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Anomalous Behavior of High Quality Factor Planar Superconducting Resonators[1] ANTHONY MEGRANT, ZIJUN CHEN, BEN CHIARO, ANDREW DUNSWORTH, CHRIS QUINTANA, BROOKS CAMPBELL, JULIAN KELLY, RAMI BARENDS, YU CHEN, EVAN JEFFREY, JOSH MUTUS, CHARLES NEILL, PETER O'MALLEY, DANIEL SANK, AMIT VAINSENCHER, JIM WENNER, TED WHITE, JORG BOCHMANN, IOCHUN HOI, CHRISTOPHER PALMSTROM, JOHN MARTINIS, ANDREW CLELAND, UC Santa Barbara — Superconducting coplanar waveguide resonators have proven to be invaluable tools in studying some of the decoherence mechanisms found in superconducting qubits. Surface two-level states tend to dominate decoherence at temperatures below Tc/10 and at very low microwave powers, assuming loss through other channels (e.g. quasiparticles, vortices, and radiation loss) has been mitigated through proper shielding and design. I will present recent measurements of resonators whose behavior diverges significantly from the standard two-level state model at low temperatures and low excitation energies, resulting in startling behavior of the internal quality factor.

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