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Unusual Cyclotron Resonance Line Broadening in Ultra-High Mobility Two-Dimensional Electron Gas System LI-CHUN TUNG, NHMFL, CHANGLI YANG, Institute of Physics, Chinese Academy of Sciences, L.N. PFEIFFER, K.W. WEST, Bell Laboratories, Lucent Technologies, R.R. DU, Department of Physics and Astronomy, Rice University, YONG-JIE WANG, NHMFL — Microwave induced resistance oscillation in the ultra high mobility two-dimensional electron gas system has attracted an intense interest in recent years. Under the illumination of an intense microwave radiation in the millimeter regime, the system exhibits a unique resistance oscillation with a microwave-frequency-dependent period. We have carried out a FIR magneto-optical study up to 33T on a set of GaAs/AlAs ultra-high mobility heterostructure samples at 4K. At low magnetic field, ultra-sharp electron CR has been observed as expected. At high magnetic field, the halfwidth of CR grows rapidly with increasing magnetic field and this phenomenon is uniquely found in the 2DEG in the heterojunction. At the same time, there is no indication of a reduced mobility at high field in the transport measurement. The sudden broadening of the CR line shape cannot be simply interpreted by either the short- or long-range random potential. The halfwidth changes by at least an order, thus it can hardly be explained by either magnetophonon effect, inhomogeneity nor magnetic oscillation.

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