QUANTUM SPIN SYSTEMS AND THEIR STOCHASTIC REPRESENTATIONS

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The spin correlations in quantum Heisenberg systems can be represented by certain loop models, as was shown by Tóth (ferromagnet) and Aizenman-Nachtergaele (antiferromagnet). Namely, spin correlations are given by the probability that two lattice sites belong to the same loop. I will describe these representations, and argue that the lengths of the large loops are proportional to the volume of the system and that their joint distribution is given by Poisson-Dirichlet. This is supported by some rigorous results and numerical simulations.

Keywords: Quantum spin system, Heisenberg model, phase transitions, two-point correlations