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Violating the Heisenberg Uncertainty Relation: An Entangled Approach JACOB COLLINGS, JEAN-FRANCOIS VAN HUELE, Brigham Young University — Since Heisenberg introduced the relation $p_1 q_1 \sim h$ in 1927, great effort has been made to refine this expression and better understand its meaning. Recent work has shown that the term “uncertainty” applies to two different quantum properties. The first pertains to preparation uncertainty, the principle that one cannot prepare a quantum system such that two incompatible observables are arbitrarily well-defined. The second pertains to measurement uncertainty, the principle that the measurement with a certain degree of accuracy of one observable disturbs the subsequent measurement of a second incompatible observable. We review recent experiments showing evidence for a violation of the measurement uncertainty. We illustrate the different relations with examples using spin measurements. We explore how entanglement affects the difference components of the proposed relations.

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