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Coexistence of quantum phases in the quantum Hall regime of the 2^{nd} Landau Level[1] TREVOR RHONE, JUN YAN, Columbia University, YANN GALLAIS, Universite de Paris 7, ARON PINCZUK, Columbia University, LOREN PFEIFFER, KEN WEST, Alcatel-Lucent — We report the experimental study of spin excitation modes in the regime of quantum hall phases of the 2^{nd} Landau Level. In the ferromagnetic state at ν=3 the long wavelength spin wave mode is seen at the bare Zeeman energy. At low temperatures and at filling factors slightly lower (ν $\sim$2.97), the spin wave attenuates and a broad 'overdamped' continuum of low-lying excitations emerges. Under these conditions, sharp and broad modes coexist, suggesting the presence of mixed quantum phases. At slightly elevated temperatures the continuum disappears. Further away from filling factor three, near the odd-denominator state at $\nu \cong 8/3$, the continuum dominates at low temperature. However, the sharp spin wave is recovered at T>1K. For even lower filling factors, such as $\nu \cong 5/2$, low temperature spectra display only the broad continuum of low-lying excitations. At high temperatures (T$\sim$2K) a sharp spin wave is recovered while the broad continuum persists, indicating the emergence of phase coexistence. The interplay between sharp and 'overdamped' modes may manifest tendencies towards loss of full spin polarization in the N=1 Landau level and may indicate that spin degrees of freedom have significant impact on the physics of quantum Hall states with $3 \geq \nu \geq 2$.

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