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【634】 Ultra-High Resolution Neutron Spectroscopy of Low-Energy Spin Dynamics in UGe₂

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Studying the prototypical ferromagnetic superconductor UGe₂ we demonstrate the potential of the Modulated Intensity by Zero Effort (MIEZE) technique—a novel neutron spectroscopy method with ultra-high energy resolution of at least 1 μeV —for the study of quantum matter. We reveal purely longitudinal spin fluctuations in UGe₂ with a dual nature arising from $5f$ electrons that are hybridized with the conduction electrons. Local spin fluctuations are perfectly described by the Ising universality class in three dimensions, whereas itinerant spin fluctuations occur over length scales comparable to the superconducting coherence length, showing that MIEZE is able to spectroscopically disentangle the complex low-energy behavior characteristic of quantum materials.

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