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Transient quantum fluctuation theorems and generalized measurements B. PRASANNA VENKATESH, Asia Pacific Center for Theoretical Physics, GENTARO WATANABE, Asia Pacific Center for Theoretical Physics, Department of Physics, POSTECH, PETER TALKNER, Institute for Physics, University of Augsburg — The transient quantum fluctuation theorems of Crooks and Jarzynski restrict and relate the statistics of work performed in forward and backward forcing protocols. So far, these theorems have been obtained under the assumption that the work is determined by two projective energy measurements, one at the end, and the other one at the beginning of each run of the protocol.We found that one can replace these two projective measurements only by special error-free generalized energy measurements with pairs of tailored, protocol-dependent post-measurement states that satisfy detailed balance-like relations. For other generalized measurements, the Crooks relation is typically not satisfied. For the validity of the Jarzynski equality, it is sufficient that the first energy measurements are error-free and the post-measurement states form a complete orthonormal set of elements in the Hilbert space of the considered system. Additionally, the effects of the second energy measurements must have unit trace. We illustrate our results by an example of a two-level system for different generalized measurements.

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