Title : IMPROVEMENT OF THE SIGNAL TO NOISE RATIO IN DIRECT DETECTION WITH A SEMICONDUCTOR OPTICAL PREAMPLIFIER

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Abstract

One of the important applications of the semiconductor optical amplifier in Fibre Optical Digital Transmission Systems is its use as a preamplifier at the receiving stage. Although the device always degradates the signal to noise ratio, the set preamplifier-photodiode (PIN) can improve this ratio in front of the one which is obtained by only using the photodetector. Several published works [1],[2],[3] confirm this hypothesis.

Furthermore, the set offers a bandwith bigger than the one that would be obtained with a PIN-FET stage or an avalanche photodiode (APD) [4].

In this work the authors analize under which conditions a traveling wave optical preamplifier (TWLA), combined with a PIN photodetector, improves the performance of the receiving stage taking into account the quantum efficiency and dark current of the photodiode.

The signal to noise ratios at the photodetector output, with and without preamplifier, have been compared in order

to be able to analize the influence of the device parameters. In order to obtain a benefit of the preamplifier it is necessary that the quantum efficiency of the photodetector remains under a determined value which depends basically on the received signal level, the preamplifier parameters and, especially of the dark current.

The obtained curves demonstrate that the set constituted by an optical preamplifier and a PIN photodetector improves the signal to noise ratio at the output of the latter. It is proved that this result is particularly interesting in the case that the dark current be appreciable. In fact, its influence on the signal to noise ratio is minimized with the use of the preamplifier.

References

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