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 for consideration to be published in “Physical Review B”.

Correlated topological models with partially filled nearly-flat electron bands have attracted much attention recently. One intriguing phenomenon resulting from the interplay between correlation effects and partially filled topological nearly-flat bands is the ferromagnetism induced quantum anomalous effect. In such systems, spin flip excitations are dominant low energy excitations. A previous work developed a generalized bosonization scheme with the harmonic approximation to study such excitations. However, the nonflatness of the topological band, which is essential to get the correct dispersion relations of spin waves and account for the physics of the destabilization of the ground state, is ignored in their scheme. In this article, by using the exact diagonalization method with a projection onto the nearly-flat topological band, we elaborate the spin flip excitations upon the ferromagnetic quantum anomalous Hall ground state, and reveal the physics related to the nonflatness of the topological band explicitly. We find that the spin flip excitations consist of two parts, the low-lying collective modes (spin waves) and the high-energy individual modes (Stoner continuum). Nonflatness of the electron band introduces dips of the lower boundary of the Stoner continuum, and significantly renormalizes the energies of the collective modes around these dips downward, leading to roton-like spin wave excitations. The destabilization of the ferromagnetic phase happens when the energy of the induced roton-like modes becomes zero with the increase of the nonflatness.

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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