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Optimizing Hardware Compatibility for Scaling Up Superconducting Qubits MICHAEL FANG, Univ of California - Santa Barbara, BROOKS CAMPBELL, ZIJUN CHEN, BEN CHIARO, ANDREW DUNSWORTH, JULIAN KELLY, ANTHONY MEGRANT, CHARLES NEILL, PETER O'MALLEY, CHRIS QUINTANA, AMIT VAINSENCHER, JIM WENNER, TED WHITE, University of California, Santa Barbara, RAMI BARENDS, YU CHEN, AUSTIN FOWLER, EVAN JEFFREY, JOSH MUTUS, PEDRAM ROUSHAN, DANIEL SANK, Google, Santa Barbara, JOHN MARTINIS, University of California and Google, Santa Barbara — Since quantum computation relies on the manipulation of fragile quantum states, qubit devices must be isolated from the noisy environment to prevent decoherence. Custom made components make isolation from thermal and infrared radiation possible, but have been unreliable, massive, and show sub-ideal microwave performance. Infrared isolation for large scale experiments (¿ 8 qubits) was achieved with compact impedance matched microwave filters which attenuate stray infrared signals on cryogenic cables with only -25 dB reflection up to 7.5 GHz. In addition, a thermal anchoring system was designed to effectively transfer unwanted heat from more than 100 coaxial cables in the dilution refrigerator and yielded a 33 percent improvement in base temperature and 50% improvement in hold time.

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