

## Spin dynamics in lightly doped $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$ : Relaxation function within the t-J model

Larionov I.

*Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia*

---

### Abstract

The relaxation function theory of doped two-dimensional  $S=1/2$  Heisenberg antiferromagnetic (AF) systems in the paramagnetic state is presented taking into account the hole subsystem as well as both the electron and AF correlations. The expression for fourth frequency moment of relaxation shape function is derived within the t-J model. The presentation obeys rotational symmetry of the spin correlation functions and is valid for all wave vectors through the Brillouin zone. The spin diffusion contribution to relaxation rates is evaluated and is shown to play a significant role in carrier free and doped antiferromagnet in agreement with exact diagonalization calculations. At low temperatures the main contribution to the nuclear spin-lattice relaxation rate,  $63(1/T_1)$ , of plane  $63\text{Cu}$  arises from the AF fluctuations, and  $17(1/T_1)$ , of plane  $17\text{O}$ , has the contributions from the wave vectors in the vicinity of  $(\pi, \pi)$  and small  $q \sim 0$ . It is shown that the theory is able to explain the main features of experimental data on temperature and doping dependence of  $63(1/T_1)$  in the paramagnetic state of both carrier free  $\text{La}_2\text{CuO}_4$  and doped  $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$  compounds.

<http://dx.doi.org/10.1103/PhysRevB.69.214525>

---