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Title:Electron transport in bulk GaN under ultrashort high-electric field transient
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Abstract:We have investigated nonlinear electron transport in GaN induced by high-electric field transients by analyzing the temporal dependence of the electron drift velocity and temperature. For picosecond transients, our calculations have established that the electron dynamics retain almost all the features of the steady-state velocity-field characteristics including the portion with negative differential conductivity. It was also found that transient currents in GaN samples give rise to the THz re-emission effect - radiation of electromagnetic field, temporal and spectral properties of which directly relate to the velocity-field characteristics of the sample. The results clearly indicate that existing methods for the generation of high-electric field transients and subpicosecond signal measurements can be applied to the characterization of hot electron transport at ultrahigh fields while avoiding Joule self-heating, hot phonon accumulation and other undesirable effects.
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