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Unconventional magnetic phase transitions and non-trivial spin structures in the DMI-magnet Ba2CuGe2O7

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Incommensurate spiral magnets have raised tremendous interest in recent years, mainly motivated by their wealth of spin structures with potential non-trivial topology, such as skyrmions. A second field of interest is multiferroicity: Helical spin structures are in general ferroelectric, enabling the coupling of the electric and magnetic properties. Both fields present enormous potential for future devices, where spin and charge degrees of freedom are coupled. Ba2CuGe2O7, characterised by a quasi-2D structure with Dzyaloshinskii-Moriya interactions (DMI), is a material that is interesting in both of these regards and combines them with a third one: a variety of unconventional magnetic phase transitions. Neutron diffraction is used for a careful examination of the distribution of critical fluctuations in reciprocal space, associated with the paramagnetic to helimagnetic transition of Ba2CuGe2O7. Caused by the reduced dimensionality of Ba2CuGe2O7, a crossover from incommensurate antiferromagnetic fluctuations to 2D antiferromagnetic Heisenberg fluctuations is observed, highlighting the rich cornucopia of magnetic phase transitions in spiral magnetic textures.

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