

Matthias Troyer

Swiss Federal Institute of Technology Zurich



Validation of Quantum Devices

Department of Physics Colloquium

About a century after the development of quantum mechanics we have now reached an exciting time where non-trivial devices that make use of quantum effects can be built. While a universal quantum computer of non-trivial size is still out of reach there are a number commercial and experimental devices: quantum random number generators, quantum encryption systems, and analog quantum simulators. In this colloquium I will present some of these devices and validation tests we performed on them. Quantum random number generators use the inherent randomness in quantum measurements to produce true random numbers, unlike classical pseudorandom number generators which are inherently deterministic. Optical lattice emulators use ultracold atomic gases in optical lattices to mimic typical models of condensed matter physics. Finally, I will discuss the devices built by Canadian company D-Wave systems, which are special purpose quantum simulators for solving hard classical optimization problems.