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Anomalous magneto-plasmonic spectra: evidence for stimulated emission or superradiance? Y.D. JHO, X. WANG, Univ. of Florida, J. KONO, Rice Univ., D.H. REITZE, G.D. SANDERS, C.J. STANTON, Univ. of Florida, X. WEI, NHMFL, G.S. SOLOMON, Stanford Univ. — Previous studies on electron-hole magneto-plasmas have been limited to relatively low laser intensity and/or low magnetic fields. Here, we extend this regime by probing the emission characteristics of dense magneto-plasmas in high magnetic fields (25 T) and at carrier densities approaching $10^{13}/\mathrm{cm}^2$. Using a 150 fs, 775 nm Ti:sapphire chirped pulse amplifier and optical parametric amplifier, we have performed intensity and magnetic field dependent magneto-photoluminescence (MPL) measurements on the heavy hole exciton in 8 nm $In_{0.2}Ga_{0.8}As$ multiple quantum well (QW) samples separated by 15 nm GaAs barriers. Above a threshold intensity, the emission from higher-lying Landau levels (LL's) exhibit anomalous features appearing asymmetrically on the high-energy side of the peaks. These narrow features dominate the spectrum at high excitation power. The line width of the feature is significantly narrower than the lowest LL, implying a different physical origin than simple radiative recombination. In addition, the appearance of the peaks correlates with a threshold magnetic field value of approximately 13 T. An examination of the wavelength dependence of the MPL spectra as well as a line-shape analysis suggest that the inter-LL emission is a stimulated process, arising from the high electron hole densities.

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