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The nonlinear characteristic of the plasma boundary sheath: Results from a self-consistent model¹ MUSTAFA BAYRAK, DENNIS ZIEGLER, THOMAS MUSSENBROCK, RALF PETER BRINKMANN, Ruhr University Bochum — The phase-resolved voltage drop across an rf modulated plasma boundary sheath is calculated on the basis of a self-consistent fluid model. The situation is described in terms of a nonlinear charge voltage relation V(t) = V(Q(t)), where Q(t) is the instantaneous charge of the sheath. It is found that the form of the curve V(Q) is approximately quadratic. The coefficients of that form, however, are not constant but strongly dependent on the amplitude of the modulation itself. An effective model is constructed which captures this behavior in terms of simple algebraic formulas, and which may be used for a consistent analysis of the nonlinear behavior of capacitively coupled plasmas as a whole.

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