\( \nu = 1 \) bilayer in a periodic potential\(^1\) GANPATHY MURTHY, University of Kentucky, JIANMIN SUN, HERBERT FERTIG, Indiana University, NOAH BRAY-ALI, University of Kentucky — The clean \( \nu = 1 \) quantum Hall bilayer is an excitonic superfluid. Experimentally, due to disorder, the counterflow conductivity \( \sigma_{CF} \) remains finite even at the lowest \( T \) and the zero-bias peak has finite width. We mimic the nonperturbative effects of disorder \([1]\) by a periodic potential\([2]\) which couples, in a spin-only model, to the topological density \( \mathbf{n} \cdot \partial_x \mathbf{n} \times \partial_y \mathbf{n} (= \text{charge density}) \). We find a set of ground state phase transitions as the potential strength increases, with increasing local charge density. The transitions are weakly first order, with a new, quadratically dispersing, charge-carrying mode which represent incipient meron-antimeron pairs forming in regions of large potential gradient. These modes can become nearly gapless at and near the transition, which we argue leads to a strong suppression of the interlayer tunneling \( h \). We demonstrate that near the transitions vortex-antivortex pairs become easy to create, leading to a strong suppression of \( T_{KT} \). We discuss an effective theory that incorporates both the Goldstone mode and the new, quadratically dispersion mode.


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