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摘要: Semiconductor plasmons have long held out a promise for terahertz generation, but competitive plasmonic mechanisms have yet to be found. Here, we introduce amplifying terahertz mirrors: planar interfaces for two-dimensional electron channels that amplify plasmons in the presence of electron drift. In contrast to existing formulations, we develop a rigorous mode matching technique that takes the complete mode spectrum into account. Mirrors are characterized by plasmon reflection and transmission coefficients whose values can increase with drift. Amplitude and power coefficients are determined, and conditions are found for their values to exceed unity. Resonators based on different combinations of amplifying mirrors are investigated, and an asymmetric configuration (consisting of two different electron channels confined between conducting planes) whose roundtrip gain can exceed unity is identified. The unusual conditions needed for oscillation are examined in detail and the general advantages of asymmetric arrangements are highlighted. Finally, the potential of mode matching as a universal tool for plasmonics is discussed. (C) 2012 American Institute of Physics. [http://dx.doi.org/10.1063/1.4766924]
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