MAR17-2016-020330
Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Quantum Computing

MATTHIAS STEFFEN, IBM T J Watson Res Ctr

Solving computational problems require resources such as time, memory, and space. In the classical model of computation, computational complexity theory has categorized problems according to how difficult it is to solve them as the problem size increases. Remarkably, a quantum computer could solve certain problems using fundamentally fewer resources compared to a conventional computer, and therefore has garnered significant attention. Yet because of the delicate nature of entangled quantum states, the construction of a quantum computer poses an enormous challenge for experimental and theoretical scientists across multi-disciplinary areas including physics, engineering, materials science, and mathematics. While the field of quantum computing still has a long way to grow before reaching full maturity, state-of-the-art experiments on the order of 10 qubits are beginning to reach a fascinating stage at which they can no longer be emulated using even the fastest supercomputer. This raises the hope that small quantum computer demonstrations could be capable of approximately simulating or solving problems that also have practical applications. In this talk I will review the concepts behind quantum computing, and focus on the status of superconducting qubits which includes steps towards quantum error correction and quantum simulations.