

IHP presents Joint Lab research results on silicon-organic hybrid electro-optical (EO) modulator for RF photonic ICs at IEDM in San Francisco

Opening a path to ultra-low-power photonic building blocks

Frankfurt (Oder). Researchers of the Joint Lab between IHP – Innovations for High Performance Microelectronics and TH Wildau will report on a hybrid silicon-organic electro-optical (EO) modulator at the IEEE International Electron Devices Meeting (IEDM) from 3rd – 5th December, 2018 in San Francisco. This novel device takes advantage of the quadratic EO effect, opening a path to ultra-low-power photonic building blocks such as tunable filters, switches and RF modulators. Existing silicon-organic hybrid EO modulators employ the linear EO effect in polymers, which initially requires to apply a high voltage in order to activate the organic material. This is, however, associated with longterm and temperature stability issues. The researchers from IHP and TH Wildau investigated an EO polymer that employs the quadratic EO effect instead of the linear effect. While it avoids high-voltage poling, the photonic device itself is designed for an ultra-low per-bit energy consumption of 87 aJ/bit. Small signal frequency experiments show the ability of RF modulation and a voltage-length product of 1 Vcm was deduced from DC experiments, which would lead to low-power EO switches and modulators that operate at CMOS-compatible driver voltages.

The Joint Lab IHP / TH Wildau with its more than 10 years history concentrates on the cooperation for teaching and research. The joint education of young scientists is the focus of this successful cooperation. The Joint Lab format bridges between research and universities. Within the Leibniz-Association, IHP was one of the first institutions with this form of cooperation and is still one of the most active. IHP has eight Joint Labs: In Potsdam, Cottbus, Wildau and Berlin as well as on an international level in Poznań and Istanbul, scientists of the institute are working closely together with the students. Topics of these cooperations are strategically aligned. There is an intensive and successful team work within numerous research projects, which can also be seen in the number of joint publications. IHP is very active within the teaching as well as the supervision and assessment of qualification theses of the partner universities.



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IEEE International Electron Devices Meeting (IEDM) is the world's preeminent forum for reporting technological breakthroughs in the areas of semiconductor and electronic device technology, design, manufacturing, physics, and modeling. IEDM is the flagship conference for nanometer-scale CMOS transistor technology, advanced memory, displays, sensors, MEMS devices, novel quantum and nano-scale devices and phenomenology, optoelectronics, devices for power and energy harvesting, high-speed devices, as well as process technology and device modeling and simulation.

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Further Information:

Joint Lab: <https://www.ihp-microelectronics.com/en/joint-labs/technical-university-of-applied-sciences-wildau/overview.html>

Video IEDM: <https://www.youtube.com/watch?v=BKwGWYyEkmQ>

Paper: <http://btbmarketing.com/iedm/docs/Paper%202023.3,%20Si-Organic%20Electro-Optical%20Modulator%20For%20Low-Power%20Photonic%20ICs,%20IHP%20et%20al.docx>

About IHP:

The IHP is an institute of the Leibniz Association and conducts research and development of silicon-based systems and ultrahigh frequency circuits and technologies including new materials. It develops innovative solutions for application areas such as wireless and broadband communication, security, medical technology, industry 4.0, automotive industry, and aerospace. The IHP employs approximately 300 people. It operates a pilot line for technological developments and the preparation of high-speed circuits with 0.13/0.25 μm BiCMOS technologies, located in a 1000 m² class 1 cleanroom.

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