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Abstract:A hybrid numerical simulation method is presented to model and analyze integrated terahertz (THz) photomixer antennas. The proposed computational method combines an optoelectronic solver and a full-wave electromagnetic solver to rigorously model continuous wave (CW) THz photomixer sources. In this hybrid computational approach, the photomixer source is modeled in a rigorous manner without any approximation. The optoelectronic solver is used to find absorbed optical intensity and optical carrier generation rate inside the fast photoconductive region through solving an optical scattering problem. Then, the equations governing the charge carrier transport inside the photoconductor are solved to give THz photo-current by considering realistic material parameters. Finally, through a full-wave electromagnetic solver, and using calculated photo-current from the optoelectronic simulator, antenna parameters and radiated THz power are obtained. Using the proposed hybrid simulation method the effects of photomixer parameters on the THz photo-current and radiated power is rigorously investigated for several geometries. Moreover, results of a parametric study on various factors such as carrier lifetime of material, incident optical power density, applied bias voltage, THz beat frequency, and the gap size are presented. The method can be used for accurate design refinement at pre-fabrication stage.

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Controlled terms:Antennas - Carrier transport - Computational methods - Computer simulation - Electromagnetism
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