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Title:Radiation model for terahertz transmission-line metamaterial quantum-cascade lasers
Authors:Hon, P.W.C. (1); Tavallaee, A.A. (1); Qi-Sheng Chen (2); Williams, B.S. (1); Itoh, T. (1)
Author affiliation:(1) Electr. Eng. Dept., Univ. of California, Los Angeles, CA, United States; (2) Northrop Grumman Aerosp. Syst., Redondo Beach, CA, United States
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Abstract:We present the use of the cavity antenna model in predicting the radiative loss, far-field polarization and far-field beam patterns of terahertz quantum-cascade (QC) lasers. Metal-metal waveguide QC-lasers, transmission-line metamaterial QC-lasers, and leaky-wave metamaterial antennas are considered. Comparison of the fundamental and first higher order lateral mode in a metal-metal waveguide QC-laser shows distinct differences in the radiation characteristics. Full-wave finite-element simulations, cavity model predictions and measurements of far-field beam patterns are compared for a one-dimensional leaky-wave antenna. Lastly, an active leaky-wave metamaterial antenna with full backward to forward wave beam steering is proposed and analyzed using the cavity antenna model.
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