Kosterlitz-Thouless Transition in Finite-Size BEC Systems[1]

GARY WILLIAMS, UCLA — The Kosterlitz-Thouless transition in two-dimensional BEC condensates is calculated taking into account the fact that these are finite-size systems. The outer boundaries of the condensate effectively act as hard walls, and this has a polarizing effect on the vortex pairs. As a consequence the superfluid fraction becomes strongly anisotropic, with the tensor component perpendicular to a wall falling to zero there, while the parallel component remains finite. The decreased pair energy near the walls results in an enhanced vortex density near the boundaries. Possible experiments are proposed to probe the anisotropic properties of the superfluid density, including an unusual sharp dip in the superfluid density that is predicted to occur down the middle of a long superfluid strip.

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