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Continuing Success at Chip Olympics

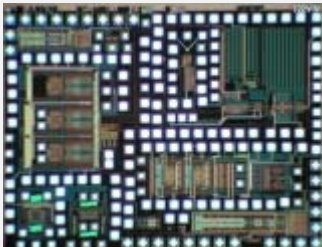
Hong Kong University of Science and Technology (HKUST) researchers have, for the sixth time, presented their latest research findings in integrated circuit (IC) design technology at the IEEE International Solid-State Circuits Conference (ISSCC) - the top international forum in the field, commonly known as the "Chip Olympics".

Two HKUST teams from the Department of Electrical and Electronic Engineering presented at this year's ISSCC, held in San Francisco from 9 to 13 February. They were Postdoctoral Research Associate Dr Vincent Cheung and Associate Professor Howard Luong, who are responsible for the development of a novel signal-conditioning system that can be applied in pacemakers and; MPhil graduate Mei Xue and Associate Professor Mansun Chan, who have applied microelectronics technology to the field of molecular biology to create micro-DNA chips.

This is the sixth time, and also the fifth consecutive year, that HKUST researchers have been selected to present their findings at the Chip Olympics. To date, HKUST is the only university from Hong Kong and the Chinese Mainland to appear at this international event, which reflects positively on the University's decision to make integrated circuit design and packaging one of its key research foci.



[Hi-res image](#) From left: Vincent Cheung, Mei Xue and Dr Howard Luong at the Chip Olympics in San Francisco



[Hi-res image](#) The chip designed by Vincent Cheung

Dr Cheung has created an ultra low-power, low-voltage IC that can minimize power consumption by five to 10 times. Improving on conventional architecture, he has reduced the number of active elements to one super-unit through a time-multiplexing scheme, and optimized the system's operating power consumption at a low voltage supply of only 0.9v, with only 0.5 microWatts dissipation.

Ideal for use in implantable biomedical devices, Dr Cheung's invention consumes less power and less voltage, but increases reliability while using a smaller battery that has a prolonged lifespan. These factors mean a significant reduction in the amount of surgery that patients risk being subjected to.

Appearing at this year's Chip Olympics was a significant personal achievement for Dr Cheung, who has now been invited to present his findings to three ISSCC meetings (2000, 2001, 2003) while a student at HKUST. Dr Cheung's three ISSCC papers focused on the design of low-voltage switched-opamp switched-capacitor systems, an area in which he already holds one US patent for the development of high-performance analog circuits.

Dr Cheung was born in Hong Kong and received each of his BEng (1997), MPhil (1999) and PhD (2002) degrees



from HKUST. "HKUST provides a favorable research environment conducive to new ideas and inventions. To be at the forefront of research, you must compete with top researchers from around the world," says Dr Cheung.

Mei Xue used advanced microchip fabrication technology to develop a high density DNA array with a modified metallization process. The detection of DNA sequences is manipulated by a conductivity differentiation of matched and unmatched DNA molecules.

"The micro-DNA chip is easy to use, fast and accurate. Unlike conventional fluorescence or radioactive detection systems that require human interactions, detection using the chip is automated by the underlying circuits. This will significantly reduce the time and cost involved in complicated diagnosis, such as mutations in the human genome," says Dr Mansun Chan.

Mei Xue is currently pursuing her doctoral studies at the University of California, Los Angeles (UCLA).

The ISSCC is the foremost global forum in solid-state circuits, and is attended by leading academics and industry leaders. Researchers from Intel, Hitachi, Texas Instruments, Samsung Electronics, NEC, MIT, Caltech, UCLA, and Carnegie Mellon University, to name but a few, gather annually at this event to showcase their latest research findings.