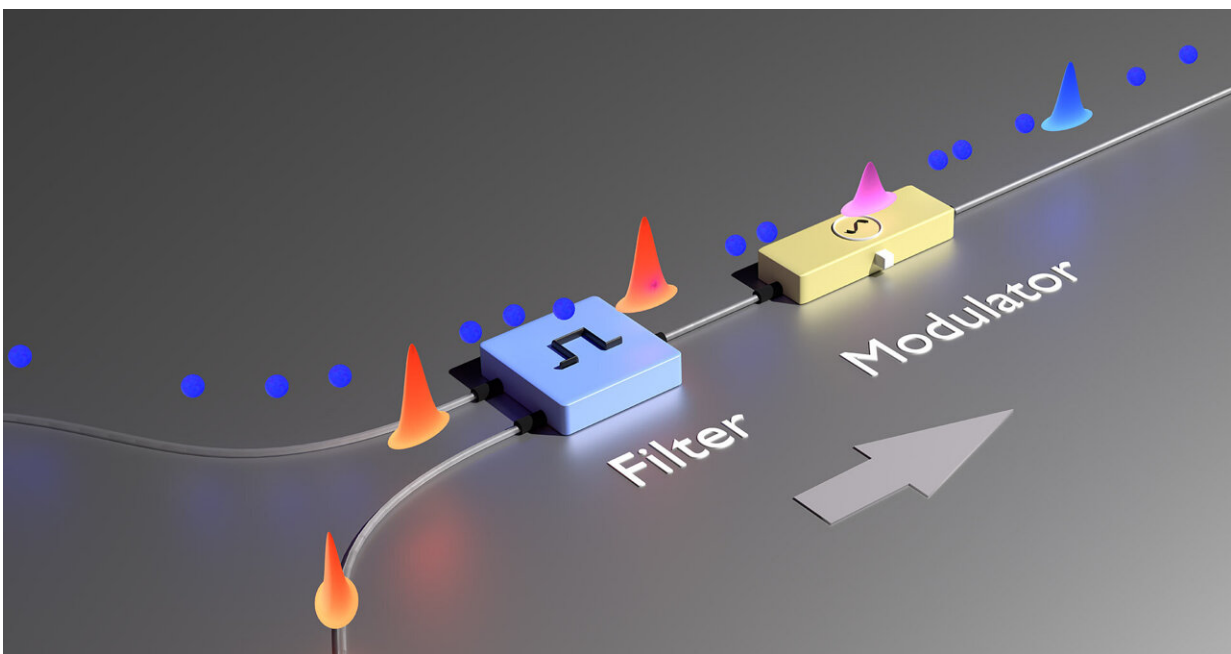


Physicists develop new method to combine conventional internet with the quantum internet

August 5 2024



In their experiment, the researchers can change the color of a laser pulse with a high-speed electrical signal so that it matches the color of the entangled photon. This effect enables the researchers to launch laser pulses and entangled photons of the same color into an optical fiber, and to separate them after transmission. Credit: Institute of Photonics

Four researchers from the Institute of Photonics at Leibniz University

Hannover have developed a new transmitter-receiver concept for transmitting entangled photons over an optical fiber. This breakthrough could enable the next generation of telecommunications technology, the quantum internet, to be routed via optical fibers. The quantum internet promises eavesdropping-proof encryption methods that even future quantum computers cannot decrypt, ensuring the security of critical infrastructure.

"To make the [quantum internet](#) a reality, we need to transmit entangled photons via fiber optic networks," says Prof. Dr. Michael Kues, Head of the Institute of Photonics and Board Member of the PhoenixD Cluster of Excellence at Leibniz University Hannover.

"We also want to continue using optical fibers for conventional data transmission. Our [research](#) is an important step to combine the conventional internet with the quantum internet."

In their experiment, the researchers demonstrated that the entanglement of photons is maintained even when they are sent together with a laser pulse. The research results were [published](#) in *Science Advances*.

"We can change the color of a laser pulse with a high-speed electrical signal so that it matches the color of the entangled photons," explains Philip Rübeling, a doctoral student at the Institute of Photonics researching the quantum internet. "This effect enables us to combine [laser pulses](#) and entangled photons of the same color in an optical fiber and separate them again."

This effect could integrate the conventional internet with the quantum internet. Until now, it has not been possible to use both transmission methods per color in an optical fiber. "The entangled photons block a data channel in the [optical fiber](#), preventing its use for conventional data transmission," says Jan Heine, a doctoral student in Kues' group.

With the concept demonstrated for the first time in the experiment, the [photons](#) can now be sent in the same color channel as the [laser light](#). This implies that all color channels could still be used for conventional data transmission.

"Our experiment shows how the practical implementation of hybrid networks can succeed," says Prof. Kues.

More information: Philip Rübeling et al, Quantum and coherent signal transmission on a single-frequency channel via the electro-optic serrodyne technique, *Science Advances* (2024). [DOI: 10.1126/sciadv.adn8907](#)

Provided by Leibniz University Hannover

Citation: Physicists develop new method to combine conventional internet with the quantum internet (2024, August 5) retrieved 5 August 2024 from <https://phys.org/news/2024-08-physicists-method-combine-conventional-internet.html>

<p>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.</p>
--