

Yu Chen

Google Inc.

Progress towards building quantum annealer V2.0

A quantum annealer holds promises for improving solutions to hard optimization problems using quantum enhancement. Constructing a quantum annealer, however, stands as an outstanding challenge.

Here, we are reporting our recent progresses in Google Quantum Hardware Lab, focusing on the development of quantum annealer V2.0. Using coplanar waveguide-based 'fluxmon' qubits, we construct quantum annealer V2.0 as a multi-layer circuit, integrated with flip chip technology and airbridge crossovers. Under such a structure, we demonstrated GHz level qubit-qubit coupling at a minimal control crosstalk, an essential requirement for quantum annealers. Meanwhile, without utilizing lossy amorphous dielectrics, we were able to retain the qubit coherence while dramatically increasing the complexity of the circuit. We will conclude by discussing why such an architecture is suitable for small-scale quantum annealers with enhanced connectivity and coherence.