COMPETITION BETWEEN MULTIPOLE SITE ORDERS AND NONSINGLET VALENCE BONDS IN HIGH SPIN SYSTEMS

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High spin models with biquadratic, bicubic and even higher order spin exchange interaction can describe complicated spin systems and their different phases including not only the usual site centered spin (dipole) order but multipole orders, too. These models in numerous cases can be simulated by high spin ultracold atom systems, and are intensively studied experimentally and theoretically. These systems can be treated within a concept that contains bond orders in addition to site centered orders leading to the appearance of nonsinglet valence bonds [1]. The mean field phase diagram is determined by comparing the ground state energies obtained from the two different concepts for special systems that can be realized experimentally with high spin ultracold atoms loaded into optical lattices.

[1] arxiv:1009.4868 (2010).

Subject category :
2. Quantum and Classical Spin Systems

Presentation mode :
oral

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