Tektronix Supports Next-Generation Computer Research at University of Tokyo's School of Engineering

AWG5014C Arbitrary Waveform Generator Will Contribute to Development of Quantum Computers

BEAVERTON, Ore., August 23, 2011 – Tektronix, Inc., the world's leading manufacturer of oscilloscopes, today announced its AWG5014C arbitrary wave generator was adopted for use in quantum computer research currently in progress at the Tarucha-Oiwa Laboratory in the School of Engineering at the University of Tokyo. The AWG5014C will serve to enlarge the scale of basic circuits through increasing the controlled number of artificial atoms (quantum bits), the computing element used in quantum computers.

Quantum computers, which represent the next generation of computing, perform calculations of data using quantum dots made through combining artificial atoms with a size of 1 μm (microns) or smaller called quantum bits with electron spins. At the Tarucha-Oiwa Laboratory in the University of Tokyo's School of Engineering, research is in progress that enables the computing of quantum calculations through the control of the quantum mechanical properties controlled by quantum dots to create an on/off state that allows calculations of data to be made.

"Future quantum computer research will involve increasing the number of quantum dots in order to enlarge the scale of basic circuits. For that purpose, a signal generator that enables the accurate and predictable control of multiple quantum dots is a necessity," said Akira Oiwa, Lecturer in the Department of Applied Physics at University of Tokyo's School of Engineering. "We anticipate significant contributions that the AWG5014C will make to our research, not only in terms of the number of channels that it offers, but also in terms of start-up time, jitter, noise and other aspects that determine superior waveform quality."

Quantum dots are semiconductor elements that act as special FET (Field Effect Transistors) capable of controlling electrons inside channels one at a time. In order to control quantum dots, it is necessary to control the gate electrodes of FET at an ultrafast speed that is less than nanosecond units. Additionally, the waveforms and frequencies of the control pulse also must be measured with the greatest degree of accuracy possible. Up until now, the Tarucha-Oiwa Laboratory had been utilizing the two-channel output AWG520 arbitrary waveform generator, but has elected to adopt use of the AWG5014C based on the predicted increase in the number of controlled quantum dots that future advances in research will bring.

The AGW5014C is a four-channel, eight-marker output arbitrary waveform generator. Upon processing error corrections for computations, which represents the foundation of quantum computing, a minimum of three quantum bits is necessary. In order to control a single quantum bit, a signal from one channel at the very least is required. With its ability to simultaneously output using four channels and eight markers, the AWG5014C can be effectively used to control three quantum bits.

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