

Quantum Insider Insights: Volume 4 – China’s Quantum Quest

At TQD access to our leading data platform - [The Quantum Insider](#) – allows us to provide deeper insights into the key recent quantum news.

[China’s Superconducting Quantum Computer](#)

China recently published a paper on [the pre-print server ArXiv](#) that its superconducting quantum computer bested classical computers, an achievement that researchers refer to as “quantum supremacy.” While it’s an impressive scientific achievement, what can we glean from the study that may give us an idea about the current status of Quantum China and can it help us take a glimpse into the nation’s quantum future?

Key points in [our story in TQD](#):

- A team of researchers performed random quantum circuits sampling for benchmarking on the superconducting quantum processor developed by the team. The quantum computer, named Zuchongzhi, is described as a two-dimensional programmable computer composed of 66 functional qubits in a tunable coupling architecture.
- They found that the computational cost of the classical simulation of this task is estimated to be **2-3 orders of magnitude higher** than the previous work on **Google’s 53-qubit Sycamore processor**.
- The scientists estimate that the sampling task finished by Zuchongzhi in **about 1.2 hours would take the most powerful supercomputer at least 8 years**.
- In May, 2021, the team announced it had [built the superconducting computer](#). According to the paper, the computer is an 8×8 two-dimensional square superconducting qubit device with 62 functional qubits.
- In December, 2020, [a team of Chinese researchers](#) reported that an optical circuit has performed a quantum computation called “Gaussian boson sampling” (GBS) much faster — in fact, 100 trillion times faster — than a supercomputer could.
- All the research teams were led by Jian-Wei Pan, often called that country’s Father of Quantum, and this is a name that should be followed by all quantum-watchers.

Observations

Chinese Scientific Advances

It is almost impossible not to frame news coming from quantum scientists in China in any other way than “China versus the West” or, even more directly, “China versus the United States.” But that unfortunately tends to obscure this team’s impressive work and the significant amount of international collaboration, at least going on between more junior researchers. In fact, this latest announcement of quantum supremacy is just the latest in a series of world firsts for the nation. The computer itself has more superconducting qubits than any other quantum computer. Further, this milestone was reached only six months after a paper established that China’s optical circuit quantum computer could vastly outperform classical supercomputers. This doesn’t even include the work Chinese scientists – and Dr. Pan, in particular – have done in quantum communication.

If we are able to pull back far enough from the quantum nationalism debate, just for a moment, we can appreciate these achievements and even recognize that these advances will most likely contribute to the total effort to create practical quantum computing around the world.

Quantum Supremacy with Two Modalities

Now, let's consider the quantum nationalism frame. The Chinese study – even though it has not been yet verified by peer review – offers a striking example of that nation's quantum engineering prowess, if confirmed. The scientists rapidly developed different modalities to accomplish quantum supremacy. So far, in the West, no company - nor research institution - has been able to match this versatility.

The first modality that achieved better-than-supercomputer status used an optical circuit approach. This announcement received some criticism because the device is built to accomplish the specific task, which, suggests that using the device for other tasks would be impractical. The superconducting qubit approach is more practical, although suffers from the same scalability and complexity issues encountered by other superconducting designs.

The Insider View

Many view China as having an international leadership position in quantum. The skill and knowledge of China's scientific teams are undisputed. Nonetheless, what we are learning from other markets and ecosystems is that even the best researchers and the most well-equipped laboratories are obviously important, but are only one ingredient in a complex recipe for successful quantum ecosystems. For China, the crackdown on tech businesses – [Alibaba](#), [Ant](#) and, more recently, [Didi](#) – show signs of backfiring, at least anecdotally. For example, the number of [Chinese unicorn IPOs – companies worth a billion dollars – are in a steep decline](#). If this is a result of the crackdown, which can't be perfectly assessed, and if this reluctance to build companies extends to quantum, two things may result: Chinese entrepreneurs may leave to pursue quantum ambitions elsewhere and-or this impressive research never builds out that final mile from the lab to practical applications.



Matt Swayne, Editor and Analyst

Matt Swayne is the editor of The Quantum Daily. He is a science and information officer at Penn State and has over 30 years journalistic experience. He has written extensively on the key quantum ethics issues, including numerous interviews with key industry thought leaders

**Alex Challans, CEO**

Alex Challans is the CEO of The Quantum Daily. He was previously an Investment Director of a London-based Private Equity fund, focussed on technology investments.