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Sequential quantum measurements: What can be gained by measuring the same system twice MARK HILLERY, JANOS BERGOU, Hunter College of CUNY, EDGAR FELDMAN, Graduate Center of CUNY — It is usually assumed that when a quantum system is measured, the system's state is reset to an eigenstate of the measured observable, and no further information about the initial state of the system can be gained by subsequent measurements. We give two examples to show that this picture is too simple. The first due to Rapcan, et al.[1] shows that if Bob is given a qubit, which Alice has previously measured, and Bob has no information about Alice's measurement, he can nonetheless gain information about the initial state of the system by making a further measurement. The second shows that if Alice sends a qubit in one of two nonorthogonal states to Bob, Bob can perform an unambiguous state discrimination measurement on the qubit and then send the same qubit on to Charlie, who can also perform an unambiguous discrimination measurement on it, even though the state of the qubit was disturbed by Bob's measurement. This allows both Bob and Charlie to determine, with a certain probability, in which state Alice prepared the qubit. This procedure could be useful in quantum communication schemes.

[1]P. Rapcan, et al., Phys. Rev. A, 84, 032326 (2012).

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