

2010 PSTA WINNER CITATIONS

PRESIDENT'S TECHNOLOGY AWARDS 2010



(from front to back; left to right)

Dr Patrick Lo Guo-Qiang

Dr Liow Tsung-Yang

Dr Ang Kah Wee

Dr Yu Mingbin

Institute of Microelectronics, A*STAR

“For their outstanding contributions in advancing Singapore’s semiconductor technology and industry development through cutting edge research on silicon photonics”

The research on silicon photonics by Dr Patrick Lo and his team from the Institute of Microelectronics (IME) has enabled them to successfully realise a modulator that can transmit optical signals at an ultra fast speed. This was designed to work in tandem with one of the highest gain-bandwidth photodetectors, the Ge/Si avalanche photodetector, also developed by the team. With this silicon photonics technology, extra transmission distance of up to 30km could be achieved. In addition, the ultra low energy per bit Ge electro-adsorption modulator with the smallest device foot-print would also offer a green solution to photonics applications. This development by the team, which helps to transmit data at an ultra high-speed with lower power usage, is set to revolutionise the way we communicate. In carrying out research in a high growth area where research is only emerging, the team is solving a problem that people around the world are trying hard to solve. The research also presents the team with opportunities to stretch the performance boundaries imposed by Moore’s law.

The key differentiator in the team’s silicon photonics research can be found in the silicon photonics devices themselves. Crucially, the team came up with fabrication solutions and designs which are industry-viable and can be fully integrated with existing technology. The highly sensitive photodetector and high performance modulator are built with CMOS-compatible fabrication processes to enable cutting edge products to be readily manufactured with standard manufacturing techniques that are largely available in the electronics industry. Hence, CMOS-compatible processes allow ready integration into the industry processes without companies having to invest in costly new equipment.

While other research teams in the world have kept their research proprietary, the team has chosen to share its findings through its partnership with a foundry, presenting industry with not only a technical solution, but a business model. The innovation presents the industry with a huge opportunity to upgrade to a next generation platform. The team has also completed a library of both active and passive devices for the industry to tap on. This will help to seed an entire technological process in a way which had not been done before.

The team has published more than 50 papers in top prestigious journals, leading IME to earn a reputation as a world leading cost-effective solutions provider for ultra high data-rate low cost optical communications. The team has also developed high performance and low cost silicon photonics devices with industry-viable fabrication solutions and designs, which enable industry partners to accelerate innovation of their products and allowing the companies to gain a foothold in the upcoming optoelectronics market. The silicon photonics research at IME has already begun to bring in potential investors to consider Singapore as a launch pad for their operations and services to the world. Fortune 500 companies and a number of innovative start-ups from the United States have pumped in millions of dollars to leverage on these capabilities. These developments will have positive ramifications on Singapore's economy and will lead to new job opportunities in Singapore.

For their outstanding contributions in advancing Singapore's semiconductor technology and industry development through their leading edge research on silicon photonics, the team, made up of Dr Patrick Lo Guo-Qiang, Dr Yu Mingbin, Dr Ang Kah Wee, Dr Liow Tsung-Yang from the Institute of Microelectronics, A*STAR, is awarded the 2010 President's Technology Award.