Impurity scattering interference in high-$T_c$ superconductors
CHUNG-PIN CHOU, TING KUO LEE, NOBORU FUKUSHIMA, Academia Sinica
— Recent STM measurements have observed many inhomogeneous patterns of the
local density of state (LDOS) on the surface of high-$T_c$ cuprates. In particular, for
Bi$_2$212 crystals, well defined interference patterns in the momentum space has been
seen at low bias voltage. And recently, for the underdoped sample, it has been
observed that the spatially “checkerboard” LDOS modulations appear at higher en-
ergies. By using a simple impurity scattering potential with BCS Hamiltonian, we
describe all LDOS features in Bi$_2$212 materials in terms of quasiparticle scattering
interference. We are able to obtain all these features seen by STM experiments in
both real- and momentum- space. Our results also show that the observed “checker-
board” patterns are dispersionless. Additionally, by using variational Monte Carlo
method, we show that the impurity scattering are greatly suppressed due to the
presence of strong correlations.