Editors

Physical Review B

Dear Editors,

Attached please find a manuscript entitled “Ferromagnetism and spin excitations in topological Hubbard models with a flatband” by Xiao-Fei Su, Zhao-Long Gu, Zhao-Yang Dong, Shun-Li Yu and Jian-Xin Li, which is submitted to “Physical Review B” as a regular paper.

Interacting fermionic systems with topological bands constitute a hot issue in condensed matter physics. One particular intriguing situation occurs when the topological bands are nearly flat so that interaction effects are highly enhanced. In such systems, exotic topological phases can emerge out of a fractionally filled band with the aid of itinerant ferromagnetism although the noninteracting counterpart is just a featureless metal. The existence of itinerant ferromagnetism is essential for the emergence of such topological phases but has been less studied before.

Here, we study the stability and excitation spectra of the topological Chern Hubbard and Hubbard models by using the numerical exact diagonalization method with a projection onto the nearly-flat band. We find quite distinct spectra for both cases, in particular explore the effects of the nonflatness of the energy band which is unavoidable in real systems. We show that the nonflatness results in the coupling between the spin waves and individual excitations in the Stoner continuum and in turn leads to the emergence of the roton-like modes. We elaborate a new mechanism, the softening of the roton-like modes, for the destabilization of the ferromagnetic state. This allows us to determine the parameter region where the ferromagnetic phase is stable, which is of particular importance for the research of the flatband topological phases.

We believe that our work is suitable for a publication in “Physical Review B”. Thanks in advance for your kind consideration.

Yours sincerely,

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