Ram Narayan Deb, J Laser Opt Photonics 2018, Volume 5
DOI: 10.4172/2469-410X-C3-029

International Conference on
Quantum Mechanics and Applications
July 20-21, 2018 | Atlanta, USA

# A total measure of multi-particle quantum correlations in atomic Schrödinger cat states

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Detection, measurement, and quantification of multi-particle quantum correlations in multi-particle quantum systems is an important area of research nowadays. Complete understanding of multi-particle quantum correlations is still an open challenge. In this paper, our main objective is to show the way for the detection, measurement, and quantification of multi-particle quantum correlations in a system of N two-level atoms. We propose a total measure of multi-particle quantum correlation in a system of N two-level atoms (N qubits) and show how this measure can be used in a real physical system. We construct a parameter that encompasses all possible bipartite quantum correlations among N two-level atoms in arbitrary symmetric pure states and defines its numerical value to be the total measure of the net atom-atom correlations. As an example, we use that parameter to quantify the total quantum correlations in atomic Schrödinger cat states, which are generated by the dispersive interaction in a cavity. We have applied our theoretical tools, developed in this paper, to Atomic Schrödinger cat states as it plays a fundamental role in the foundation of quantum mechanics. We study the variation of the net amount of quantum correlation as we vary the number of atoms from N=2 to N=100 and obtain some interesting results. We also study the variation of the net correlation, for fixed interaction time, as we increase the number of atoms in the excited state of the initial system, and notice some interesting features. We also observe the behavior of the net quantum correlation as we continuously increase the interaction time, for the general state of N two-level atoms in a dispersive cavity.

## Biography

Ram Narayan Deb completed his PhD in the year 2008 at the age of 34 years from S. N. Bose National Centre for Basic Sciences, Kolkata, India. He worked on theoretical Quantum Optics. The main aspects in his research are to understand more deeply the ideas of spin squeezing and quantum correlations in two-level atomic systems. He also worked to broaden the scope of quantum mechanics by doing research on pseudo-Hermitian Hamiltonians and to use it in quantum mechanics. He is the Associate Professor of Physics, under West Bengal Education Service of Government of West Bengal in India. He has published thirteen papers in reputed journals. Recently, he has proposed a total measure of multi-particle quantum correlations in the arbitrary symmetric pure state of two-level atoms, which is a significant step toward the detection and quantification of multi-particle quantum correlations in two-level atomic systems. He has used the theoretical tools developed by him for the detection and quantification of multi-particle quantum correlations in real physical systems.

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