

The Stripe State in Cuprates^a

T.-K. Lee

Institute of Physics, Academia Sinica, Nankang, Taipei, Taiwan, Republic of China

Abstract. Since the discovery of high temperature superconductors (HTS) two decades ago, many anomalous properties have been reported. One of the most interesting properties is the possible existence of the stripe state consisting of one dimensional charge-density modulation coupled with some kind of spin ordering. X-ray and neutron scattering experiments and recently high resolution scanning tunneling microscopy have reported direct evidences of such a structure. In particular it has found in the La-Sr-Cu-O (LSCO) family the existence of the half-doped stripe with average of half a hole in one charge modulation period below and about 1/8 hole density. These results have fueled the idea about the presence of these charge or spin density wave states competing with the superconducting phase in underdoped HTS. They may even contribute to the pairing mechanism. In this talk, we will demonstrate that the presence of these stripes is actually a natural consequence of the strongly interacting t-J model by using a variational approach which provides a good enough accuracy to address the subtle result. Furthermore we show that half-doped stripes could be stabilized in hole-doped systems if we assume a simple electron-phonon interaction to renormalize the electron mass. However we have not found any evidence to support half-doped stripes in electron-doped systems.

^a The presentation slides are available at the website
http://www.its.caltech.edu/~yehgroup/documents/ITAP2011_Conference_LeeTK.pdf