Effect of Decoherence and Measurement Strength on the Fidelity of a Quantum Uncollapsing Operation

Quantum uncollapsing is, rudimentarily, the taking of two partial measurements that contradict each other with a Pi rotation in between which, although yielding no new classical information, restores the original quantum state.

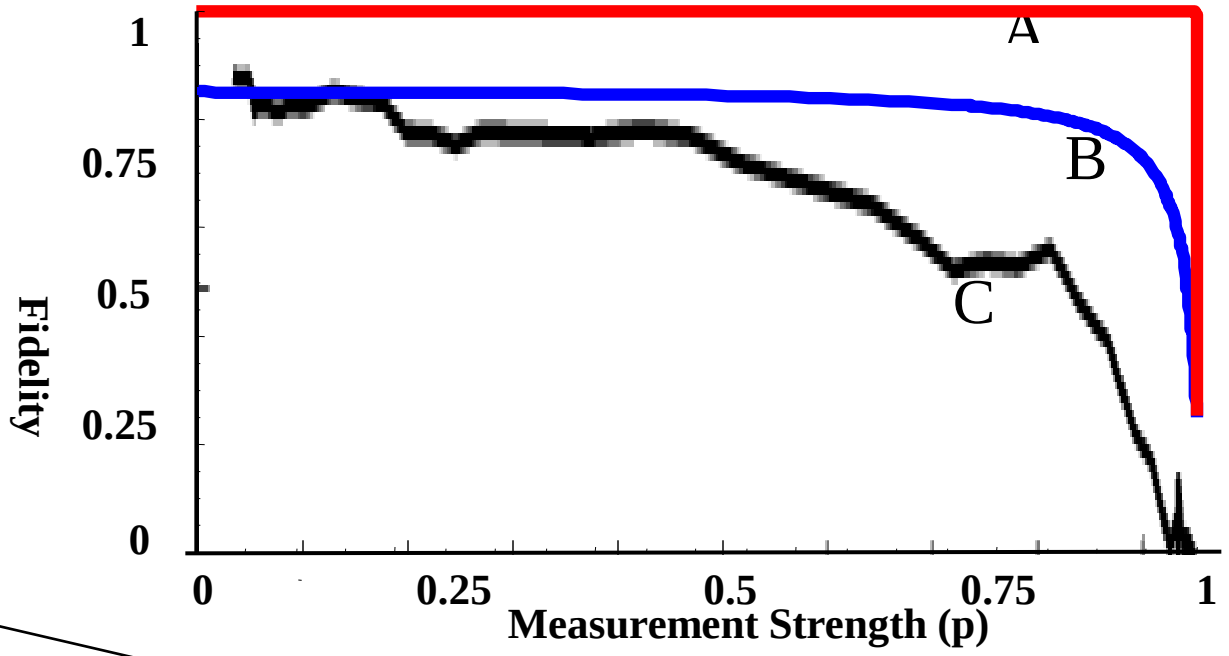
Fidelity, here, refers to the certainty that, given the uncollapsing procedure was completed, the original state has been restored completely.

Experimental Results Compared to Theoretical Model

A) **Basic Limits:** Two non-measurements have 100% certainty of restoring the same state-f(p=0)=1. A projective measurement cannot be contradicted-f(p=0)=0.25

B) **Numeric Results of Model**

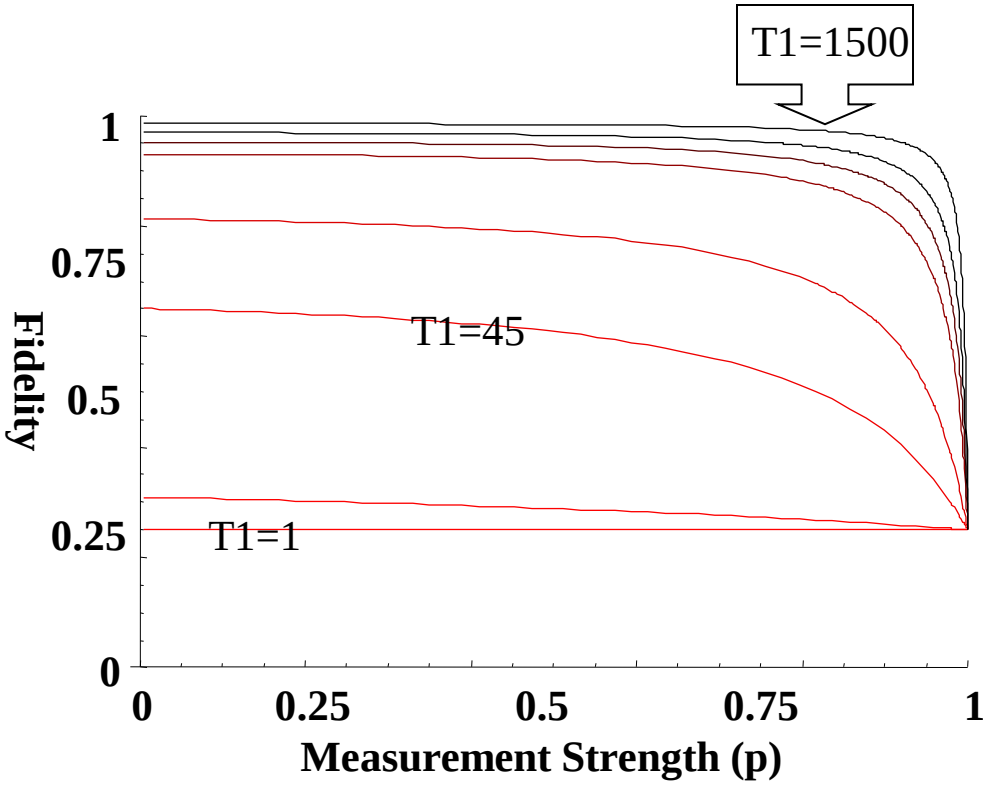
C) **Experimental Results**



N. Katz et al., Phys. Rev. Lett. 101, 200401 (2008)

Important Results

The Effect of Relaxation (T1) on Fidelity



Duration of Process = 44 ns

T1(ns)= 1, 10, 45, 100, 300, 450, 700, 1500

F(p=0)

$$\frac{1}{4}\left(1 + e^{-t/T1} + 2e^{-t/T2}\right)$$

Duration of Process = t

Universal Scaling of F(p near 1)

$$F = \frac{1}{4}\left(1 + \frac{1}{1 + \frac{1}{x}} + \frac{2}{1 + \frac{1}{2x}}\right)$$

where $$x = \frac{1 - p}{1 - e^{-t_3/T1}}$$

t_3 = the amount of time between the Pi rotation and the second measurement