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**Precision and the approach to optimality in quantum annealing processors**

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The last few years have seen both a significant technological advance towards the practical application of, and a growing scientific interest in the underlying behaviour of quantum annealing (QA) algorithms [1]. A series of commercially available QA processors, most recently the D-Wave 2X$^{TM}$ 1000 qubit processor, have provided a valuable platform for empirical study of QA at a non-trivial scale. From this it has become clear that misspecification of Hamiltonian parameters is an important performance consideration, both for the goal of studying the underlying physics of QA, as well as that of building a practical and useful QA processor. The empirical study of the physics of QA requires a way to look beyond Hamiltonian misspecification.
Recently, a solver metric called 'time-to-target' was proposed [2] as a way to compare quantum annealing processors to classical heuristic algorithms. This approach puts emphasis on analyzing a solver's short time approach to the ground state. In this presentation I will review the processor technology, based on superconducting flux qubits, and some of the known sources of error in Hamiltonian specification. I will then discuss recent advances in reducing Hamiltonian specification error, as well as review the time-to-target metric and empirical results analyzed in this way.
[1] E.g. "Discussion and Debate: Quantum Annealing: The Fastest Route to Quantum Computation?", S Suzuki and A Das eds., Eur. Phys. J. Special Topics, 224 (1), Feb 2015.
[2] J. King, et al.; "Benchmarking a [QA] processor with the time-to-target metric", arXiv:1508.05087 [quant-ph]