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Coulomb Enhancement of Superfluorescence Bursts from the Fermi Edge in Highly-Excited Quantum Wells JI-HEE KIM, TIM NOE, Dep. of Electrical and Computer Engineering, Rice University, STEPHEN A. MCGILL, National High Magnetic Field laboratory, Florida State University, YONGRUI WANG, ALEKSANDER K. WÓJCIK, ALEXEY A. BELYANIN, Dep. of Physics and Astronomy, Texas A&M University, JUNICHIRO KONO, Dep. of Electrical and Computer Engineering, Rice University — Superfluorescence (SF) is a many-body process in which an ensemble of excited dipoles spontaneously develops macroscopic coherence and abruptly decays by producing a burst of coherent radiation. We have recently reported the first observation of SF from semiconductor quantum wells in the presence of a strong perpendicular magnetic field [1]. Here, we report on results of our systematic magnetic field dependent studies of light emission from high-density electron-hole systems with gain. We observed SF pulses even at 0 Tesla when the excitation power is high and the temperature is low. The SF radiation at 0 Tesla shows a continuous band of emission in time-resolved photoluminescence images, i.e., the photon energy of the emitted light changes continuously with time. We interpret this phenomenon in terms of Coulomb enhancement of gain near the Fermi energy in a high-density electron-hole system. In addition, we demonstrate that the delay between the pump pulse and the SF pulses is tunable through the magnetic field and excitation pump power. Finally, the delay is longer for a lower-energy Landau level at a given magnetic field, i.e., the SF bursts proceed in a sequential manner from higher to lower Landau levels.

[1] Noe *et al.*, Nature 8, 219 (2012)

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