Quantum News Briefs February 23: How can quantum technology improve earthquake detection?; Toronto startup Quantum Bridge Technologies to test its quantum-resistant key distribution solution; QuantWare launches technology that makes superconducting quantum computers massively scalable + MORE.

By Sandra Helsel posted 23 Feb 2023

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How can quantum technology improve earthquake detection?

The Quantum Technology hub for Sensors and Timing led by the University of Birmingham is developing sensors that exploit the quantum behaviour of cold atoms to measure gravity accurately. Quantum News Briefs summarizes a University of Birmingham article explaining quantum sensors' ability to provide a warning before current methodoligies can detect danger.

Earthquakes induce redistribution of mass and this generates observable changes of the Earth's gravitational field, measurable using specialized instruments. High accuracy gravity measurements may provide a useful tool to help with managing the risk by identifying which faults are under stress and most likely to be active. .

Perhaps even more impressively, it is possible to detect an instantaneous gravity signal caused by the shifting of the mass in the ground which arrives before the first seismic waves. Such an approach has the potential to give earlier warnings by overcoming limitations imposed by the propagation speed of seismic waves.

While an alert triggered by a gravity signal might only give a few additional seconds, such a warning can provide extra time to allow the public to take preventative action, such as ensuring fire station doors are opened before they may be disabled. It could also allow the shutdown of public transit to avoid derailment, as well as power, gas and other networks which may be damaged or provide secondary risks such as fire, saving lives.

Current earthquake warning systems are based on networks of accelerometers and seismometers which detect the early arrival "P" seismic waves prior to the arrival of the more destructive shear waves, but are unable to respond before the ground movements have already started greatly limiting how advanced the warning can be.

Toronto startup Quantum Bridge Technologies to test its quantum-resistant key distribution solution

Quantum Bridge Technologies (QBT) has received a $1 million contract that will allow the department of Innovation, Science and Economic Development's research unit to test its Key Management Entity and Black Phone products. Quantum News Briefs summarizes February 21 IT World Canada article.

Quantum Bridge says its Key Management Entity uses distributed symmetric key exchange (DSKE) and can integrate with existing network appliances and infrastructure. It says its Black Phone app for instant messaging, voice and video calls uses DSKE to deliver secure authentication and end-to-end encryption and authentication that can't be hacked by a quantum computer.

The tests involve creating two points of presence — one in Ottawa and one in Montreal — with Layer 3 tunnel (a VPN) with IPsec, and a Layer 2 tunnel. Quantum Bridge's key management solution will provide the encryption and authentication for the tunnels.

Over a two-month period, there will be performance and penetration tests plus an audit. For the mobile test, there will be iPhones and laptops, plus scalability and penetration tests.

Michele Mosca, a member of the University of Waterloo's Institute for Quantum Computing, welcomed news of the Quantum Bridge test. "Part of making Canadian digital infrastructures quantum-safe is to be ready for the possibility that what we currently believe is strong public-key cryptography is unexpectedly broken," he said in an email. "So, in addition to the public-key methods, for critical systems we need robust and scalable solutions that aren't susceptible to mathematical cryptanalysis.

The test is just one of the efforts Canada is taking to help companies here find and market quantum-resistant solutions. Click here to read IT World Canada article in-entirety.

QuantWare launches technology that makes superconducting quantum computers massively scalable

QuantWare, the leading provider of large-scale superconducting quantum processors, has launched Tenor, a new processor which features a massively scalable technology and enables quantum computers with 64 fully controllable qubits to be built commercially.
Superconducting qubits have led the quantum computing race for the last few decades, but have yet to scale to truly useful qubit counts because of scaling bottlenecks. Previous generation devices have been planar: the connections between the qubits and the outside world were routed to the edges of the chip. This limits the number of qubits to the numbers seen today.
QuantWare has developed a patented 3D technology that routes the connections vertically, making it possible to scale superconducting quantum processors to thousands of qubits – opening the door to 'quantum advantage' where quantum computers will overtake the most powerful classical computer. Tenor marks a significant advance in commercial quantum computing because it is the first device commercially available that features this technology.
The quantum processor features 64 fully controllable qubits, which is a device with more than twice the number of qubits than the previously largest available quantum processor. Because the qubits are fully controllable, these processors are very suitable for powerful error-correction schemes. Such a design requires more connections per qubit than the often used fixed frequency qubits, and as such were impossible at a scale of 64 qubits with conventional planar devices. QuantWare unlocks these powerful devices for the quantum community by bringing its technology to the market at a 10x lower price point than competing solutions
>QuantWare's aim is to become the 'Intel of quantum computing' by providing easy-to-use, increasingly powerful and affordable quantum processors to organisations across the world. Last year, QuantWare was selected to deliver quantum processing units for Israel's first fully functional quantum computer.

CERN QTI launches its new series of online lectures to explore quantum science

The CERN Quantum Technology Initiative has organised a new lecture series in the framework of its education and training programme. Starting on 1 March 2023, the curated talks will cover various aspects of four key research areas: quantum theory and simulation; quantum sensing, metrology and materials; quantum computing and algorithms; and quantum communication and networks. The first lectures will capitalise on poster contributions submitted for QT4HEP22, but all young researchers and doctoral students who would like to present their ongoing research are welcome to give a talk.

The primary goal of the programme is to provide a platform for young scientists to showcase their work and experiences, exchange ideas with fellow emerging professionals and bring new insights into the rapidly evolving field of quantum science. Each lecture is intended to raise awareness and understanding of the recent developments, opportunities and challenges in various areas of quantum research, and will also offer resources and tools to learn more about the topics covered independently.

Free and open to all, the online lectures will take place regularly, on Wednesdays, starting at 11.00 a.m. CET. They will be broadcast live for participants worldwide and will also be made available via Zoom to everyone who has a valid Indico account. All lectures will be recorded and published on the CERN QTI website and on the CERN Lectures YouTube channel to watch and re-watch in the future.

The first round of talks, coming up in March, is listed below, and a full list of lectures can be found here*. Join us as we explore the exciting possibilities of quantum technologies together! Click here to read full details on CERN website.

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