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Time-reversibility in quantum measurement[1] PATRICK HARRINGTON, Washington University, St. Louis, ANDREW JORDAN, University of Rochester, KATER MURCH, Washington University, St. Louis — In quantum mechanics, the stochastic backaction of quantum measurement disrupts unitary Schrödinger dynamics—canonically referred to as wavefunction collapse—causing irreversible quantum evolution by virtue of the many-to-one property of projective measurements. However, weak measurements cause minimal perturbations to the quantum state and therefore can be reversible. We develop statistical measures to characterize the arrow of time from individual quantum trajectories. These measures involve a comparison of path probabilities for both forward and time-reversed trajectories. We apply this analysis to different measurement schemes for superconducting qubits ranging from dispersive quantum non-demolition measurement to fluorescence detection.

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