

## GaAs photonic crystal/InAs quantum dot-based all-optical flip-flop:PC-FF

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A photonic crystal (PC)/quantum dot (QD)-based optical flip-flop (PC-FF)<sup>[1]</sup> has been proposed by combining two PC-SMZs<sup>[2]</sup> (Fig.1). A feed-back loop connecting the PC-SMZs provides a latch function by set and reset pulses, while a clock pulse refreshes the "on-state" which otherwise decays due to the carrier relaxation in the QDs (Fig.2). A topology optimization method<sup>[3]</sup> has been used to design intersection, bend and asymmetric Y-branch PC waveguides with wide /flat bandwidths, while a metal mask method has been used for selective-area-growth of QDs, both essential for the PC-FF. Figure 3 shows grand design of the PC-FF. The result will pave the way to the ultra-fast photonic digital signal processors in the future photonic network.

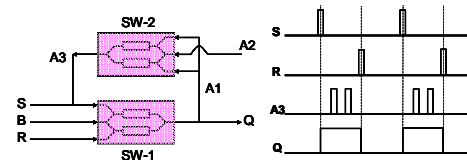


Fig. 1 Concept of the PC-FF Fig. 2 Time chart

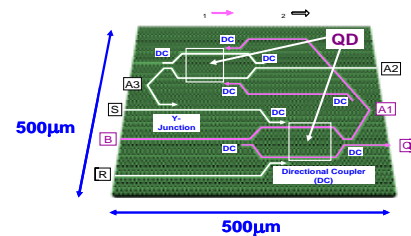


Fig. 3 Grand design of the PC-FF

[1] K. Asakawa *et al.*, *New J. Phys.* **8**, 208 (2006). [2] H. Nakamura *et al.*, *Opt. Express* **12**, 6606 (2004).

[3] J. S. Jensen and O. Sigmund, *Appl. Phys. Lett.* **84**, 2022 (2004).