Decoherence in a Josephson junction biased with constant current consists of a set of metastable quantum energy levels. We probe area Al/AlOx/Al junctions at 60 mK. The data is well fit by a model that includes the dephasing effects of both low-frequency current noise and the escape rate to the voltage state. We discuss implications for quantum computation using current-biased Josephson junction qubits, including limits on the minimum number of levels needed in the well to obtain an acceptable error limit per gate.
$\Delta \Gamma / \Gamma_0$ vs $I (\mu A)$

- $|0\rangle \rightarrow |1\rangle$
- $|1\rangle \rightarrow |2\rangle$