



# THE COUPLING CONSTANT THRESHOLD EFFECTS FOR ONE-PARTICLE SCHRÖDINGER-TYPE OPERATORS IN LATTICE

FIRDAVS ALMURATOV, XURSHID SHARIPOV and SALOKHIDDIN ALIMOV

Communicated by Francesco G. Russo

We investigate the threshold effects self-adjoint bounded discrete Schrödinger-type operators in the Hilbert space of square-summable complex-valued functions defined on the  $d$ -dimensional lattice and establish the existence of eigenvalues and their asymptotics at coupling constant threshold.

MSC: 81Q10, 47A10, 47A55, 47A75, 47J10

Keywords: Asymptotics, asymptotic behaviour, eigenvalue, essential spectrum, potential

---

## Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>One-Particle Schrödinger Operator in Lattice</b>	<b>3</b>
<b>3</b>	<b>Proof of the Main Results</b>	<b>6</b>
<b>A</b>	<b>Asymptotic Expansion of Birman-Schwinger-Type Operators</b>	<b>12</b>
	<b>References</b>	<b>18</b>

## 1. Introduction

In this paper we study the the coupling constant threshold phenomena for one-particle Schrödinger-type operators of the form  $\hat{h}_\mu = \hat{h}_0 + \mu\hat{v}$ . The free Hamiltonian  $\hat{h}_0$  of a system of one quantum mechanical particles on the  $d$ -dimensional lattice  $\mathbb{Z}^d$ , where  $d = 1, 2$ , is bounded self-adjoint operator on the Hilbert space  $\ell^2(\mathbb{Z}^d)$  and has only essential spectrum consisting of closed interval,  $\mu \geq 0$  is coupling constant,  $\hat{v}$  is non-zero and compact. In particular, the Birman-Schwinger