

Dual-Rail Microwave Cavity Qubits

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장소 연세대학교 과학관 B103호

Speaker



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Abstract

Dual-Rail qubits were originally proposed for optical quantum computation and communication, and the logical states are represented by a single photon which can be in one of two different modes. This talk will discuss recent experimental and theoretical progress extending this concept to a single microwave photon shared between two microwave cavities. Single-qubit gates require only simple beam-splitter operations between the two cavities and can now be performed with very high fidelity. Novel two-qubit entangling gates are also being developed.

The most common error, loss of the photon, causes a leakage out of the logical code space, but this otherwise dangerous fault can be efficiently converted to an erasure, heralded by a change in the parity of the total photon number. Recent work by Shruti Puri and Jeff Thompson on Rydberg arrays has shown that erasure errors are efficiently corrected by concatenation of the error-detection code of the dual-rail qubit into a higher-level error correction code such as the surface code. The fact that erasure errors have heralded locations reduces their entropy and effectively doubles the distance of the higher-level code leading to very efficient error correction.