TWO QUBIT X-STATE SPACE STRATIFICATION UNDER THE ACTION OF GLOBAL AND LOCAL UNITARY GROUPS

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The understanding of symmetries of a physical system allows to explain in a unique manner a wide variety of phenomena in many areas of physics, including elementary particle physics and condensed matter physics. The mathematical formulation of symmetries related to the Lie group action consists of the detection of the stratification of the representation space of corresponding symmetry group. In the present talk we discuss the stratification of states of quantum sytem by the unitary group action. More precessely, we consider a special quantum system composed of a pair of 2-level systems, two qubits in the so-called mixed X-states. We will analyze symmetries associated with two subgroups of the special unitary group SU(4), the "global invariance" group G_X of such X-states and the corresponding "local invariance" group LG_X. The latter is given by the tensor product of mutually independent unitary transformations acting on each qubit. Two types of the corresponding stratification of 2-qubits X-state space are described. The equations and inequalities, determining all components of both stratifications, are given in terms of the corresponding group invariants. The primary stratification classifies the X-state space in accordance with the properties of two-qubit system as a whole, while the secondary stratification provides complete information on non-local characteristics of the given composite system.