

Report: Planar Lightwave Circuit – 3

Integrated In-Band OSNR Monitor Based on Planar Lightwave Circuit (PLC)

We propose a novel integrated in-band optical signal-to-noise ratio (OSNR) monitor based on planar lightwave circuit (PLC) technology. We successfully demonstrate a 10-25 dB in-band OSNR measurement with errors of less than 0.6 dB.

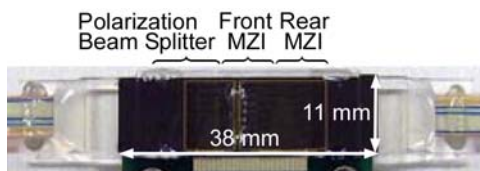
Monitoring the optical signal-to-noise ratio (OSNR) is becoming important in optical networks. The OSNR was conventionally estimated by linearly interpolating the amplified spontaneous emission (ASE) noise spectrum. However, in reconfigurable wavelength division multiplexing (WDM) networks, where each channel is filtered through different routes, the noise level may differ channel by channel. This means conventional out-of-band monitoring cannot correctly measure the actual OSNR. To overcome this problem, in-band OSNR monitoring techniques that measure the OSNR within the signal bandwidth have been proposed.

In this work, we propose a novel integrated in-band OSNR monitor based on planar lightwave circuit (PLC) technology, and demonstrate excellent performance of a compact in-band OSNR monitor module.

Figure 1 shows the circuit configuration. In our PLC-based method, we assume that the optical signals are polarized while the noise is non-polarized. When

the difference between the output optical powers of the two output ports is set at its maximum value, the light output from one output port will consist of an optical signal and noise, while the light output from the other output port will consist solely of noise. Thus, by measuring the output power difference, we can directly acquire the in-band OSNR.

The proposed OSNR monitor was fabricated on silica based PLC. Figure 2 shows the in-band OSNR measured with our device. Each measurement was performed for over 30 different states of polarization. We successfully measured an OSNR up to 25 dB with an error of less than 0.6 dB. Since a PLC-type optical monitor is compact and simple, our proposed device would be excellent for performance monitoring in future WDM networks.



(a) Eight OSNR monitors integrated in a PLC module

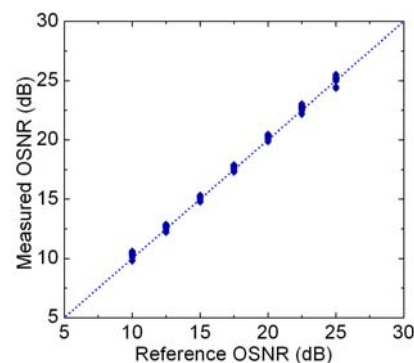


Fig.2 OSNR measured with our proposed monitor

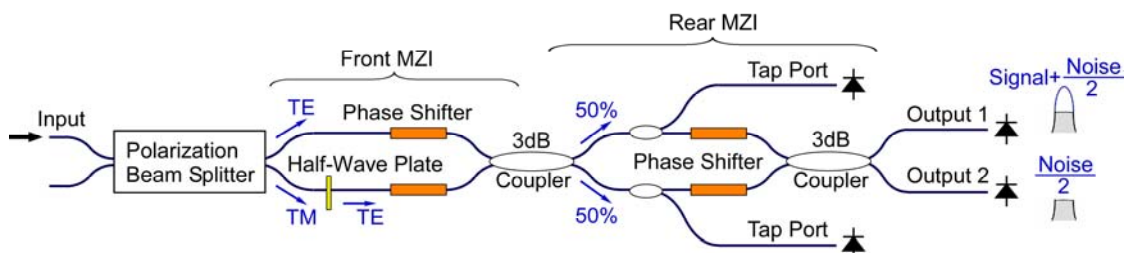


Fig.1 (b) A schematic diagram of the proposed PLC-type in-band OSNR monitor