Yarovaya E.B. (Moscow, Russia) **Large deviations and asymptotic behavior of stochastic evolutionary systems.**

The talk is devoted to various continuous-time models with generation and walking of particles on $\mathbb{Z}^d$, $d \geq 1$. Points of $\mathbb{Z}^d$, at which the particle generation (that is birth and death of particles) can occur, are called *sources of branching*, and the process itself is called *a branching random walk* (BRW). The talk provides a series of asymptotic results on the behavior of the particle numbers and/or their integer moments, as $t \to \infty$, for the following models: 1) a symmetric BRW with one source of branching and a finite or infinite number of the initial particles, see [1]; 2) a symmetric BRW with a finite number of sources of various positive intensities and one initial particle, see [2]; 3) a BRW with pseudo-sources, admitting possible violation of symmetry at sources of branching and one initial particle, see [3]; 4) BRWs with sources of equal intensities at every lattice point and a finite or infinite number of the initial particles, see, for example, [4]. The behavior of a BRW is essentially determined by the properties of the underlying random walk. Let $p(t, x, y)$ be the transition probability of the underlying random walk. As shown in [5,6], for a homogeneous symmetric random walk the analysis of large deviations significantly depends on the behavior of $p(t, x, y)$ for $|y-x|+t \to \infty$ (under various assumptions about the relationship between $|y-x|$ and t with their joint growth), and also on the behavior of the function $G_\lambda(y-x) = \int_0^\infty e^{\lambda t} p(t, x, y)\, dt$ for $|y-x| \to \infty$ under the different assumptions on λ. The description of the models and the proofs of some related statements can be found, for example, in [1-6], and the remaining statements are new. The proof of the limit theorems on the exponential growth of particle numbers for BRWs with a finite number of sources with various positive intensities, if a positive discrete spectrum of the evolutionary operator of mean particle numbers is not empty, is based on the asymptotic behavior of their moments under some assumptions about generating functions for the branching processes in sources. The proof of convergence in distribution given, for example, in [2], is based on the Carleman criterion. Using the methods of the asymptotic theory of integrals and properties of the Lambert W function, it is shown that the quadratic rate of growth of ratios of successive moments and the well-known Hardy condition, as a sufficient conditions under which probability distribution is uniquely determined by its moments, are more restrictive than the Carleman condition [7].

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