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IMPLEMENTATION OF FOPA WITH PUMP PHASE MODULATION FOR AN 8 CHANNEL DWDM TRANSMISSION SYSTEM

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In the last decade the usage of fiber nonlinearity for optical amplification has been of particular interest. Fiber optical parametric amplifiers (FOPAs) are an innovative type of amplifiers that are based on four wave mixing (FWM). FOPAs can ensure high level of amplification (up to 70 dB) over a wide wavelength band (up to 208 nm) [1].

In this report we investigated the performance of a single in-line FOPA in a 10Gbit/s 8 channel DWDM transmission system with NRZ-OOK modulation format and 50 GHz channel spacing. Phase modulation of the pump was introduced in order to suppress the unwanted impact of Stimulated Brillouin Scattering.

The FOPA was based on a 1 km long high non-linearity fiber (HNLF). The FOPA pumping radiation was configured so that the peak amplification would coincide with the wavelengths of the amplified signal. It was concluded that the usage of 660 mW 1553.9 nm pump is the most appropriate solution. Such configuration ensured on-off gain up to 22.8 dB (fig.1). For powers higher that 660 mW the FWM produced inter-channel crosstalk has caused severe degradation of amplified signal quality (fig.2).

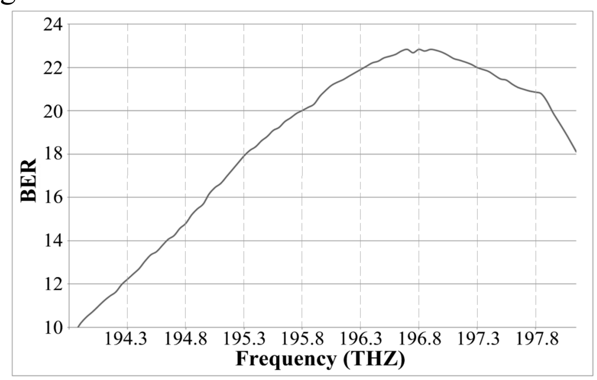

Fig.1 660 mW 1553.9 nm single pump FOPA provided on-off gain for the 8 channel DWDM transmission system

The 660 mW 1553.9 nm pump was phase modulated by four radio-frequency tones of 180 MHz, 420 MHz, 1.087 GHz and 2.133 GHz. It has been found that the usage of phase modulation has ensured 5.2 dB gain improvement in comparison with the case with no SBS mitigation for the same level of pump power at the input of the HNLF.

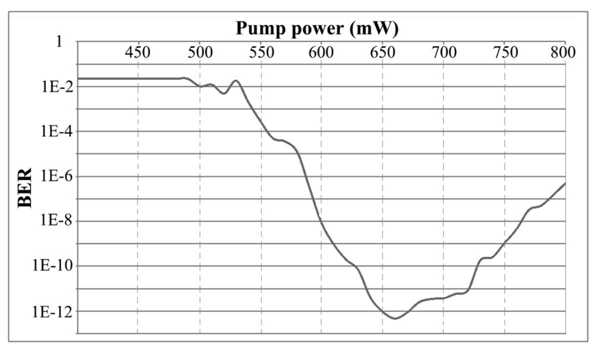

Fig.2 System BER value dependence on the pumping power of the FOPA.

The obtained results have shown that the maximal length of the optical link in the system with no amplification for which BER values were below the 10^{-12} mark was 46 km. In the system with the single in-line FOPA transmission distance has reached 141km, therefore a 95 km benefit in transmission distance was obtained.

ERAF
EIROPAS REĢIONĀLĀS ATTĪSTĪBAS FONDS
EIROPAS SAVIENĪBA
IEGULDĪJUMS TAVĀ NĀKOTNĒ

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