Exclusive NIST Tour Shows Off Quantum Physics' ARTIQ

Using FPGAs in science

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1 Comment

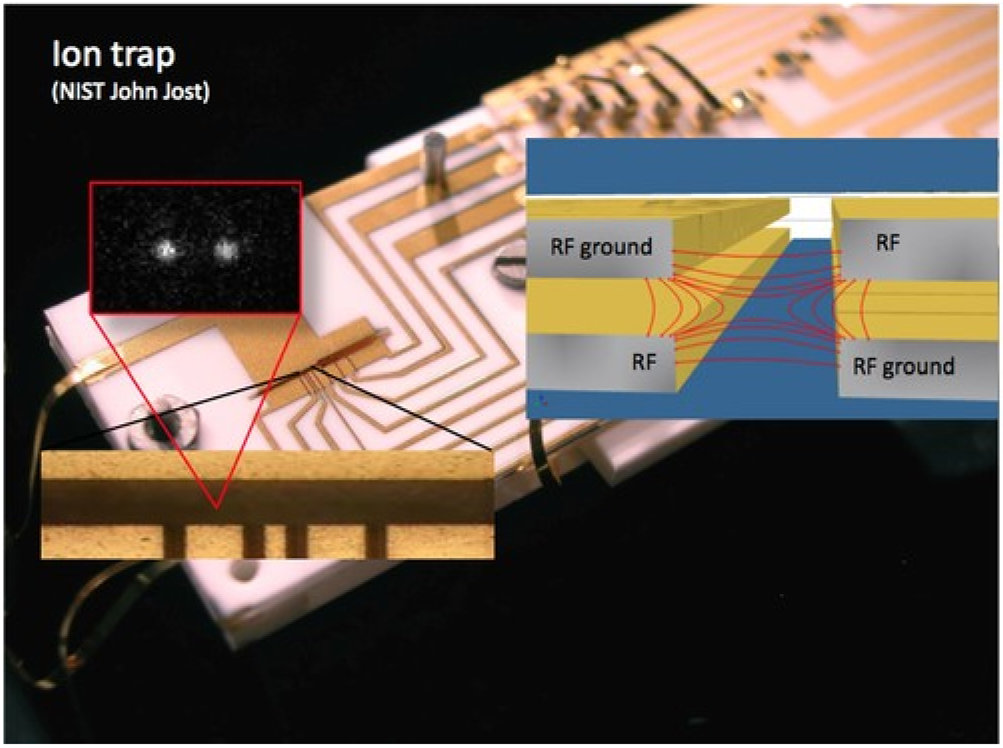
BOULDER, Co. -- The National Institute of Standards and Technology (NIST) continues to create new technologies for quantum computing and bettering direct digital synthesizers (DDS) for many applications including telecommunications technology and standards. Recently I toured some of the laboratories of NIST's Ion Storage Group and viewing some of their developments, including ARTIQ. ARTIQ (Advanced Real-Time Infrastructure for Quantum physics), a new communications protocol being developed by the Ion Storage Group at NIST, is an open-source control system for laser-cooled trapped ion experiments.

I spoke with Sébastien Bourdeauducq, director and founder of m-labs -- the prime contractor for ARTIQ -- about some goals the project aimed to achieve. In an exclusive interview for EE Times he said, "the main goal is a control system that has both high expressivity (you can describe complex experiments with few lines of code) and high timing performance... it's a middle ground between running the control algorithms on a PC, which has high level programming language but bad timing performance, and running the control algorithms on a dedicated FPGA design, which has excellent timing performance but is a pain to program."

The system features a high-level programming language that helps describe complex experiments, which is compiled and executed on hardware with nanosecond timing resolution and sub-microsecond latency. The system and procedure utilize various hardware technologies and programming languages such as Python, Migen, MiSoC/mor1kx, LLVM and llvmpy.

Click on the images below to view a slideshow of the laboratories and technologies utilizing ARTIQ at NIST .

www.eetimes.com/document.asp?doc_id=1324797



An ion trap is a combination of electric or magnetic fields used to capture charged particles in a vacuum. Ion traps have a number of scientific uses such as mass spectrometery, physics research, and controlling quantum states. The two most common types of ion trap are the Penning trap and the RF (Paul) trap (quadrupole ion trap).

The team at NIST uses both Penning and Paul traps, and ARTIQ will help with timing and other difficult problems that arise during experiments.

Source: NIST.