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Topological excitations in low dimensional magnetic systems

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The low-dimensional magnetic systems, particularly the quasi-two dimensional ones, are of paramount technological importance in the present times in view of the possible existence of vortices/anti-vortices and merons/anti-merons, characterized as topological excitations. Besides, they provide considerable challenges to condensed matter physicists, both theoreticians and experimentalists for their satisfactory microscopic understanding. In collaboration with other members of my research group, I have investigated the nature of magnetic correlations and spin excitations in layered XY-anisotropic ferromagnetic and anti-ferromagnetic spin $\frac{1}{2}$ systems realized in K_2CuF_4 and La_2CuO_4 , by a combination of phenomenological and field theoretical techniques. These methodologies include semi-classical Berezinskii-Kosterlitz-Thouless (BKT) phenomenology corresponding to the unbinding of topological excitations and coherent state based effective action approach to identify the topological excitations themselves. Our theoretical works were motivated by the occurrences of prominent “central peak”s in the dynamical structure function in the constant-q scan of the inelastic neutron scattering experiments performed on the above two materials. Our detailed study of the spin dynamics induced by the translational motion of the unbound topological excitations for temperatures above T_{BKT} supported by the experimental results, brings out the clear possibilities of the emergence of the novel phenomenon of “quantum BKT transition” in the above two systems, with the observed limitations of the conventional semi-classical phenomenology.

Biography

Ranjan Chaudhury received his PhD from TIFR (Mumbai, India) in 1988. Thereafter, he held Post-doctoral and Visiting Scientist positions at ICTP (Trieste, Italy), McMaster University (Hamilton, Canada), University of Minnesota (Minneapolis, USA), LEPES-CNRS (Grenoble, France) and BLTP-JINR (Dubna, Russia). He is at present Professor (Associate) at SNBNCBS (Kolkata, India). He has published about 40 papers in several internationally reputed journals and has 20 other scientific publications. He has won several awards and honours including publication of his biography in Marquis Who's Who in the World (New Jersey, USA 1999 & 2011), in Marquis Who's Who in Asia (New Jersey, USA 2007) and International Scientist of the Year (IBC, Cambridge, Great Britain 2007).

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