

## Magnetic Excitations in Multiferroic TbMnO<sub>3</sub>

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In the recently discovered class of multiferroic materials, ferroelectricity is closely connected with a complex magnetic ordering. The electric polarization and a magnetic component appear simultaneously at the multiferroic transition. As this transition is continuous, one may expect an associated collective soft mode called electromagnon [1].

We present results of detailed neutron scattering experiments on the magnetic excitations in TbMnO<sub>3</sub>, which is a key material for this new multiferroic class. The ferroelectric transition in TbMnO<sub>3</sub> at T<sub>FE</sub>=28K coincides with a magnetic reorientation from a SDW-phase into a cycloidal ordering. In the ferroelectric spiral phase the magnon-spectrum consists of three branches, and using polarization analysis we may fully identify the character of the various magnetic excitations. The frequencies of two zone-centre excitations perfectly agree with recent IR-spectroscopy studies [2]. As IR-spectroscopy senses the phononic part only, whereas polarized neutron scattering measures a magnetic component, the combination of both techniques proves that these excitations possess mixed phonon-magnon character. These mode thus are the electromagnon excitations. We will discuss the temperature and magnetic field dependencies of the electromagnon signal.

[1] G.A. Smolenskii and I.E. Chapuis, Sov. Phys. Usp. 25, 475 (1983).

[2] A. Pimenov et al., Nature Physics 2, 97 (2006).

