

Degenerate energy spectra and quantum coherent states

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Construction of quantum coherent states obtained as some specific superpositions of energy eigenstates is adapted to systems that admit a degenerate discrete energy spectrum. Both generalized and gaussian coherent states are considered. The generalized coherent states are eigenstates of a certain annihilation operator that has to be properly defined in the presence of degeneracies. The gaussian coherent states are, in the particular harmonic oscillator case, an approximation of the generalized coherent states and so the localizability in phase space of the particle in those states is very good. For other quantum systems, this last property serves as a definition of those gaussian coherent states. Their properties are illustrated in two examples : a scalar particle in a square box known as the infinite square well and a two-level atom coupled to a single cavity mode known as the Jaynes-Cummings model.