



Dear Colleagues!

Institute of Mathematics of the University of Georgia is pleased to invite you to the Online Tbilisi Analysis & PDE Seminar. The seminar is held bi-weekly on Mondays (at 16 : 00 GMT at 17 : 00 CET, at 20 : 00 local time in Tbilisi).

Talk on November 22

Speaker: Vladimir Rabinovich, National Polytechnic Institute of Mexico, ESIME Zacatenco,
<https://www.researchgate.net/profile/Vladimir-Rabinovich>

The title of the lecture: **Interaction problems for the Dirac operators on \mathbb{R}^n**

Abstract: We consider the formal Dirac operators on \mathbb{R}^n

$$D_{\mathbf{A},\Phi,m,\Gamma\delta_\Sigma} = \mathfrak{D}_{\mathbf{A},\Phi,m} + \Gamma\delta_\Sigma \quad (1)$$

where

$$\mathfrak{D}_{\mathbf{A},\Phi,m} = \sum_{j=1}^n \alpha_j (-i\partial_{x_j} + A_j) + m\alpha_{n+1} + \Phi I_N \quad (2)$$

is the Dirac operator on \mathbb{R}^n with a regular magnetic potential $\mathbf{A} = (A_1, \dots, A_n)$, electrostatic scalar potentials Φ , and with variable mass m of particles. In formula (2) $\alpha_j, j = 1, \dots, n + 1$ are the $N \times N$ Dirac matrices, $N = 2^{\lfloor \frac{n+1}{2} \rfloor}$, $\Gamma\delta_\Sigma$ is the singular potential given by $N \times N$ matrix $\Gamma = (\Gamma_{i,j})_{i,j=1}^N$ and δ_Σ is the delta-function with the support on a C^2 -hypersurface $\Sigma \subset \mathbb{R}^n$ being the common boundary of open sets $\Omega_\pm \subset \mathbb{R}^n$. We associate with the formal Dirac operator (1) the interaction (transmission) problem on \mathbb{R}^n

$$\mathbb{D}_{\mathbf{A},\Phi,m,\mathfrak{B}_\Sigma} u = \begin{pmatrix} \mathfrak{D}_{\mathbf{A},\Phi,m} u \text{ on } \mathbb{R}^n \setminus \Sigma \\ \mathfrak{B}_\Sigma u \text{ on } \Sigma \end{pmatrix} \quad (3)$$

where $u \rightarrow \mathfrak{B}_\Sigma u$ is the operator of transmission conditions, generated by the singular potential. We consider the operator $\mathbb{D}_{\mathbf{A},\Phi,m,\mathfrak{B}_\Sigma}$ as acting from the Sobolev space $H^1(\Omega_+, \mathbb{C}^N) \oplus H^1(\Omega_-, \mathbb{C}^N)$ into $L^2(\mathbb{R}^n, \mathbb{C}^N) \oplus H^{1/2}(\Sigma, \mathbb{C}^N)$. We introduce the analogues of the Lopatinsky-Shapiro conditions for interaction problems (3) and give the application of these conditions to the self-adjointness of the realization of interaction problem as the unbounded operator $\mathcal{D}_{\mathbf{A},\Phi,m,\mathfrak{B}_\Sigma}$ in $L^2(\mathbb{R}^n, \mathbb{C}^N)$. We consider also the Fredholm property of $\mathbb{D}_{\mathbf{A},\Phi,m,\mathfrak{B}_\Sigma}$ and the essential spectrum of $\mathcal{D}_{\mathbf{A},\Phi,m,\mathfrak{B}_\Sigma}$ for compact and some noncompact C^2 -hypersurfaces Σ .

Date: November 22, 2021

Time: 16 : 00 GMT (17 : 00 CET and 20 : 00 local time in Tbilisi)

How to join:

The seminar is organized on the **Cisco Webex Meetings**. If you are already registered, you do not need to register again. Otherwise, to join the seminar please send an e-mail to seminarim@ug.edu.ge or register here:

<https://forms.gle/xfQJ9fg1uqe7CrZw6>

You will then receive further information.

WEB of Seminar: <https://www.ug.edu.ge/en/tbilisi-analysis-and-pde-seminars>

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