Isotropy dependence of spiral order in triangular lattice Hubbard model

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Abstract
Investigation of broken symmetry phases with long range order in strongly correlated electron systems is among subjects that have always been of interest to condensed matter scientists. In this paper we tried to study the existence of the 120 degrees magnetic spiral order, based on anisotropy in geometrically frustrated triangular lattices, using variational cluster approximation. We observed that by increasing the anisotropy in the system, the spiral order can be found for $U \geq 7.5t$ and for $t' < 1.35$; however, it is limited by decreasing $t'$ since antiferromagnetism is dominant for $t' < 0.85t$. Studying the Mott transition shows that a paramagnetic insulating phase, called quantum spin liquid, happens in the neighborhood of the spiral ordered phase.

Keywords: strongly correlated electron system, Hubbard model, magnetic spiral order, quantum spin liquid, anisotropy

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