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Distinguishing Environmental Coupling from Universal Decoherence in Gravitational Wave Detector Noise[1] NICHOLAS LARACUENTE, MARIUS JUNGE, Univ of Illinois - Urbana — The quantum description of time evolution via unitary operators describes microscopic phenomena at low temperature with excellent precision. It does not, however, preclude the existence of a universal decoherence mechanism that would be undetectably weak in microscopic quantum experiments, yet significant in macroscopic objects. Gravitational wave detection involves measurement of macroscopic objects with extraordinary precision. Recent studies use observed noise levels in experiments such as LISA Pathfinder and LIGO to upper bound the strength of possible decoherence mechanisms. These bounds could be improved by distinguishing universal from environmental noise sources. We address this problem via information theory, asking when it is possible to distinguish random functions from each other. Furthermore, we consider possible bounds to the speed of decoherence in quantum systems under unavoidable noise.

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