ON THE UNCERTAINTY RELATIONS IN STOCHASTIC MECHANICS

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Abstract. It is shown that the Bohm equations for the phase $S$ and squared modulus $\rho$ of the quantum mechanical wave function can be derived from the classical ensemble equations admitting an additional momentum $p_s$ of the form proportional to the osmotic velocity in the Nelson stochastic mechanics and using the variational principle with appropriate change of variables. The possibility to treat $\text{grad} S$ and $p_s$ as two parts of the momentum of quantum ensemble particles is considered from the viewpoint of uncertainty relations of Robertson - Schrödinger type on the examples of the stochastic image of quantum mechanical canonical coherent and squeezed states.

1. Introduction

The uncertainty (indeterminacy) principle in quantum physics, which quantitatively is expressed in the form of uncertainty relations (URs) [13, 14, 24, 25] is commonly regarded as the most radical departure from the classical physics. However in the recent decades publications have appeared [5, 11, 12, 21, 23] in which inequalities are introduced in Nelson stochastic mechanics (SM) [19] and discussed as Heisenberg-type URs. The equations of motion in this mechanics coincide with the David Bohm equations [1] (the continuity equation and the

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†Reprinted from JGSP 16 (2009) 57–75.