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Technology Integration for Practical-Scale Quantum Annealing Machine

We propose a technology integration scheme for quantum annealing machine towards solving practical-scale problems. The manufacturability is discussed with an example application of a factoring machine consisting of superconducting qubits, inter-qubit couplers, and auxiliary circuits. A central idea is restriction of the functionality: the factoring machine is designed only for the factoring application. The simplification strategy, which we call an Application Specific Annealing Computing (ASAC) architecture, increases the available hardware budget and reduces the cost and time for development. The circuits consist of Josephson junctions and are implemented by using superconducting integrated circuit technology. We plan to fabricate the factoring machine in a 3-dimensional packaging structure, namely, a Qubit chips, Interposers and a Package substrate (QUIP) structure, which is essential to sufficiently large scale systems for practical applications.