Effect of the dimensionality in spin- and superconducting-fluctuations

Y. Fuseya and M. Ogata

Department of Physics, University of Tokyo, Hongo 7-3-1, Bunkyo-ku Tokyo 113-0033, Japan.

The behavior of the spin- and superconducting-fluctuations against the dimensionality effect (interchain hopping $t_\perp$) is investigated for quasi-one-dimensional (Q1D) electron systems. The response functions for the spin density wave (SDW) and the *d*-wave singlet superconductivity (*d*SS) are calculated by the newly developed renormalization group (RG) technique, *N*-chain RG[1].

The response function for SDW, χ_{SDW}, is enhanced by $t_\perp$, but saturated below the energy scale of the imperfection of the nesting $t_{\perp 2}$ (the dash-dotted line of Fig. 1). On the other hand, the response function for *d*SS, χ_{dSC}, is affected hardly by $t_{\perp 2}$, though it is also enhanced by $t_\perp$. Consequently, χ_{dSS} can keep increasing by pressure *P*, even if χ_{SDW} is saturated below $t_{\perp 2}$. (Here, $t_\perp$ and $t_{\perp 2}$ are certain increasing function of *P*, e.g., $t_\perp \sim P$ and $t_{\perp 2} \sim P^2$.) This suggests that the transition temperature of the superconductivity can keep increasing by *P* even after SDW phase is destroyed.

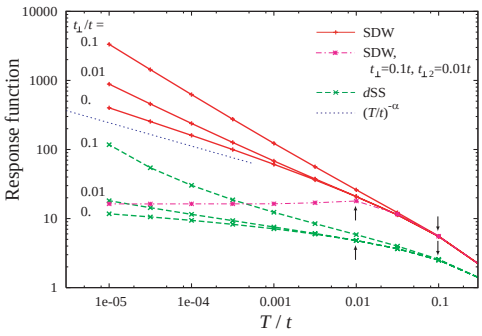

FIG.1: Response functions for the SDW (solid lines) and the *d*SS (dashed lines) with U/t =3.0, $t_\perp/t$ =0,0.01, 0.1. The case of the nesting deviation ($t_{\perp 2}/t$=0.01) is also indicated by the dash-dotted line.

[1] Y. Fuseya et al, cond-mat/0606795.