Monitoring Excitations of the N=1 Landau Level by Optical Emission at mK Temperatures\footnote{Supported by NSF and AvH} ANTONIO LEVY, URSULA WURSTBAUER, DOV FIELDS, ARON PINCZUK, Columbia University, JOHN WATSON, SUMIT MONDAL, MICHAEL J. MANFRA, Purdue University, KEN W. WEST, LOREN N. PFEIFFER, Princeton University — Optical emission experiments have proven to be powerful contactless probe of collective states of electrons in the second (N=1) Landau Level (LL) \cite{1,2}. We report the emission spectrum from optical recombination in the N=0 and N=1 LL’s the second LL. The 2DEG is confined in ultra-high-mobility GaAs quantum well structures. Optical emission red-shifted from the main luminescence of the N=0 and N=1 LL are interpreted as shakeup processes of quasiparticles in the N=1 LL. Results of two samples with different carrier densities measured in the temperature range of 42mK\leq T\leq 650mK will be compared. The experimental observations will be discussed taking into account the striking quantum phases dominating the second LL. \cite{1} Manfra, M. J. et al. Phys. Rev. B 57, R9467 (1998) \cite{2} Gravier, L. et al. Phys. Rev. Lett. 80, 3344 (1998).