APPLIED MATHEMATICS SEMINAR

Environmental-induced Work Extraction

by

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Abstract: A local measurement extracts work as a backaction, e.g., in a system of two entangled cavities: first cavity, a, comprises a piston and the measurement is carried out on the second cavity, b. When no one makes a measurement on the cavity b, i.e., it is simply placed in vacuum; environmental monitoring results in the coherent states as the einselected pointer states (the measurement basis) [PRL 70, 1187 (1993)]. This makes the measurement, that nature itself performs, a Gaussian one with a fixed strength $\lambda = 1$. We show that this makes nature assign a *fixed* amount of work to a particular entanglement degree $0 \leq \xi \leq 1$, i.e., $W = \xi(r) \times (\bar{n}\hbar\omega_a)$, nothing that the term in parenthesis is the entire thermal energy. Afterwards, we show that this phenomenon applies quite generally, i.e, not restricted to a two-cavities system. We also touch on the influence of inherited symmterization entanglement in this context. We can arrive an additional phenomenon by considering that work is simply the process of converting randomly moving microscopic ingredients (vanishing mean-velocity) into a directional one, i.e, with a nonzero mean-velocity. We show that such a change in the character of the motion introduces curvature in spacetime regarding general relativity. This phenomenon is the first demonstration of a quantitative relation between entanglement and curvature using solely the quantum optics arguments.

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