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Title:Internally Integrated Active-type Patch Antenna for Semiconductor Superlattice THz Oscillators
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Abstract:Semiconductor superlattices are well known to exhibit negative resistance i.e., gain medium like properties at high frequencies. In order to exploit these gain-like properties as an oscillator, one has to compensate very large inductive impedance (Im[Z] ⩾ 150 |Re[Z]|). In this paper, we present a novel integrated active-type patch antenna to design the semiconductor superlattice THz oscillators. Within this integrated model, the active source is embedded within a benzocyclobutene dielectric cavity sandwiched between gold metal layers. The metal layer underneath provides THz/DC ground whereas the top metal functions as a radiating antenna simultaneously providing DC bias to the embedded superlattice active source. The design principle is based on satisfying the self-consistent oscillator impedance relationship, along with the efficient radiation of resonating cavity mode. The two oscillator-type active antenna configurations proposed are capable of matching impedance within few ohms of Im[Z] while achieving an antenna gain of > 5 dBi for a TM₁₀ cavity resonating mode.
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Uncontrolled terms:internally integrated active-type patch antenna - semiconductor superlattice oscillators - semiconductor superlattices - negative resistance - gain medium - gain-like properties - inductive impedance - semiconductor superlattice oscillator design - benzocyclobutene dielectric cavity - gold metal layers - radiating antenna - DC bias - embedded superlattice active source - self-consistent oscillator impedance relationship - resonating cavity mode - oscillator-type active antenna configurations - antenna gain
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