Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Origin of electron-hole asymmetry in the scanning tunneling spectrum of $Bi_2Sr_2CaCu_2O_{8+\delta}$ A. BANSIL, Northeastern U., JOUKO NIEMINEN, Tampere U. of Tech., Finland and Northeastern U., HSIN LIN, R. S. MARKIEWICZ, Northeastern U. — We have developed a material specific theoretical framework for modelling scanning tunneling spectroscopy (STS) of high temperature superconducting materials in the normal as well as the superconducting state. Results for $Bi_2Sr_2CaCu_2O_{8+\delta}$ (Bi2212) show clearly that the tunneling process strongly modifies the STS spectrum from the local density of states (LDOS) of the $d_{x^2-y^2}$ orbital of Cu. The dominant tunneling channel to the surface Bi involves the $d_{x^2-y^2}$ orbitals of the four neighbouring Cu atoms. In accord with experimental observations, the computed spectrum displays a remarkable asymmetry between the processes of electron injection and extraction, which arises from contributions of Cu d_{z^2} and other orbitals to the tunneling current. Work supported in part by the USDOE.

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Date submitted: 19 Nov 2008 Electronic form version 1.4