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Discrimination of Ohmic thermal baths by quantum dephasing probes

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The discrimination of structured baths at different temperatures by dephasing quantum probes is studied. The exact reduced dynamic is derived, and the minimum error probability is evaluated by three different kinds of quantum probes, namely a qubit, a qutrit, and a quantum register made of two qubits. The results indicate that dephasing quantum probes are useful in discriminating low values of temperature and that lower probabilities of error are achieved for intermediate values of the interaction time. A qutrit probe outperforms a qubit one in the discrimination task, whereas a register made of two qubits does not offer any advantage compared to two single qubits used sequentially.

Presenter: CANDELORO, Alessandro

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