

# Heat kernel for random walk trace on $\mathbb{Z}^3$ and $\mathbb{Z}^4$

Daisuke Shiraishi

Kyoto University

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## **Abstract.**

We study the simple random walk  $X$  on the range of simple random walk on  $\mathbb{Z}^3$  and  $\mathbb{Z}^4$ . In dimension four, we establish quenched bounds for the heat kernel of  $X$  and  $\max_{0 \leq k \leq n} |X_k|$  which require extra logarithmic correction terms to the higher-dimensional case. In dimension three, we demonstrate anomalous behavior of  $X$  at the quenched level. In order to establish these estimates, we obtain several asymptotic estimates for cut times of simple random walk and asymptotic estimates for loop-erased random walk, which are of independent interest.