Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Phase-sensitive mapping of electronic wavefunctions in atomically precise nanostructures[1] LAILA S. MATTOS, HARI C. MANOHARAN, Department of Physics, Stanford University, Stanford, CA 94305 — We use a custom-built scanning tunneling microscope (STM) to assemble atomically precise nanostructures and to study the evolution of engineered electronic wavefunctions. We investigate resonant structures of different geometries constructed from individual atoms and molecules at 4 K. STM measurements directly probe wavefunction probability density but can indirectly provide information about quantum-mechanical phase. Through controlled quantum interference we thus use the STM as a phase-sensitive probe of single electron wavefunctions formed from the two-dimensional electron gas on the Cu(111) surface. By varying constraints imposed by symmetry, the boundary geometry, and relative or statistical phase (e.g. via magnetism or field effects), we can tune and elucidate energy and phase information of specific electronic quantum states. This level of detection and control is critical for new technologies based on few-electron devices.

[1]Performed in collaboration with B. K. Foster, R. G. Harris, C. R. Moon, and G. Zeltzer. This work was supported by DOE, NSF, and ONR

Laila S. Mattos
Department of Physics, Stanford University, Stanford, CA 94305

Date submitted: 17 Nov 2006 Electronic form version 1.4