

## Invisible states Potts model

*Tuesday, 24 September 2024 17:40 (5 minutes)*

The Potts model with invisible states was introduced to explain discrepancies between theoretical predictions and experimental observations of phase transitions in some systems where  $Z_q$  symmetry is spontaneously broken [1]. It differs from the ordinary  $q$ -state Potts model in that each spin, besides the usual  $q$  visible states, can be also in any of  $r$  so-called invisible states. Spins in an invisible state do not interact with their neighbours but they do contribute to the entropy of the system. As a consequence, an increase in  $r$  may cause a phase transition to change from second to first order. Potts models with invisible states describe a number of systems of interest in physics and beyond and have been treated by various tools of statistical and mathematical physics. We aim to give a review of this fundamental topic based on our results [2-4]. Mainly, our goal was to investigate the energy-entropy interplay influence on the phase transition in the Potts model with invisible states in 1D case [2] as well as on different graph topologies [3].

We acknowledge support from the National Research Foundation of Ukraine, Project 2023.03/0099 "Criticality of complex systems: fundamental aspects and applications".

[1] S. Tanaka, R. Tamura, N. Kawashima. J. Phys. Conf. Ser., 297 (2011) 012022.

[2]. Petro Sarkanych, Yuriy Holovatch, Ralph Kenna. Journ. Phys. A vol. 51 (2018) 505001; Phys. Lett. A vol. 381, (2017) 3589-3593

[3] M. Krasnytska, P. Sarkanych, B. Berche, Yu. Holovatch, R. Kenna. J. Phys. A: Math. Theor., 49(25) (2016) 255001;

P. Sarkanych, M. Krasnytska. Cond. Matt. Phys., 26 (1) (2023) 13507.

[4] M. Krasnytska, P. Sarkanych, B. Berche, Yu. Holovatch, R. Kenna. Eur. Phys. J. Spec. Top. 232, 1681–1691 (2023).

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**Session Classification:** Poster Session

**Track Classification:** CONDENSED MATTER PHYSICS