

# ESTIMATION OF COMBINED NRZ-DUOBINARY-NRZ HDWDM SYSTEM PERFORMANCE

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In this work we have evaluated possible realizations of combined HDWD communication systems, because current telecommunication networks operators using the simplest 2.5 or 10 Gbps WDM solutions with pulse modulation methods, but they need to combine multiple systems.

As a study object, communication system with 10 Gbps channel and NRZ encoding base were chosen, because NRZ coding scheme are the most often used by telecommunication operators because of its spectral properties, while 2.5 Gbps channel with duobinary encoding scheme was chosen as a central channel of transmission system under study. Duobinary encoding methods for optical signal modulation ensures transmitted signals greater protection in dense channel spaced WDM systems from Kerr effects, because of its spectral properties. In this case channel spacing was chosen equal to 18.5 GHz and the reasoning for it is based on ITU-T G.694.1 Recommendation. System simulation was performed using OptSim software and simulation scheme consists of: three transmitters, 80 km of SSMF. Output signal is filtered by optical filter and then each channel was detected by PIN photodiode for estimation of signal quality using eye and spectral diagrams [1].

The system output spectrum is shown in Fig.1 (a) and, as you can see, the Kerr effect influence is noticeable but it's not degrading and system worst BER is for 3<sup>rd</sup> channel but it's less than the ITU-T Recommendation  $BER \leq 10^{-9}$  (see Fig.1 (b)). If we increase bit rate of 2<sup>nd</sup> channel up to 10 Gbps while maintaining the pervious spacing, then the worst channel again is 3<sup>rd</sup> channel and its BER is raised up to two orders but it still fulfils recommendation (see Fig.1 (c)). Duobinary coding - scheme provides to telecommunication companies strategic advance in the future, as well as, more opportunities for WDM system further development, because it's a long-term solution.

## Reference

1. Bobrovs V., Ivanovs G. *Comparison of Different Modulation Formats and Their Compatibility with WDM Transmission System // Latvian Journal of Physics and Technical Sciences.* - 4. (2008) 6.-21. lpp.

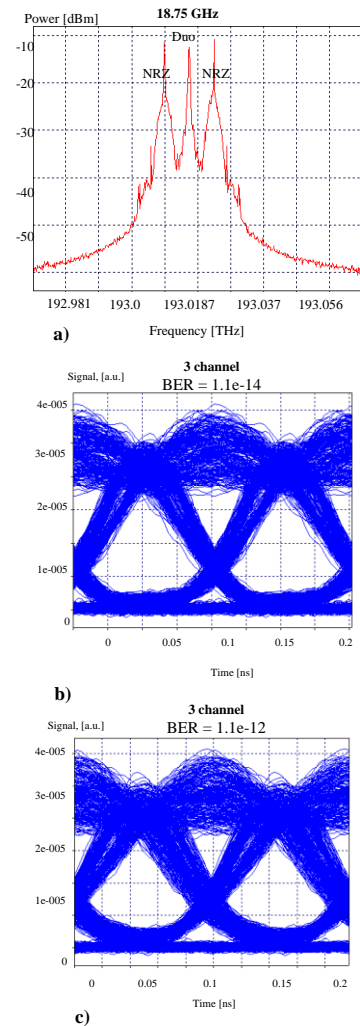


Fig.1 a) Output spectrum after 80 km b) 2.5 Gbps duobinary channel c) 10 Gbps duobinary channel