MAR11-2010-007574

Abstract for an Invited Paper
for the MAR11 Meeting of
the American Physical Society

Luttinger–liquid and BEC physics in spin ladders[1]

CHRISTIAN RUEGG, Paul Scherrer Institute

Spin ladder materials serve as model systems in which the fundamental phases, exotic order, and elementary excitations of low-dimensional quantum magnets can be studied experimentally and compared quantitatively to predictions by theory. We have utilised the optimal energy scale of the exchange interactions and excellent low dimensionality of the metal–organic spin ladder material $(C_5H_{12}N)_2CuBr_4$ to study spin Luttinger–liquid (LL) and magnon Bose–Einstein Condensate (BEC) physics realized at low temperatures and in high magnetic fields in this magnetic insulator. Furthermore, the inherent chemical flexibility and the structural tunability of such metal–organic compounds enable studies of the effects of bond randomness and of non–magnetic and magnetic dopants on the spin LL and magnon BEC. Bose glass phases form and the localized impurities dominate the physics near the intrinsic quantum critical points of the ladder. Measurements of the elementary excitations, phase diagrams, and thermodynamic and magnetic properties of the LL and BEC have also been extended recently to $BiCu_2PO_6$ in which these phenomena are combined intriguingly with frustration of the magnetic exchange interactions.

[1]Research supported by the Royal Society, EPSRC and the Swiss National Science Foundation.