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## Spin response in HTSC cuprates: Generalized RPA approach with projection operators method

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### Abstract

© Kazan Federal University (KFU). We derive the dynamical spin susceptibility in the t-J-G model combining the random phase approximation (RPA) and projection operator method, which allows describing the mutual interplay between the local and the itinerant components of susceptibility. Near the antiferromagnetic wave vector the calculated dispersion of the spin excitations reproduces well the so-called hour-glass dispersion, characteristic for several layered cuprates. It is formed as a result of competition between the original spin-gap in magnon-like excitations spectrum and the superconducting gap, which affects the itinerant component of the susceptibility. Furthermore, the calculated collective spin excitations along  $(0, 0)$ - $(0, \pi)$  are in agreement with the positions of the absorption peaks in the inelastic X-ray scattering spectra. They refer to the paramagnon-like modes, characteristic to the itinerant spin system, rather than magnon-like excitations that originate from short range order effect in the system of local spins at Cu sites.

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### Keywords

Collective spin excitations, Cuprates, Dynamical spin susceptibility, HTSC