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Self-Consistent Monte Carlo Study of the Coulomb Interaction under Nano-Scale Device Structures[1] NOBUYUKI SANO, University of Tsukuba — It has been pointed that the Coulomb interaction between the electrons is expected to be of crucial importance to predict reliable device characteristics. In particular, the device performance is greatly degraded due to the plasmon excitation represented by dynamical potential fluctuations in high-doped source and drain regions by the channel electrons. We employ the self-consistent 3D Monte Carlo (MC) simulations, which could reproduce both the correct mobility under various electron concentrations and the collective plasma waves, to study the physical impact of dynamical potential fluctuations on device performance under the Double-gate MOSFETs. The average force experienced by an electron due to the Coulomb interaction inside the device is evaluated by performing the self-consistent MC simulations and the fixed-potential MC simulations without the Coulomb interaction. Also, the band-tailing associated with the local potential fluctuations in high-doped source region is quantitatively evaluated and it is found that the band-tailing becomes strongly dependent of position in real space even inside the uniform source region.

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