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Quantum transport simulation of graphene transistors

YANG LU, JING GUO, University of Florida, COMPUTATIONAL NANOTECHNOLOGY TEAM — Owing to its unique electrical and thermal properties, graphene has attracted great interests as potential building blocks of next generation electronics, especially for RF applications. Due to lack of band gap, Klein tunneling plays an important role in sub-100nm graphene transistors. Inelastic phonon scattering introduced by intrinsic phonons of graphene and polarized substrate also affect device performance. We show that coupling between inelastic phonon scattering and Klein tunneling leads to different device physics of graphene transistors from common nanoscale transistors. The electron-phonon interaction and quantum transport in graphene transistors are modeled by the non-equilibrium green's function method within the self-consistent Born approximation. We evaluate the effect of inelastic process on both DC and RF performance of graphene transistors. We also briefly discuss the self-heating effects in graphene transistors introduced by inelastic phonon scattering.

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