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The momentum distribution of one-dimensional strongly repulsive Bose gas at large momenta

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The physics of ultracold Bose gases is a rapidly developing field due to the recent remarkable achievement in the experiment and intensive theoretical investigations. However, when understanding quantum correlations, the calculation of correlation functions of such many-body systems always imposes a big challenge. In this communication, we analytically calculate the momentum distribution of the one-dimensional Bose gas at high momenta through the Fourier transform of the single-particle density matrix. Using the Bethe ansatz wave function of the one-dimensional strongly interacting bosons at the ground state, we find that asymptotic behavior of the momentum distribution for large values of momenta obeys the universal power law C/p4 decay, where the Tan's contact C can be given explicitly in terms of the generalized exclusion statistics parameter.

Keywords: Bose gas, Momentum distribution, Tan contact.

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