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From Bloch oscillations to plasmon oscillations in biased semiconductor superlattices LIJUN YANG, MARC DIGNAM, Department of Physics, Queen's University, Kingston, ON, Canada, K7L 3N6 — We have recently shown [1] that, even at moderate excitation densities, many features of the ultrafast interband response of asymmetric semiconductor nanostructures such as Biased Semiconductor Superlattices (BSSLs) cannot be even qualitatively understood via calculations of the response to a finite order in the optical field. We have extended this treatment to the intraband response and present a formalism for calculating the THz radiation emission from BSSLs excited via ultrashort optical pulses. The calculations are done to infinite-order in the optical field, with the inclusion of essential many-body correlations and interactions. This formalism accounts for a variety of phenomena from the low-excitation excitonic Bloch oscillations to the high-excitation plasmon oscillations. As optical intensity is increased, the spectrum of the THz emission from a BSSL first experiences a red-shift due to the asymmetric energy structure of the BSSLs. This red-shift then saturates and a high-frequency plasmon peak emerges as the exciton-exciton interactions begin to dominate. * This work is supported in part by the Natural Sciences and Engineering Research Council of Canada. 1. M. Hawton and M. M. Dignam, Phys. Rev. Lett. 91, 267402 (2003).

Lijun Yang

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