Researchers increase the switching contrast of an all-optical flip-flop

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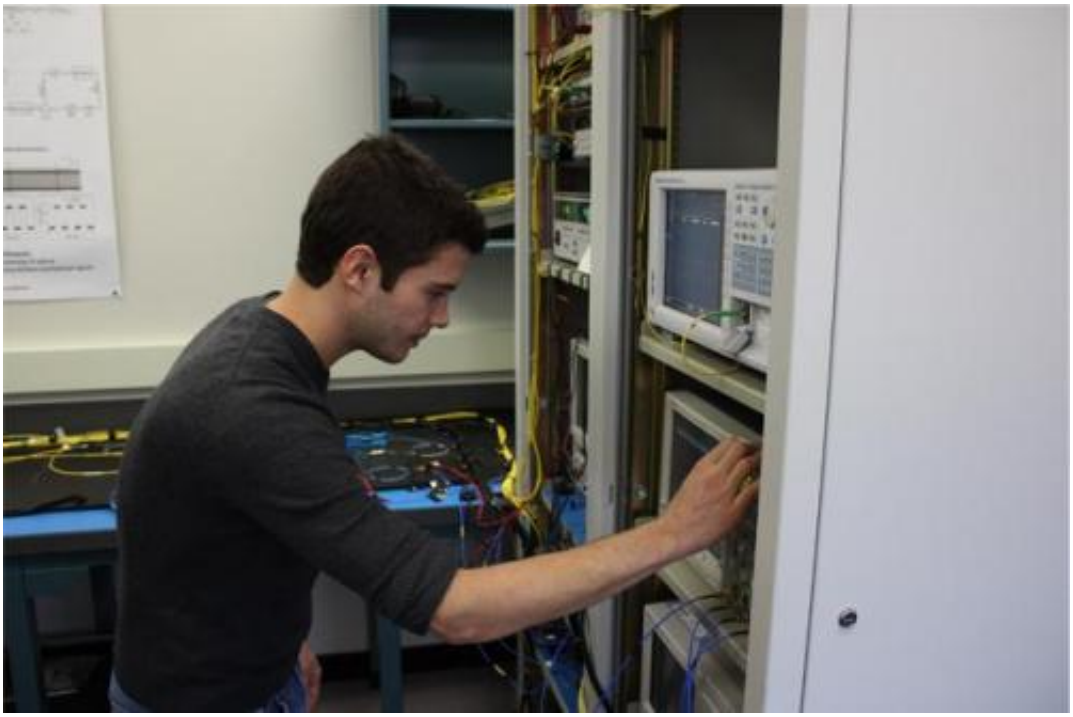

Claudio Ippolito, investigating optical flip-flops at the Rochester Institute of Technology

Researchers at the Rochester Institute of Technology in New York have increased the switching contrast of a particular kind of all-optical flip-flop by 28 dB, resulting in a switching contrast of 36.6 dB. This could provide a huge leap in the performances of a range of photonic techniques, such as all-optical packet switching, all-optical label

addressing, and square-wave clock generation, as well as other photonic devices housing semiconductor optical amplifiers or even passive nonlinear media.

Speeding up

All-optical flip-flops provide a means of sequential signal processing – as opposed to combinational signal processing – in the optical domain. The sequential-processing nature of all-optical flip-flops provides a latchable control signal for devices based on combinational processing. Drew Maywar, one of the authors of the Letter, told us that "advances in optical-packet switching performed at the University of Ghent, the University of Tokyo, and Eindhoven University of Technology, for example, use optical flip-flops to drive data-wavelength converters to achieve wavelength routing of optical packets."

However, Maywar explained, the switching performance of some previous optical flip-flops is poor – control signals operate with only specific polarisation states, over a narrow wavelength range of operation, or with high optical power. "The cycle switching time of some flip-flops is longer than 1 ns," he said, "which is not ideal for some applications, and the switching contrast is also poor (