Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Strong impurities freezing nematicity in underdoped d-wave high-temperature superconductors[1] HONG YI CHEN, YU YO CHEN, National Taiwan Normal University, YUANUUAN ZHAO, University of Houston, CHING YU HUANG, State University of New York at Stony Brook, CHUNG YU MOU, National Tsing Hua University — The physical properties of high-T_c superconductors are affected by spatial inhomogeneities introduced by impurities. In addition, superconductivity, smectic and electronic nematicity seem intertwined in these materials. Due to a connection between dislocation positions and the position of dopants which represent external disorder, we examine effects of multiple non-magnetic impurities on the stripe phase induced by antiferromagnetic ordering in underdoped region. The calculation is based on self-consistent Bogoliubov-de Gennes (BdG) equations derived from a mean-field $t-t'-U-V$ Hamiltonian. Our results indicate that the quasi one-dimensional stripe is pinned by non-magnetic impurities in the system. In addition, as the impurity concentration increases, the system undergoes phase transitions from the stripe phase to a smectic phase and then from the smectic phase to a nematic phase. We further examine the spatial distribution of order parameters and compute disorder effects on the density of states and the superfluid density for the pure d-wave superconducting phase and the stripe phase.

[1]MoST of Taiwan under Grant No. 104-2112-M-003-003-MY3, 102-2112-M-002-003-MY3, 103-2112-M-007-016-MY3, and Welch Foundation under the Grant NO. E-1146

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Date submitted: 04 Jan 2017 Electronic form version 1.4