O'ZBEKISTON RESPUBLIKASI OLIY TA'LIM, FAN VA INNOVATSIYALAR VAZIRLIGI

BUXORO DAVLAT UNIVERSITETI 1930

FIZIKA, MATEMATIKA VA MEXANIKANING DOLZARB MUAMMOLARI XALQARO ILMIY-AMALIY ANJUMANI

MATERIALLARI

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xalqaro ilmiy-amaliy anjumani

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(I qism)

Buxoro, O‘zbekiston, 24-25-may, 2023-yil

МИНИСТЕРСТВО ВЫСШЕГО ОБРАЗОВАНИЯ, НАУКИ И ИННОВАЦИЙ РЕСПУБЛИКИ УЗБЕКИСТАН
БУХАРСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

ТЕЗИСЫ ДОКЛАДОВ

(Часть I)

международной научно-практической конференции

АКТУАЛЬНЫЕ ПРОБЛЕМЫ ФИЗИКИ, МАТЕМАТИКИ И МЕХАНИКИ

Бухара, Узбекистан, 24-25 мая, 2023 год

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF THE REPUBLIC OF UZBEKISTAN
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ABSTRACTS

(Part I)

of the international scientific and practical conference

ACTUAL PROBLEMS OF PHYSICS, MATHEMATICS AND MECHANICS

Bukhara, Uzbekistan, May 24-25, 2023

$$\sigma_{\text{three}}(\mathcal{A}_\mu) = [\varepsilon; \varepsilon + 4].$$

Since $E_\mu^1 < \varepsilon$ and $E_\mu^2 > \varepsilon + 2$ for all $\mu > 0$, one can conclude that

$$\min \sigma_{\text{two}}(\mathcal{A}_\mu) < \min \sigma_{\text{three}}(\mathcal{A}_\mu) \text{ and } \max \sigma_{\text{three}}(\mathcal{A}_\mu) < \max \sigma_{\text{two}}(\mathcal{A}_\mu)$$

for all $\mu > 0$.

Literatures:

1.C.Tretter. Spectral theory of block operator matrices and applications. Imperial College Press, 2008.

2.T.H.Rasulov, N.A.Tosheva. Analytic description of the essential spectrum of a family of 3×3 operator matrices. Nanosystems: Physics, chemistry, mathematics, 10:5(2019), pp. 511-519.

UCHNCHI TARTIBLI OPERATORLI MATRITSALAR OILASI UCHUN BIRMAN-SHVINGER PRINSIPI

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$\mathbb{C}$ orqali bir o'lchamli kompleks fazoni, $L_2(\mathbb{T}^3)$ orqali $\mathbb{T}^3$ da aniqlangan kvadrati bilan integrallanuvchi (umuman olganda kompleks qiymatlarni qabul qiluvchi) funksiyalarning Hilbert fazosini, $L_2^{\text{s}}((\mathbb{T}^3)^2)$ orqali $(\mathbb{T}^3)^2$ da aniqlangan kvadrati bilan integrallanuvchi (umuman olganda kompleks qiymatlarni qabul qiluvchi) simmetrik funksiyalarning Hilbert fazosini hamda $\mathcal{H}$ orqali $\mathcal{H}_0 := \mathbb{C}$, $\mathcal{H}_1 := L_2(\mathbb{T}^3)$ va $\mathcal{H}_2 := L_2^{\text{s}}((\mathbb{T}^3)^2)$ fazolarning to'g'ri yig'indisini belgilaymiz, ya'ni $\mathcal{H} := \mathcal{H}_0 \oplus \mathcal{H}_1 \oplus \mathcal{H}_2$. Bunda $\mathcal{H}_0$, $\mathcal{H}_1$ va $\mathcal{H}_2$ fazolarga $L_2(\mathbb{T}^3)$ fazo yordamida qurilgan $\mathcal{F}_{\text{s}}(L_2(\mathbb{T}^3))$ bozonli Fok fazoning mos ravishda nol zarrachali, bir zarrachali va ikki zarrachali qism fazolari deyiladi.

$\mathcal{H}$ Hilbert fazosida ta'sir qiluvchi quyidagi

$$H(K) := \begin{pmatrix} H_{00}(K) & H_{01} & 0 \\ H_{01}^* & H_{11}(K) & H_{12} \\ 0 & H_{12}^* & H_{22}(K) \end{pmatrix}$$

uchinchi tartibli operatorli matritsalar oilasini qaraymiz. Bu yerda matritsaviy elementlar

$$H_{00}(K)f_0 = w_0(K)f_0, \quad H_{01}f_1 = \int_{\mathbb{T}^3} v_0(t)f_1(t)dt;$$

$$(H_{11}(K)f_1)(p) = w_1(K;p)f_1(p), \quad (H_{12}f_2)(p) = \int_{\mathbb{T}^3} v_1(t)f_2(p,t)dt;$$

$$(H_{22}(K)f_2)(p,q) = w_2(K;p,q)f_2(p,q), \quad f_i \in \mathcal{H}_i, \quad i = 0,1,2$$

kabi aniqlangan bo‘lib, H_{ij}^* $(i < j)$ orqali H_{ij} operatorga qo‘shma operator belgilangan. Bundan tashqari $w_0(\cdot)$ va $v_i(\cdot)$, $i = 0,1$ funksiyalar $\mathbb{T}^3$ da aniqlangan haqiqiy qiymatli chegaralangan funksiyalar, $w_1(\cdot;\cdot)$ va $w_2(\cdot;\cdot,\cdot)$ funksiyalar esa mos ravishda

$$w_1(K;p) := l_1\varepsilon(p) + l_2\varepsilon(K-p) + 1,$$
$$w_2(K;p,q) := l_1\varepsilon(p) + l_1\varepsilon(q) + l_2\varepsilon(K-p-q),$$

tengliklar yordamida aniqlanib, $l_1, l_2 > 0$ va

$$\varepsilon(q) := \sum_{i=1}^{3} (1 - \cos(nq^{(i)})), \quad q = (q^{(1)}, q^{(2)}, q^{(3)}) \in \mathbb{T}^3, \quad n \in \mathbb{N}.$$

Ta’kidlash joizki, H_{01} va H_{12} operatorlarga yo‘qotish operatorlari, H_{01}^* va H_{12}^* operatorlarga esa paydo qilish operatorlari deyiladi.

$\mathcal{H}_0 \oplus \mathcal{H}_1$ fazoda ta’sir qiluvchi hamda o‘z-o‘ziga qo‘shma $\hat{T}(K,z)$, $z < \tau_{\mathrm{ess}}(K)$ kompakt ikkinchi tartibli operatorli matritsani quyidagicha aniqlaymiz:

$$\hat{T}(K,z) := \begin{pmatrix} \hat{T}_{00}(K,z) & \hat{T}_{01}(K,z) \\ \hat{T}_{01}^*(K,z) & \hat{T}_{11}(K,z) \end{pmatrix}.$$

Uning matritsaviy elementlari quyidagicha aniqlangan:

$$\hat{T}_{00}(K,z)g_0 = \big(1 + z - w_0(K)\big)g_0, \;\; \hat{T}_{01}(K,z)g_1 = \int_{\mathbb{T}^3} \frac{v_0(t)g_1(t)dt}{\sqrt{\Delta(K-t\,; z - l_1\varepsilon(t))}};$$

$$(\hat{T}_{11}(K,z)g_1)(p) = \frac{v_1(p)}{2\sqrt{\Delta(K-p\,;z-l_1\varepsilon(p))}}\int_{\mathbb{T}^3}\frac{(w_2(K;p,t)-z)^{-1}v_1(t)g_1(t)dt}{\sqrt{\Delta(K-t\,;z-l_1\varepsilon(t))}}.$$

Bunda $g_i \in \mathcal{H}_i, i = 0{,}1$ va

$$(\hat{T}_{01}^*(K,z)g_0)(p) = -\frac{v_0(p)g_0}{\sqrt{\Delta(K-p;z-l_1\varepsilon(p))}}, \quad g_0 \in \mathcal{H}.$$

$\mathcal{H}$ Gilbert fazosida ta’sir qiluvchi $\mathcal{A}$ chiziqli, chegaralangan, o‘z-o‘ziga qo‘shma operator uchun $n(\gamma,\mathcal{A})$ sonini quyidagi qoida yordamida aniqlaymiz:

$$n(\gamma,\mathcal{A}) = \sup\{\dim F: (\mathcal{A}u,u) > \gamma, u \in F \subset \mathcal{H}, ||u|| = 1\}.$$

Agar $\gamma < \max \sigma_{\text{ess}}(\mathcal{A})$ bo‘lsa, u holda $n(\gamma,\mathcal{A})$ soni cheksizga teng bo‘ladi, agar $n(\gamma,\mathcal{A})$ soni chekli bo‘lsa, u holda bu son $\mathcal{A}$ operatorning γ dan katta xos qiymatlar soniga (karraliklari bilan qo‘shib hisoblaganda) teng bo‘ladi.

$\tau_{\text{ess}}(K)$ orqali $H(K)$ kanal operatorli matritsa muhim spektrining quyi chegarasini belgilaymiz, ya’ni *ya’ni*

$$\tau_{\text{ess}}(K) := \min \sigma_{\text{ess}}(H(K)).$$

$N(K,z)$ orqali $H(K)$ operatorli matritsaning $z \leq \tau_{\text{ess}}(K)$ dan chapda joylashgan xos qiymatlari sonini belgilaymiz. U holda

$$N(K,z) = n(-z,-H(K)), -z > -\tau_{\text{ess}}(K)$$

tenglik o‘rinlidir.

Quyidagi natija $H(K)$ operatorli matritsa uchun mashhur Birman-Shvinger prinsipini ifodalaydi.[1-3]

Teorema. *Faraz qilaylik,* $K \in \mathbb{T}^3$ *bo‘lsin.U holda* $\hat{T}(K,z)$ *operatorli matritsa* $z < \tau_{ess}(K)$ *bo‘lganda kompakt va uzluksiz hamda*

$$N(K,z) = n(1,\hat{T}(K,z))$$

tenglik o‘rinlidir.

Foydalanilgan adabiyotlar

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MUNDARIJA

СОДЕРЖАНИЕ

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