



ICFO Colloquium MATTHIAS TROYER 'Validation of quantum devices: from quantum random numbers to the D-Wave devices'

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October 03, 2014

Friday, October 3rd, 12:00, ICFO's Auditorium

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Professor of Computational Physics, ETH Zurich ~~\$\$~~Prof. Matthias Troyer is a recognized authority on quantum nature and performance of D-Wave machine and other quantum devices. He is a recipient of an ERC Advanced Grant of the European Research Council and a Fellow of the American Physical Society. His research activities center on numerically accurate simulations of quantum many body systems, with applications to quantum magnets, correlated materials, ultracold quantum gases, quantum devices and topological quantum computing.

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.

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