

Australian-led research in nanotechnology a huge breakthrough

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(PhysOrg.com) -- Groundbreaking research in quantum light source led by the University of Sydney will result in information speeds many times faster and data that is almost impossible to hack.

The breakthrough, which uses silicon photonic crystals to slow down [light](#), is a collaboration between Centre of Excellence for Ultrahigh Bandwidth Devices for [Optical Systems](#) (CUDOS) nodes at the University of Sydney and Macquarie University, along with colleagues at the University of Bristol and the University of St Andrews (UK), and the Ecole Centrale de Lyon in France.

CUDOS researchers have generated individual pairs of photons in the smallest device ever by slowing light down using silicon photonic crystals. At 100 microns long (approximately the thickness of a human hair) CUDOS's quantum photon device is 100 times smaller than the one-centimetre devices used by other groups.

Dr Chunle Xiong of the University of Sydney, a co-author and project leader for the CUDOS program in Quantum Integrated Photonics, says the device's nano-scale means that potentially hundreds of these photon devices can be incorporated into a single chip. This is a key step to building practical [quantum technologies](#) that will make communications much more secure and computations many times faster.

"We are able to do this by slowing light down through the use of silicon [photonic crystals](#), which means the ultrashort device behaves as a much

longer device, so that the photons are generated in only 100 microns," says Dr Xiong.

Macquarie University's Associate Professor Michael Steel, co-author and CUDOS Chief Investigator, says: "Current systems use classical light to carry information, which hackers can easily tap into and use to their advantage. But you cannot copy the information encoded in quantum states without being noticed by the system. Single photon devices will ensure communication and information systems are secure from hackers, guaranteeing peace of mind for the users."

This pioneering technology will ensure the next generation of information systems is secure and faster, says the University of Sydney's Professor Ben Eggleton, co-author and director of ARC Centre of Excellence CUDOS. The experiment is outlined in a groundbreaking paper to be presented at a prestigious international conference in Baltimore, USA next week for the world's leading researchers in laser and quantum electronics.

Professor Eggleton says this breakthrough is taking CUDOS 'Mark II' into a new and exciting direction. Federal Minister for Innovation, Industry, Science and Research, Senator Kim Carr, officially launched CUDOS II only three weeks ago.

Provided by University of Sydney

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