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Criticality Induced First-Order Phase Transition in Dzyaloshinskii-Moriya Helimagnets MARC JANOSCHEK[1], Los Alamos National Laboratory, MARKUS GARST, Universitaet zu Köln, ANDREAS BAUER, Technische Universitaet Muenchen, PASCAL KRAUTSCHEID, Universitaet zu Köln, ROBERT GEORGII, FRM II Technische Universitaet Muenchen, PETER BOENI, CHRISTIAN PFLEIDERER, Technische Universitaet Muenchen — Almost two centuries of research on phase transitions have repeatedly highlighted the importance of critical phenomena. One fascinating implication of critical phenomena is that critical fluctuations may drive the associated phase transition first order if symmetry allows them to assume enough phase space. As discussed by Brazovski, this is in particular the case if critical fluctuations become soft on a sphere in momentum space. By means of combined specific heat, magnetic susceptibility and neutron scattering measurements of the model helimagnet MnSi we show that this scenario is realized for the helimagnetic phase transition in Dzyaloshinskii-Moriya(DM) helimagnets with weak magnetic anisotropy. The remarkable agreement observed between experiment and theory clarifies the longstanding issue of the nature of the helimagnetic transition in MnSi, but more importantly, our calculations are entirely based on symmetry arguments, making this result relevant to DM helimagnets in general. This is in particular noteworthy in the light of a series of new discoveries that show that DM helimagnetism is at the heart of problems such as topological magnetism, multiferroics, and spintronics.

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