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Geometric Phase of Unitary Evolution Operator[1] DMITRY USKOV, RAVI RAU, Louisiana State University — The common geometric phase is understood in terms of curvature of the space of normalized quantum states (Berry-Simon and Aharonov-Anandan geometric phase). We demonstrate how the geometric phase can be self-consistently defined in the space of unitary operators if the dynamic group of a quantum system has physically meaningful partitioning into a subgroup and complimentary coset space. To motivate the introduction of a geometric phase of a unitary operator, we demonstrate that this phase does not vanish even if the quantum system is in a mixed state, described by a density matrix. Illustrative examples of calculating the geometric phase of a unitary operator are provided for SU(2) and SU(4) groups i.e. one- and two-qubit transformations.

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