

Seminar: Hard Condensed Matter Theory

Room: Galilei room, 01-128 (Staudinger Weg 9)
Time: Tuesday, 27.10.2015, 14:15

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Finding skyrmions in magnetic materials

The fundamental mechanism for the formation of chiral skyrmions in certain acentric (ferro)magnets is beautifully simple [1], solution for the localized two-dimensional skyrmion is known for more than 25 years [2]. But, existence of multidimensional static solitons is exceptional. The stability of localized magnetization textures can be explained by the existence of multi-dimensional Lifshitz-invariants in the classical phenomenological Landau-Ginzburg functional for the magnetic order parameter. Such theories are called Dzyaloshinskii models and embody a frozen gauge-background and violate the weak Lifshitz condition of the Landau theory for continuous phase transitions. Chiral skyrmions in the magnets with certain non-centrosymmetric crystal structures are one realization of such textures. The form these theories leads to intertwined amplitude and directional parts of the order-parameter with dramatic consequences for thermodynamic ordering transitions and dynamics. The theoretical ideas suggest that a much wider class of ordering modes may display similar twisted and localized textures, as illustrated the anomalous ordering transition of incommensurate spin-density waves in Fe_{1+y}Te [3].

[1] A. Bogdanov, Pis'ma Zh. Eksp. Teor. Fiz. 62 (1995) 231 [JETP Letter 62 (1995), 247].

[2] A.N. Bogdanov, D. A. Yablonskii, Zh. Eksp. Teor. Fiz 95 (1989) 182 [Sov. Phys. JETP 66 (1989) 101].

[3] Ph. Materne, C. Koz, UKR, M. Doerr, T. Goltz, H.H. Klauss, U. Schwarz, S. Wirth, and S. Rößler, PRL (2015), in press.

All interested are cordially welcome!