Dependence of pinning modes of 2D electron system on short-ranged alloy disorder

B.H. MOON, B.A. MAGILL, L.W. ENGEL, NHMFL/FSU, D.C. TSUI, L.N. PFEIFFER, K.W. WEST, Princeton University — A 2D electron system (2DES) in a low Landau filling ($\nu$) pinned Wigner solid state exhibits a striking resonance in its rf or microwave spectrum. The resonance is understood as a pinning mode, in which the electrons oscillate about their pinned positions, and the frequency ($f_{pk}$) increases for larger disorder. We report on microwave spectroscopy of the low-$\nu$ Wigner solids in Al$_x$Ga$_{1-x}$As-Al$_{0.01}$Ga$_{0.99}$As heterojunctions with $x=0.4$ and 0.8%. The 2DES resides mainly in the dilute Al$_x$Ga$_{1-x}$As, and the alloy disorder has been shown to be randomly distributed [1]. We compare the pinning modes of the samples as density ($n$, controlled by backgates) and magnetic field are varied. For example, with densities around $n \sim 6.5 \times 10^{10} \text{cm}^{-2}$ (in sample state with no indication of a 1/5 fractional quantum Hall effect) $f_{pk} \approx 5.93$ and 8.55 GHz at $\nu \sim 0.2$ for $x=0.4$ and 0.8% respectively.