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Quantum measurement in superconducting qubits

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Recent research on superconducting qubits has been accompanied by innovative ideas and technological advances in measurement techniques. For example, some experiments have demonstrated measurements of qubit states where the back-action was limited by the Heisenberg uncertainty principle. I will briefly mention some of the measurement ideas employed in recent experiments. I will then present some of our recent results on the information about the state of a qubit gained by a weakly coupled detector. In particular, we analyze the case where the measurement is concurrent with coherent dynamics or decoherence. In this case, extracting meaningful measurement results from the observed signal can become a complicated task. However, with proper analysis several pieces of information are accessible. Our approach complements the stochastic master equation approach, which describes the evolution of the qubit's state but does not keep track of the acquired measurement information.