universität innsbruck

# Innsbruck Physics Colloquium

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## High-coherence superconducting qubits

I will discuss two approaches towards the development of high-coherence superconducting qubits. First, I will show how encoding a qubit in logical quantum states with wavefunctions characterized by disjoint support and robust energies can offer simultaneous protection against relaxation and pure dephasing. Using a circuit-quantum-electrodynamics architecture, we experimentally realize a superconducting 0-pi qubit, which hosts protected states suitable for quantum-information processing. The measured relaxation (1.6 ms) and dephasing times (25 µs) demonstrate that our implementation of the 0–pi circuit not only broadens the family of superconducting qubits, but also represents a promising candidate for the building block of a fault-tolerant quantum processor. Second, I will show how a rigorous approach towards materials engineering can improve coherence even in traditional transmon devices. In particular, with relatively simple changes, we have developed a reliable process to make 2D transmon qubits with coherence in excess of 0.3 ms.

**Tuesday, 28.1.2020, at 17:15 h in lecture hall C**

Innsbruck Physics Colloquium, Organisation: M. Beyer, H.-C. Nägerl, A. Reimer