Structure and phase transitions of a magnetic kink crystal

SEBASTIAN MUEHLBAUER, ANDREY ZHELUDEV, ETH Zurich, Neutron Scattering and Magnetism Group, Switzerland, EKATERINA POMJAKUSHINA, PSI, Villingen, Switzerland — The insulator Ba$_2$CuGe$_2$O$_7$ crystallizes in the non-centrosymmetric space group $P_{-}$421 allowing for the Dzyaloshinskii-Moriya interaction. Below $T_N$=3.2K Ba$_2$CuGe$_2$O$_7$ exhibits an almost antiferromagnetic cycloidal magnetic order. For $H$ parallel to the c-axis, the cycloid distorts to solitons or kink domain walls. Using small angle neutron scattering and neutron diffraction the structure and phase transitions of a magnetic kink crystal have been examined in Ba$_2$CuGe$_2$O$_7$. A magnetic phase transition seen with SANS and complementary measurements of the magnetization is interpreted in terms of a transition from a Neel domain wall with the propagation vector parallel to its plane of spin rotation to a Bloch domain wall with a propagation vector perpendicular to its plane of spin rotation. Indicated by the occurrence of satellite reflections with even and odd harmonics around the AF Neel point (1,0,0) and around the FM zone center (0,0,0) it was further shown that the AF cycloidal magnetic structure of Ba$_2$CuGe$_2$O$_7$ is considerably distorted by the staggered Dzyaloshinskii vector $D_z$.

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