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Concentric transmon qubit featuring fast tunability and site-selective Z coupling MARTIN WEIDES, JOCHEN BRAUMUELLER, Karlsruhe Institute of Technology, MARTIN SANDBERG, MICHAEL VISSERS, National Institute of Standards and Technology, ANDRE SCHNEIDER, STEFFEN SCHLOER, LUKAS GRUENHAUPT, HANNES ROTZINGER, MICHAEL MARTHALER, ALEXANDER LUKASHENKO, AMADEUS DIETER, ALEXEY USTINOV, Karlsruhe Institute of Technology, DAVID PAPPAS, National Institute of Standards and Technology — We present a planar qubit design based on a superconducting circuit that we call concentric transmon. While employing a simple fabrication process using Al evaporation and lift-off lithography, we observe qubit lifetimes and coherence times in the order of 10 μs. We systematically characterize loss channels such as incoherent dielectric loss, Purcell decay and radiative losses. The implementation of a gradiometric SQUID loop allows for a fast tuning of the qubit transition frequency and therefore for full tomographic control of the quantum circuit. The presented qubit design features a passive direct Z coupling between neighboring qubits, being a pending quest in the field of quantum simulation.

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