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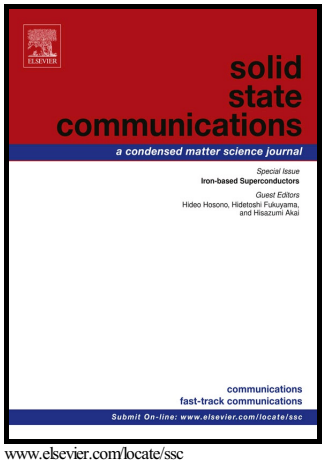

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Low-Bias Flat Band-Stop Filter Based on Velocity Modulated Gaussian Graphene Superlattice

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Abstract

Transport properties of biased planar Gaussian graphene superlattice (PGGSL) with Fermi velocity barrier is investigated by transfer matrix method (TMM). It is observed that enlargement of bias voltage over miniband width breaks the miniband to WSLs leads to suppressing resonant tunneling. Transmission spectrum shows flat wide stop-band property controllable by external bias voltage with stop-band width of near 200 meV. The simulations demonstrate that strong velocity barriers prevent tunneling of Dirac electrons leading to controllable enhancement of stop-band width. By increasing ratio of Fermi velocity in barriers to wells υ_c stop-band width increase. As wide transmission stop-band width (BW_T) of filter is tunable from 40 meV to 340 meV is obtained by enhancing ratio of υ_c from 0.2 to 1.5, respectively. Proposed structure suggests easy tunable wide band-stop electronic filter with a modulated flat stop-band characteristic by height of electrostatic barrier and structural parameters. Robust sensitivity of band width to velocity barrier intensity in certain bias voltages and flat band feature of proposed filter may be opens novel venue in GSL based flat band low noise filters and velocity modulation devices.

Keywords: Band-stop filter, Gussian graphene superlattice, biased graphene superlattice, velocity modulation filter, flat-band filter, Fermi velocity,

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1. INTRODUCTION

Graphene as a one of candidate of the post-silicon era shows exceptional electrical properties and easy tenability of transport nature. Moreover, graphene superlattices (GSL's) with amazing properties which often give rise the interesting phenomena [1-4] opened up novel venue to development of electronic devices such as switches and filters. Substantially, GSL's media offer tunable enhance Dirac Fermion blocking and resonant tunneling structures that enhance Dirac Fermion transmission band are obtained and presents intrinsic potential, compatibility and flexibility in electron and photon filter designing application. Band-stop filters (BSF) so called as band elimination filters, band reject filters and notch filters, with optimum selectivity, high and wide attenuation band to reject unwanted signal and pass the desired signals, play critical role in modern communication and radar systems [5, 6]. Different types of planar GSL include substrate [7, 8], local electric field (electrostatic potential barrier) [9, 10], local magnetic field (magnetic barrier) [11], Fermi velocity barrier (FVB) [8, 12-14], and external bias voltage [15] has been proposed theoretically. Moreover, GSL has been done experimentally by different methods. Planar hybrid

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