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High quality factor superconducting resonators on Si/SiGe semiconductor heterostructures[1] JEFFREY CADY, XIAO MI, J.R. PETTA, Department of Physics, Princeton University, Princeton, New Jersey 08544 — The circuit quantum electrodynamics architecture may allow for the generation of entanglement between spatially separated spin qubits [1]. This approach has introduced the challenge of fabricating high quality factor superconducting resonators on multilayered semiconductor substrates. Here we present electric field simulations which show that 30% of the resonator electric field resides in the 675μm thick Si substrate on which the Si/SiGe heterostructure is grown, 55% resides in the 3 μm thick SiGe relaxed buffer and 300 nm of $Si_{0.7}Ge_{0.3}$ grown above the relaxed buffer, and 15% resides in the remaining Si/SiGe heterostructure. We evaluate the performance of Nb coplanar waveguide resonators fabricated on top of a strained Si/SiGe quantum well at 4.2 K and 10 mK. The tested resonators exhibit a high quality factor despite the presence of an accumulated two-dimensional electron gas beneath the resonator center pin.

[1] K. D. Petersson *et al.*, Nature **490**, 380-383 (2012).

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Jeffrey Cady
Department of Physics, Princeton University, Princeton, New Jersey 08544

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