

Using photons and electrons for higher data transmission rates and greater energy efficiency

- **Data centers for data processing and storage are particularly energy-intensive**
- **The growing demand for generative artificial intelligence is causing the amount of data and thus the computing power to increase enormously**
- **Photonic approaches can be used to handle these workloads in a more energy-efficient way. One solution: photonic processors designed for parallel processing of large amounts of data**

(Frankfurt a. M., 24.10.2024) Artificial intelligence (AI) has now arrived in all areas of life. The use of this technology continues to increase and with it, the amount of data is exploding – the power demand in data centers is rising. The VDE, the Association for Electrical, Electronic & Information Technologies, sees this as an enormous challenge for the future.

“In the interest of digital sovereignty and economic resilience, sensitive data and applications must be stored and processed securely and reliably,” says Dr. Damian Dudek, managing director of the Information Technology Society within VDE (VDE ITG). Both the training of AI systems and their operation require large amounts of energy. When a user sends a request to ChatGPT, it consumes an estimated three to nine watt-hours. If all of the nine billion daily searches were answered by AI, electricity consumption would increase by a factor of 30.

How can the problem be solved? In the future, data channels that support transmission speeds of up to 400 gigabits per second over a single laser wavelength in a fiber optic cable will be required. To process these data transmission rates in a more energy-efficient way, alternatives to conventional integrated digital circuits must be addressed, for example, through integrated silicon photonics-electronics circuits, so-called photonic integrated circuits (PICs).

This is because the use of integrated photonics could reduce energy consumption in data centers. In addition, data can be transmitted in higher bandwidths in the high-frequency spectrum of light. Furthermore, losses due to heat dissipation in photonic circuits are lower, which leads to higher energy efficiency. This is because PICs generate less heat than electrical components and thus relieve the cooling system. "Photonic technologies could play a key role in reducing the energy requirements of data centers while meeting the growing demands for speed and computing power," says Dr. Matthias Wirth, Project Manager Innovation at VDE. "In particular, integrated photonics are increasingly being used in the field of high-performance computing. We expect these solutions to become the industry standard in the near future."

About the Information Technology Society within VDE (VDE ITG)

The Information Technology Society within VDE (VDE ITG) is the national association of all people working in the field of information technology in business, administration, teaching and research and science. Its objectives are to promote the scientific and technical development and evaluation of information technology in theory and practice. Founded in 1954 as the Nachrichtentechnische Gesellschaft, it is the oldest professional association in the VDE. Its nine technical divisions, to which more than 80 technical committees are assigned, represent the entire spectrum of information technology. About 10,000 VDE members have assigned themselves to the ITG and more than 1,000 experts work voluntarily in the committees.

For more information, visit www.vde.com/itg

About VDE:

VDE, one of the largest technology organizations in Europe, has been regarded as a synonym for innovation and technological progress for more than 130 years. VDE is the only organization in the world that combines science, standardization, testing, certification, and application consulting under one umbrella. The VDE mark has been synonymous with the highest safety standards and consumer protection for more than 100 years.

Our passion is the advancement of technology, the next generation of engineers and technologists, and lifelong learning and career development "on the job". Within the VDE network more than 2,000 employees at over 60 locations worldwide, more than 100,000 honorary experts, and around 1,500 companies are dedicated to ensuring a future worth living: networked, digital, electrical. Shaping the e-dialistic future.

The VDE (VDE Association for Electrical, Electronic & Information Technologies) is headquartered in Frankfurt am Main. For more information, visit www.vde.com

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