Measurement driven quantum clock implemented with a superconducting qubit

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We demonstrate a quantum clock, near zero temperature, driven in part by entropy reduction through measurement, and necessarily subject to quantum noise. The experimental setup is a superconducting Transmon qubit dispersively coupled to an open co-planar resonator. The cavity and qubit are driven by coherent fields and the cavity output is monitored with a quantum noise-limited amplifier. When the continuous measurement is weak, it induces sustained coherent oscillations (with fluctuating periods) in the conditional moments. Strong continuous measurement leads to an incoherent cycle of quantum jumps. Both regimes constitute a clock with a signal extracted from the observed measurement current. This signal is analysed to demonstrate the relation between clock period noise and dissipated power for measurement-driven quantum clocks. We show that a good clock requires high rates of energy dissipation and entropy generation.