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Abstract:We investigated several proposals utilizing the unique electronic properties of carbon nanotubes (CNTs) for a broad range of applications to THz optoelectronics, including THz generation by Cerenkov-type emitters based on carbon nanotubes and by hot electrons in quasimetallic nanotubes, frequency multiplication in chiral-nanotube-based superlattices controlled by a transverse electric field, and THz radiation detection and emission by armchair nanotubes in a strong magnetic field. Dispersion equations of the electron beam instability and the threshold conditions of the stimulated emission have been derived and analyzed, demonstrating realizability of the nanotube-based nanoFEL at realistic parameters of nanotubes and electronic beams.
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