

Quantum telecloning: Captain Kirk's clone and the eavesdropper

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Imagine Captain Kirk being beamed back to the Starship Enterprise and two versions of the Star Trek hero arriving in the spacecraft's transporter room. It happened 40 years ago in an episode of the TV science fiction classic, and now scientists at the University of York and colleagues in Japan have managed something strikingly similar in the laboratory - though no starship commander was involved.

The first experimental demonstration of quantum telecloning has been achieved by scientists at the University of Tokyo, the Japan Science and Technology Agency, and the University of York. The work is reported in the latest issue of *Physical Review Letters*. Telecloning combines cloning (or copying) with teleportation (i.e., disembodied transport).

The scientists have succeeded in making the first remote copies of beams of laser light, by combining quantum cloning with quantum teleportation into a single experimental step. Telecloning is more efficient than any combination of teleportation and local cloning because it relies on a new form of quantum entanglement - multipartite entanglement.

Professor Sam Braunstein, of the Department of Computer Science at York, said: "Quantum mechanics allows us to do things which we previously thought were impossible. In 1998, I was involved in an experiment in America which was one of the first for quantum teleportation in which we transmitted a beam of light without it crossing the physical medium in between.

"This new experiment is an extension of that work. Whether it will change the world for individuals or is just of use to governments or big companies is hard to say. Any new protocol is like a new-born baby and it has to develop, but we know this one could be used to tap cryptographic channels.

"Quantum cryptographic protocols are so secure that they can not only discover tapping but also where and how much information is leaking out. Now, using telecloning, the identity and location of the eavesdropper can be concealed."

Telecloning and teleportation may no longer be theories, but we are still a long way from teleporting people.

Professor Braunstein said: "What we know is that it would be incredibly difficult and from the perspective of today's technology, a completely outrageous thing. But in 100 years, who knows?"

The article "Demonstration of quantum telecloning of optical coherent states" is scheduled for publication in the February 17 issue of the scientific journal *Physical Review Letters*. The full list of authors is: S.Koike, H.Takahashi, H.Yonezawa, N.Takei, Prof. S.L.Braunstein, T.Aoki and Prof. A.Furusawa.

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