Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Quasiparticles in the tunneling spectrum of the fractional quantum Hall system OLIVER DIAL, RAYMOND ASHOORI, MIT, LOREN PFEIFFER, KEN WEST, Bell Laboratories, Alcatel-Lucent — Despite the central role that the tunneling (or single-particle) particle density of states (TDOS) plays in our theories of many-body systems, it has proven a difficult quantity to access experimentally in two dimensional electron systems. We have developed a technique, time domain capacitance spectroscopy, which allows measurement of the TDOS over a range of 30 meV centered about the Fermi surface, revealing the detailed and beautiful structure present in these systems far from the Fermi energy. With increased sample quality and higher magnetic fields, we see the emergence of the fractional quantum Hall effect in the TDOS along with negative compressibility and chemical potential jumps associated with several fractions. Most strikingly, we also observe a number of new, sharp quasiparticle lines far from the Fermi energy. The dependence of the quasiparticle energies on density allows us to identify different fractional quasiparticles as well as estimate emergent effective quasiparticle masses. These high energy spectral features shed new light on the highly correlated fractional ground state, as well as the nature of the state near $\nu = 1$.

Oliver Dial
MIT

Date submitted: 21 Nov 2008 Electronic form version 1.4