

INTERSECTION LOCAL TIMES: EXPONENTIAL ASYMPTOTICS AND LAWS OF THE ITERATED LOGARITHM

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The report consists of three recent papers, one is the joint work with W. Li (2002) and one is the joint work with R. Bass (2003).

Let $\{S_1(n)\}_{n \geq 1}, \dots, \{S_p(n)\}_{n \geq 1}$ be independent, symmetric and square integrable d -dimensional lattice valued random walks. It is a classic fact that they intersect if and only if

$$p(d-2) \leq 2 \tag{*}$$

This talk concerns about the law of the iterated logarithm and related large (moderate) deviations for the intersection local time defined by

$$I_n = \#\left\{(k_1, \dots, k_p) \in [1, n]^p; S_1(k_1) = \dots = S_p(k_p)\right\} \quad n = 1, 2, \dots$$

under the condition (*). The critical cases “ $d = 4, p = 2$ ” and “ $d = p = 3$ ” have been studied by Marcus-Rosen (1997) and by Rosen (1997), respectively. To complete the picture, my focus is on the non-critical cases defined by

$$p(d-2) < 2 \tag{**}$$

and I will report some quite complete results recently obtained in Chen-Li (2002) in the case $d = 1$ and in Chen (2003) in the case $d \geq 2$.

I will also speak on the same type of problems for self-intersection local time

$$J_n = \#\left\{(k_1, \dots, k_p); 1 \leq k_1 < \dots < k_p \leq n \text{ and } S(k_1) = \dots = S(k_p)\right\} \quad n = 1, 2, \dots$$

in the context of a single random walk $\{S(n)\}_{n \geq 1}$. I will first talk about some essentially complete results achieved in Chen-Li (2002) as $d = 1$. The case of multi-dimensions is a different story. In this talk I will report some results obtained in Bass-Chen (2003) in the context of renormalized self intersection local times of 2-dimensional Brownian motion and explain how this is related to our problems.

Some background, links, and applications of our results will also be provided.