Percolation in a finite strip for Gibbs lattice models

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With the help of cluster expansions the problem of percolation of the random field in the finite strip for the lattice percolation model and the ferromagnetic Ising model is solved. The probability of impermeability from the top of the cylinder to its bottom along random defects is represented in an exponential form with an analytic function in the index. Cluster structure of the exponent index is described; in an explicit form the first few terms of the index exponential expansion by the percolation parameter are found. Limit theorems of Poisson type are proved. It is shown that under certain multiplicative character terms effecting the shape of the cylinder and the percolation parameter, the probability distribution of the number of defective paths converges to Poisson distribution. And inversely, at a constant percolation parameter for any Poisson parameter λ there is a sequence of volumes in which the distribution of the number of paths tends to Poisson distribution with λ-parameter. It is shown that without any changes all the calculations can be extended to include wider group of lattice models (for which cluster expansions are applicable).

Keywords: *percolation, lattice model, the Ising model, a Gibbs field, permeable path, limit theorems of Poisson type.*

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