

Quantum Information with Solid-State Devices

VO 141.A55

SS2016

Dr. Johannes Majer

Lecture 3

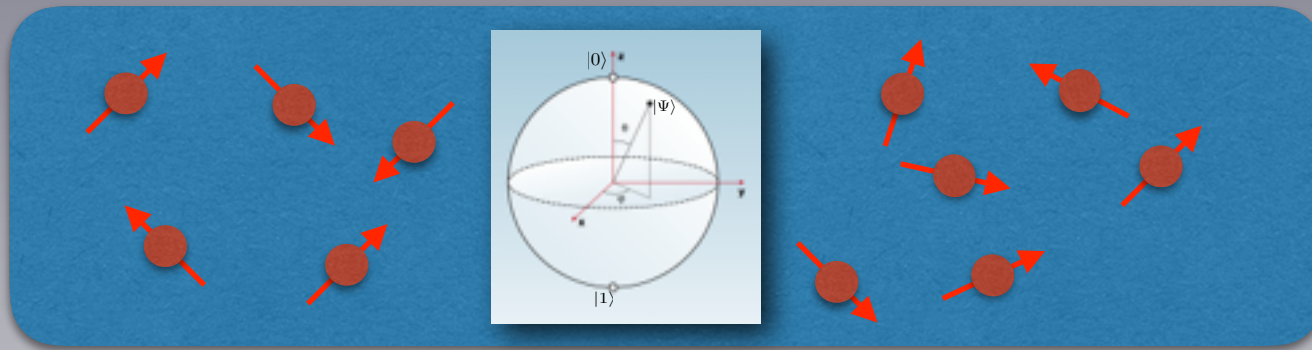


Motivation

Solid-state qubit
+ environment



open quantum system



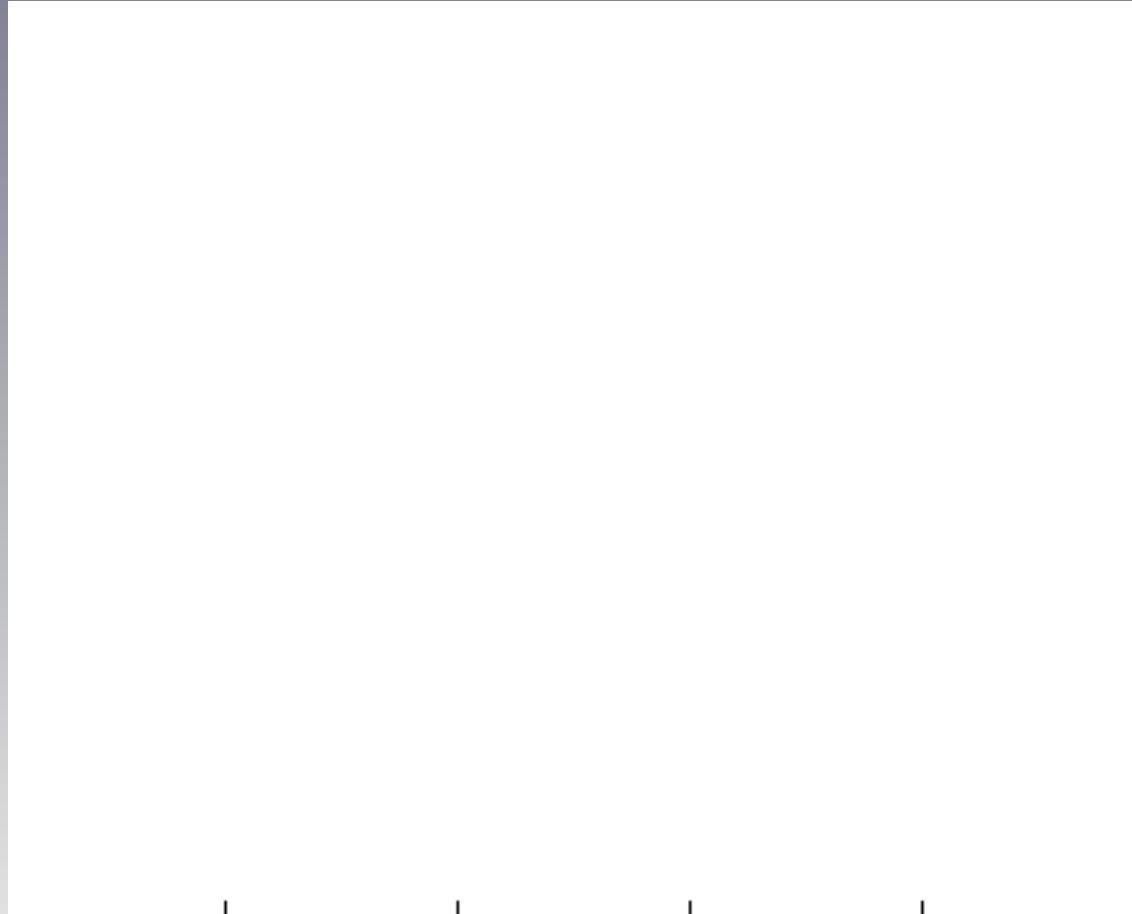
can we describe the qubit with few parameters?

dephasing rate, relaxation time, ...

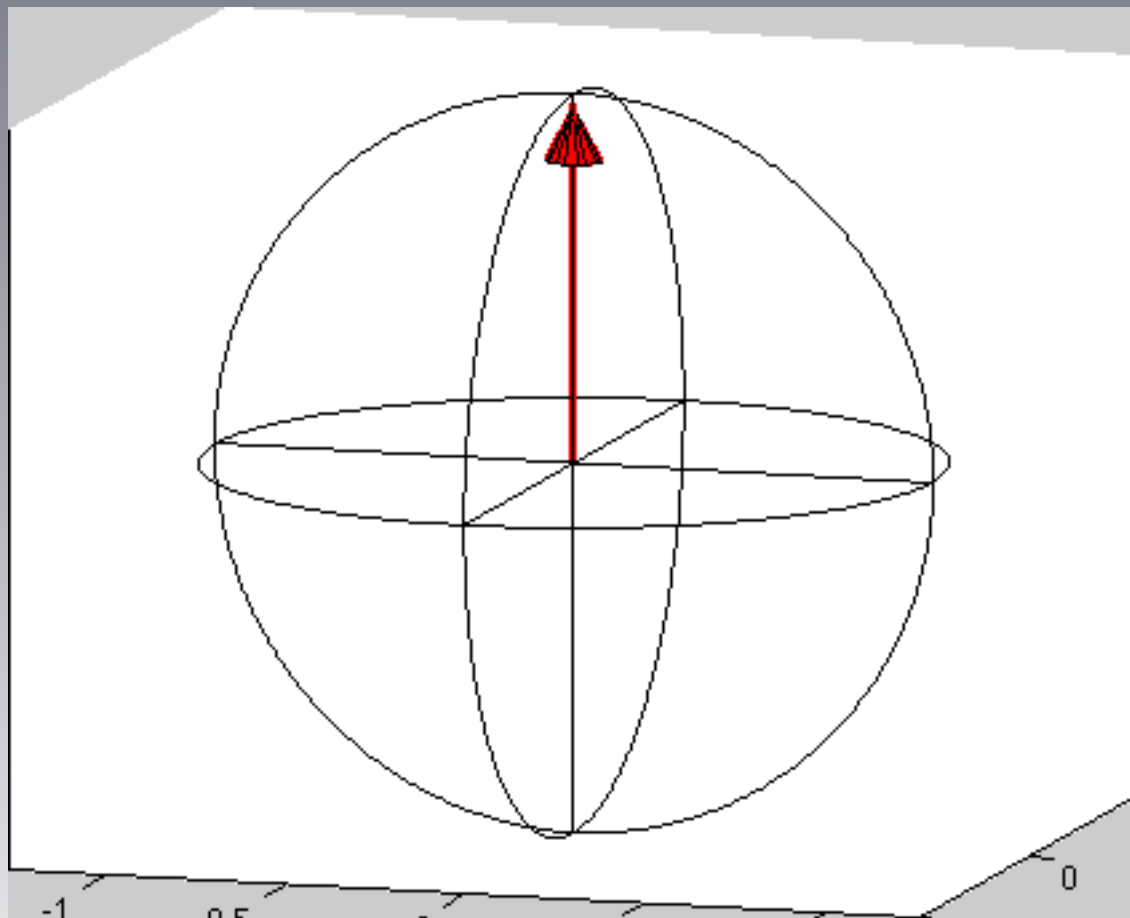
how to measure them?

relaxation measurement, Ramsey, Hahn echo

Relaxation



Relaxation



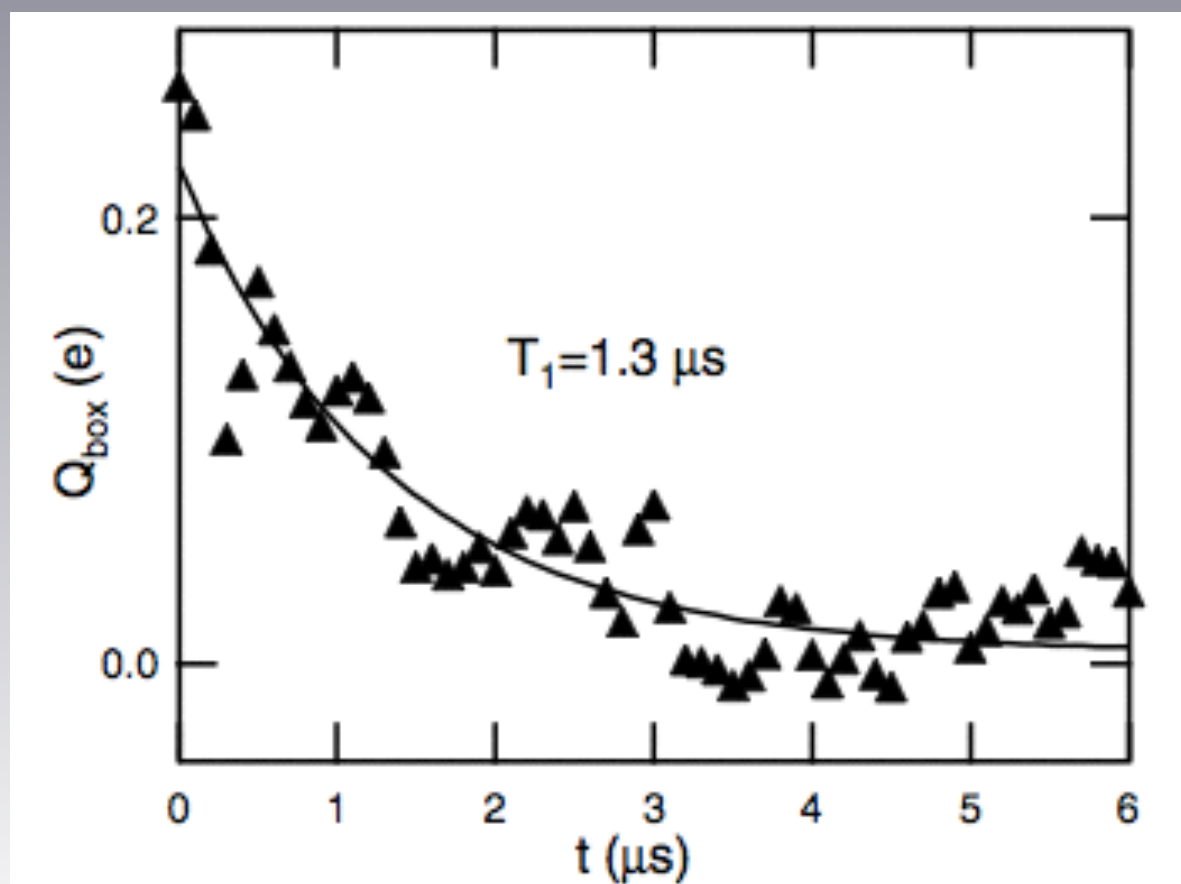
Measurement of the Excited-State Lifetime of a Microelectronic Circuit

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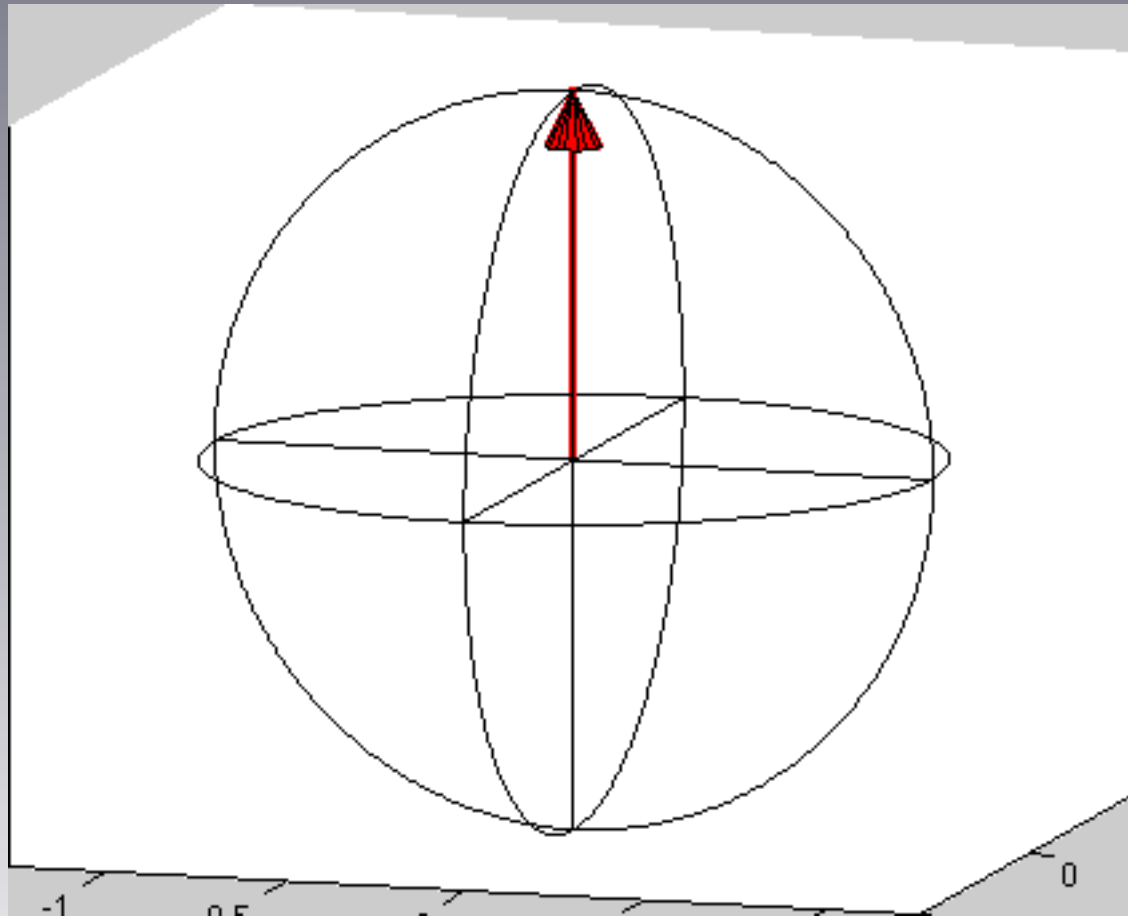
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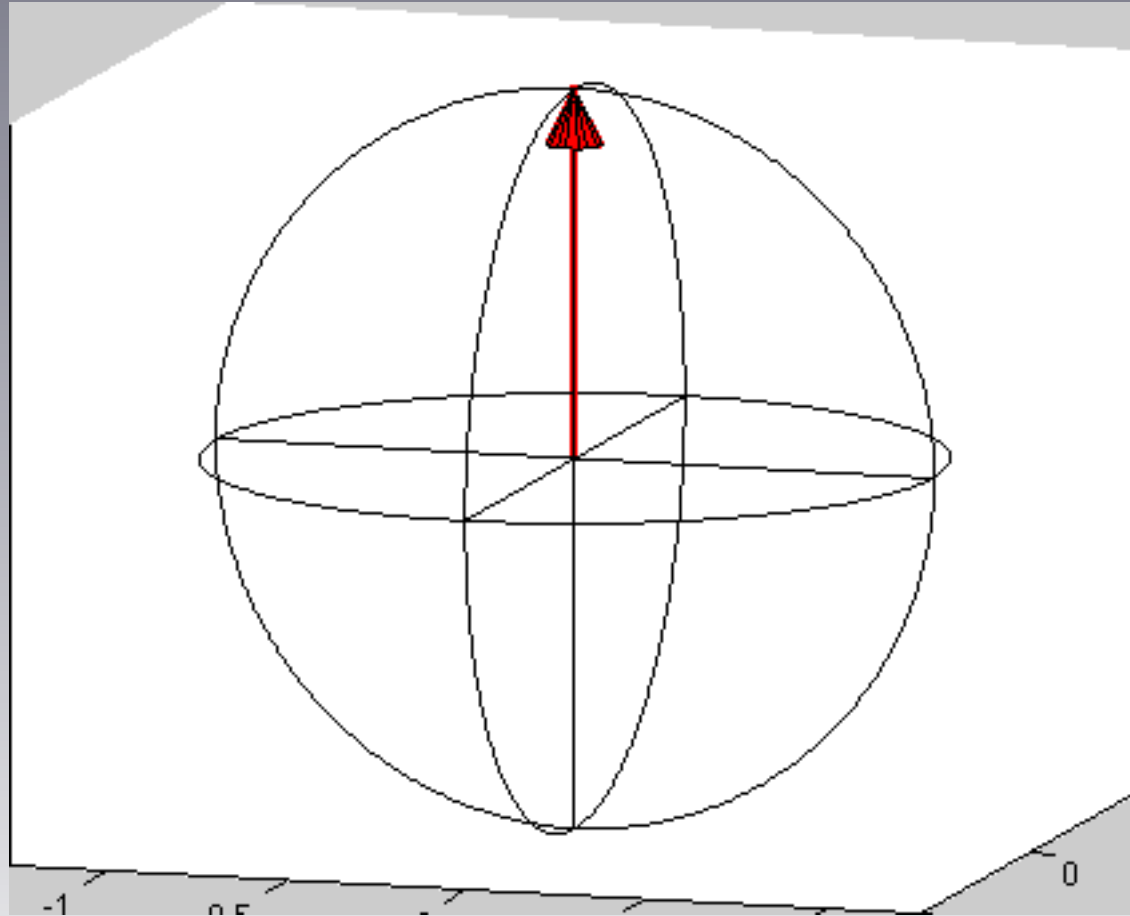
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Ramsey Oscillations



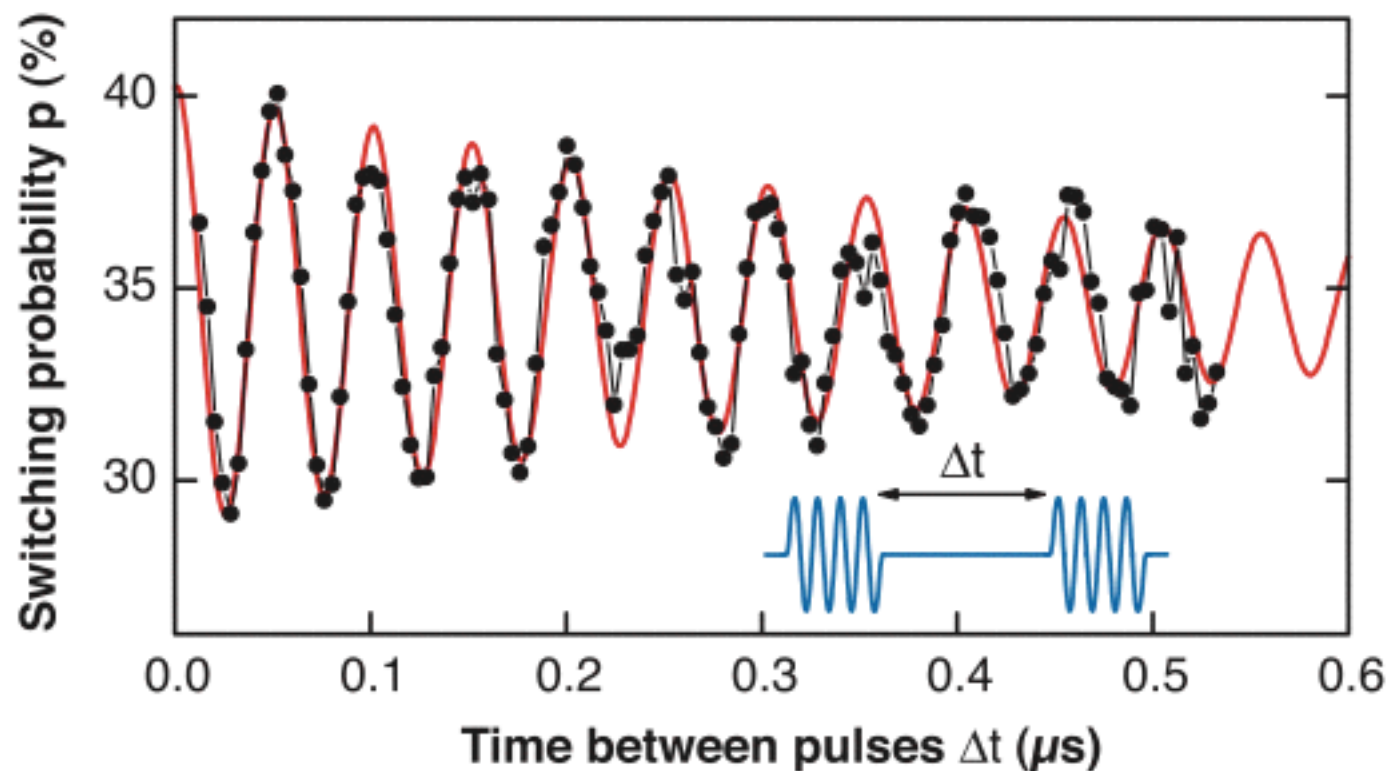
Ramsey Oscillations



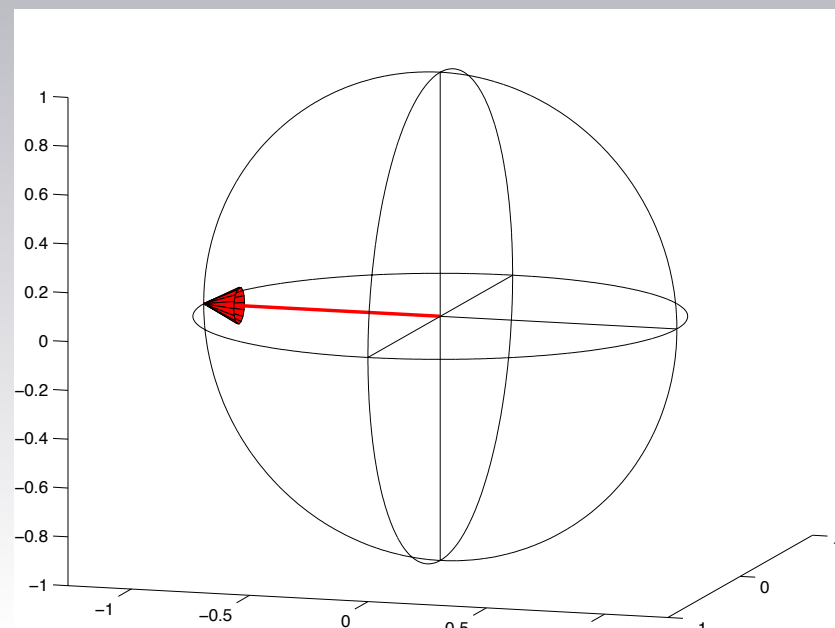
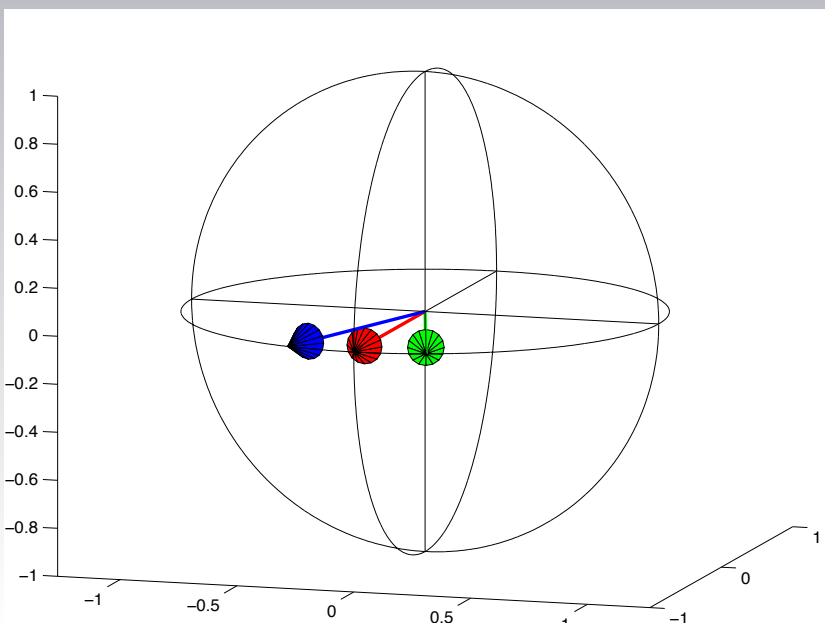
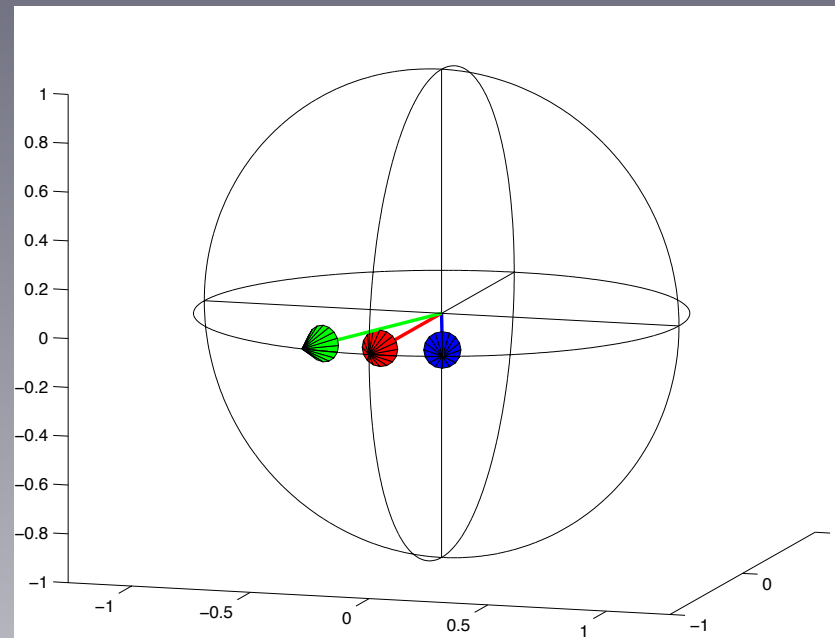
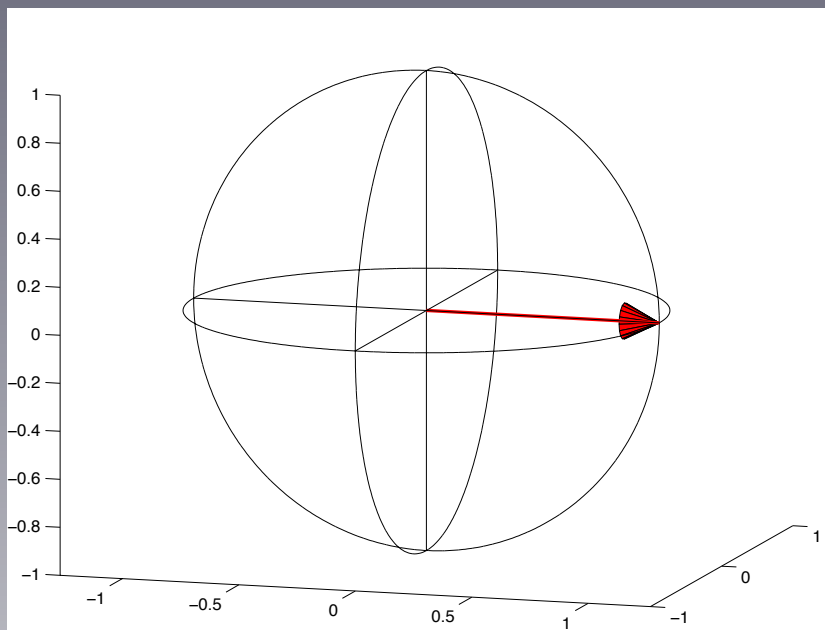
Manipulating the Quantum State of an Electrical Circuit

D. Vion,* A. Aassime, A. Cottet, P. Joyez, H. Pothier,
C. Urbina,† D. Esteve, M. H. Devoret‡

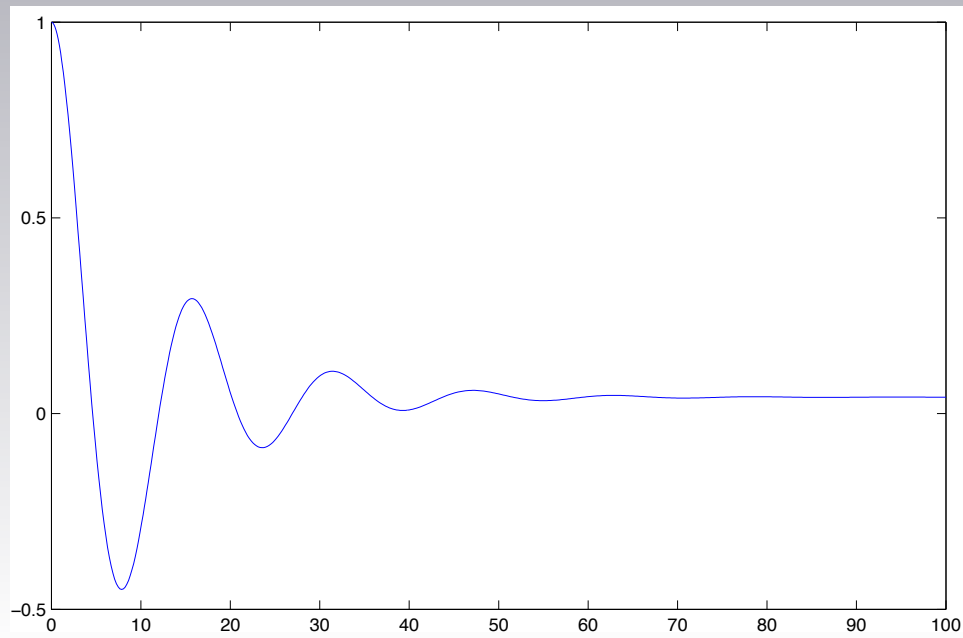
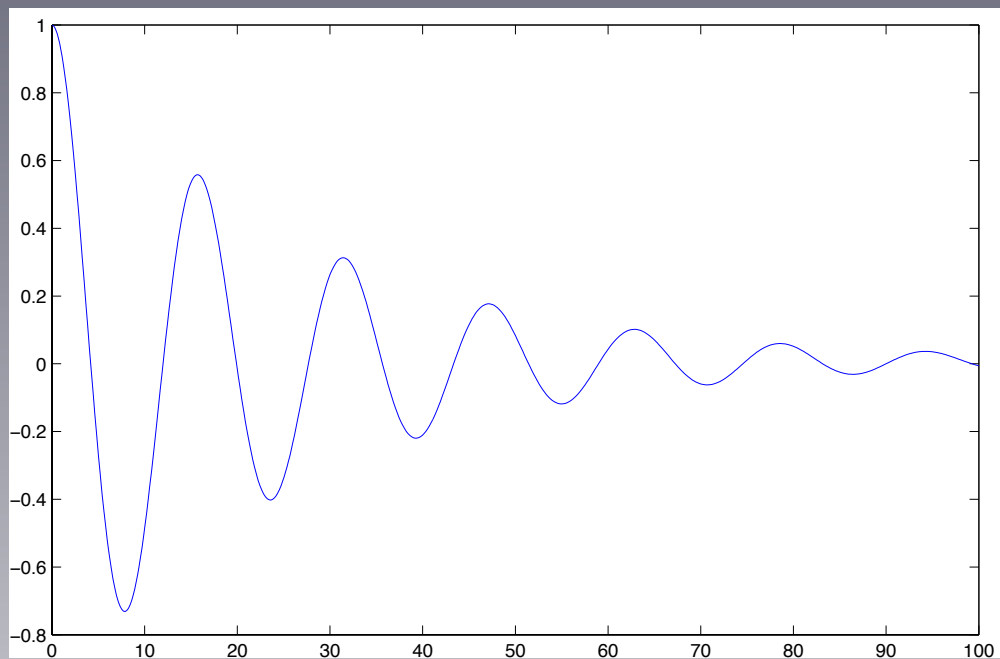
3 MAY 2002 VOL 296 SCIENCE www.sciencemag.org



Hahn Echo



Rabi



Summary

- open quantum systems can be described with the Lindblad equation, ...operators
- relaxation describes the energy loss and mixes the state
- dephasing describes the collapse towards the z-axis, limited by the relaxation
- Hahn echo allows to recover inhomogeneous broadening