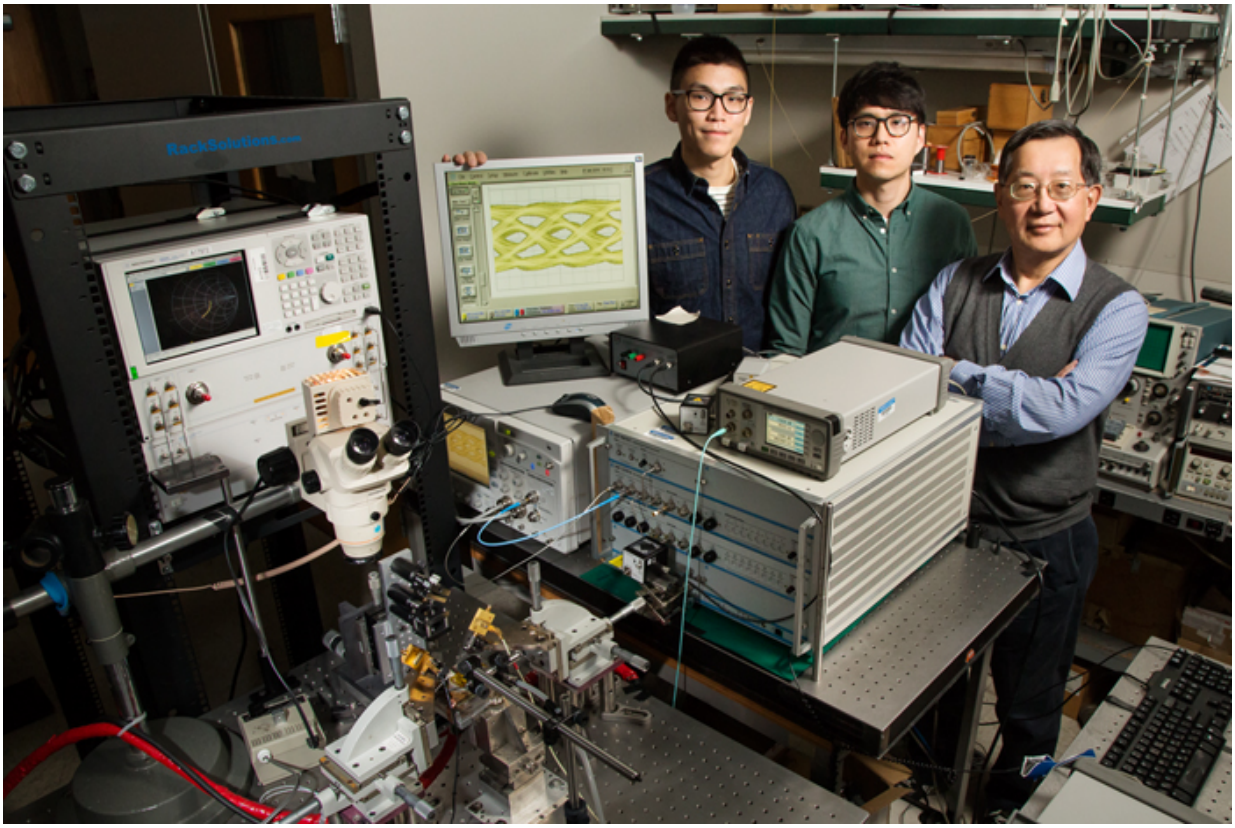
Record-speed data transmission could make big data more accessible

March 23 2016, by Liz Ahlberg



University of Illinois engineers developed fiber-optic technology that can transmit data at a blazing-fast 57 gigabits per second, without errors. Pictured are graduate students Curtis Wang and Michael Liu with professor Milton Feng. Credit: L. Brian Stauffer

With record-breaking speeds for fiber-optic data transmission,

University of Illinois engineers have paved a fast lane on the information superhighway—creating on-ramps for big data in the process.

Graduate researcher Michael Liu will present the research team's developments in oxide-VCSEL technology, which underpins fiber-optic communications systems, at the Optical Fiber Communication Conference and Exposition today in Anaheim, California. The research team was led by electrical and computer engineering professor Milton Feng—who will be in attendance at the conference—and also included professor emeritus Nick Holonyak Jr. and graduate researcher Curtis Wang.

As big data has gotten bigger, the need has grown for a high-speed data transmission infrastructure that can accommodate the ever-growing volume of bits transferred from one place to another.

"Our big question has always been, how do you make information transmit faster?" Feng said. "There is a lot of data out there, but if your data transmission is not fast enough, you cannot use data that's been collected; you cannot use upcoming technologies that use large data streams, like virtual reality. The direction toward fiber-optic communication is going to increase because there's a higher speed data rate, especially over distance."

Feng's group has been pushing VCSEL technology to higher speeds in recent years, and in 2014 was the first group in the U.S. to achieve error-free data transmission at 40 gigabits per second (denoted as Gbps). Now, in a series of conference papers, they report 57 Gbps error-free data transmission at room temperature, as well as 50 Gbps speeds at higher temperatures up to 85 degrees Celsius (185 degrees Fahrenheit).

Achieving high speeds at high temperatures is very difficult, Feng said, due to the nature of the materials used, which prefer lower temperatures.

However, computing components grow warm over extended operation, as anyone who has worked on an increasingly heated laptop can attest.

"That's why data centers are refrigerated and have cooling systems," Feng said. "For data centers and for commercial use, you'd like a device not to carry a refrigerator. The device needs to be operational from room temperature all the way up to 85 degrees without spending energy and resources on cooling."

Feng hopes that the conference presentations and papers will prove that high-speed operation at high temperatures is scientifically possible and useful for commercial applications.

"This type of technology is going to be used not only for data centers, but also for airborne, lightweight communications, like in airplanes, because the fiber-optic wires are much lighter than copper wire," Feng said. "We believe this could be very useful for industry. That's what makes the work so important to us."

More information: The paper "50 Gb/s Error-Free Data Transmission of 850 nm Oxide-Confined VCSELs" is available online as part of the OFC Proceedings. dx.doi.org/10.1364/OFC.2016.Tu3D.2

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