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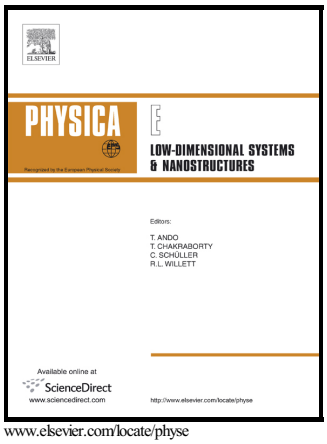

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Abstract

In this paper, the Hartman effect is investigated in electron tunneling through a barrier on the graphene channel in the presence of Rashba spin orbit interaction (RSOI). Two cases of normal and ferromagnetic channel are considered. The calculated results indicate that the occurrence of the Hartman effect in tunneling process depends strongly on Rashba SOI parameter, incidence angle, energy of the carriers and the ferromagnetic exchange energy of the leads**.**

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Keywords

Hartman effect, Graphene, Rashba effect, magnetic tunnel junction**.**

Introduction

The long range spin relaxation length[2,3] beside the unique and fantastic electronic properties, makes graphene[1] a promising candidate for prospective applications in spintronic and nanoelectronics[4,5].

Recently, the tunneling time through the magnetic barrier in graphene-based nanostructures has been investigated both theoretically[6,7]and experimentally[8–10]. The Hartman effect is identified as the independency of the quantum tunneling time on the barrier width[11].

Spin-orbit interaction in graphene includes the intrinsic and Rashba (extrinsic) components[12-14]. Carbon intra-atomic SOI induces the intrinsic one which is weak in a free standing graphene[14], so we have neglected it in this paper. The Rashba SOI arises due to the structure inversion asymmetry in the system and introduces an effective magnetic field. This interaction may open a