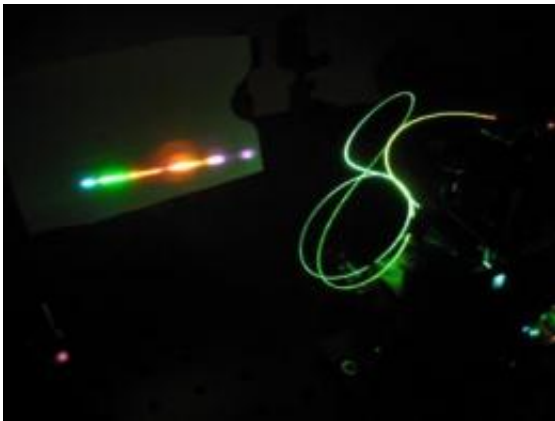


# Scientists demonstrate all-fiber quantum logic

May 28 2009

---



This is an image of a photonic crystal fiber. Credit: Alex Clark

A team of physicists and engineers have demonstrated all-fibre quantum logic, where single photons are generated and used to perform the controlled-NOT quantum logic gate in optical fibres with high fidelity.

The only quantum technology in practical use today is [quantum cryptography](#) and is currently limited in the distance over which secure communication may occur.

More sophisticated quantum networks will require multiple nodes with the ability to implement small-scale quantum processing in order to increase the range of quantum communications. Such networks will rely on optical fibre links, making fibre-based [photon](#) generation and

information processing of key technological importance.

Jeremy O'Brien, Professor of Physics and Electrical Engineering at Bristol University and colleagues, have shown it is possible for a high-fidelity fibre controlled-NOT gate to operate with fibre heralded single-photon sources.

Professor O'Brien speaking about the research, said: "On the basis of a simple model we are able to conclude that imperfections are primarily due to the photon sources, meaning that the gate itself works with very high fidelity."

"Such all fibre quantum information processing will likely have important applications in future quantum networks."

All-fibre [quantum information processing](#) could be used in less mature quantum technologies such as computing, communication and advanced measurement, as well as in the fundamental science of [quantum optics](#).

More information: The team reported its results in the March 2009 issue of *Physical Review A* (Vol 79, No 3).

'All-optical-fiber polarization-based quantum logic gate', Alex S. Clark, Jérémie Fulconis, John G. Rarity, William J. Wadsworth, and Jeremy L. O'Brien, *Physical Review A* (Volume 79, No 3), published 26 March 2009. [link.aps.org/abstract/PRA/v79/e030303](http://link.aps.org/abstract/PRA/v79/e030303)

Source: University of Bristol ([news](#) : [web](#))

Citation: Scientists demonstrate all-fiber quantum logic (2009, May 28) retrieved 27 April 2024 from <https://phys.org/news/2009-05-scientists-all-fiber-quantum-logic.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.