Magnetic Correlations in Incommensurate MnSi and Cr: Investigations with Polarized Neutrons

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Abstract - Strongly correlated magnetic materials with incommensurate ordering like MnSi and Cr show very interesting ordering patterns and magnetic excitations. Because of the non-centrosymmetric crystal structure of MnSi, the antisymmetric Dzyaloshinskii-Moriya interaction leads to chiral spin waves in the ordered phase transforming to regular ferromagnetic spin waves when a large magnetic field is applied. Near T_C, critical scattering develops on a shell of a sphere coexisting with Bragg scattering from the magnetic satellites. Under application of a magnetic field, the chiral order transforms to a new state of magnetic order. In incommensurate Cr we show that the spin wave modes attain a larger velocity than the phason modes. Moreover, we demonstrate that the longitudinal modes are responsible for the "tilting" of the dispersion cones that emerge from the incommensurate peaks towards the commensurate position. We discuss the relevance of the new results in perspective of the excitation spectrum in high-T_c superconductors. Most interestingly, we find that despite the centro-symmetric bcc structure of Cr, the low energy fluctuations, i.e. the Fincher-Burke modes are not symmetric with respect to the propagation direction of the magnetic excitations, i.e. with respect to the commensurate position.