22 Dec Wednesday 12:00 – 12:45 Chair: YOU Jian Qiang (游建强)

Determining the Range of Magnetic Interactions from the Relations Between Magnon Eigenvalues at High-Symmetry K Points

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Professor WAN Xiangang is a Professor at Nanjing University. As a computational theorist in condensed matter physics, Professor WAN has made a series of original breakthroughs in studies of topological materials, including his signature discoveries of Weyl semimetals in 2011, and axion insulators based on 5d spinel compounds in 2012. Professor WAN's research has been well recognized internationally, with his recent work published in Nature 2019 offering a comprehensive method to search for topological material using symmetry indicators.

Abstract:

Magnetic exchange interactions (MEIs) define networks of coupled magnetic moments and lead to a surprisingly rich variety of their magnetic properties. Typically MEIs can be estimated by fitting experimental results. But how many MEIs need to be included in the fitting process for a material is not clear a priori, which limits the quality of results obtained by these conventional methods. In this paper, based on linear spin-wave theory but without performing matrix diagonalization, we show that for a general quadratic spin Hamiltonian, there is a simple relation between the Fourier transform of MEIs and the sum of square of magnon energies (SSME). We further show that according to the real-space distance range within which MEIs are considered relevant, one can obtain the corresponding relationships between SSME in momentum space.