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Computational performance and scaling of adiabatic quantum annealing processors[1] TROELS FRIMODT RØNNOW, SERGEI ISAKOV, Institut f. Theoretische Physik, ETH Zürich, DAVE WECKER, Microsoft Corporation, SERGIO BOIXO, Center for Quantum Information Science & Technology - Information Sciences Institute, MATTHIAS TROYER, Institut f. Theoretische Physik, ETH Zürich — We characterise the recent 128 qubit quantum annealing processor, D-Wave One, through investigation of hardness and scaling of "time-to-solution" for several thousand realisations of $\pm J$ spin glass problems, ranging from 8 to 108 qubits in size. We compare statistics of the results to classical- and simulated quantum annealing. Within the processors noise and calibration uncertainties, we find that the results generated by the D-Wave One are statistically indistinguishable from results generated by a simulated quantum annealer while significantly different from those of a classical annealer. An intriguing feature is strong bimodal separation of the instances into two categories: hard and easy. This feature is not observed for the classical annealer. Based on the similarities between the simulated quantum annealer and D-Wave One, we make predictions for the 512 qubit processor, D-Wave Two.

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