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What does a continuously monitored qubit readout really show?[1]
JUSTIN DRESSEL, LUIS PEDRO GARCA-PINTOS , Chapman University — For continuous measurements of a quantum observable it is widely recognized that the measurement output approximates the expectation value of the observable, hidden by additive white noise. Filtering the measurement readout can thus approximately uncover the dynamics of the expectation value, during a single realization. However, using information from the entire output history yields a different, smoothed, observable estimate. We derive the form of this smoothed estimate and show that the observed readout quantitatively tracks it with higher fidelity than the expectation value during a single realization, making it an objectively meaningful quantity. In the weak measurement limit this smoothed estimate approximates a weak value, with no need for additional postselection.

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