Majorana-Magnon Interactions in Topological Shiba Chains

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A chain of magnetic impurities deposited on the surface of a superconductor can form a topological Shiba band that supports Majorana zero modes and hold a promise for topological quantum computing. Yet, most experiments scrutinizing these zero modes rely on transport measurements, which only capture local properties. Here we propose to leverage the intrinsic dynamics of the magnetic impurities to access their non-local character. Specifically, we calculate the spin susceptibility of the magnetic chain and show that the uniform magnonic mode, which spreads over the entire chain, becomes imprinted with the parity of the ground state. We find that the visibility of the spin susceptibility associated with the two parities oscillates between -1 and 1 in the topological regime as a function of the magnon frequency, while it is arbitrary in the trivial regime. These two distinct patterns originate from interference effects and are robust against moderate disorder. Our approach offers non-invasive alternative to the scanning tunnelling microscopy techniques used to probe Majorana zero modes. Conversely, the magnons could facilitate the manipulation of Shiba states and the Majorana zero modes.

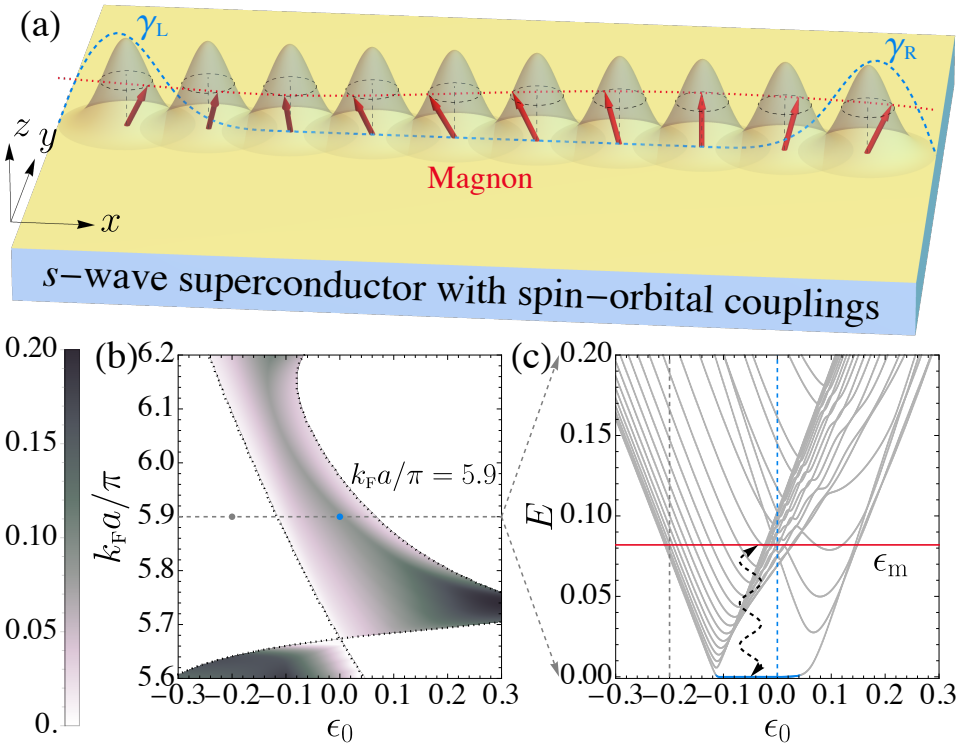

Figure 1: (a) A Sketch of the topological Shiba chain in the presence of magnons. (b) The phase diagram. (c) The spectrum and the Majorana zero mode.