

## Universal velocity-field characteristics for a nanowire arbitrary degeneracy

### Abstract:

The effects of electric field on the carrier motion and drift velocity in nanowire (NW) are presented in this paper. When the electric field is applied in NW, the electron is expected to move in anti-parallel direction to the electric field. This is so-called randomness motion is transformed into streamlined motion in extremely high electric field. The normalized Fermi energy and relative electron population as a function of electric field are examined for various degeneracies. It was found that the electric field has lesser influence on the relative electron population with the increased degeneracy. The drift velocity in NW is shown to increase with electric field until it reaches the saturation velocity. Two approximations have been made to simplify the theoretical equation. It is also shown in this paper that when the quantum emission is taken into account, the drift and saturation velocity degrades.