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Quantum effects of impurity-induced frustrations in diluted antiferromagnets[1] SHIU LIU, SASHA CHERNYSHEV, University of California, Irvine — We show that in an antiferromagnet doped with non-magnetic impurities, e.g. Zn-doped La_2CuO_4, an impurity can induce substantial frustrating interactions among the next- and next-next-nearest neighbor Cu spins around the impurity site, J'_{Zn} and J''_{Zn}, respectively. Such interactions arise from the virtual transitions through the Zn and O orbitals. We study the 2D, square lattice, $S = 1/2$ Heisenberg antiferromagnet in which the frustration is induced by the dilution with such impurities. We use the T-matrix approach to calculate the quantum effect of such dilution on the antiferromagnetic order parameter, staggered magnetization $M(x)$, as a function of the doping concentration x. In the experimentally relevant range of J'_{Zn} and J''_{Zn} we find substantial deviation of our results for $M(x)$ from the non-frustrated site-dilution theories. We argue that the frustration effect explains discrepancies between the experimental data and the non-frustrated site-dilution theory of the copper-oxide plane with Zn impurities.

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