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Characterization of Macroscopic Ordering in Exciton Rings SEN YANG, A.T. HAMMACK, L.V. BUTOV, UCSD, L.S. LEVITOV, MIT, B.D. SIMONS, Cavendish Laboratory, A.C. GOSSARD, UCSB — Recently observed complex PL patterns in 2D QW structures exhibit the inner [1,3] and the outer [1-4] exciton rings, localized bright spots [1,3], and the macroscopically ordered exciton state (MOES) [1,3]. The latter appears at the outer ring via its fragmentation into a periodic array of aggregates. While the gross features have been explained within classical framework, attributing the inner rings to nonradiative exciton transport and cooling [1], and the outermost rings and the bright spots to macroscopic charge separation [3,4], the origin of the MOES remains unidentified [5]. Here, for the first time, we report experiments demonstrating the exciton energy modulation over the MOES as well as the phase diagram of MOES in exciton density and temperature coordinates. The experiments shed new light on the dynamical origin of MOES. Besides, we present the studies of dynamical processes within MOES including the observation of aggregate instabilities and bifurcations that point to the spontaneous character of the instability.[1] L.V. Butov, A.C. Gossard, D.S. Chemla, Nature 418, 751 (2002). [2] D. Snoke, S. Denev, Y. Liu, L. Pfeiffer, K. West, Nature 418, 754 (2002). [3] L.V. Butov, L.S. Levitov, A.V. Mintsev, B.D. Simons, A.C. Gossard, D.S. Chemla PRL 92, 117404 (2004). [4] R. Rapaport, G. Chen, D. Snoke, S.H. Simon, L. Pfeiffer, K. West, Y. Liu, S. Denev PRL 92, 117405 (2004). [5] L.S. Levitov, B.D. Simons, L.V. Butov, cond-mat/0403377.

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