



Contribution ID: 260

Type: **Parallel Talk**

Symmetry Breaking and Clock Model Interpolation in 2D Classical $O(2)$ Spin Systems

Friday, August 4, 2023 9:00 AM (20 minutes)

Motivated by attempts to quantum simulate lattice models with continuous Abelian symmetries using discrete approximations, we study an extended- $O(2)$ model that differs from the ordinary $O(2)$ model by the addition of an explicit symmetry breaking term. Its coupling allows to smoothly interpolate between the $O(2)$ model (zero coupling) and a q -state clock model (infinite coupling). In the latter case, a q -state clock model can also be defined for non-integer values of q . Thus, such a limit can also be considered as an analytic continuation of an ordinary q -state clock model to non-integer q . In previous work, we established the phase diagram of the model in the infinite coupling limit. We showed that for non-integer q , there is a second-order phase transition at low temperature and a crossover at high temperature. In this work, we establish the phase diagram at finite values of the coupling using Monte Carlo and tensor methods. We show that for non-integer q , the second-order phase transition at low temperature and crossover at high temperature persist to finite coupling. For integer $q = 2, 3, 4$, there is a second-order phase transition at infinite coupling (i.e. the clock models). At intermediate coupling, there are second-order phase transitions, but the critical exponents vary with the coupling. At small coupling, the second-order phase transitions may turn into BKT transitions.

Topical area

Quantum Computing and Quantum Information

Primary authors: HOSTETLER, Leon (Michigan State University); SAKAI, Ryo (Syracuse University); ZHANG, Jin (U. of Iowa); BAZAVOV, Alexei (Michigan State University); MEURICE, Yannick (U. of Iowa)

Presenter: HOSTETLER, Leon (Michigan State University)

Session Classification: Quantum Computing and Quantum Information