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Dynamics of correlations in a Werner state weakly coupled to a thermal bath

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Quantum thermodynamics aims to understand how thermodynamic processes emerge in quantum systems, particularly in relation to information and entanglement. In this work we study the dynamics of correlations of a Werner state composed of two qubits weakly coupled to a thermal bath. The system is described using a Lindblad master equation, modelling the environment as a thermal reservoir that induces transitions between the qubit energy levels according to Boltzmann statistics. Within this framework we analyze the evolution of thermodynamic and informational quantities, such as entropy and mutual information, as functions of temperature and of the Werner-state parameter. Finally, we discuss mechanisms governing the transformation between different Werner states and the thermodynamic aspects associated with these changes.

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