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Title:Intersubband rabi oscillations in asymmetric nanoheterostructures: Implications for a tunable continuous-wave source of a Far-infrared and THz radiation
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Abstract:A tunable continuous-wave source of a far-infrared and THz radiation based on a semiconductor nanoheterostructure with asymmetric quantum wells is suggested. It utilizes Rabi oscillations at a transition between quantum well subbands excited by external femtosecond pulses of a mid-infrared electromagnetic field. Due to quantum well broken inversion symmetry the subbands possess different average dipole moments, which enables the creation of polarization at the Rabi frequency as the subband populations change. It is shown that if this polarization is excited so that it is periodic in space, then, though being pulsed, it can produce continuous-wave output radiation. Changing the polarization space period and the time intervals between the exciting pulses, one can tune the frequency of this radiation throughout the far-infrared and THz range. In the present work a concrete multiple quantum well heterostructure design and a scheme of its space-periodic polarization are suggested. It is shown that for existing sources of mid-infrared femtosecond pulses the proposed scheme can provide a continuous-wave output power of order the power of far-infrared and THz quantum cascade lasers. Being added to the possibility of its output frequency tuning, this can make the suggested device attractive for fundamental research and various applications. 
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