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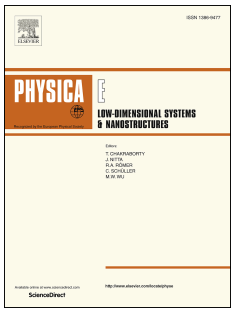

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Origin of resonant tunneling through single-point barriers

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Abstract

The physical interpretation of the appearance of resonant transmission through single-point barriers is discussed on the basis of a double-layer heterostructure in the squeezing limit as both the thickness of the layers and the distance between them tend to zero simultaneously. In this limit, the electron transmission through a barrier-well structure is derived to be non-zero at certain discrete values of the system parameters forming the so-called resonance set, while beyond this set, the structure behaves as a perfectly reflecting wall. The origin of this phenomenon is shown to result from the reflection coefficients at the interfaces in the inter-layer space. The transmission amplitude is computed as a set function defined on the trihedral angle surface in a three-dimensional parameter space.

Keywords:
One-dimensional quantum systems
Transmission
Point interactions
Resonant tunneling

1. Introduction

Since the pioneering studies [1, 2, 3] of resonant transmission through quantum multilayer heterostructures, electronic tunnel systems are a source of considerable interest. These structures are not only important in micro- and nanodevices, but their study involves a great deal of basic physics. In recent years it has been realized that the study of the electron transmission through heterostructures can be investigated in the zero-thickness limit