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Investigation of the magnetic behavior of doped quantum antiferromagnets on low-dimensional lattices

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The doped quantum Heisenberg antiferromagnets are extremely alluring for their interesting magnetic properties and inherent itinerant character. Even the magnetic behaviors of the one-dimensional and two-dimensional antiferromagnets are quite distinct which is in contrast to the age old idea of the theoreticians and experimentalists. The strongly correlated t-J model is the simplest model that has paramount importance in describing these itinerant systems starting from the slightly less than half-filled band limit. My work is primarily based on the calculation of generalized spin stiffness constant for low-dimensional doped antiferromagnets corresponding to the t-J model. The results can vividly elucidate on the characteristic magnetic features of doped $La_{2-x}Sr_xCuO_4$ or $YBa_2Cu_3O_{6+x}$ which are known to exhibit high temperature superconductivity at optimal doping concentration. While the generalized spin stiffness constant for 2-D systems shows a monotonous fall with increase in doping concentration, the spin stiffness in 1-D shows a peak in the lower doping region. The comparison of my results with other theoretical and experimental results substantiates the inextricable role of spin stiffness constant as effective exchange constant for these doped itinerant antiferromagnets at least in the low doping region. Moreover, the plot of spin stiffness constant versus doping concentration for 2-D systems shows a cross-over or a point of inflexion near 61% doping concentration, signifying a possible quantum phase transition, as was previously shown by Emery *et al.* Finally, it can be concluded that my formalism also puts forward a novel scheme for determining the exchange constant and magnetic correlations in the strongly correlated itinerant magnetic systems.

Biography

Suraka Bhattacharjee has completed her BSc from University of Calcutta and MSc from Presidency University in the year 2014. Currently, she is pursuing her PhD from S N Bose National Centre for Basic Sciences, India, under the supervision of Dr. Ranjan Chaudhury. Her first paper has been recently published in *Physica B*.

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