

Double-port pumped time-bin entangled photon pair generation using Si ring resonator

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We report a time-bin entangled photon pair source in telecom wavelength using a 10 μm radius Si ring resonator which has two input ports and two drop ports. We demonstrate entangled photon pair generation from two drop ports simultaneously by pumping two input ports simultaneously, and furthermore observe four wave mixing enhancement via this double-port pumping [1]. Owing to the resonator structure, four wave mixing pumped by a continuous laser is enhanced and double time-bin entangled photon pairs are generated in the telecom C-band. The Si ring resonator is horizontally coupled to two waveguides across 350 nm gap. The cross section of the ring and straight line waveguides is a square of 400 nm width and 220 nm thickness. Pump light is injected into the resonator via the input waveguide and the photon pair is output through a drop port in the other waveguide. Every port of the two waveguides is connected to a single mode fiber through a spot size converter. Figure 1(a) shows the experimental setup of double-port pumped time-bin entangled photon pair generation. As shown in Fig.1 (b), the visibilities clearly exceed the classical limit and moreover the count rates are doubled compared to the single-port pumping.

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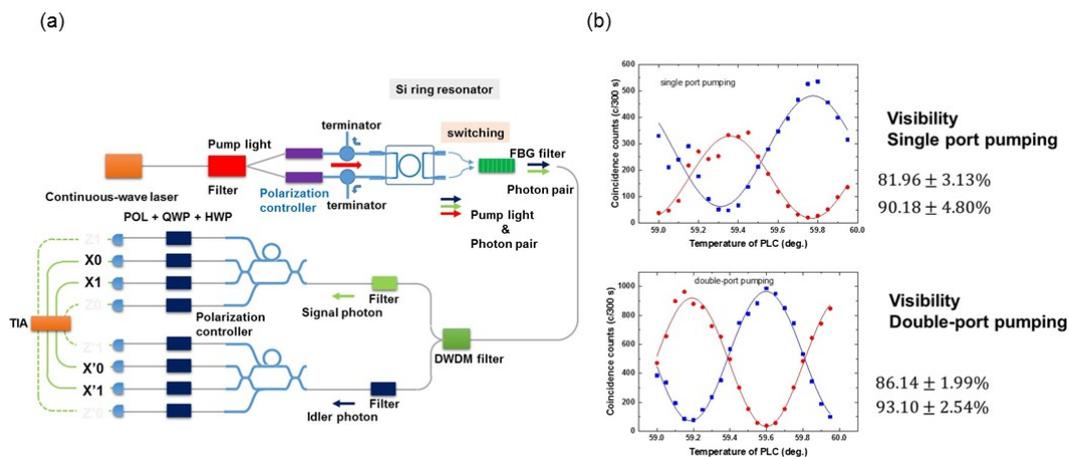


Fig. 1. (a) Conceptual view of experiment. (b) Coincidence counts as functions of the operation temperature of the planer lightwave circuit (PLC) The pump light power from each input port is set 0.5 mW. The time window is set 64 ps

Reference

[1] M. Fujiwara, R. Wakabayashi, M. Sasaki, and M. Takeoka, Opt. Express 25(4) 3224 (2017).