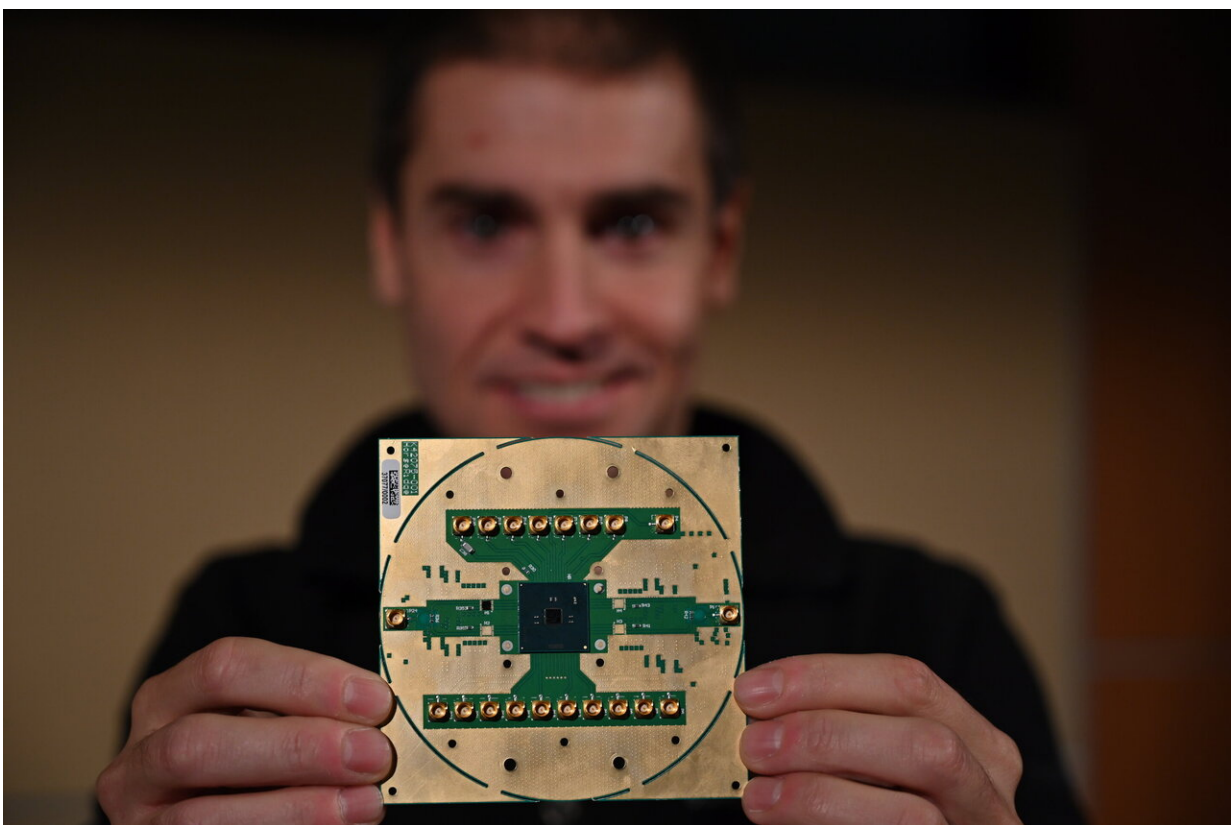


# Intel Introduces cryogenic control chip 'Horse Ridge' to enable control of multiple quantum bits

December 10 2019, by Bob Yirka

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Stefano Pellerano, principal engineer at Intel Labs, holds Horse Ridge. The new cryogenic control chip will speed development of full-stack quantum computing systems, marking a milestone in the development of a commercially viable quantum computer. Credit: Walden Kirsch/Intel Corporation

Intel has announced the development of a cryogenic control chip it calls "Horse Ridge." The chip is can control multiple qubits in a quantum computer. In its announcement, Intel claims that development of the chip represents a major milestone on the path toward a truly viable quantum computer. Also, as part of its announcement, Intel claims that other players in the quantum computer development world have neglected an important part of any such computer—a way to control many qubits at the same time. Intel reports that they developed the new chip in collaboration with TU Delft and TNO using technology developed in-house. They suggest the new chip will dramatically increase the potential for development of truly useful quantum computers.

Quantum computers are based on qubits, which are notoriously unstable. To make them more stable, quantum computer engineers build in redundancies, thus preventing errors from ruining calculations—that is why so many qubits are needed. The qubits are housed in freezers that keep them very near absolute zero. They are controlled by microwave pulses that originate outside of the freezer. This means that each unit has a host of cables sticking out of it connected to an external controller.

Intel's new chip goes inside the freezer with the qubit, eliminating the cable mess. That is why it is called a cryogenic control chip. The new [chip](#) is also a lot smaller than others that are currently in use. Taken together, the two features open the door to a single controller to manipulate more than one [qubit](#)—Intel claims that Horse Ridge lays the foundation for future controllers that will be able to control thousands or even millions of qubits, making the realization of quantum computers possible. Miniaturization, they claim, is the key. Notably, miniaturization is one of Intel's strong suits.

Intel has made another change to the design of a quantum [computer](#), as well—they have raised the temperature inside the freezer a couple of

degrees—enough to keep the heat from Horse Ridge from causing problems with the qubits. They also acknowledge that development of truly useful quantum computers is still a very long way off, calling current development "mile one" of a marathon.

**More information:** [newsroom.intel.com/news/intel- ... computers/#gs.lkj93l](https://newsroom.intel.com/news/intel-computers/#gs.lkj93l)

[newsroom.intel.com/editorials/ ... practical/#gs.lkj9xp](https://newsroom.intel.com/editorials/...practical/#gs.lkj9xp)

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