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Phase Separation of Bright and Dark Excitons in Coupled Quantum Wells NICHOLAS SINCLAIR, ZOLTAN VOROS, JEFF WUENSCHELL, DAVID SNOKE, University of Pittsburgh, KENNETH WEST, LOREN PFEIFFER, Bell Labs — The diversity and complexity of solid-state environments suggests that Bose-Einstein Condensation (BEC) of excitations in a solid might manifest in a variety of interesting ways, in correspondence with the diversity of features among ground states of these systems. The pursuit of excitonic BEC is both enriched and obfuscated by this flexibility of condensate character. Previous research pursuing BEC of interwell excitons in GaAs coupled quantum wells (CQWs) has focused attention on observing unusual luminescence from 'bright', dipole-coupled (J=1) excitons to detect a BEC. However, theorists have recently predicted a 'dark' (J=2) ground state for interwell excitons in GaAs. Our recent work with interwell excitons confined in stress-induced, in-plane traps shows the critical onset of a dark spot in the exciton-recombination luminescence at trap center, suggestive of a dense population of dark excitons and a phase separation between the dark/bright species. The critical temperature vs. density in the low temperature regime matches well with ideal 2D harmonic trap BEC criteria, and preliminary theoretical work suggests that this degree of species separation cannot be explained by a model based on classical statistical level occupation using the bright/dark state energy separation.

Nicholas Sinclair
University of Pittsburgh

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