Platonova M. V., Ryadovkin K. S. (Saint Petersburg, Russia) — **A branching random walk on graphene lattice.**

We consider a branching random walk on a graphene lattice with periodic sources of branching. Let define a set Γ by $\Gamma = \{g \in \mathbf{Z}^2 : g = n_1 g_1 + n_2 g_2,\ n_j \in \mathbf{Z},\ j = 1, \ldots, 2\}$, where $g_1 = (1,0)$, $g_2 = (0,2)$. We suggest that a matrix of transition intensities is a periodic matrix that is $a(v,u) = a(u,v) = a(v+g, u+g)$ for every vector $g \in \Gamma$. Given $v_1 = (0,0)$, $v_2 = (0,1)$ let $a(v_1,v_1) = -3$, $a(v_1,v_2) = 1$, $a(v_1, v_2 - g_1) = 1$, $a(v_1, v_2 - g_2) = 1$, $a(v_2,v_2) = -3$ and $a(v_1,u) = 0$ for all other vertices u. We assume that branching sources with intensity β_1 are located in vertices $v = v_1 + \Gamma$ and branching sources with intensity β_2 are located in the vertices $v = v_2 + \Gamma$.

Denote by $M(v_j + \gamma_{v_j}, v_k + \gamma_{v_k}, t)$ the expected value of the number of particles at the time t at the point $v_k + \gamma_{v_k}$ if at the moment $t = 0$ at the point $v_j + \gamma_{v_j}$ there was one particle. We show that as $t \to \infty$

$$M(v_j + \gamma_{v_j}, v_k + \gamma_{v_k}, t) = e^{\lambda_1(0)t} \frac{\pi\left(\frac{1}{4}(\beta_1+\beta_2)^2 + 9\right)}{t\sqrt{5}} \frac{\psi_1(v_k,0)\psi_1(v_j,0)}{\|\psi_1(0)\|^2_{\ell_2(\Omega)}} \left(1 + O(t^{-1})\right),$$

where $j,k = 1,2$, $\gamma_{v_j}, \gamma_{v_k} \in \Gamma$, $\lambda_1(0)$ is the largest eigenvalue of the matrix

$$A(0) = \begin{pmatrix} -3+\beta_1 & 3 \\ 3 & -3+\beta_2 \end{pmatrix},$$

and $\psi_1(v_j,0)$ is j-th component of a normalized eigenfunction of the matrix $A(0)$ corresponding the eigenvalue $\lambda_1(0)$.

This work is supported by the Grant RSF 17-11-01136, PDMI RAS.