

Ring-exchange-induced quantum phenomena in strongly correlated electron systems

T. Sakai,¹ K. Okamoto,² and K. Nomura³

¹*JAEA, Sping 8*

²*Tokyo Institute of Technolog*

³*Kyushu University*

We theoretically investigate several exotic quantum phenomena caused by ring-exchange interactions in strongly correlated electron systems. The numerical exact diagonalization studies of finite-size clusters and perturbation approach of some spin and electron model systems indicate the following results:

- (i) The Heisenberg spin ladder with sufficiently large ring-exchange exhibits a magnetization plateau at half the saturation magnetization.[1] And/or the system possibly has a field-induced incommensurate order parallel to the external magnetic field.[2]
- (ii) The ring-exchange can be one of the origins of the charge stripe in the square-lattice t-J model, which is supposed to be a model of high-T_c cuprates.[3]

[1] A. Nakasu, K. Totsuka, Y. Hasegawa, K. Okamoto and T. Sakai: J. Phys.: Condens. Matter **13** (2001) 7421-7428.

[2] T. Sakai and K. Okamoto: J. Phys. Chem. Solids **66** (2005) 1450-1453; N. Maeshima, K. Okunishi, K. Okamoto and T. Sakai: Phys. Rev. Lett. **93** (2004) 127203.

[3] T. Sakai: J. Phys. A: Math. Gen. **36** (2003) 9303-9310