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The Quantum Character of the Driven Qubit-Photon-Magnon

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INTRODUCTION

A promising approach for new quantum innovations has recently been identified as the mixture design of the determined qubit-photon-magnon framework. The magnon mode of a cavity resonator, an external field, and the effective wave function of a single superconducting qubit are all covered in this article. With negative Wigner values, the non-classicality of the resonator and magnon modes is studied. Using Wigner-Yanase skew data, we also talk about the qubit state's non-classicality. Our findings show that non-classicality can be controlled by the qubit-resonator mixture angle. However, the system's non-classical behavior is enhanced by the magnon-photon strength.

For the study of quantum state engineering, quantum information processing, and quantum computing in these domains, hybrid quantum systems have provided a strong experimental and theoretical foundation. Microwave opto mechanical-magnetic systems, highly coupled magnons and cavity microwave photons, photon-phonon qubits, and superconducting magnons are some examples of hybrid quantum system components. The versatility of the half breed qubit-photon-magnon quantum framework makes it one of the most interesting ones.

DESCRIPTION

The Hamiltonian interaction of different parts has provided a new technique to explore intermediate transitions. It can also be used for a wide range of fascinating activities, like producing hybrid entangled states. A single hybrid qubit-photon-magnon can entangle, according to experiments. There has also been some research done on the potential for quantum information in this system.

It is well known that the exploration of principle effects in both classical and quantum physics is primarily focused on driven qubit systems. An interesting outline is the effect of a conventional field on a two-level quantum structure seen from the outside. A two-level atom with additional medians, such as the Stark shift, the Kerr nonlinear, and the vibrating graphene membrane, has also been explored in relation to the driven classical field. The Jaynes-Cummings model can now faithfully replicate a single classical drive. Research has also been done on the driven system, which comprises of two identical superconducting qubits coupled concurrently to a cavity field.

This research proves that a hybrid qubit-photon-magnon system is non-classical in the presence of an external classical field. The current approach opens up a fresh route to more cutting-edge quantum technologies that demand additional study. The two-mode Wigner distribution function is used to explore the non-classicality of the photon-magnon subsystem in quantum phase space. However, we include our physical Hamiltonian component and drive the effective wave function in a dispersive-limit interaction in order to leverage the atomic Wigner-Yanase skew information to accomplish the non-classicality of the qubit subsystem. The quantumness of the magnon-photon in phase space is studied by reconstructing the mathematical form of the two-mode Wigner function.

The non-classicality of the qubit system was proved using atomic spin skew data. Our results show that non-classical behavior is formed at a large strength of qubit-resonator coupling and the non-classicality is decreased by a super-mixture angle when the resonator and magnon are monitored in the same phase space using the Wigner function. By calculating the magnon-resonator in magnon stage space, the non-classicality grows as the qubit-resonator coupling strength increases. The non-classicality of the resonator phase space is enhanced by the qubit-resonator interaction.

CONCLUSION

The outer field coupling scattering causes the non-classicality to typically increase on one side of the stage space. The mixture angle was used to convert the hybrid system into a generalized Jaynes-Cummings Hamiltonian model, and this resulted in a significant non-classicality in the Wigner function. In contrast, the qubit-resonator coupling restores the classicality of the qubit system while atomic non-classicality declines as the magnon-resonator coupling rise.

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