

MAR13-2012-000719

Abstract for an Invited Paper
for the MAR13 Meeting of
the American Physical Society

Are materials good enough for a superconducting quantum computer?

JOHN MARTINIS, UC Santa Barbara

Recent developments of surface codes now place superconducting quantum computing at an important crossroad, where “proof of concept” experiments involving small numbers of qubits can be transitioned to more challenging and systematic approaches that could actually lead to building a quantum computer. Although the integrated circuit nature of these qubits helps with the design of a complex architecture and control system, it also presents a serious challenge for coherence since the quantum wavefunctions are in contact with a variety of materials defects. I will review both logic gate design and recent developments in coherence in superconducting qubits, and argue that state-of-the-art devices are now near the fault tolerant threshold. Future progress looks promising for fidelity ten times better than threshold, as needed for scalable quantum error correction and computation.