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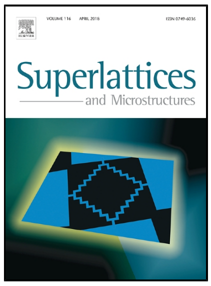

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A highly directive graphene antenna embedded inside a Fabry-Perot cavity in terahertz regime

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Abstract. In this paper, a highly directive nano-thickness graphene-based antenna is introduced in the terahertz frequency band. The antenna is a graphene patch dipole which is placed between two Bragg mirrors called Fabry-Perot cavity. Tunability of the graphene's conductivity makes it possible to excite the desired resonances of the cavity. Here, first, a single resonant antenna is introduced at 5 THz with an enhanced gain from 2.11 dBi to 12.8 dBi with a beamwidth of 22.7°. Then, a triple resonant antenna at 4.7, 5 and 5.3 THz is presented with respective gains of 7.97, 11.9 and 8.52 dBi. Finally, the effect of dimensions and number of the dielectric layers of the cavity are studied in order to further increase in directivity.

Keywords: Graphene, highly directional antenna, terahertz antenna, Fabry Perot cavity.

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1 Introduction

Graphene-based antennas have been vastly developed according to the unique properties of graphene material. One of the promising properties of graphene is its tunable conductivity. The electrical conductivity of graphene can be controlled using electrochemical potential via, for example, magnetic field, electric field bias or optical excitation. Also, according to graphene's very thin thickness, many antennas based on graphene thin film are being developed in terahertz (THz) regime which is the next communication frequency range. For example, terahertz scattering problem of a simple rectangular graphene based nano-patch antenna is numerically analyzed in [1]. Also, a nano-scale antenna -sandwiched between two graphene monolayers- is investigated in [2]. This antenna which is a photodetector converts visible and near-infrared photons into electrons, efficiently. In [3], the efficiency, integration and reconfigurability of a