Dynamics of the defective Schrödinger cat state in dispersive media

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The dynamical properties of the defected Schrödinger cat states [1] in a dispersive medium are considered within the phase-space approach based on the Wigner distribution function. In this approach, the propagation of the Wigner distribution function corresponding to these states can be expressed by the equation of motion in the Moyal form that is numerically solved by applying the spectral split-operator method [2,3]. Utilizing this method, the quantumness of the considered states expressed by the volume of the negative part of the corresponding Wigner distribution function [4] is analyzed as a function of time. Similarly, the localization degree of the considered states in the phase space is considered by using the entropic measure [5]. The above-mentioned analysis is performed in two cases. The first case describes the free propagation of the defected Schrödinger cat in a one-dimensional homogeneous dispersive medium. The second case concerns a dispersive medium with a Gaussian barrier which breaks its homogeneity. Both of these cases are analyzed in the above-barrier reflection regime [6]. This regime does not have a counterpart in classical mechanics and it becomes the source of the backscattering diffraction process [7].

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