provides an expression for the electric field in a RF modulated plasma sheath transition which yields i) the space charge field in the sheath, ii) the generalized Ohmic and ambipolar field in the plasma, and iii) a smooth interpolation for the rapid transition in between. It was derived via an expansion of an electron fluid model in terms of two smallness parameters, the ratios $\epsilon = \lambda_{\rm D}/l$ of the Debye length $\lambda_{\rm D}$ to the minimum gradient length l and $\eta = \omega_{\rm RF}/\omega_{\rm pe}$ of the RF frequency $\omega_{\rm RF}$ to the electron plasma frequency $\omega_{\rm pe}$. The explicit field formula provided by the Smooth Step Model enables semi-analytic expressions for the phased-resolved and the phase-averaged dissipated power. Comparison with other models of electron heating is made.

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