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Exploring the fluctuation-induced first-order phase transition in MnSi using neutron scattering

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Interactions of critical fluctuations in combination with an increased phase space may drive a second order phase transition first order. Using small angle neutron scattering (SANS) and modulation of intensity with zero effort (MIEZE) spectroscopy in combination with measurements of the magnetic, thermodynamic, and transport properties, we have investigated the fluctuation-induced first-order phase transition in MnSi and $Mn_{1-x}Fe_xSi$ and its evolution as a function of field, temperature, and iron concentration x.

Combining the results of the neutron scattering data with measurements of the magnetic, thermodynamic, and transport properties, we have investigated the existence of a putative tricritical point and have established the presence of fluctuating magnetic textures with nontrivial topology at temperatures above the onset of static magnetic order.

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