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Optical Memory with Extremely-low Energy Consumption

- for future all-optical RAM buffer -

NTT

Motivation

In recent years, along with the rapid increase in communication traffic, the increase in device power consumption has created a new bottleneck with respect to telecommunication networks. If we are to overcome this problem, an optical memory must be used for packet processing.

Originality

Photonic crystal (PhC) is a promising candidate as a platform on which to construct devices with dimensions of several wavelengths for future photonic integrated circuits. We developed an ultra high-Q PhC nanocavity based on InGaAsP substrate last year and operated it as an all-optical bit memory at very low power, which is hundred times less than that required for laser-based bistable memories, and successfully reduced the power to a quarter this year by optimizing the structure and the composition of the material.

Impact

The development of a micro optical memory with the potential for large-scale integration on one chip has become a critical issue in the field of optical information processing. We believe that a PhC platform in which many nanocavities are cascaded or integrated on one chip is a promising candidate as a bit memory array for optical RAM systems toward future all-optical packet switching.

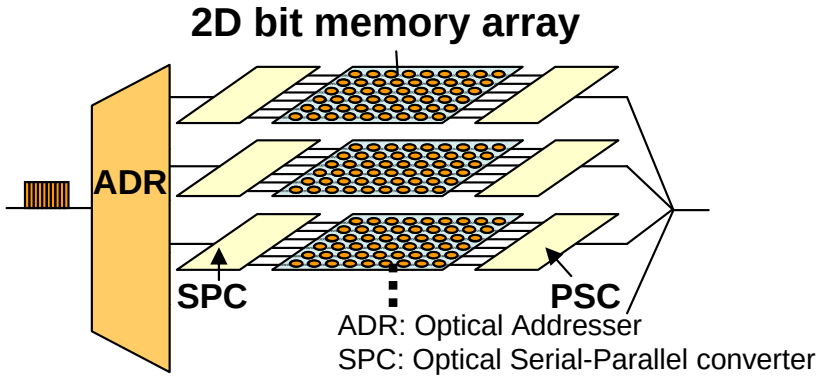

Fig. 1 : All-optical RAM buffer

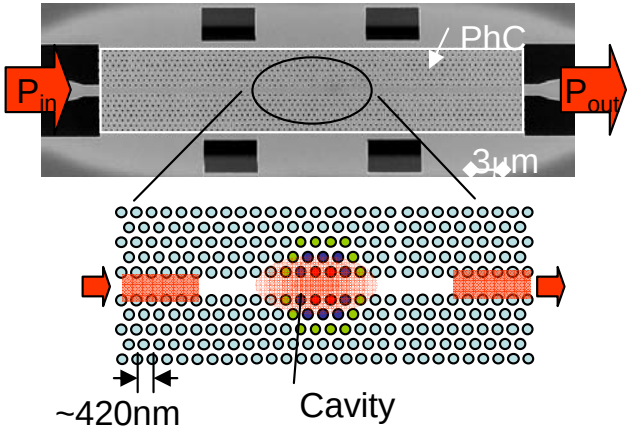

Fig. 2 : PhC nanocavity

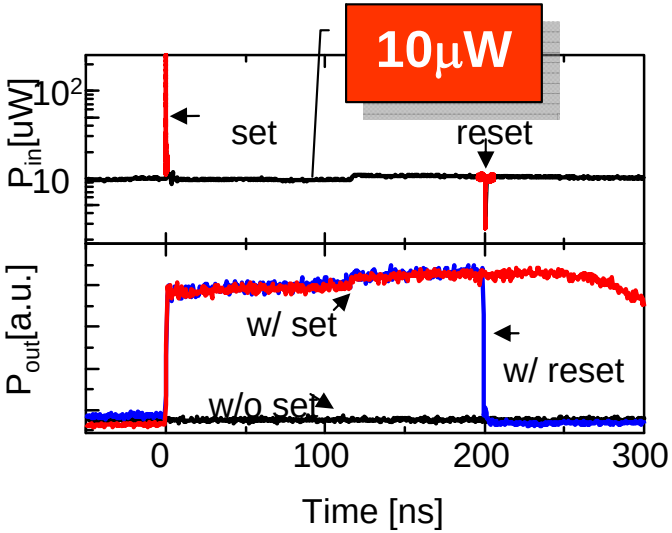

Fig. 3 : Bit memory operation

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