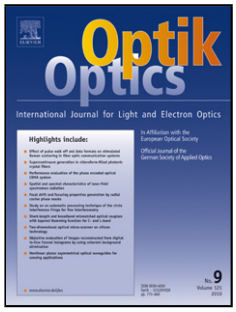

Title: Guided mode resonance in terahertz compound metamaterial waveguides

Authors: Jianjun Liu, Hang Chen, Xufeng Jing, Zhi Hong

PII: S0030-4026(18)31114-8
DOI: https://doi.org/10.1016/j.ijleo.2018.08.001
Reference: IJLEO 61298

To appear in:

Received date: 6-6-2018
Revised date: 28-7-2018
Accepted date: 1-8-2018

Please cite this article as: Liu J, Chen H, Jing X, Hong Z, Guided mode resonance in terahertz compound metamaterial waveguides, *Optik* (2018), https://doi.org/10.1016/j.ijleo.2018.08.001

Guided mode resonance in terahertz compound metamaterial waveguides

Jianjun Liu, Hang Chen, Xufeng Jing, and Zhi Hong*

Centre for THz Research, China Jiliang University, Hangzhou, 310018, China

*Corresponding author: hongzhi@cjlu.edu.cn

Abstract:

Guided mode resonances (GMR) in a planar compound metamaterial (MM) consisting of two square closed ring resonators were numerically calculated and experimentally demonstrated. The strength and bandwidth of the GMR can be controlled by changing the distance between the two square rings. Moreover, asymmetric Fano resonance or electromagnetic induced transparency (EIT) was realized by manipulating the interaction between the GMR and the dipolar resonance of the MM. The measured results at terahertz frequencies are in good agreement with simulations.

Keywords: Guided mode resonances; metamaterial; Fano resonance; EIT

1. Introduction

Guided mode resonance (GMR) in a dielectric grating waveguide was firstly proposed for an application as a filter two decades ago [1]. Since then, the GMRs have been widely investigated, and realized in either dielectric or metallic waveguide gratings in optical and terahertz frequencies [2-4]. The bandwidth of the GMR can be easily controlled, and even dramatically suppressed by changing the grating modulation depth in compound gratings [5-6]. Furthermore, GMR from a two-dimensional (2D) grating structure was proposed, and GMRs of transverse electric mode (TE) and transverse magnetic mode (TM) can be simultaneously excited [7]. Comparing to devices with similar functions, such as 1D photonic crystal [8-9], planar grating waveguide devices are thinner and easier to integrate. In meanwhile, metamaterial (MM), which consists of a periodic array of conducting resonant structures, has recently attracted considerable interest due to its potential applications in various devices, and high sensitive sensing from microwave, terahertz, to optical frequencies