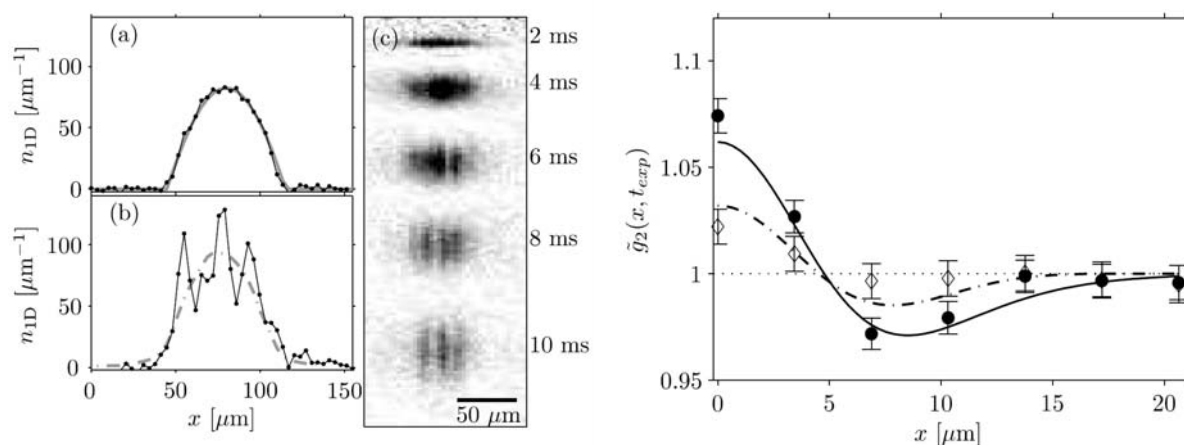


Two-point density correlations of quasicondensates in free expansion

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We measure the two-point density correlation function of freely expanding quasicondensates in the weakly interacting quasi-one-dimensional (1D) regime. While initially suppressed in the trap, density fluctuations emerge gradually during expansion as a result of initial phase fluctuations present in the trapped quasicondensate. Asymptotically, they are governed by the thermal coherence length of the system. Our measurements take place in an intermediate regime where density correlations are related to near-field diffraction effects and anomalous correlations play an important role. Comparison with a recent theoretical approach described by Imambekov et al. yields good agreement with our experimental results and shows that density correlations can be used for thermometry of quasicondensates.



(a): smooth density profile for short expansion
 (b): density fluctuations for larger expansion time
 (c): examples images for different expansion times

black dots (open diamonds): measured correlation function for two different temperatures; compared to solid (dashed) line: theoretical prediction