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Appearance of a superposition of macroscopically distinct states in adiabatic quantum computation

We propose a new theoretical method of testing the quantum speedup of quantum adiabatic algorithms (QAAs). The method is based on a conjecture that if a QAA provides a quantum speedup then a superposition of macroscopically distinct states appears during the computation. We show the results in several QAAs, such as the adiabatic Grover algorithm, which support this conjecture.