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QUANTUM ENTANGLEMENT IN MULTI-PARTICLE SYSTEM OF TWO LEVEL ATOMS

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Quantum entanglement, the basic ingredient of quantum information theory and is an important area of research now a day. Detection, measurement and quantification of multi-particle quantum entanglement is an open challenge in Physics. In this talk, the author will show a method for the detection, measurement and quantification of multi-particle quantum entanglement in two-level atomic systems. He will consider an arbitrary symmetric pure state of N two-level atoms which are mutually entangled. He will express the quantum fluctuations of that composite system as an algebraic sum of the quantum fluctuations of N individual atoms and all possible bipartite quantum correlations among them. In this way, the quantum correlation of the multi-particle system can be separated out and can be used to construct a parameter for the detection, measurement and quantification of the amount of quantum entanglement present in that system. The parameter so constructed can be related to spectroscopic squeezing parameter used in Ramsey spectroscopy. In this way, the theoretically constructed multi-particle quantum entanglement parameter can be related directly to experimentally measurable quantity. The author will also discuss how multi-particle quantum entanglement can be measured in some real physical systems of N two-level atoms.

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