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Quantum bounds for discriminating mixed states generated by weak measurements and thermal noise PIPER WYSOCKI, Wellesley College, JONATHAN HABIF, University of Southern California, Information Sciences Institute , TRACY MCASKILL, Wellesley College — The problem of optimally discriminating between known non-orthogonal quantum states has many important applications in both quantum communications and quantum computation. However, non-orthogonal states cannot be discriminated perfectly, resulting in much work on finding the quantum bounds of discrimination with minimal error. Discrimination of pure states is well understood, but little research has been done on discriminating mixed states. We compute quantum bounds for discriminating between mixed states that were prepared by a pure state mixed with thermal noise light in a channel versus the same pure state subject to weak measurement in a channel.We calculate the Helstrom bound for this discrimination problem when only one copy of the quantum state is available for measurement, and the quantum Chernoff bound, for the case when copies of the quantum state occupy many modes and can be measured individually or with a joint measurement. These results have utility in disambiguating between an attacker in a quantum key distribution system with weak measurement capabilities versus thermal noise in the channel.

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