Electrically induced spontaneous emission in open electronic system RULIN WANG, Beijing Computational Science Research Center, YU ZHANG , The University of Hong Kong, CHIYUNG YAM, Beijing Computational Science Research Center, COMPUTATION ALGORITHMS DIVISION (CSRC) TEAM, THEORETICAL AND COMPUTATIONAL CHEMISTRY (HKU) COLLABORA- TION — A quantum mechanical approach is formulated for simulation of electro- luminescence process in open electronic system. Based on nonequilibrium Greens function quantum transport equations and combining with photon-electron inter- action, this method is used to describe electrically induced spontaneous emission caused by electron-hole recombination. The accuracy and reliability of simulation depends critically on correct description of the electronic band structure and the electron occupancy in the system. In this work, instead of considering electron-hole recombination in discrete states in the previous work, we take continuous states into account to simulate the spontaneous emission in open electronic system, and discover that the polarization of emitted photon is closely related to its propagation direction. Numerical studies have been performed to silicon nanowire-based P-N junction with different bias voltage.

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