NEW YORK CITY COLLEGE OF TECHNOLOGY
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Remote entanglement of transmon qubits

Presented by:

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Abstract

An open challenge in quantum information processing with superconducting circuits is to entangle arbitrary pairs of qubits, not simply nearest neighbors. This can be accomplished by first entangling the qubits with flying microwave oscillators in the form of traveling pulses and then performing joint manipulation and measurement on a pair of such flying oscillators at a distant site. This method has the advantage of avoiding the overhead required to move information over large distances via only nearest neighbor coupling while also possessing an extremely high on/off ratio of coupling. Remarkably, such a process is naturally embedded in the act of phase-preserving amplification, which transforms two input modes, termed signal and idler, into a two-mode squeezed output state. For an ideal system, this operation generates heralded, perfectly entangled states between remote qubits with a fifty percent success rate. For an inefficient system, the partial loss of information from the flying states degrades the purity of the entanglement. Data will be shown on such a protocol involving two transmon qubits embedded in superconducting cavities connected to the signal and idler inputs of a Josephson Parametric Converter (JPC) operated as a nearly-quantum limited phase-preserving amplifier. I will also discuss new devices which will allow us to improve the process and achieve high success rates with imperfect hardware.

Light refreshments will be served.