Abstract Submitted
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Rotated Heisenberg model[1] FADI SUN, JINWU YE, Mississippi State University, WU-MING LIU, Institute of Physics Chinese Academy of Sciences — We show that Rotated Heisenberg (RH) model is a new class of quantum spin models to describe magnetic materials with strong spin-orbit couplings (SOC). We introduce Wilson loops to characterize frustrations and gauge equivalent class. For a special equivalent class, we identify a new spin-orbital entangled commensurate ground state. It supports a novel gapped elementary excitation named as in-commensurate magnons which have two gap minima continuously tuned by the SOC strength. At low temperatures, the in-commensurate magnons lead to dramatic effects in all physical quantities such as density of states, specific heat, magnetization and various spin correlation functions. At high temperatures, the specific heat and transverse spin structure factors depend on the SOC strength explicitly. We argue that one gauge may be realized in current experiments and other gauges may also be realized in near future experiments. Various experimental detections are discussed.

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