Iranian Journal of Physics Research, Vol. 18, No. 2, 2018

Research note

The effect of the coupling constants between nearest-neighbors in the quantum wire coupled to a ring

H Pahlavani, Z Rangraz Jeddi and S M Fazell

Department of Physics, University of Qom, Qom, Iran

E-mail: h-pahlavani@qom.ac.ir

(Received 03 March 2017 ; in final form 11 December 2017)

Abstract

The electronic transport in an infinite array of driven quantum wells coupled to a quantum ring is studied via a single-band tunneling the tight-biding Hamiltonian by perturbing and numerical simulations approaches. In the perturbing approach, an analytical relationship in terms of the coupling constants between the nearest-neighbors in a quantum wire coupled to a ring based on the quantum dynamical algebra is obtained. With a choice of three wells on the quantum ring, the transmission probabilities of the electron of the number zero well of a wire under the effect of a constant field to the first, second and third wells of the quantum ring are obtained for different values of the nearest-neighbors coupling constants in the wire and quantum ring of the system. The effect of changing these parameters on the location and height of the first peaks related to the diagrams of transmission probability have been studied as well.

Keywords: tight-biding model, Lie algebra, transmission probability, quantum wire, quantum ring, coupling constants, perturbing approach

For full article, refer to the Persian section