

PRESS RELEASE

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Information can be disclosed as of March 31st, 2021

Zurich Instruments introduces a new generation of signal generators for quantum computing

The SHFSG Signal Generator is an instrument designed to control superconducting and spin qubits and reach higher fidelities with less overhead time. As the first solution of its kind on the market, the SHFSG operates directly at qubit frequencies without mixer calibration. The SHFSG sets new standards in spectral purity and stability, and ensures that the highest possible gate fidelity is achieved and maintained during operation. As an integral component of the Zurich Instruments Quantum Computing Control System, the SHFSG provides a scalable solution for controlling quantum processors.

Concept

Hardware

The SHFSG generates freely programmable pulse sequences on up to 8 outputs with a signal bandwidth of 1 GHz and a variable carrier frequency up to 8.5 GHz. Such microwave signals are required to control the state of qubits in quantum computers, and they previously had to be generated using a combination of arbitrary waveform generators, microwave signal generators, and mixer circuits. The SHFSG brings together all these instruments in a single box, and it eliminates the need for time-consuming and error-prone calibration routines.

"The SHFSG sits in the sweet spot between meeting the specialized needs of today's researchers and keeping an eye on the roadmap for scaling up in the future. It addresses the improvements that truly matter for research teams in quantum computing, yet it is also an instrument versatile enough to cover the variety of approaches pursued in different quantum technology endeavors," says Dr. Mark Kasperczyk, Application Scientist for Quantum Technologies at Zurich Instruments. Through its ZSync interface and low-latency dynamic sequencing capabilities, the SHFSG supports feedback methods such as active reset and quantum error correction. The ZSync protocol also enables precise and reproducible timing synchronization across instruments, ensuring that gate operations on separate channels are well-aligned even for systems of up to 144 qubit control channels. The instrument comes in a 4- and an 8-channel variant to suit all setup sizes.

The SHFSG represents an important step toward standardized operation of today's largest quantum processors. It requires a minimum amount of memory to generate complex signals, hence it reduces the instrument's communication time – an otherwise critically limiting factor in the tune-up procedures of large quantum computing systems.

"The SHFSG is the result of long-standing and intensive collaborations with some of Europe's leading quantum computing groups," says Dr. Paolo Navaretti, Product Manager at Zurich Instruments. "These collaborations established the application know-how that has allowed us to identify the right choices at all levels of product design."

Software support and integration

As part of the Quantum Computing Control System (QCCS), the SHFSG is seamlessly integrated into setups featuring the HDAWG Arbitrary Waveform Generator and the SHFQA Quantum Analyzer. The LabOne QCCS Software allows users to define multi-channel signals involving all instruments in the setup in the form of a pulse-level description abstracted from the hardware. The LabOne user interface, already known to Zurich Instruments' customers, gives access to an overview of all hardware settings and to the instrument-level sequence description.

To read more about the new Zurich Instruments SHFSGH Signal Generator, including the complete list of its specifications, visit www.zhinst.com and the [SHFSG instrument page](#). To arrange a live demo, write to info@zhinst.com.

About Zurich Instruments

Zurich Instruments makes cutting-edge instrumentation for scientists and technologists in advanced laboratories who are passionate about phenomena that are often notoriously difficult to measure. The company's core offering includes lock-in amplifiers, impedance analyzers, arbitrary waveform generators, and the first commercially available quantum computing control system. Zurich Instruments brings innovation to scientific instrumentation and quantum control systems in the medium-frequency (MF), ultra-high-frequency (UHF) and now also super-high-frequency (SHF) ranges by combining frequency- and time-domain tools within each of its products. This approach reduces the complexity of laboratory setups and unlocks new measurement strategies.

Press contact

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