

Abstract Submitted  
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**Validating the solutions of the D-Wave quantum annealers through graph mirroring**<sup>1</sup> DILINA PERERA, J.S. HALL, M.A. NOVOTNY, Mississippi State University — D-Wave quantum annealers seek to find the ground states of Ising spin glasses. The problem Hamiltonian is formulated as an undirected graph that can be embedded into the devices native disordered Chimera graph structure. However, depending on the complexity of the problem and the specifications of the annealing schedule, the device may not necessarily find the global minimum during a given annealing process. We present a method, which we call answer checking, that enhances the expectation that the solution provided by the device is the true ground state of the problem. The underlying principle is to embed a mirrored graph  $G'$  of the original graph  $G$ , and connect the two graphs via ferromagnetic/antiferromagnetic couplers. This allows one to rule out solutions for the composite graph that do not comply with the underlying mirror symmetry inherent to the true ground state, which in turn, reduces the uncertainty associated with the solutions. Using the 1097 qubit D-Wave 2X, we test this approach by applying it to a range of problems, including random spanning trees and generally allowed graphs  $G$ .

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Dilina Perera  
Mississippi State University

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