

Introduction

We report the demonstration of all-optical wavelength conversion of intensity-modulated data from the probe wavelength to the conjugate wavelength separated by more than 250 GHz, at a data rate of 10 Gbps. The conjugate wavelength is present only when both the pump and the probe (data) is present. Hence amplitude modulated data present in probe, gets transferred to conjugate wavelength.

Experimental Setup

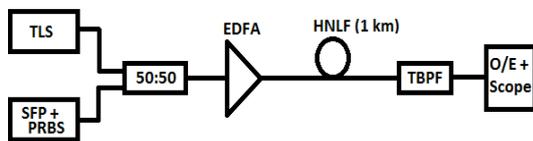


Figure 1. Schematic of the experimental setup.

Figure 1 shows the experimental setup for wavelength conversion of data. Light from two laser sources - Tunable Laser Source (TLS)/pump at 1549 nm and Small Form factor Pluggable device (SFP)/probe modulated by a Pseudo Random Bit Sequence (PRBS) at 10 Gbps, at 1547 nm is combined using a 3 dB coupler and amplified using a high power Erbium Doped Fiber Amplifier (EDFA), and passed through a highly nonlinear fiber (HNLF) of length 1 km and nonlinear coefficient $11.1 \text{ W}^{-1} \text{ km}^{-1}$. A tunable band-pass filter (TBPF - bandwidth of 1 nm) is used for isolating the probe and the conjugate after the wavelength-conversion process. During the analysis of the wavelength converted data in the conjugate, the input probe-power is adjusted such that, the power in the conjugate is sufficient enough for detection, while that in the probe is below the detection threshold of the APD detector used.

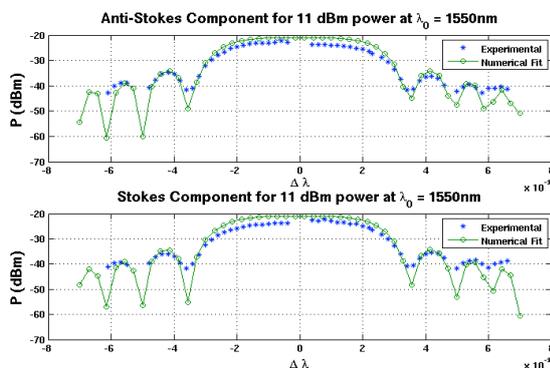


Figure 2. Power of conjugate vs wavelength separation for the Stokes and the anti-Stokes component.

Results

Experiments are performed to study the conversion efficiency of the FWM process as a function of the wavelength separation between the pump and the probe, and the results are shown in Figure 2. The conversion efficiency is found to be constant for wavelength separations of up to 2 nm. Figure 3 shows the output when the conjugate is filtered through the TBPF and the corresponding eye pattern of the input data, the probe and the conjugate.

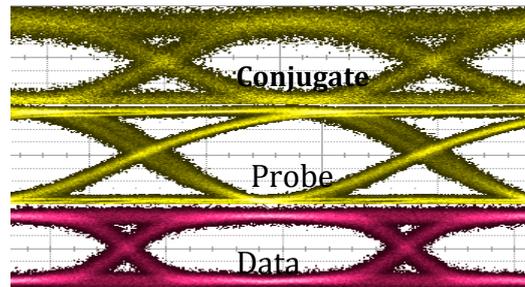
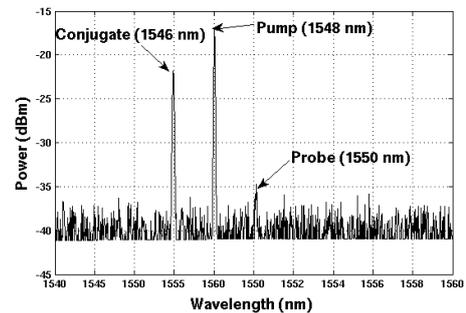


Figure 3. Output spectrum when conjugate is filtered and the corresponding eye-pattern at 10 Gbps.

Conclusion

All optical wavelength conversion using four-wave mixing demonstrated at 10 Gbps bit rate, over 250 GHz range.

Publication

Aravind P.A., D. Venkitesh, "Analysis of data-quality in all-optical wavelength conversion", in NLO50, Spain 2012.