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Tunneling at $\nu_T = 1$ in a bilayer quantum Hall exciton condensate D. NANDI, T. KHAIRE, A.D.K. FINCK, J.P. EISENSTEIN, California Institute of Technology, L.N. PFEIFFER, K.W. WEST, Princeton University — Closely-spaced bilayer quantum Hall systems at total filling factor $\nu_T = 1$ exhibit spontaneous interlayer phase coherence. This phase coherence, which is tantamount to excitonic Bose condensation, is most dramatically revealed via interlayer tunneling measurements.In the condensed phase the tunneling current-voltage (IV) characteristic of this semiconductor system strongly resembles the dc Josephson effect observed in superconducting tunnel junctions. Here we report on a detailed study of this phenomenon. We find the maximum, or critical tunneling current I_c to be a well-defined global property of the macroscopic tunnel junction, insensitive to external circuit elements and the precise contact configuration used to observe it. Interestingly, the temperature dependence of I_c displays an unexpected scaling behavior. At the lowest temperatures the slope of the "supercurrent" branch of the tunneling IV curve, while extremely large, remains finite. Careful measurements in this regime suggest that dissipative processes arising from in-plane exciton transport limit the maximum tunneling conductance. Finally, comparisons of the experimentally observed IV with recent theoretical predictions will be discussed.

Debaleena Nandi
California Institute of Technology

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