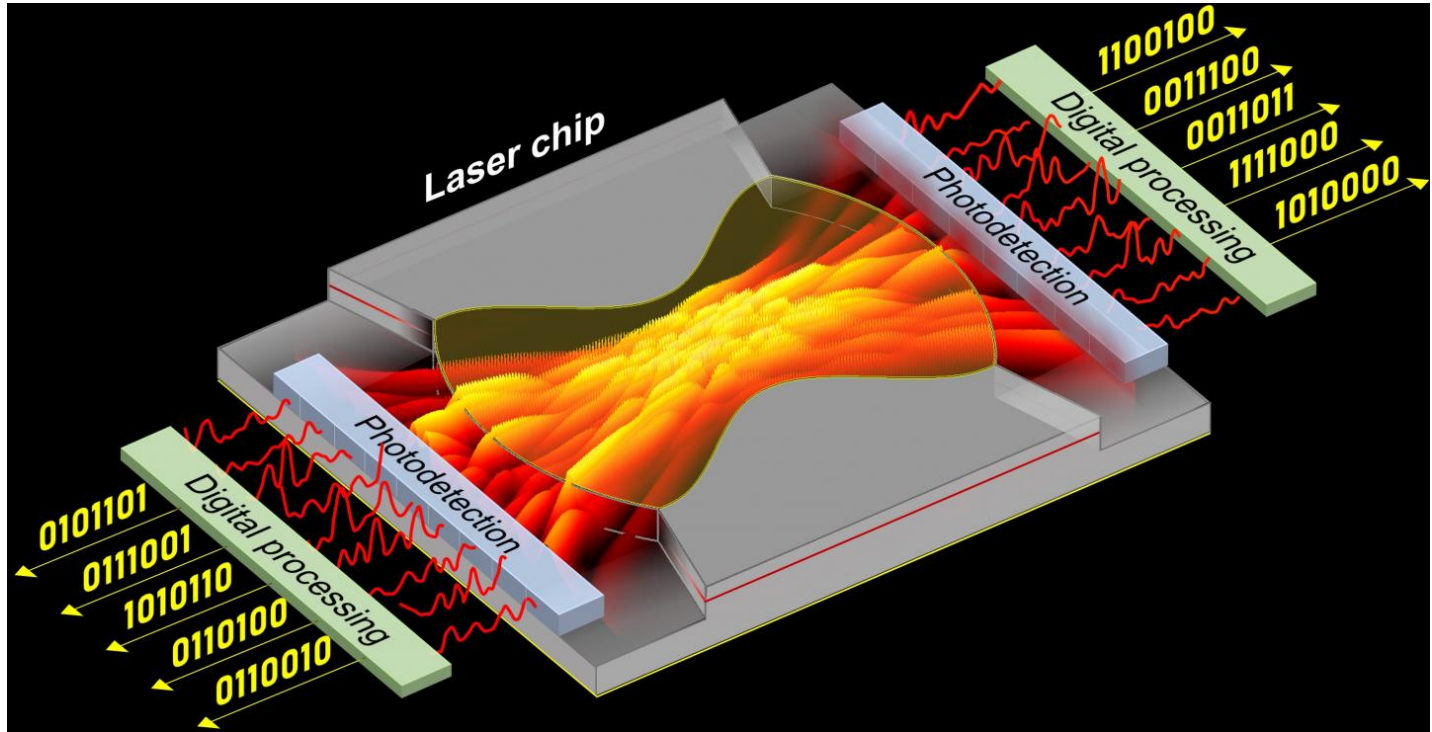
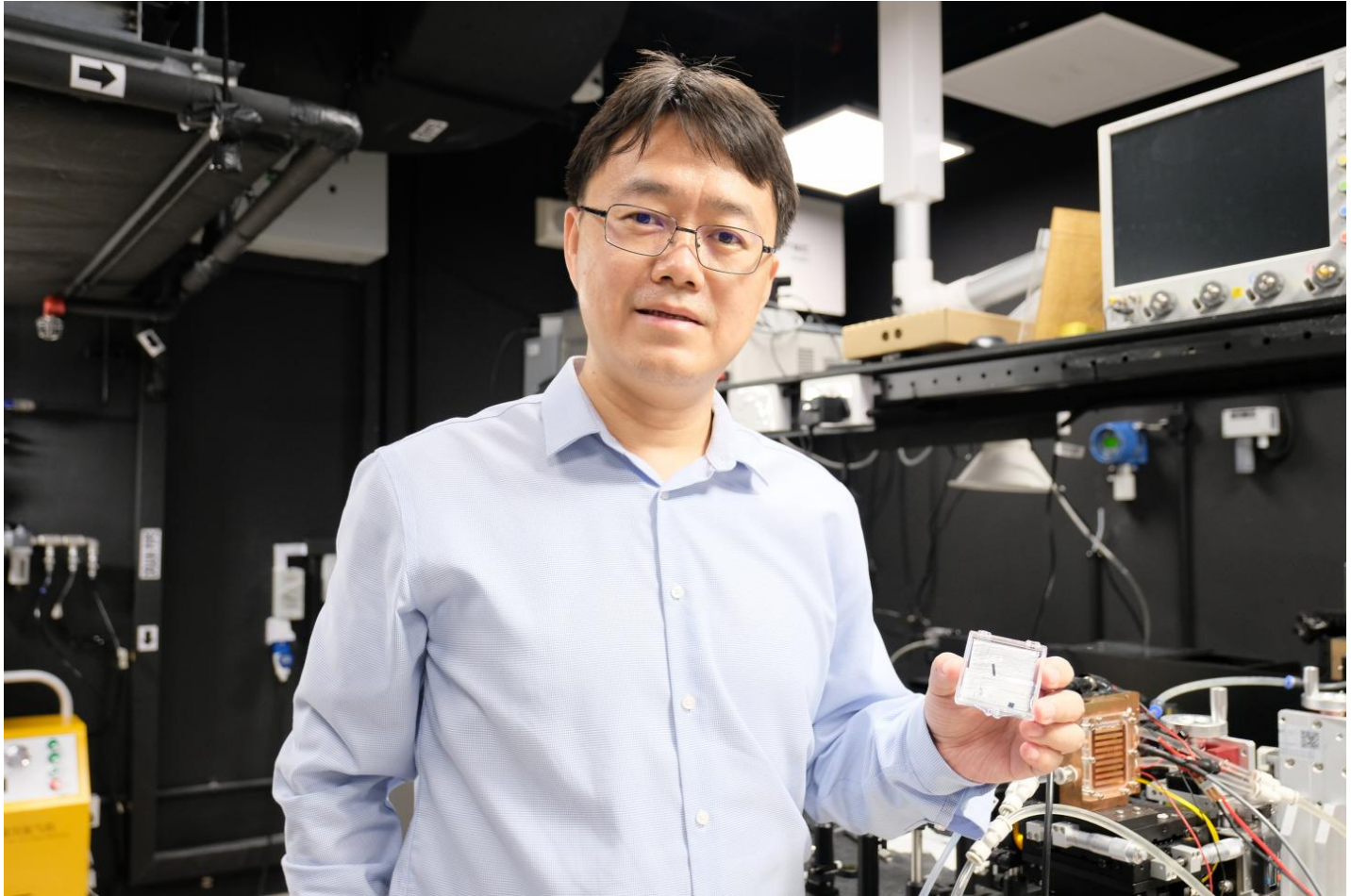


# NTU RESEARCHERS ARE DEVELOPING LASER SYSTEMS THAT GENERATE RANDOM NUMBERS AT ULTRA-FAST SPEEDS

🕒 February 25, 2021 📁 Technology 👁 2 Views





**PICTURE:** Professor Wang Qijie, a leading researcher in the development of the laser system, pictured with a prototype. [view more >](#)

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Credit: NTU Singapore

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An international team of researchers has developed a system that can generate random numbers over a hundred times faster than today's technology, and paves the way for faster, cheaper and more secure data encryption in today-

7;s digitally connected world.

The random generator system was developed jointly by researchers from Nanyang Technological University, Singapore (NTU Singapore), Yale University and Trinity College Dublin, and created at NTU.

Random numbers are used for a variety of purposes, such as generating data encryption keys and one-time passwords (OTP) in day-to-day processes such as online banking and e-commerce to ensure security.

The system uses a laser with a special hourglass-shaped cavity to generate random patterns, which are formed by light rays that reflect and interact with each other in the cavity. By reading the patterns, the system generates many series of random numbers at the same time (see picture 1).

The researchers found that like snowflakes, no two number sequences were generated using the system, the same due to the unpredictable nature of how the light rays reflect and interact with each other in the cavity.

The laser used in the system is about a millimeter long, smaller than most other lasers. It is also energy efficient and can be operated with any household socket, as it requires only one ampere (1A) of power.

In their study published in one of the world's leading scientific journals *Science* On February 26, 2021, researchers verified the efficiency of their random number generator using two tests, including one published by the US National Institute of Standards and Technology.

The research team has proven that the NTU-produced random number generator, which is faster and more secure than existing comparable technologies, can help protect users' data in a world that increasingly trusts Internet transactions (see Figure 2).

Professor Wang Qijie from NTU's School of Electrical and Electronic Engineering & School of Physical and Mathematical Science, as well as The Photonics Institute, who led the NTU team involved in international research, said: "Current random number generators powered by computers are cheap and However, they are vulnerable to attack, as hackers can predict future number sequences if they discover the algorithm used to generate the numbers. Our system is more secure as it uses an unpredictable method of generating numbers, making it impossible for even those with the same device to be replicated. "

Dr Zeng Yongquan, a fellow at NTU's School of Physical and Mathematical Sciences, who co-designed the laser system, said: "Our system surpasses current random number generators, as the method can simultaneously generate many more random sequences of information at a steady faster speed."

The team's laser system can also generate around 250 terabytes of random bits per second – more than a hundred times faster than today's computerized random number generators.

At its speed, the system would only take about 12 seconds to generate a set of random numbers equal to the size of the information in the largest library in the world – the US Library of Congress.

The team continues to work on the system of the future and works to make the technology ready for practical use by incorporating the laser into a compact chip that makes it possible to add random numbers generated directly to a computer.

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