

Lieb's soliton-like excitations in harmonic trap

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Abstract:

We study the solitonic Lieb II branch of excitations in one-dimensional Bose gas in homogeneous and trapped geometry. Using Bethe *ansatz* equations we calculate the “number of particles” and the “effective mass” of a soliton. The frequency of oscillations in a harmonic trap is calculated. It changes continuously from its “soliton-like” value $\omega_h/\sqrt{2}$ in the high density mean field regime to ω_h in the low density Tonks-Girardeau regime with ω_h the frequency of the harmonic trapping. The phase jump of the order parameter is calculated.