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Semiconductor and Superconductor Quantum Devices

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Message from the Guest Editors

Superconductivity is itself a macroscopic quantum phenomenon with such unique features as dissipationless current flow, ideal diamagnetism, magnetic flux quantization, and Cooper pair tunneling. Using advanced thin-film technologies and combining superconductors and materials with distinct electron orderings, we are able to create devices that behave entirely quantum-mechanically. At present, superconducting quantum devices are regarded as an outstanding playground for investigating new physics under well-defined boundary conditions.

In the Special Issue, we expect to present a wide panorama of various superconductor-based devices, especially those that are micro- or nano-fabricated and operate at or near the quantum regime. The Special Issue will include experimental and theoretical works dealing with ordinary Josephson junctions playing for superconducting circuitry the same role as transistors for modern semiconductor devices, quantum materials for their fabrication, different kinds of digital setups ranging from quantum bits for quantum information experiments to the most sensitive wideband sensors, and novel ideas concerning their implementation in industry.

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Message from the Editor-in-Chief

We get more and more evidence that quantum theory is the correct description of nature. It was born a century ago by explaining a few paradoxical results that could not be understood in the framework of classical physics. Today, quantum physics leads technological revolution in metrology, communication, computation, and the design of novel materials. Still it needs more solid foundations, and we need to develop a deeper understanding of how it can be used for new applications.

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