

## **SCIENTIFIC PRESS RELEASE**

### **A\*STAR IME DEVELOPS A SILICON-BASED OPTICAL MODULATOR FOR ULTRA FAST TELECOMMUNICATIONS**

*An affordable optical modulator to enable high-definition online gaming experience in real-time with multiple players from anywhere in the world*

1. Singapore, 30 May 2013 – Imagine being able to download 10 high-definition movies (each of 4 GB capacity) in less than 1 second or be able to enjoy superior lag-free online gaming experience with multiple players from anywhere in the world. Researchers from A\*STAR Institute of Microelectronics (IME) have designed and developed a silicon-based optical modulator for ultra fast long-distance telecommunications. The device would enable 50% faster download speed than the latest Ethernet standard<sup>1</sup>. The technology can be realised with existing industry fabrication processes, paving way for affordable high speed data communications to the masses.
2. A modulator in an optical telecommunication network transforms electrical signals into optical signals. It performs one of the most critical steps as its switching speed in the signal conversion process dictates the overall rate at which data packets are sent out. In long distance optical communications, the quality of signals transmitted takes on greater significance — a critical performance feature defined by the extinction ratio of the modulator.
3. At record-high extinction ratio of 5.5 dB with 50Gbps data speed, IME's modulator exhibits the highest reported immunity against data distortion to deliver high quality optical signals over even longer distances. The modulator uses the on-off keying (OOK) format, which is widely used commercially. When this format is applied to advanced multilevel modulation format such as QPSK and DP-QPSK, the information capacity and total data communication can be increased to 100 Gbps and 200 Gbps, respectively. Compared to current state-of-the-art, IME's modulator would need 50% less input power to impart optimised cooling, energy and cost savings in high-performance computing and data centres.

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<sup>1</sup> Latest Ethernet speed of 25 Gbit/s per channel specified by newest IEEE standard 802.3ba

4. On the breakthrough, Dr Tu Xiaoguang, the IME scientist involved in the project, said, “By applying a novel structure design, our team was able to achieve a precisely-defined P-N junction profile that can reach high modulation speed without compromising optical signal quality, which has troubled designers in the past. This leads to the remarkable performance of the silicon modulator. Work is underway to develop new designs for pushing the switching speed further.”
  5. Professor Dim-Lee Kwong, Executive Director of IME, said, “Silicon photonics offers promising solutions to marry photonic functionality with electronic intelligence. With the results achieved using CMOS technology, we expect IME’s silicon modulator to offer a distinct lead that is competitive with optical modulators in the market.”
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### **About Institute of Microelectronics (IME)**

The Institute of Microelectronics (IME) is a research institute of the Science and Engineering Research Council of the Agency for Science, Technology and Research (A\*STAR). Positioned to bridge the R&D between academia and industry, IME's mission is to add value to Singapore's semiconductor industry by developing strategic competencies, innovative technologies and intellectual property; enabling enterprises to be technologically competitive; and cultivating a technology talent pool to inject new knowledge to the industry. Its key research areas are in integrated circuits design, advanced packaging, bioelectronics and medical devices, MEMS, nanoelectronics, and photonics. For more information about IME, please visit <http://www.ime.a-star.edu.sg>.

### **About Agency for Science, Technology and Research (A\*STAR)**

The Agency for Science, Technology and Research (A\*STAR) is the lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based and innovation-driven Singapore. A\*STAR oversees 14 biomedical sciences, and physical sciences and engineering research institutes, and seven consortia & centre, which are located in Biopolis and Fusionopolis, as well as their immediate vicinity. A\*STAR supports Singapore's key economic clusters by providing intellectual, human and industrial capital to its partners in industry. It also supports extramural research in the universities, hospitals, research centres, and with other local and international partners. For more information about A\*STAR, please visit <http://www.a-star.edu.sg>.

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