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High-field Transport in Low Symmetry β-Ga_2O_3 Crystal.[1] KRISHNENDU GHOSH, UTTAM SINGISETTI, University at Buffalo — High-field carrier transport plays an important role in many disciplines of electronics. Conventional transport theories work well on high-symmetry materials but lacks insight as the crystal symmetry goes down. Newly emerging materials, many of which possess low symmetry, demand more rigorous treatment of charge transport. We will present a comprehensive study of high-field transport using ab initio electron-phonon interaction (EPI) elements in a full-band Monte Carlo (FBMC) algorithm. We use monoclinic β-Ga_2O_3 as a benchmark low-symmetry material which is also an emerging wide-bandgap semiconductor. β-Ga_2O_3 has a C_{2m} space group and a 10 atom primitive cell. In this work the EPIs are calculated under density-functional perturbation theory framework. We will focus on the computational challenges arising from many phonon modes and low crystal symmetry. Significant insights will be presented on the details of energy relaxation by the hot electrons mediated by different phonon modes. We will also show the velocity-field curves of electrons in different crystal directions.

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