Analytical Response Characterization of High Mobility Transistor Channels

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Abstract : We propose an analytical approach for the admittance response calculation of the high mobility InGaAs channel transistors. The development of the small-signal admittance takes into account the longitudinal and transverse electric fields through a pseudo two-dimensional approximation of the Poisson equation. The total currents and the potentials matrix relation between the gate and the drain terminals determine the frequency-dependent small-signal admittance response. The analytical results show that the admittance spectrum exhibits a series of resonant peaks corresponding to the excitation of plasma waves. The appearance of the resonance is discussed and analyzed as functions of the channel length and the temperature. The model can be used, on one hand, to control the appearance of plasma resonances, and on the other hand, can give significant information about the admittance phase frequency dependence.

Keywords : small-signal admittance, Poisson equation, currents and potentials matrix, the drain and the gate terminals, analytical model

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