Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Measurement of a sign-changing two-gap superconducting phase in $Ba(Fe_{1-x}Co_x)_2As_2$ single crystals using scanning tunneling spectroscopy (STS) M.L. TEAGUE, G.K. DRAYNA, G.P. LOCKHART, T.P. WU, N.-C. YEH, Dept. of Physics, Caltech, Pasadena, CA 91125, USA, P. CHEN, B. SHEN, H.-H. WEN, Institute of Physics, Chinese Academy of Sciences, CHINA — We present STS studies of the iron pnictide superconductors $Ba(Fe_{1-x}Co_x)_2As_2$ (x=0.06, 0.08, 0.12). Studies on single crystals, cleaved at room temperature in a pure argon atmosphere, reveal direct spectroscopic evidence for predominantly two-gap superconductivity. These gaps decrease with increasing temperature and vanish immediately above the superconducting transition, T_C. Fourier transformation of the tunneling conductance demonstrates slight doping- and energy-dependent quasiparticle scattering interferences (QPI) near the nesting wave-vectors $(\pm\pi,0)/(0,\pm\pi)$ and also near $(\pm2\pi,0)/(0,\pm2\pi)$. The dominant QPI near $(\pm\pi,0)/(0,\pm\pi)$ and the two-gap nature are consistent with sign-changing s-wave superconductivity. The excess zero-bias conductance and the large gap-to-T_C ratios suggest significant unitary impurity scattering. Further studies of the magnetic field dependence will be discussed. This work was supported by NSF Grant DMR-0907251.

Marcus Teague
Dept. of Physics, Caltech, Pasadena, CA 91125, USA

Date submitted: 23 Nov 2010 Electronic form version 1.4