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Transient response and electric field domain relocation in semiconductor superlattices HUIDONG XU, STEPHEN TEITSWORTH, Duke University — Numerical simulation results are presented for a discrete drift-diffusion model that describes electronic transport in weakly-coupled semiconductor superlattices under voltage bias [1]. Sequential resonant tunneling between adjacent quantum wells is the primary conduction mechanism for this model which also incorporates an effective conductivity σ associated with the injecting contact. We study time-averaged current-voltage characteristics and the transient current response associated with electric field domain relocation when the applied voltage is abruptly shifted by an amount V_{step}. For intermediate values of σ and a range of V_{step} values, two types of complex transient response are observed: 1) the **tripole/dipole** mechanism in which a charge depletion and a charge accumulation layer move together from the contact, and 2) the **injected monopole** mechanism, in which a small amplitude accumulation layer moves rapidly from the contact. Generally, the injected monopole relocation mechanism is much faster than the tripole/dipole mechanism. At moderately larger values of σ, the tripole/dipole mechanism is not observed for any value of V_{step} because the higher levels of injected charge suppress formation of a moving depletion layer. Thus, a relatively small increase in σ can result in significantly shorter domain relocation times. [1] L. L. Bonilla and H. T. Grahn, Rep. Prog. Phys. **68**, pp. 577 - 683, and references therein.

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