Available online at www.scholarsresearchlibrary.com

Extended Abstract

Archives of Physics Research, 2021, 13 (1)
(https://www.scholarsresearchlibrary.com/journals/archives-of-physics-research/)

ISSN 0976-0970
CODEN (USA): APRRC7

Nonlinear quantum mechanics: A necessary result of development of quantum mechanics

Pang Xiao Feng
University of Electronic Science and Technology of China, China
E-mail: pangxf2006@aliyun.com

In this paper we investigated the problem of the nonlinear quantum mechanics. It contains the following problems: 1. the establishment of quantum mechanics and its fundamental postulates, 2. quantum mechanics is a linear and wave theory, it cannot describe the real properties of microscopic particles, 3. the results obtained from quantum mechanics are contradicting with experimental values, 4. the difficulties and contradictions of quantum mechanics cannot be eliminated in itself framework, 5. disputations for the difficulties and contradictions of quantum mechanics in physic, 6. the roots of the difficulties of quantum mechanics and their shortcomings, 7. the direction of development of quantum mechanics, 8. the nonlinear quantum mechanics eliminates thoroughly the difficulties and contradictions of quantum mechanics and give the wave-corpuscle duality of microscopic particles and 9. the establishment of nonlinear quantum is a necessary result of development of quantum mechanics and its basic contents. From these investigations, we abstained the following conclusions: (1) The quantum mechanics is a linear and wave theory, it cannot be used to describe correctly the real proprieties of microscopic particles. (2) The wave feature of microscopic particles is produced by the dispersing effect of the kinetic term in the dynamic equation or in the Hamiltonian operator in quantum mechanics. (3) We can affirm that the difficulties and contradictions of quantum mechanics are widely existed in quantum mechanics and cannot be eliminated in quantum mechanical framework no matter how. (4) We confirmed also that the difficulties and contradiction of quantum mechanics can eliminated thoroughly by using the nonlinear quantum mechanics. The nonlinear quantum mechanics is a necessary result of development of quantum mechanics. The nonlinear theory of quantum mechanics can be used widely in physics.

We here exhibited first the basic theorem of quantum mechanics and its features. From these investigations we know that the quantum mechanics is only a linear and wave theory because the dynamic equation or Schrödinger equation can only give a wave feature, cannot embody the wave-corpuscle duality of microscopic particles. These results directly contradict with the experimental results, the latter exhibited clearly the wave-corpuscle duality of microscopic particles. This showed obviously that quantum mechanics is only a linear and approximate theory, cannot represent the real properties of microscopic particles. This implies that quantum mechanics need to be transformed and developed. In order to find the direction and method of transformation and development, we investigate and analyze completely and deeply the reasons of wave feature appeared by microscopic particles. The reasons are due to the missing or neglecting or lacking the nonlinear interactions among the particles or between the particle and ground fields. Thus the properties and natures of microscopic particles are only controlled and determined by the kinetic term in the dynamic equation because its potential are not related with the wave function of the particle, then it cannot change the features and natures of the particles. Thus the particles have only wave feature due to the dispersing effect of the kinetic term. Based on this reason we added a nonlinear interaction related the wave function of the particles, such as into the dynamic equation of the particles or the Hamilton operator of the systems. In this case the nonlinear interaction can also deform the wave features of microscopic particles, Hence it can obstruct and suppress this dispersing effect of the kinetic term in the dynamic equation. Thus the microscopic particles can be localized, and have the wave-corpuscle duality, which are consisted with the experiment results, then their difficulties and contradictions were eliminated completely. These investigations and results affirm and confirm that introducing the nonlinear interactions in quantum mechanics and establishing the nonlinear quantum mechanics is a prefect and correct direction and method of eliminating the difficulties and contradictions of quantum mechanics. Therefore we can affirm and confirm that the establishment of nonlinear quantum mechanics is a necessary result of development of quantum mechanics.

Nonlinearity can enter quantum mechanics in various ways, so there are a number of associations a physicist can have with the term “nonlinear quantum mechanics”. Because of this, we shall start with a (certainly incomplete) list of those ways that we shall not deal with here. In quantum field theory, nonlinearity occurs in the equations of interacting field operators. These equations may be quantizations of nonlinear classical field equations or mathematically tractable models as in φ4-theory. Here, however, the field operators remain linear, as does the whole quantum mechanical setup for these quantum field theories. On a first quantized level, nonlinear terms have been proposed very early for a phenomenological and semi-classical description of self-interactions, e.g., of electrons in their own electromagnetic field. Being phenomenological, these approaches are build on linear quantum mechanics and use the standard notion of observables and states. For complex systems, the linear multi-particle Schr¨odinger equation is often replaced by a nonlinear single-particle Schr¨odinger equation as in the density functional theory of solid state physics. There have also been attempts to incorporate friction on a microscopic level using nonlinear Schr¨odinger equations.

Bottom Note: *This work is partly presented at 5th World Congress on Physics July 17-18, 2018, Prague, Czech Republic*