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Quantum Physics

Solitons in Maximally Entangled Two Qubit Phase Space

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Motivated by M\"obius transformation for symmetrical points under the generalized circle in complex plane, the system of symmetrical spin coherent states corresponding to antipodal qubit states is introduced. It implies the maximally entangled spin coherent states basis, which in the limiting cases reduces to the Bell basis. A specific property of our symmetric image coherent states is that they never become unentangled for any value of ψ from complex plane. By the reduced density matrix and the concurrence determinant methods, it is shown that our basis is maximally entangled. In addition we find that the average of spin operators in these states vanish, as it must be according to another, operational definition of completely entangled states. Universal one qubit and two qubit gates in this new basis are calculated and time evolution of these states for some spin systems is derived. We find that the average energy for XYZ model in two qubit case (Q symbol of H) shows regular finite energy localized structure with characteristic extremum points, and appears as a soliton in maximally entangled two qubit phase space. Generalizations to three and higher qubit states are discussed.

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