Abstract:

The description of the microscopic world in quantum mechanics is very different from that in classical physics, and there are some points of view that are contrary to intuition and logic. The first is the problem of reality, quantum mechanics believes the behavior of micro particles is random and jumping. The second is the loss of certainty, the conjugate physical variables of a system cannot be determined synchronously, they satisfy the Heisenberg uncertainty principle. The third is the non-local correlation. The measurement of one particle in the quantum entanglement pair will influence the state of the other entangled particle simultaneously. In this paper, some concepts related to quantum entanglement, such as EPR correlation, quantum entanglement correlation function, Bell's inequality and so on, are analyzed in detail. Analysis shows that the mystery and confusion in quantum theory may be caused by the logical problems in its basic framework. Bell's inequality is only a mathematical theorem, but its physical meaning is actually unclear. The Bell state of quantum entangled pair may not satisfy the dynamic equation of quantum theory, so it cannot describe the true state of microscopic particles. In this paper, the correct correlation functions of spin entanglement pair and photonic entanglement pair are strictly derived according to normal logic. Quantum theory is a more fundamental theory than classical mechanics, and they may be not equal relation in logic. However, there are still some unreasonable contents in the framework of quantum theory, which need to be improved. In order to disclose the real relationship between quantum theory and classical mechanics, we propose some experiments which provide intuitionistic teaching materials for the new interpretation of quantum theory.