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Dielectric effects at a magnetic Bose-Einstein condensation[1] KIRILL POVAROV, AARON REICHERT, ERIK WULF, ANDREY ZHELUDEV, Neutron Scattering and Magnetism Group, ETH Zürich, Switzerland — In the presence of magnetoelectric coupling one can expect non-trivial dielectric properties at a magnetic quantum phase transition. A "toy model" here is a spin spiral undergoing a field-induced transition into a quantum-disordered phase. In the incommensurate phase the in-plane spin rotational symmetry is protected, making the analogy between the magnetic long-range ordering and BEC exact, but the spin spiral may also host an electric polarization complicating the picture. We have experimentally studied this transition in the spin tube material Sul-Cu_2Cl_4 [1] to understand if it can be described as a magnetic BEC. We have found that indeed it can. Dielectric spectroscopy results combined with calorimetric measurements, clearly show the absence of polarization fluctuations in the disordered phase down to the very critical point. At the same time the ordered phase shows a huge nonlinearity in dielectric permittivity even for small electric fields. The phase boundary shows beautiful consistency with the 3D BEC universality class. We conclude, that although magnetoelectric coupling does not alter the nature of the transition, it gives rise to complex magnetoelectric effects in the helimagnetically ordered phase.

[1] K. Povarov et al.; Phys. Rev. B 92 140410 (2015)

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