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Optical quantum transmitter with finesse of 30 at 800-nm central wavelength using microring resonators

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Abstract A microring resonator (MRR) system incorporating an add/drop system is presented. The finesse of the proposed system can be determined using the full width at half maximum (FWHM) and free spectrum range (FSR) of the generated multiple soliton pulses. The central wavelength of the bright input soliton pulse has been selected as 800 nm, at which a ring system with better sensitivity shows high finesse that is suitable for applications to many optical communication systems such as optical transmitters and sensors. Simulation results show that FSR of 0.3 nm and 1.1 ns and FWHM of 10 pm and 36.6 ps could be obtained. Therefore, a system with finesse of 30 can be obtained; in such a system, the MRR system shows high performance. This system can be used in optical communication networks as a transmitter system for optical soliton pulses with finesse of 30, and theses pulses can be detected via an optical receiver.

Keywords Microring resonator · Finesse · Optical soliton · Communication networks

1 Introduction

Microring resonators (MRRs) have shown great promise for applications in many research areas such as computers, communications, and signal processing in the micro- and nano-scale regime (Yoo 2009; Bergman 2009; Li et al. 2011). MRRs have attracted interest in recent years owing to their versatile applications such as optical filters, optical sensors, optical transmitters, Wavelength Division Multiplexing (WDM) (Melloni et al. 2003), and on-off switches (Willner et al. 2012; Dokania 2008; Zhang and Willner 2010). An optical soliton is a powerful laser pulse that can be used to enlarge the optical bandwidth during propagation

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