Keynote Speaker

Signal Processing via Micro Ring Resonator for All-optical Arithmetic Elements

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Abstract

We propose a design of the secured packet switching using the nonlinear behaviors of Gaussian pluses in a micro ring resonator. The use of chaotic signals are generated by a Kerr effects nonlinear type, where the control input power or device parameters can be used to specify the output signals. Results obtained have shown the potential of using such a proposed device for the tunable band-pass and band-stop filters, in which the packet switching data can be performed and secured. The nonlinear behavior of light known as bifurcation which can be generated to form the start-stop bits of secure digital codes for optical packet switching data and digital encoding of chaotic signals in nonlinear micro ring resonator.

The generated chaotic signals can be formed as the logical pulses "1" or "0" using the signal quantizing method. Systems of the simultaneous fast and slow light generation using Gaussian pluses propagating within the nonlinear micro ring resonators. Results show the selected down-link and up-link frequency bands are 500 MHz and 2 GHz, respectively. Such small device system can be implemented within the mobile telephone hand set. And we can use a micro-ring resonator to compose optical gate such as NOT gate, OR gate, AND gate, NAND gate, all-optical arithmetic elements and its can apply to use for other application such as DNA codes. The DNA codes can be generated and formed by the logical pulses "A" or "T" or "C" or "G" by using the chaotic signal quantizing method, which can be randomly coded by controlling the specific optical input coupling power, i.e. coupling coefficient and ring radii. Simulation results obtained have shown that the packet switching data can be high secured by using the DNA codes. The high security concept provided by DNA codes can be generated using the random control of coupling powers. The advantage is that the information data can be high secured in the transmission lines in the optical wireless link, where the nonlinear penalty of light traveling in the device is beneficial.