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Impact of Dynamic Orbital Correlations on Magnetic Excitations in the Normal State of Iron-Based Superconductors[1] WEI-CHENG LEE, University of Illinois at Urbana-Champaign, WEICHENG LV, University of Tennessee at Knoxville, JOHN TRANQUADA, Brookhaven National Lab, PHILIP PHILLIPS, University of Illinois at Urbana-Champaign — We show here that orbital degrees of freedom produce a distinct signature in the magnetic excitation spectrum of iron-based superconductors above the magnetic ordering temperature. Because d_{xz} and d_{yz} orbitals are strongly connected with Fermi surface topology, the nature of magnetic excitations can be modified significantly due to the presence of either static or fluctuating orbital correlations. Within a five-orbital itinerant model, we show that static orbital order generally leads to an enhancement of commensurate magnetic excitations even when the original Fermi surface lacks nesting at commensurate wavevectors. When long-range orbital order is absent, Gaussian fluctuations beyond the standard random-phase approximation capture the effects of fluctuating orbital correlations on the magnetic excitations. We find that commensurate magnetic excitations can also be enhanced if the orbital correlations are strong. We propose that this unusual incommensurate-to-commensurate transformation is an important signature to distinguish orbital from spin physics in the normal state of iron-based superconductors.

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