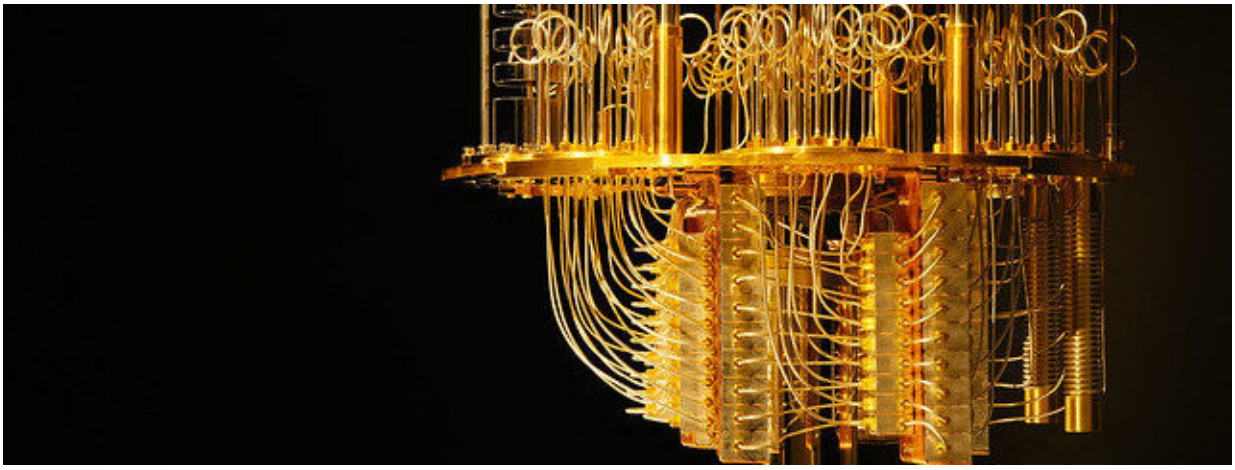
Scientists develop first quantum algorithm to characterize noise across large systems

August 10 2020



The researchers used the IBM Quantum Experience to conduct their experiments. Credit: IBM

Quantum systems are notoriously prone to errors and noise. In order to overcome this and build a functional quantum computer, physicists should ideally understand the noise across an entire system. That has been out of reach until now, with Dr. Robin Harper and colleagues developing the first system-wide quantum algorithm to characterize noise.

Noise is the main obstacle to building large-scale quantum computers. To tame the noise (interference or instability), scientists need to

understand how it affects an entire quantum system. Until now, this information was only available for very small devices or subsets of devices.

Work by Dr. Robin Harper and colleagues published today in *Nature Physics* develops algorithms that will work across large quantum devices. They demonstrate this by diagnosing the noise in an IBM Quantum Experience device, discovering correlations in the 14-qubit machine not previously detected.

Dr. Harper said: "The results are the first implementation of provably rigorous and scalable diagnostic algorithms capable of being run on current quantum devices and beyond."

Dr. Harper is a postdoctoral researcher at the University of Sydney Nano Institute and part of the Australian Research Council Center of Excellence for Engineered Quantum Systems.

More information: Efficient learning of quantum noise, *Nature Physics* (2020). DOI: 10.1038/s41567-020-0992-8 , www.nature.com/articles/s41567-020-0992-8

Provided by University of Sydney