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Decoherence and Coupling in 3D Transmons OLIVER DIAL, DOUGLAS MCCLURE, STEFANO POLETTO, JAY GAMBETTA, IBM T.J. Watson Research Center, Yorktown Heights, NY 10598, USA, HANHEE PAIK, Raytheon BBN Technologies, Cambridge, MA 02138, MATTHIAS STEFFEN, CHRIS LIRAKIS, IBM T.J. Watson Research Center, Yorktown Heights, NY 10598, USA — Transmons based on 3D architectures can attain coherence times currently unreachable in 2D systems and can be post-selected based on factors such as coherence times and frequency to construct complex quantum systems. Furthermore, because they are measured in simple, well isolated cavity resonators, they provide an ideal testbed for studying decoherence mechanisms. By developing fast design techniques for creating qubits with targeted cavity couplings and anharmonicities, we design, build, and measure a variety of devices tuned to have different participation ratios for different interfaces within the system. Using these devices we explore the different decoherence mechanisms that dominate single cavity qubits and "bridge" qubits that cross between two cavity resonators. We acknowledge support from IARPA under contract W911NF-10-1-0324.

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