

Quick Take

Incremental Progress for China's Commercial Quantum Computing Sector

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HYPERION RESEARCH OPINION

In late January of 2021, Origin Quantum (OriginQ), China's first domestic quantum computing (QC) start up, successfully raised US\$15.4 million in a Series A round needed to continue development of its full-stack QC system capability. Its current QC system, the Wu Yuan, incorporates OriginQ's in-house developed quantum processor, the KF C6-130, that has six superconducting qubits. Despite such examples of progress, continued advancement by the small number of commercial Chinese QC developers is not assured. China's significant and broad base of government funding for QC research and its resulting world-class capabilities primarily resides within Chinese government facilities. Improved mechanisms for transferring or independently fostering those same skills within the nascent Chinese QC commercial sector may be needed if Chinese commercial QC vendors are to close the technology and product development gap with leading-edge US and European commercial QC counterparts.

CURRENT SITUATION

In late January of 2021, Origin Quantum (OriginQ), China's first domestic quantum computing start up, successfully raised US\$15.4 million in a Series A funding to continue development of its full-stack quantum computer capability. OriginQ was founded in 2017 as a spinoff of the Key Laboratory of Quantum Information at the Chinese Academy of Sciences, where the company's two co-founders had previously held senior research positions. This particular round of investments was led by the China Internet Investment Fund, a Chinese government-affiliated fund, with additional participants including the China Reform Fund, a state-owned assets management corporation under direct supervision from the central government, and CCB International, a Chinese bank-owned investment service.

Currently, OriginQ offers a full stack quantum system, supplying its own quantum processor and related measurement and control hardware as well as a quantum OS, a quantum programming language and related compilers, and a range of quantum applications. Its current QC system, the Wu Yuan, incorporates OriginQ's in-house developed quantum processor, the KF C6-130, that houses six superconducting qubits. The chip also incorporates a quantum data bus that uses microwave photons to support long-distance coupling and information transmission among multiple qubits on a single chip.

- OriginQ has also announced details on its development of a second quantum processor, the XW S2-200, which is a two-qubit silicon spin device, an alternate modality to superconducting qubits that can operate at higher temperatures and draw more heavily on traditional semiconductor production capabilities.

In September 2020 the company began offering a cloud service that enables developers to write quantum software applications and simulate them on a quantum virtual machine. Going forward, the company's new 24-qubit computer is in the debugging stage, expected to be launched in mid-February 2021. OriginQ plans to deliver a 64-qubit machine at the end of 2021 or early in 2022.

OriginQ stands with a handful of other Chinese commercial quantum computing developers, primarily cloud service providers. They include Aliyun, an 11-qubit quantum computing service, jointly launched by Chinese cloud service provider Alibaba and the Chinese Academy of Science, along with Baidu, which offers cloud-based quantum computing platform called Quantum Leaf designed for programming, simulating, and executing quantum workloads.

- There are some additional Chinese start-ups, most that emerged from Chinese national labs, including Origin, Qasky and QuantumCTek. The major Chinese computer makers, Lenovo, Inspur and Sugon, currently have no significant QC research activities.

FUTURE OUTLOOK

Despite the progress noted here, continued advancement by the small number of commercial Chinese quantum computing developers are not assured. Attempts by these or other new Chinese entrants to compete effectively with world-class US and European commercial organizations may fall short due to a lack of funding targeted for the commercial sector, be it from government or commercial funding entities.

Beijing's significant and broad base of government funding for QC research and its resulting world-class capabilities are well documented, but much of that ability currently resides within Chinese government facilities. Transferring those skills into a nascent commercial sector will not be easy, and to date only a small number of companies have made that leap. Recognizing this, Beijing may need to consider additional incentives that target the development of a more competitive commercial QC supplier base either through direct funding or by taking steps to attract commercial investment.

Absent that, China may not be able to keep on a development pace sufficient to close the commercial QC ecosystem gap that currently exists with US and some European counterparts. In the long term, Chinese QC end users in the commercial sector may find themselves dependent on foreign suppliers to meet any growing needs for QC hardware, software, and applications.

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