



Iranian Journal of Physics Research, Vol. 23, No. 2, 2023  
DOI: 10.47176/ijpr.23.2.61705

## Investigating and analysis of the properties of coherent states of a deformed nonlinear harmonic oscillator

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(Received 27 June 2023 ; in final form 11 August 2023)

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### Abstract

In this research, we study the coherent states of a deformed nonlinear harmonic oscillator. We use the perturbation theory to compute eigenstates and eigen-values for a deformed nonlinear harmonic oscillator and then define the generalized coherent states based on the Gazeau-Klauder formulation. Then, using the Mandel parameter and the second-order correlation function, we will investigate the statistical properties of the system. The analysis shows that the coherent states for a deformed and non-deformed nonlinear harmonic oscillator follows the sub-Poissonian and super-Poissonian statistics, and exhibits the antibunching and bunching effects, respectively. In addition, we show that the anti-correlation function for a deformed nonlinear oscillator is strongly fluctuating and irregular. Also, the anti-correlation function of a non-deformed nonlinear harmonic oscillator shows the phenomena of collapse and revival of fractional revelations. We also examine the limits of different parameters so that the obtained results are valid.

**Keywords:** deformed nonlinear harmonic oscillator, coherent states, Mandel parameter, super-Poissonian and sub-Poissonian statistical distributions, the bunching and antibunching effects

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