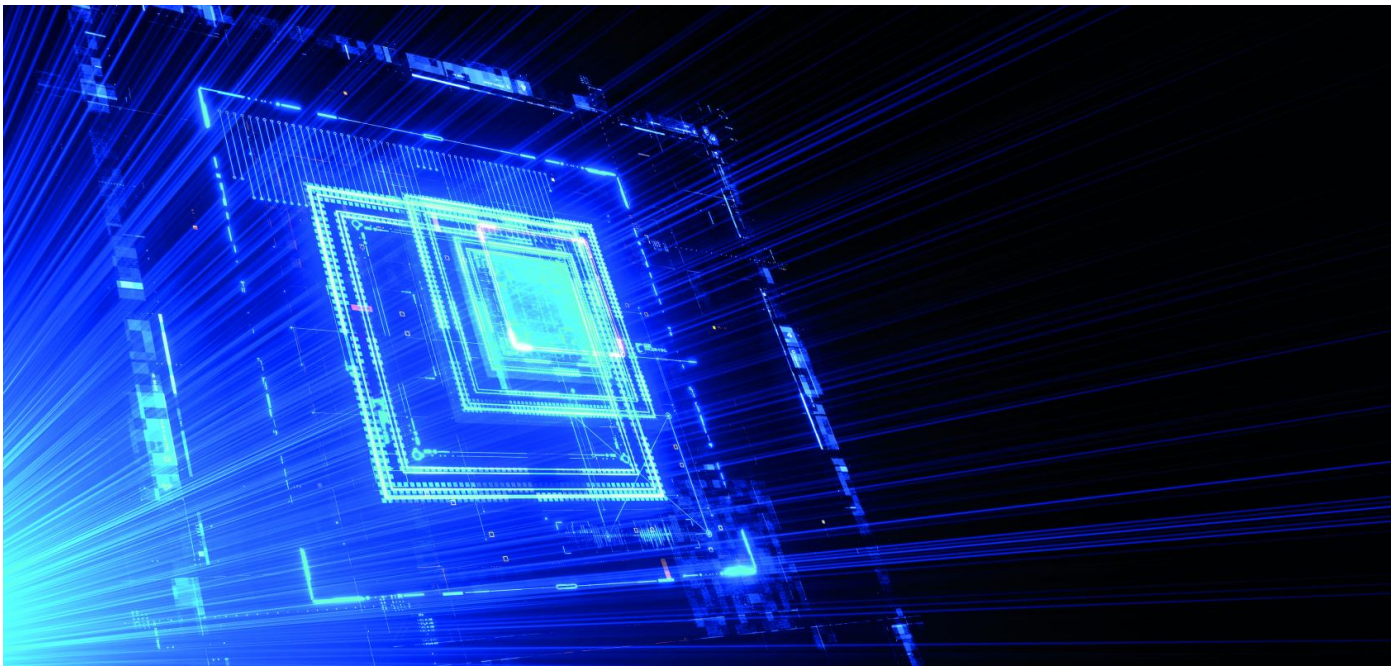
Photonic integrated circuits delivering next-gen optical communications



Scintil's photonic integrated circuit solution is designed to boost communications in data centres, high-performance computing, and 5G networks (Jiang Jie Feng/Shutterstock.com)

In March, OpenLight demonstrated a 224G Indium phosphide-based modulator available for Tower's PH18DA platform, in a move expected to enable faster communication speeds.

The new 224G modulator is integrated on a demonstration photonic integration circuit (PIC) with a heterogeneous integrated laser and other required silicon photonics components to enable a full transmitter. Fabricating these components on a heterogeneous silicon photonics platform enables significant gains in yield, decrease of production complexity, and improved performance.

Measured as part of a fully operational PIC, OpenLight extended the speed of its PAM4 modulator and demonstrated a PAM4 224G eye.

"200G modulation is a key building block and critical path to the delivery of next-generation Ethernet speeds based upon 200G/lane," said Jim Theodoras, Vice President of Research and Development at HGGenuine USA. "This is not just a 200G modulator, but one that is available in a hybrid photonic integrated circuit. Next generation Ethernet cannot be delivered at the power and densities being requested by datacom customers without photonic integrated circuits."

Datacom customers can now extend their multi-lane DR and FR based datacom designs to 224G per wavelength, doubling overall speed without increasing PIC cost.

"This new modulator doubles the speed of every PIC," said Dr Adam Carter, Chief Executive Officer at OpenLight. "For instance, our 800G DR8 PIC, which was recently announced, can become a 1.6T PIC (8x200G). Alternatively, a 400G DR4 PIC can now deliver 800G with four lanes. Our latest offering allows datacom customers to not only prepare for the future, but also keep up with the growing need for increased connectivity speeds."

The technology enables 224G operation on a silicon photonics platform, achieving the same benefits offered by on-chip lasers and optical gain without the need for separate lasers and costly attachment methods.

"As the demand for higher data rates continues to grow unabated, the development of advanced technologies to meet these needs becomes ever more crucial," said Sameh Boujelbene, Vice President Datacenter and Campus Ethernet Switch Market Research at Dell'Oro Group. "200G/channel optical links will be crucial in bringing 1.6Tb and 3.2Tb optical links at the right density and power consumption in parallel with the release of next generation Serdes for use in a variety of architectures to support the massive bandwidth scaling required for cloud, AI/ML and HPC applications."

Commercialising photonic integrated circuits

Other companies working on integrated circuits have achieved significant moves towards commercialisation of PICs over the last year.

Valencia-based start-up iPronics, for example, the developer of a plug-and-play, programmable photonic microchip, delivered its first shipments to customers. These included a multinational telecommunications and electronics company, a European-based optical networking firm and a large US technology company.

The announcement came just months after the firm raised €3.7m in 2022 to bring its photonic processors to market. Its goal is to make computational photonics commercially affordable and encourage its adoption across all layers of industry. Scintil Photonics launched a prototype III-V-augmented silicon photonic integrated circuit (IC). A single solution comprising all the active and passive components made from standard silicon photonics available in commercial foundries, the solution integrated III-V optical amplifiers/lasers on the backside of advanced silicon photonic circuits.

Scintil's solution is designed to boost communications in data centres, high-performance computing (HPC), and 5G networks, prime users of optical transceivers. The 1,600Gb/s prototype IC integrates silicon modulators and germanium photodetectors supporting 56GBaud PAM 4, with integrated III-V-optical amplifiers. It offers the capability of delivering sustainable bit rates through parallelisation and the increase of Baud rates at a competitive cost-per-gigabit-per-second. The IC leverages wafer-scale bonding of III-V materials on silicon for integrating optical amplifiers/lasers.

At OFC 2023, the company demonstrated a single-chip multi-port 100GHz distributed feedback comb laser source for high-performance computing and AI applications.

The Scintil Comb Laser Source is the first fully integrated single chip that achieves 100GHz frequency spacing, which is half to one-quarter of the spacing available today. One of its key advantages is its very narrow controlled channel spacing, an important capability for increasing the number of optical carriers in a single fibre.

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