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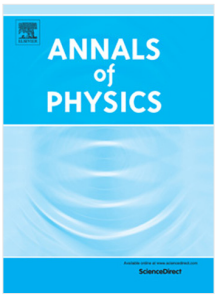

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Resonant Transmission in One-Dimensional Quantum Mechanics with Two Independent Point Interactions: Full Parameter Analysis

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Abstract

We discuss the scattering of a quantum particle by two independent successive point interactions in one dimension. The parameter space for two point interactions is given by $U(2) \times U(2)$, which is described by eight real parameters. We perform an analysis of perfect resonant transmission on the whole parameter space. By investigating the effects of the two point interactions on the scattering matrix of plane wave, we find the condition under which perfect resonant transmission occurs. We also provide the physical interpretation of the resonance condition.

Keywords:
one-dimensional quantum systems, transmission, resonance
PACS: 03.65.-w, 03.65.Xp, 03.65.Db

1. Introduction

One-dimensional quantum systems with point interactions are quite nontrivial. The point interaction in one-dimensional quantum systems has a relatively large parameter space, in comparison with those in higher dimensions. It has been known that a point interaction in one dimension is parametrized by the group $U(2)$ [1, 2, 3], while that in two or three dimensions is parametrized by $U(1)$. The parameters characterize connection

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