178
Accession number:20123715419734
Title:Distributed gain in plasmonic reflectors and its use for terahertz generation
Authors:Sydoruk, O. (1); Syms, R.R.A. (1); Solymar, L. (1)
Author affiliation:(1) Optical and Semiconductor Devices Group, Department of Electrical and Electronic Engineering, Imperial College London, Exhibition Road, London SW7 2AZ, United Kingdom
Corresponding author:Sydoruk, O.(osydoruk@imperial.ac.uk)
Source title:Optics Express
Abbreviated source title:Opt. Express
Volume:20
Issue:18
Issue date:August 27, 2012
Publication year:2012
Pages:19618-19627
Language:English
E-ISSN:10944087
Document type:Journal article (JA)
Publisher:Optical Society of America, 2010 Massachusetts Avenue NW, Washington, DC 20036-1023, United States
Abstract:Semiconductor plasmons have potential for terahertz generation. Because practical device formats may be quasi-optical, we studied theoretically distributed plasmonic reflectors that comprise multiple interfaces between cascaded two-dimensional electron channels. Employing a mode-matching technique, we show that transmission through and reflection from a single interface depend on the magnitude and direction of a dc current flowing in the channels. As a result, plasmons can be amplified at an interface, and the cumulative effect of multiple interfaces increases the total gain, leading to plasmonic reflection coefficients exceeding unity. Reversing the current direction in a distributed reflector, however, has the opposite effect of plasmonic deamplification. Consequently, we propose structurally asymmetric resonators comprising two different distributed reflectors and predict that they are capable of terahertz oscillations at low threshold currents. © 2012 Optical Society of America.
Number of references:22
Main heading:Plasmons
Controlled terms:Reflection - Terahertz waves
Uncontrolled terms:Cumulative effects - Current direction - Dc current - Deamplification - Distributed reflectors - Low threshold current - Mode matching technique - Multiple interfaces - Plasmonic - Quasi-optical - Terahertz generation - Terahertz oscillations - Two-dimensional electron channel
Classification code:711 Electromagnetic Waves - 712.1 Semiconducting Materials
DOI:10.1364/OE.20.019618
Database:Compendex
Compilation and indexing terms, Copyright 2012 Elsevier Inc.