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SIMULATING HARD COMPUTATIONAL PROBLEMS WITH LASER LIGHT FOR THE APPLICATION IN QUANTUM TECHNOLOGY

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Many practical problems in all science and technological disciples have been classified as computationally NP hard like combinatorial optimization, prime factorization of large integer, finding the ground state of the Ising Hamiltonian. More specifically, some cryptographic algorithms such as RSA (Rivest–Shamir–Adleman) critically depends on the fact that the terrible difficulty for finding the prime factorization of large integer. A polynomial-time algorithm was invented by Shor for quantum computers. Is there any optical system able to compute such a factoring algorithm? Optical systems are perhaps the most robust and fastest accessible system capable of dealing Shor's function. In this work, we have developed an optical platform of proof of concept experiment for period finding. We present an experimental and numerical observation, that demonstrate the prime factorization based on Shor's algorithm using laser light. Scalability is one of the major strength inherent in this DMD (digital micromirror device) based technique. Although, this classical approach cannot compete with the quantum algorithm in terms of efficiency, quantum entanglement can potentially be used aiming at speeding up prime factorization for classical computers.

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