

Phase Transitions in Ising Model Defined on Complex Networks

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Received: March 04, 2023

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Abstract. In this work, we consider an Ising model which allows spin-spin interaction in the systems. We assume that two-level quantum systems are randomly located in N nodes of a complex annealed scale-free network described by the Barabasi-Albert model. It is defined by the power-law degree distribution of nodes. We consider the mean-field approach to the system described by the Ising Hamiltonian. At a certain level, the system is totally characterized by the order parameter S_z . It contains a critical inverse temperature β , which depends on parameter ζ_2 as the ratio of the second to the first moment of the degree distribution. We have found that for ζ_2 , that exceeds its critical value $\zeta_{2,c}$, high temperature phase transition occurs that can be explained by the hubs and clusters which appear in scale-free networks.

Acknowledgements. This work was supported by the Ministry of Science and Higher Education of Russian Federation (Goszadanie no. 2019-1339).

Citation: Rev. Adv. Mater. Technol., 2023, vol. 5, no. 1, pp. 16–21

View online: <https://doi.org/10.17586/2687-0568-2023-5-1-16-21>

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