# Superconductivity seen from STS Studies of Vortex Core states in $Bi_2Sr_2CaCu_2O_x$ and $YNi_2B_2C$

Nobuhiko Nishida

Department of Physics, Tokyo Institute of technology, Tokyo 152-8551

In type-II superconductors under magnetic field, quasi-particles are generated due to de-pairing of Cooper pairs and confined in the vortex core to form the bound states, reflecting symmetry of the superconducting order parameter and a shape of the Fermi surface. They are able to be observed in real space by using scanning tunneling spectroscopy. We have developed a high magnetic field (15 T)/ low temperature (down to 0.18 K) scanning tunneling microscope with high spatial resolution (50pm) and high spatial stability (0.1nm xy-drift/day). Vortex core states in $Bi_2Sr_2CaCu_2O_x$ and $YNi_2B_2C$ were measured by STS precisely. In a clean sample of $YNi_2B_2C$, highly anisotropic BCS superconductor probably with nodes in $\Delta$(k), quantum limiting behaviors have been observed; they can be interpreted by BCS theory based on the realistic band structure. In $Bi_2Sr_2CaCu_2O_x$ elctronic states of the vortex core have not been understood microscopically at all. We have found that they exhibit the stripe structure with $4a_0$ width extending along the Cu-O bonding direction. It has also been studied how the electronic inhomogeneity of $\Delta$(r) and the local 1D short-range order existing in $Bi_2Sr_2CaCu_2O_x$ affect vortex core electronic states.