

ON ρ -PERCOLATION AND THE NUMBER OF POLYMER PATHS

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Consider oriented Bernoulli site percolation with parameter p in dimension $1 + d$. Let $Q_n(k)$ be the number of oriented path of length n which have exactly k open vertices. We prove that

$$\sum_{k \geq n\rho} Q_n(k) = \exp n[\alpha(\rho) + o(1)]$$

a.s. as n tends to infinity, for all ρ except maybe two values. The function $\alpha(\cdot)$ is deterministic and relates to the free energy of directed polymers in random environment. This function has an explicit expression for $d \geq 3$ and ρ not too far from p . Moreover, we obtain an equivalent for $Q_n(k_n)$ itself, for $k_n \sim n\rho$, ρ close to p and $d > 2$.

This question relates to ρ -percolation, i.e. the event that there exists an infinite (oriented) path with a density at least ρ of open vertices. It also relates to directed polymers in random environment.

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