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Component Concepts for Super-Classical Quantum Annealing

The design of hardware components for application-relevant quantum annealing systems presents many difficult design challenges. Central to these challenges are the many disparate properties that are conjectured to be critical. These include qubit couplers that are high precision, non-stoquastic, high weight, long range, and compatible with high-degree connectivity. Further, these properties may need to be simultaneously implementable, and may need to be compatible with high coherence flux qubits. This talk will present two innovative designs developed by Northrop Grumman—a non-stoquastic XX coupler and a weight-three ZZZ coupler—that address some of these challenges. We will also discuss some of the design trade-offs that are likely to be important in the design of advanced, super-classical quantum annealing systems.