Big scientific breakthrough at sub-atomic level holds promise for secure comms

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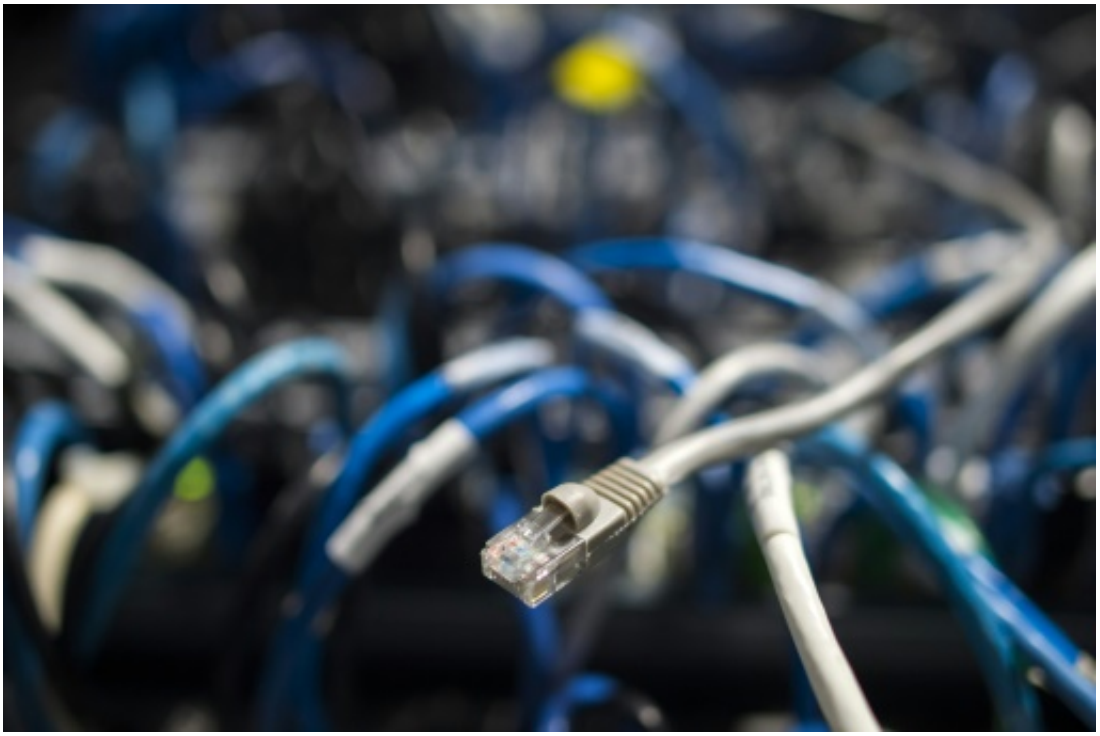

Entangled particles hold the promise of creating a communications system that can send secure messages without cables, signals or code

Chinese scientists have pulled off a major feat with one of the sub-atomic world's weirdest phenomena: photons that behave like twins and experience the same things simultaneously, even over great distances.

The space-based technique developed by the researchers and reported in

the journal *Science* holds potential for revolutionizing telecommunications and perhaps someday developing a hack-proof internet.

The principle is called quantum entanglement, in which photons or neutrons are created in such a way that they are linked and behave as if they were one entity, even if they are physically separated.

In a groundbreaking experiment led by Professor Jian-Wei Pan of Hefei University in China, a laser on a satellite orbiting 300 miles above the earth produced entangled photons.

They were then transmitted to two different ground-based stations 750 miles (1,200 kilometers) apart, without breaking the link between the photons, the researchers said.

That distance is 10 times greater than the previous record for entanglement. The experiment also marked the first time entangled photons were generated in space.

Both stations are in the mountains of Tibet, at a height that reduced the amount of air the fragile photons had to traverse.

"It's a huge, major achievement," Thomas Jennewein, physicist at the University of Waterloo in Canada, told Science. "They started with this bold idea and managed to do it."

Entangled particles hold the promise of creating a communications system that can send secure messages without cables, signals or code: any action on one of the twins is detected by the other, so the message sent along such a conduit can't be hacked.

Those properties of quantum physics also hold the potential for super-

fast computers.

American and European teams are considering sending quantum-based equipment to the International Space Station.

One test would see whether changing gravitational fields affect entanglement.

Scientists would compare photons in the weaker gravitational environment of orbit with entangled partners sent to Earth, says Anton Zeilinger, a physicist at the Austrian Academy of Sciences in Vienna.

"There are not many experiments which test links between gravity and quantum physics," he told Science.

"I'm personally convinced that the internet of the future will be based on these quantum principles."

More information: J. Yin el al., "Satellite-based entanglement distribution over 1200 kilometers," *Science* (2017). science.sciencemag.org/cgi/doi … 1126/science.aan3211