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标题: Rectification of terahertz radiation in semiconductor superlattices in the absence of domains 作者: Isohatala, J (Isohatala, J.); Alekseev, KN (Alekseev, K. N.)

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摘要: We study theoretically the dynamical rectification of a terahertz AC electric field, i.e. the DC current and voltage response to the incident radiation, in strongly coupled semiconductor superlattices. We address the problem of stability against electric field domains: a spontaneous DC voltage is known to appear exactly for parameters for which a spatially homogeneous electron distribution is unstable. We show that by applying a weak direct current bias the rectifier can be switched from a state with zero DC voltage to one with a finite voltage in full absence of domains. The switching occurs near the conditions of dynamical symmetry breaking of an unbiased semiconductor superlattice. Therefore our scheme allows for the generation of DC voltages that would otherwise be unreachable due to domain instabilities. Furthermore, for realistic, highly doped wide miniband superlattices at room temperature, the generated DC field can be nearly quantized, that is, be approximately proportional to an integer multiple of (h) over bar omega/ea where a is the superlattice period and omega is the AC field frequency.

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