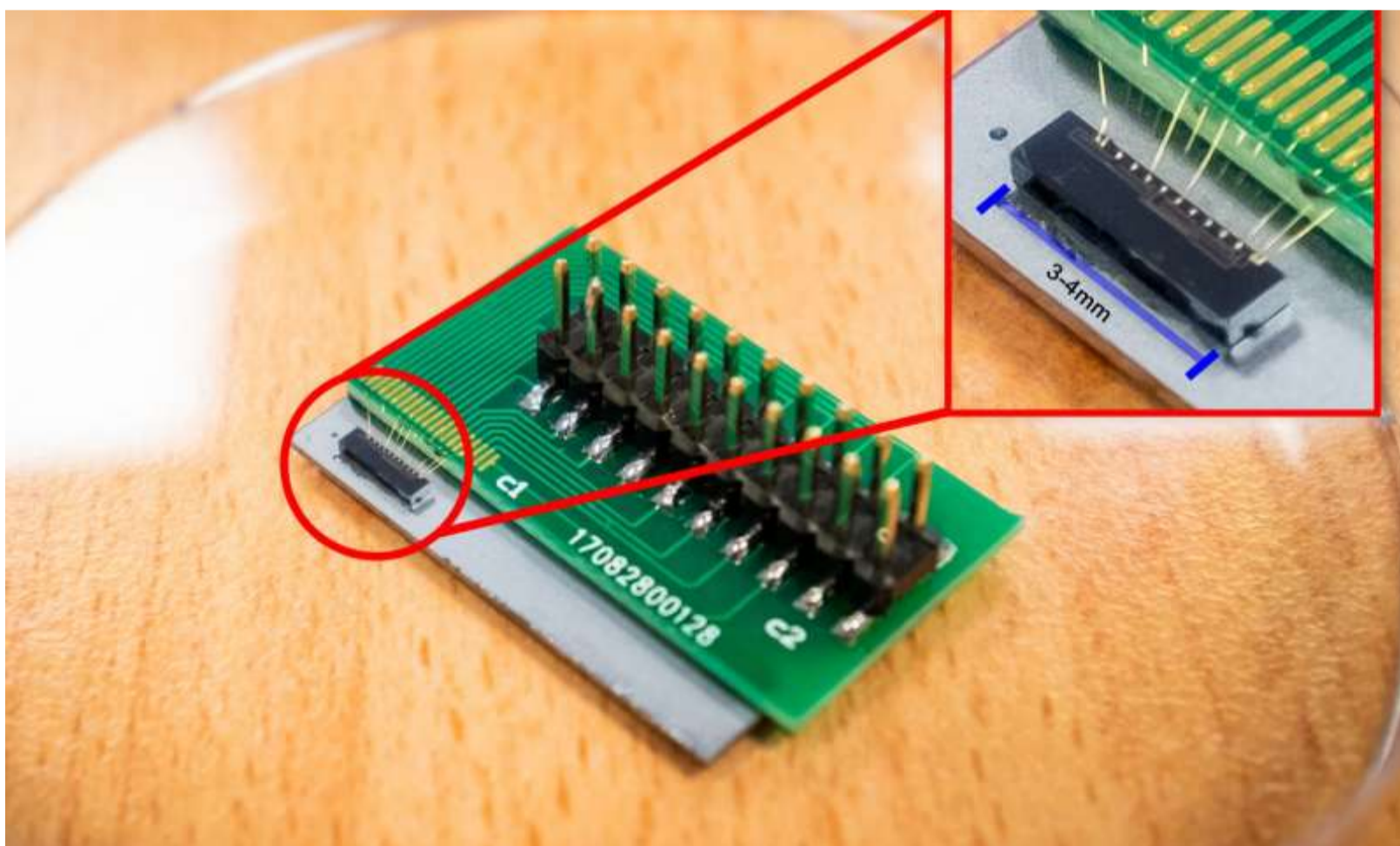
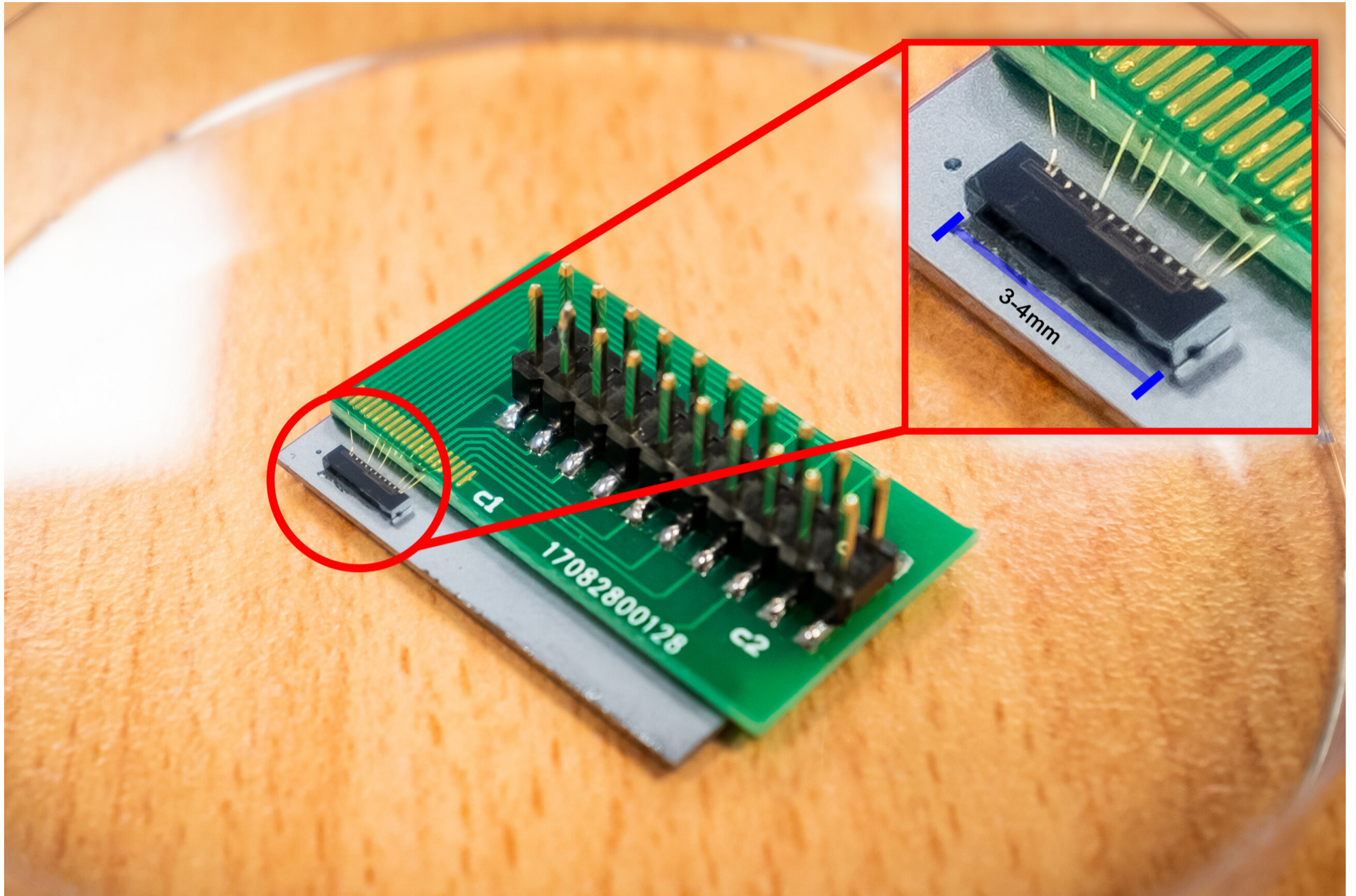


SCIENTISTS CREATE QUANTUM CHIPS 1000 TIMES LESS THAN CURRENT SETTINGS

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About 3 mm in size, small chips developed by NTU researchers use quantum communication algorithms to provide improved security compared to existing industry standards. It also needs 1,000 times less space than current quantum communication settings, open doors for more secure communication technologies

that can be distributed in compact devices such as smartphones, tablets, and smart watches. Credit: NTU Singapore

Researchers at Nanyang Technological University, Singapore (NTU Singapore) have developed a quantum communication chip that is 1,000 times smaller than current quantum settings, but offers the same superior security quantum technology that is known for.

The most leading security standards used in secure communication methods – from withdrawing cash from ATM to buying goods online on the smartphone – do not compromise quantum technology. The electronic transfer of personal identification number (PIN) or password can be captured, which poses a security risk.

About three millimeters in size, the small chip uses quantum communication algorithms to provide improved security compared to existing standards. It does this by integrating passwords in the information supplied and forming a secure quantum key. Once the information is received, it is destroyed along with the key, making it an extremely secure form of communication.

It also needs 1,000 times less space than current quantum communication settings that can be as large as a refrigerator or even take up space for an entire room or office floor. This opens doors to more secure communication technologies that can be distributed in compact devices such as smartphones, tablets and smart watches. It also lays the foundation for better encryption methods for online transactions and electronic communications.

Led by NTU Professor Liu Ai Qun and Associate Professor Kwek Leong Chuan, the team's results were published in a leading peer-review journal, *Nature Photonics*.

Prof Liu, who is from NTU's School of Electrical and Electronic Engineering, said: "In today's world, cyber security is very important because so much of our data is stored and communicated digitally. Almost all digital platforms and repositories require users to specify their passwords and biometric data, and as long as this is the case, it can be intercepted or decrypted. Quantum technology eliminates this because both the password and the information are integrated into the message sent and form a quantum key."

Assoc Prof Kwek explains that quantum communication works of random code strings to encrypt the information, which can only be opened by the recipient with the right button closed. There is no need to transfer additional passwords or biometric data, which is standard practice in current forms of communication.

"It's like sending a secure letter. Imagine the person who wrote the letter locked the message in an envelope with its key inside as well. The recipient needs the same key to open it. Quantum technology ensures that key distribution is secure, which prevents manipulate the key," says Assoc Prof Kwek, a physicist at NTU's National Institute of Education.

(LR) NTU Prof Liu Ai Qun and Assoc Prof Kwek Leong Chuan show the small 3mm quantum communication chip embedded in the bottom right of the green circuit board, which is 1 000 times less than the current settings and provides almost unacceptable levels of encryption. Credit: NTU Singapore

Military Communication Technology, Cost Effective

The world's largest tech companies including Google and IBM are competing to develop quantum supercomputers that would revolutionize computers at speeds that are now unthinkable.

A much-anticipated power of quantum technology lies in cryptography, the art of secret communication.

With the proliferation of Internet services, e-mails and messaging platforms such as WhatsApp, Facebook, Skype, Snapchat, Telegram etc. have created their own secure channels of communication – what are called "classic channels."

In contrast, quantum channels that carry information have security protocols integrated into the encrypted data. Each channel is uniquely different from each other, which reduces or even eliminates the risk of information being intercepted or leaked during transmission.

Simply put, quantum technology does not require additional passwords or biometric data needed in "classical channels." This eliminates the risk of eavesdropping or information leakage, creating an almost unbreakable encryption.

The quantum communication chip developed by the NTU researchers will be cost-effective as it uses standard industrial materials such as silicon, which also makes it easy to manufacture.

Prof Liu said: "This is the future of communication security and our research will lead us closer to quantum computing and communication. It will help create the next generation of communication devices and improve digital services such as online financial portals for banks and digital government services."

[19659005] The NTU team now wants to develop a hybrid network of traditional optical communication systems and quantum communication systems. This will improve the compatibility of quantum technologies that can be used in a wider range of applications such as internet connection. ^

Measurement unit independent quantum communication without encryption

More information:

G. Zhang et al., An Silicon Chip Integrated Photonic Platform for Continuous-Variable Quantum Key Distribution, *Nature Photonics* (2019). DOI: 10.1038 / s41566-019-0504-5