BIR UMUMLASHGAN FRIDRIXS MODEL OPERATORINING XOS QIYMATI HAQIDA

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Bir umumlashgan Fridrixs model operatorining xos qiymatlarini o’rganish masalalari ko’p mualliflar tomonidan o’rganilgan bo’lib xususan akademik S. N. Lakaev maktabda shunga o’xshash Fridrixs modeli qaralgan bo’lib, ikki zarrachali Shroedinger operatori zarrachalar tortishuvchi bo‘lgan hol qaralgan va muhim spektrdan quyidagi xos qiymatlari soni o’rganilgan.

Kalit so’zlar: Bir umumlashgan Fridrixs model operatorining xos qiymatlari, paydo qiluvchi va yo’qotuvchi operatorlar, xos qiymatlar.

Bu maqolada ham shunga o’xshash model operator qaralgan bo’lib ikki zarrachali Shroedinger operatori zarrachalar itarishuvchi bolgan hol o‘rganilgan.

$\mathcal{H} = \mathcal{H}_0 \oplus \mathcal{H}_1$ Gilbert fazosi. Bunda $\mathcal{H}_0 = C^1$ kompleks sonlar gilbert fazosi va $\mathcal{H}_1 = L^{2,e}(\mathbb{T}^1)$ bilan $\mathbb{T}^1 = (-\pi, \pi]$ da modulining kvadrati bilan integrallanuvchi juft funksiyalar gilbert fazosini belgilaymiz.

E(k), k=∈ $\mathbb{T}^1$- operator $\mathcal{H}_0$ Gilbert fazosida songa kopaytirish operatori bo’lib quyidagi formula yordamida aniqlanadi:

$$\mathrm{E}(k)f_0 = \varepsilon(k)\, f_0\,,\ f_0 \in \mathcal{H}_0\,,$$

bunda $\varepsilon(k) = -2(1 - cosk)$.

$H_{\lambda\mu}(k)$, $k \in \mathbb{T}^1$, operator $\mathcal{H}_1$ Gilbert fazosida aniqlangan nuqtada va bir qadamda tasirlashuvchi ikki zarrachali diskret Shroedinger operatori bo’lib quyidagi formula yordamida aniqlangan :

$$H_{\mu\lambda}(k)\, f_1(\mathrm{q}) = \varepsilon_k(q) f_1(\mathrm{q}) + \int_{\mathbb{T}^1} (\mu + \lambda \cos s \cos q)\, f_1\ (s) d\eta,$$

bunda $\varepsilon_k(q) = \varepsilon\left(\frac{k}{2} - q\right) + \varepsilon\left(\frac{k}{2} + q\right), d\eta = d\eta(q)$ Xaar o’lchovi , ya’ni $d\eta = \frac{dq}{(2\pi)^1}$

$H_{\gamma\mu\lambda}(k)$, $k \in \mathbb{T}^d$, γ, μ,λ ∈ [0,+ ∞) operator $\mathcal{H}$ Gilbert fazosida quyidagi formula yordamida aniqlangan:

$$H_{\gamma\mu\lambda}\ (k)\begin{pmatrix} f_0 \\ f_1(q) \end{pmatrix} = \begin{pmatrix} \mathrm{E(k)}f_0 + \mathrm{C}_\gamma^* f_0 \\ \mathrm{C}_\gamma^* f_0 + H_{\mu\lambda}(\mathrm{k}) f_1(q) \end{pmatrix},$$

bunda $C_\gamma^* f_1 = \gamma(f_1, 1)_{\mathcal{H}_1}$ (mos ravishda. $C_\gamma^* f_0 = \gamma(f_0, 1)_{\mathcal{H}_0}$) paydo qiluvchi (mos ravishda yo'qotuvchi) operator.

Теорема. a). γ=μ=0 va $\lambda \neq 0$, k $\in \mathbb{T}^1$ bo'lsin. U holda $H_{00\lambda}(k)$ operator $(\varepsilon_{max}(k), +\infty)$ intervalda yagona $E_{00\lambda}(k)$ xos qiymatga ega.

b) Shunday =0 va γ, μ ∈ [0,+ ∞), k $\in \mathbb{T}^1$ lar mavjudki, $H_{\gamma\mu 0}(k)$ operator $(\varepsilon_{max}(k), +\infty)$ intervalda yagona $E_{00\lambda}(k)$ xos qiymatga ega.

s) Shunday =0 va γ, μ ∈ [0,+ ∞), k $\in \mathbb{T}^1$ lar mavjudki, $H_{\gamma\mu 0}(k)$ operator $(\varepsilon_{max}(k), +\infty)$ intervalda xos qiymatga ega emas.

d) Shunday =0 va γ, μ ∈ [0,+ ∞), k $\in \mathbb{T}^1$ lar mavjudki, $H_{\gamma\mu 0}(k)$ operator

(-∞, $\varepsilon_{min}(k)$) intervalda yagona xos qiymatga ega .

Foydalanilgan adabiyotlar

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