

MAR06-2005-002754

Abstract for an Invited Paper
for the MAR06 Meeting of
the American Physical Society

Solid state technologies for quantum computers

DAVID DIVINCENZO, IBM Research Division

Impressive progress is now being made in realizing the rudiments of quantum computers in solid state devices. I will discuss two of them. First, single electron quantum dots now offer a highly coherent spin state for use as a qubit. Decoherence effects, arising from hyperfine interactions and the spin-orbit interaction, are well on their way to being understood and controlled. Second, Josephson junction devices, in many forms, are showing promise as qubits. The dynamics of these electric circuits can be designed to exhibit a wide variety of quantum effects; good two-level systems can be produced by careful design, and careful schemes for decoupling from the environment. Coupling to harmonic modes offer a wide variety of “quantum optic” realizations in the microwave regime.