

TOWARD FAULT-TOLERANT SUPERCONDUCTING QUANTUM COMPUTERS

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ABSTRACT

Here is the talk abstract: The development of quantum computers is accelerating. Quantum computation has been attracting attention as cutting-edge technology in recent years. Superconducting circuits are the most successful platform for quantum computing, given that they are design-able and integrable electric circuitry on a silicon substrate. In my talk, I discuss tileable qubit structures and I/O packages and their scalability for fault-tolerant quantum computation. The introduction of a unit cell structure enables us to design the qubit through band calculations: the local geometric shape and the interconnects at the boundary determine the performance of the quantum processors. To suppress spurious electromagnetic modes, we introduce thru-silicon electrodes into qubit chips and have established a fabrication process. Currently, 64 qubit devices are in operation.

Furthermore, we have been developing control devices and decoding circuits for error-correcting codes. I will talk about our future direction at the end of my talk.