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Hunting for flawed chips? Look no farther

By **CHANG AI-LIEN**

SINGAPORE: RESEARCHERS here have come up with a machine that uses highly-focused laser beams to pin-point faults in a newly-made microprocessor or computer chip.

As a result, work to make sure that the problem does not re-occur can start within hours, rather than weeks or months.

It is so effective that American computer chip giant Advanced Micro Devices (AMD) has bought five of the machines _ each costing \$1 million _ for its plants in Singapore, California and Texas.

The machines use techniques patented by the National University of Singapore, and were built by its spin-off company, Semicaps, together with AMD.

The researchers' preliminary work was so promising that AMD chose to work with them to produce the machines two years ago, said NUS Professor Jacob Phang, the man behind the deal.

Prof Phang, who is from its electrical and computer engineering department, also set up scientific equipment manufacturer Semicaps, which employs about 100 staff and has an annual revenue of \$20million.

Mr Glen Gilfeather, AMD's director of worldwide device analysis in his organisation's corporate quality division, told The Straits Times that his company wanted to work with NUS and Semicaps.

He said: "Being a premier competitor in the microprocessor landscape, we need leading-edge tools to develop our products, and such tools are not common in the industry.

"When dealing with microprocessors, localising the fault is the most difficult problem."

He added: "The idea of attempting to do so in a modern-day microprocessor is equivalent to locating a cell phone you've dropped somewhere on the island of Singapore."

The world's second-largest maker of microprocessors, which had revenues of US\$3.9 billion (S\$7 billion) last year, it placed four of its engineers at NUS to work on the machines.

The microprocessor _ the brains of the computer _ is the chip that controls its maths, logic and data-transfer functions.

Prof Phang explained that because these chips are so complex -- there are millions of tiny parts in each -- only 70 to 80 per cent of those produced work perfectly. The rest are defective and are thrown away.

"The machine uses lasers to heat up each part of the chip, to see exactly where it has failed, so that this can be corrected in the next batch," he said.

And it is able to locate where and what went wrong within one to two hours, rather than weeks or months.

In the US\$32-billion microprocessor market, being able to do this faster means millions of dollars saved, he added.

The work done by NUS, Semicaps and AMD has won them the prestigious Best Paper Award at the International Symposium on Testing and Failure Analysis for two years running.

Prof Phang said that Semicaps is in discussion with other major chip companies and hopes to sell up to 30 machines to them.