A gate tunable transmon qubit in planar Ge

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Gate-tunable transmons (gatemons) employing semiconductor Josephson junctions have emerged as new building blocks for hybrid quantum circuits [1-3]. Here, we demonstrate and characterize a gatemon on planar Ge. We induce superconductivity in Ge by evaporating aluminum atop a thin spacer, which separates the superconductor from the quantum well [4]. The Josephson junction is capacitively coupled to a transmission line resonator. We reach the qubit-resonator strong coupling regime and showcase the qubit's tunability in a broad frequency range with one and two-tone spectroscopy. Time-domain measurements reveal energy relaxation and coherence times up to 75 ns. Our results, combined with the recent advances in Ge spin qubits [5, 6], pave the way towards Andreev spin qubits in a group-IV, CMOS-compatible material.

References

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Figures

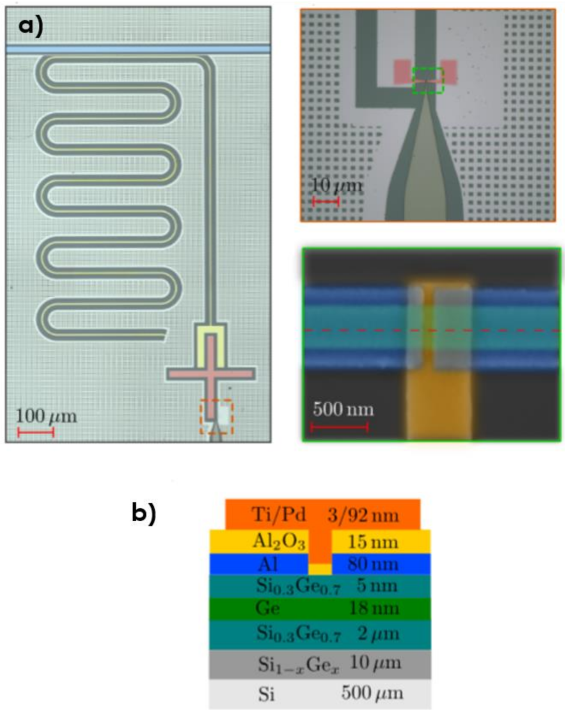

Figure 1: a) Device layout from the cQED parts down to the nanosized Ge junction. b) Cross-section of the wafer stack along the red line in the panel above.

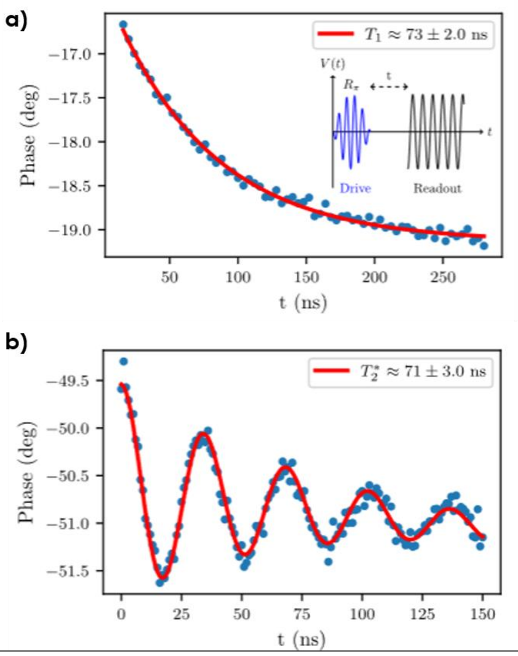

Figure 2: Characterization of the qubit times T1 and T2* in panel a) and b), respectively. Both dataset acquired at a qubit frequency of 2.8 GHz.