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Quantum Versus Classical Advantages in Secret Key Distillation (and Their Links to Quantum Entanglement ERIC CHITAMBAR, BENJAMIN FORTESCUE, Southern Illinois University Carbondale, MIN-HSIU HSIEH, University of Technology Sydney — We consider the extraction of shared secret key from correlations that are generated by either a classical or quantum source. In the classical setting, two honest parties (Alice and Bob) use public discussion and local operations to distill secret key from some distribution p_{XYZ} that is shared with an unwanted eavesdropper (Eve). In the quantum settings, the correlations p_{XYZ} are delivered to the parties as either an incoherent mixture of orthogonal quantum states or as coherent superposition of such states. Here we demonstrate that the classical and quantum key rates are equivalent when the correlations are generated incoherently in the quantum setting. For coherent sources, we next show that the rates are incomparable, and in fact, their difference can be arbitrarily large in either direction. However, we identify a large class of non-trivial distributions that possess the following properties: (i) Eve's advantage is always greater in the quantum source than classically, and (ii) for the entanglement shared in the coherent source, the so-called entanglement cost/squashed entanglement/relative entropy of entanglement can all be computed. We thus present a rare instance in which various entropic entanglement measures of a quantum state can be explicitly computed.

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