

# Noise correlations of two-dimensional Bose gases

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We analyze the density-density correlations of the expanding clouds of weakly interacting two-dimensional (2D) Bose gases below and above the Berezinskii-Kosterlitz-Thouless (BKT) transition [1, 2]. Such a system has two thermal phases in equilibrium, defined through the long-range order of the two-point correlation function. In the course of a time-of-flight expansion, both thermal and quantum fluctuations present in the trapped system transform into density fluctuations. The spectrum of density distributions shows an oscillatory shape controlled only by the scaling exponent of the quasi-condensed phase (below the transition) and by the correlation length (above the transition). This exponent can be extracted by analyzing the evolution of the spectrum of density distributions as a function of the expansion time. In order to analyze the quasi-condensed phase of the 2D Bose gases, we derive analytic expressions for the power spectrum of density distributions and for the positions of spectral peaks. The positions of the spectral peaks show a scaling behavior with the expansion time. How these features can be extracted in experiment will be discussed as well.

References:

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- [2] J. M. Kosterlitz and Thouless, J. Phys. C **6**, 1181 (1973).