

O. Ozolins, Graduate Student Member, IEEE, Dr. V. Bobrovs, Prof. G. Ivanovs

Riga Technical University, Institute of Telecommunications, e-mail: oskars.ozolins@rtu.lv

Address: Azenes str. 12, LV-1048, Riga, Latvia

Abstract - The number of consumers to the optical fiber technology has grown rapidly due to benefits of broadband connections. Under this assumption new concept for optical access architecture will be needed. This concept is dense wavelength division multiplexing (DWDM) – direct in which multiple wavelengths are directly connected to each optical network unit (ONU) [1]. Due to multiple wavelengths assignment requests for each ONU optical band-pass filters are required to perform channel separation. Our proposed approach for increasing the transmission capacity is to reduce the channel spacing of a DWDM-direct system for broadband access to the minimum while keeping the employed optical band-pass filter technologies.

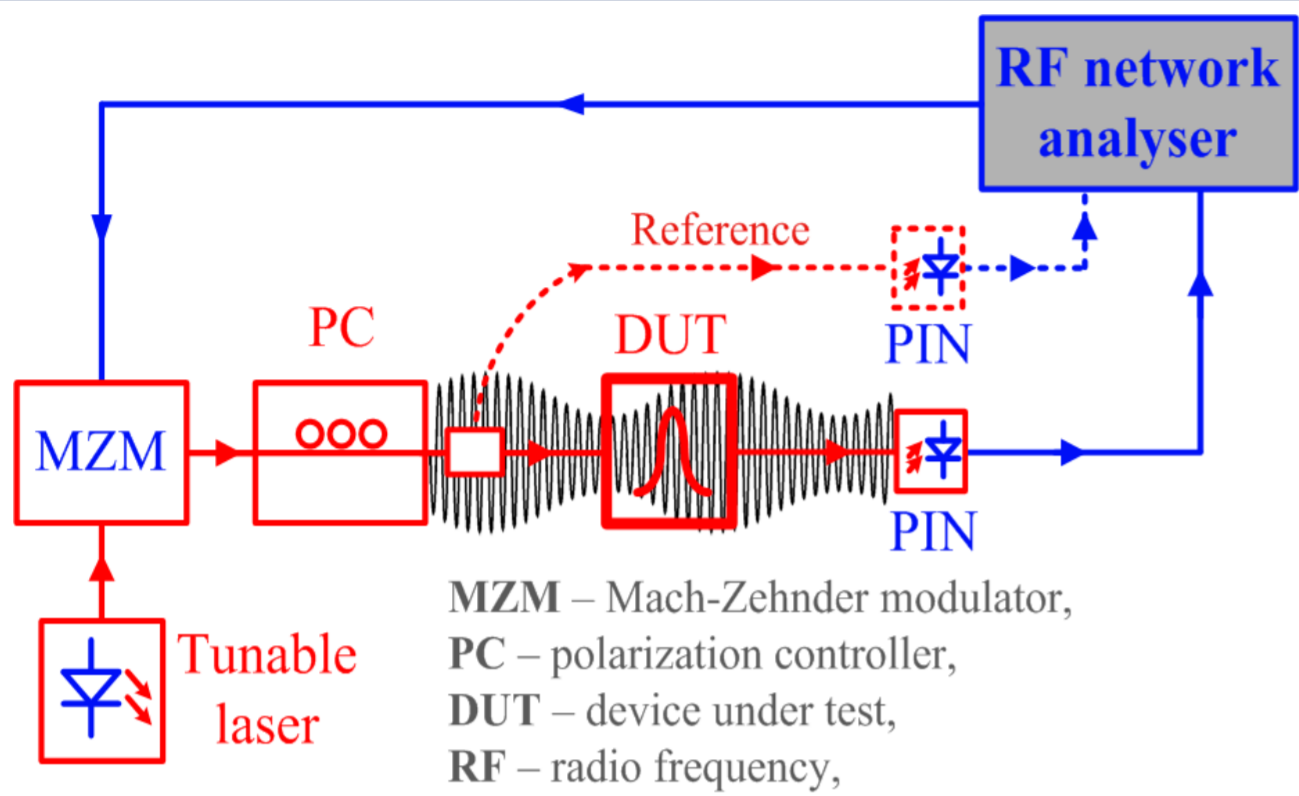


Fig. 1 Modulation phase shift method measurement scheme [2].

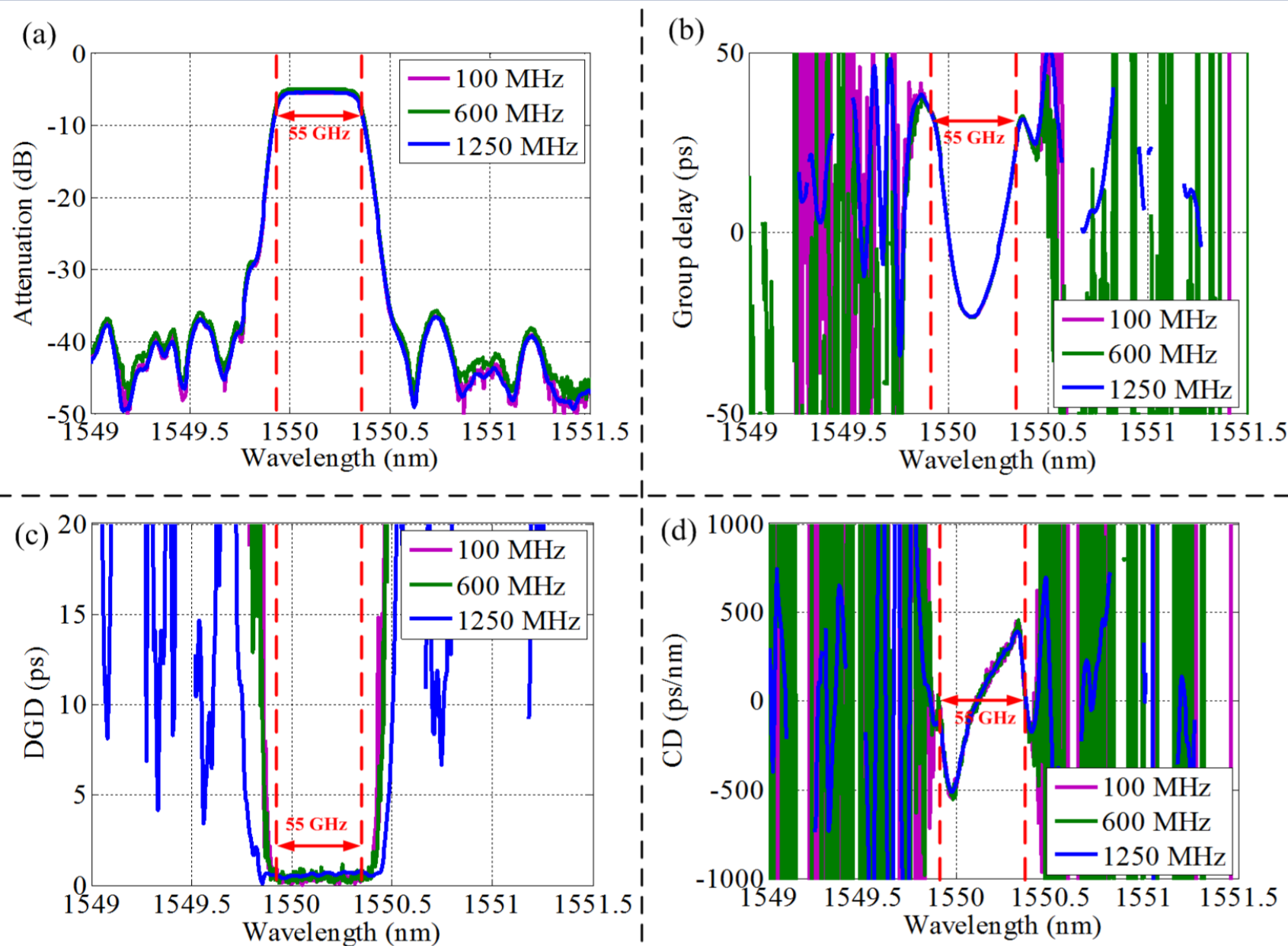


Fig. 2 Measured attenuation (a), group delay (b), differential group delay (c) and chromatic dispersion (d) as function of wavelength for FBG device with different modulation frequencies shown in inset.

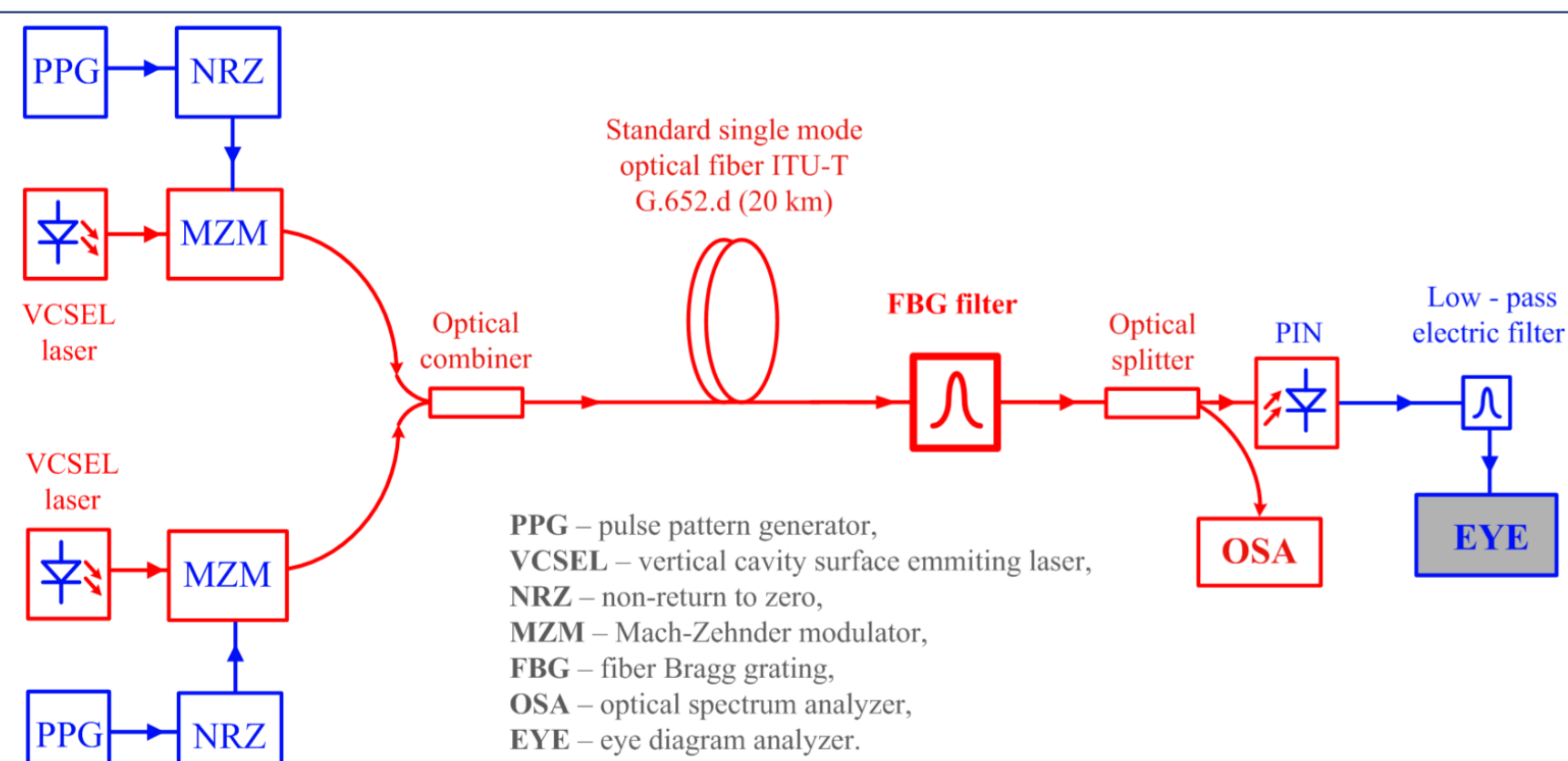


Fig. 3 DWDM-direct measurement scheme.

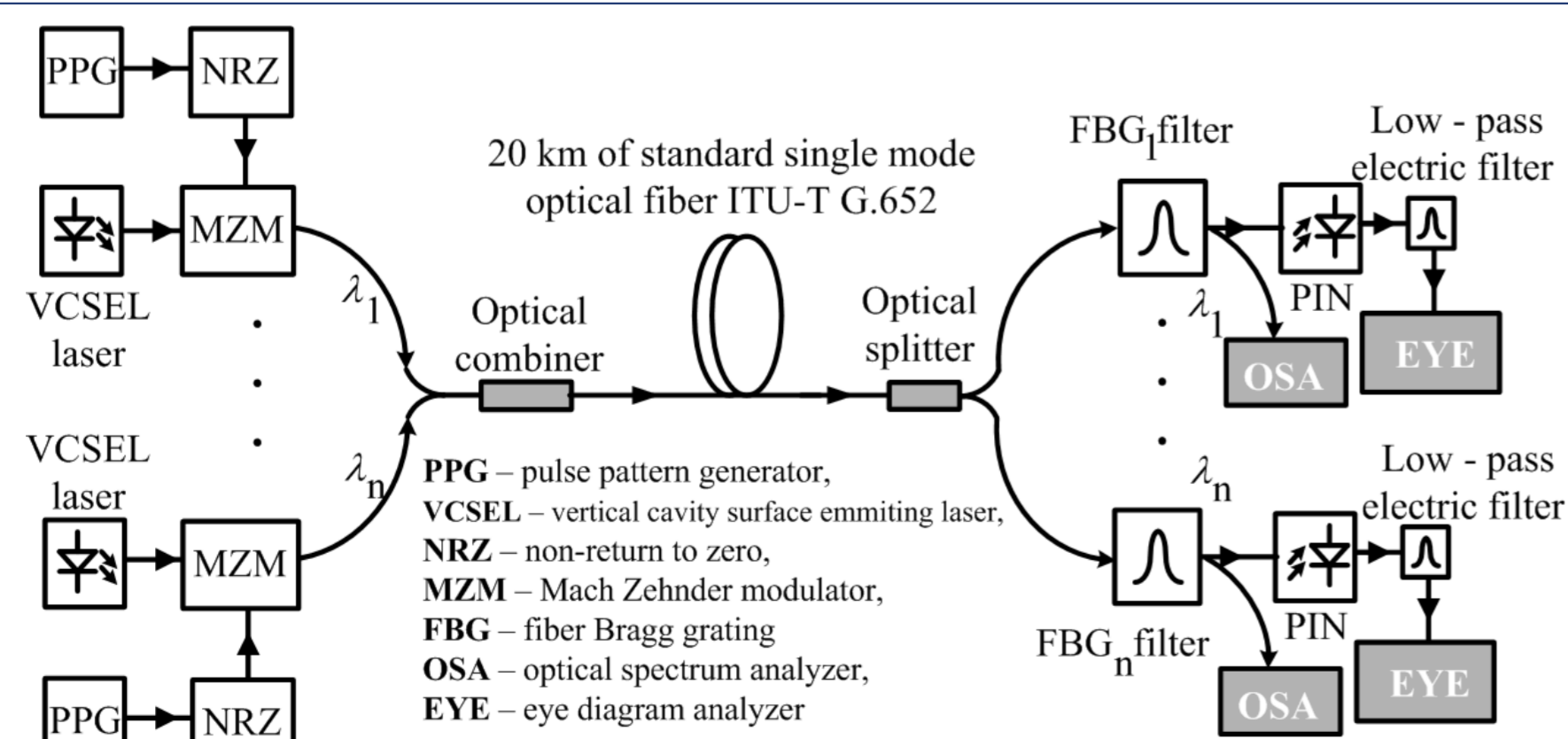


Fig. 4 DWDM-direct simulation scheme.

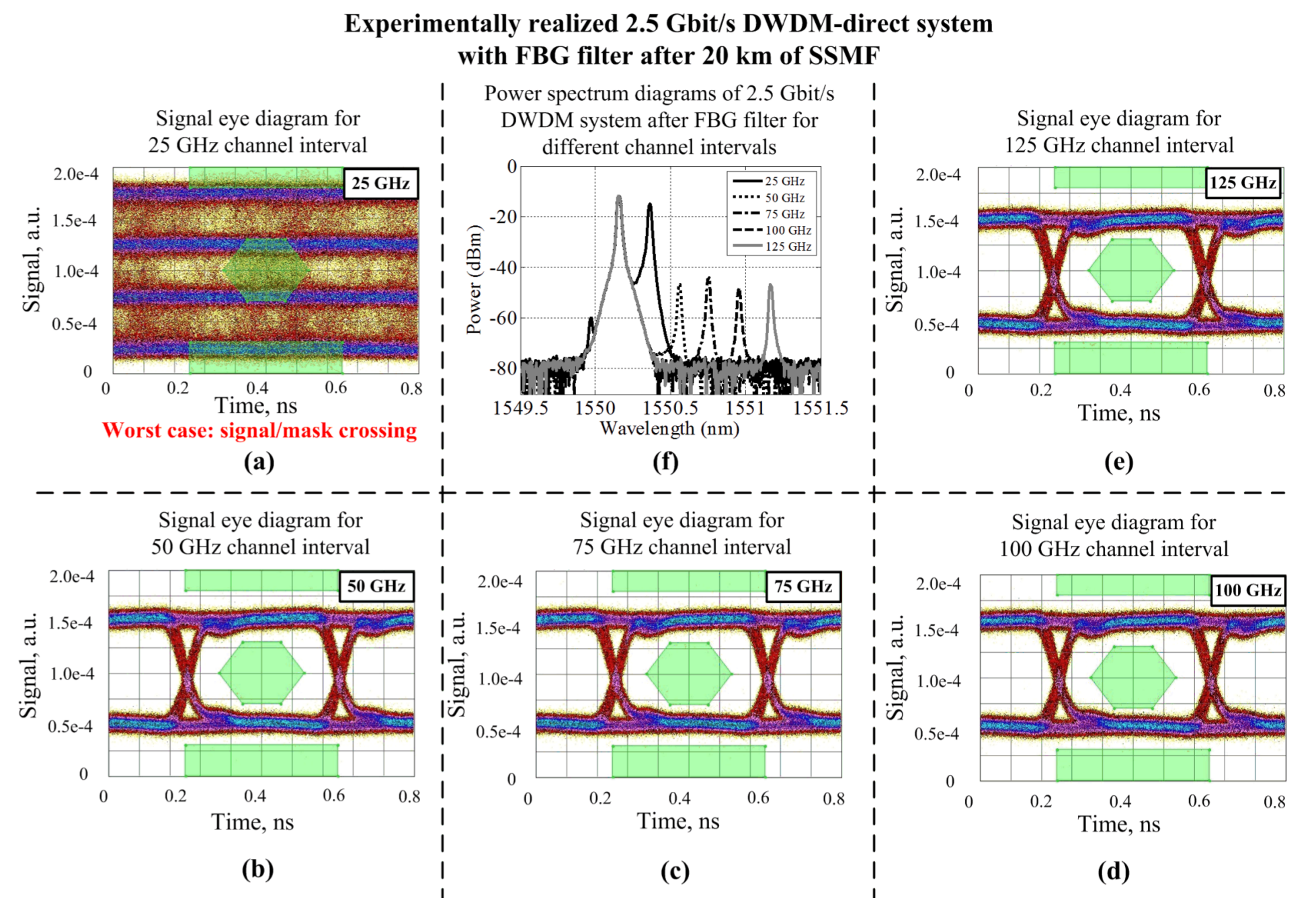


Fig. 5 Measured eye diagrams (a–e) and optical power spectral densities (f) of 2.5 Gbit/s DWDM-direct system realized with a FBG filter after 20 km of SSMF for different channel intervals (shown in insets).

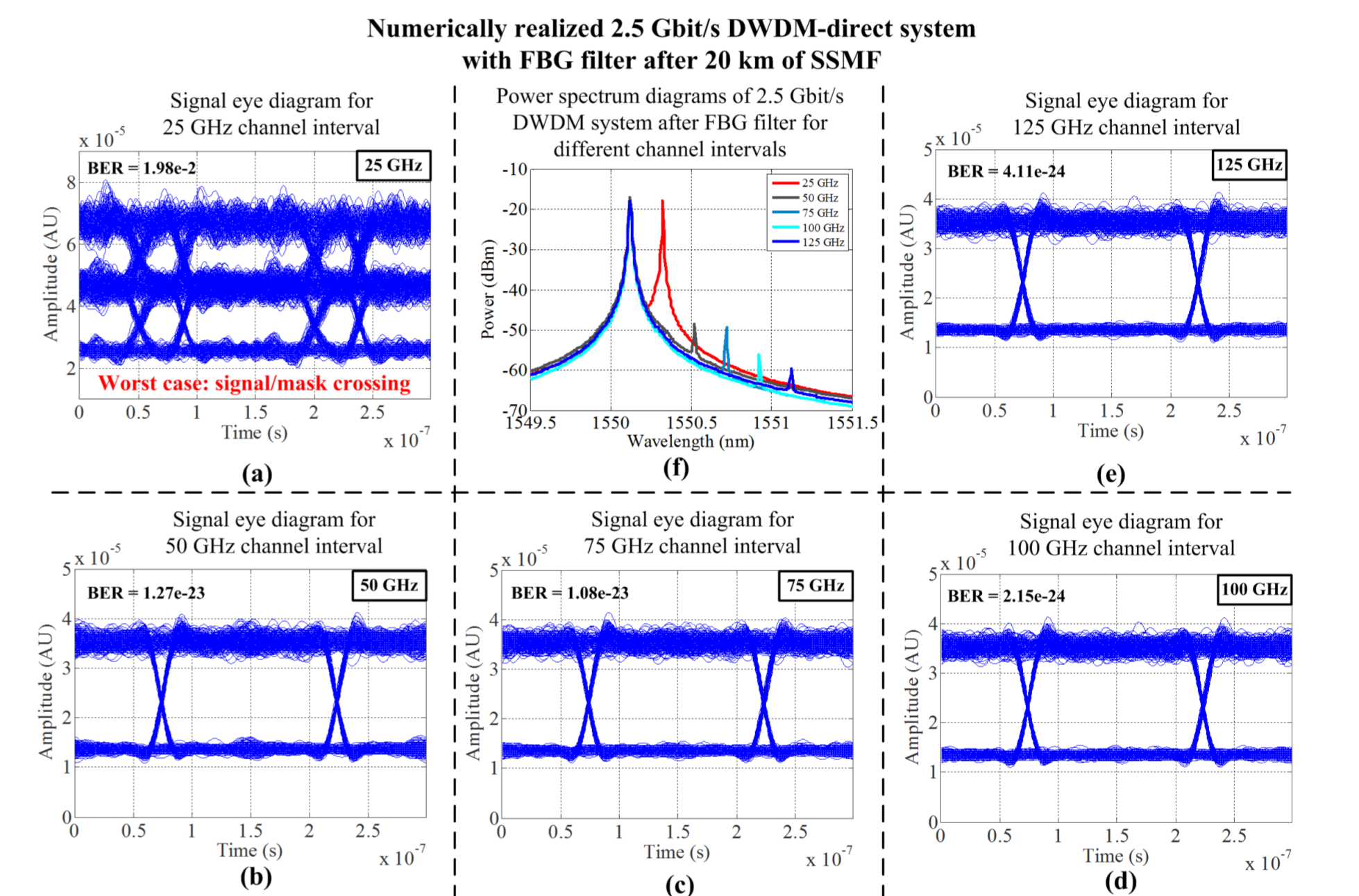


Fig. 6 Calculated eye diagrams (a–e) and optical power spectral densities (f) of 2.5 Gbit/s DWDM-direct system realized with a FBG filter after 20 km of SSMF for different channel intervals (shown in insets).

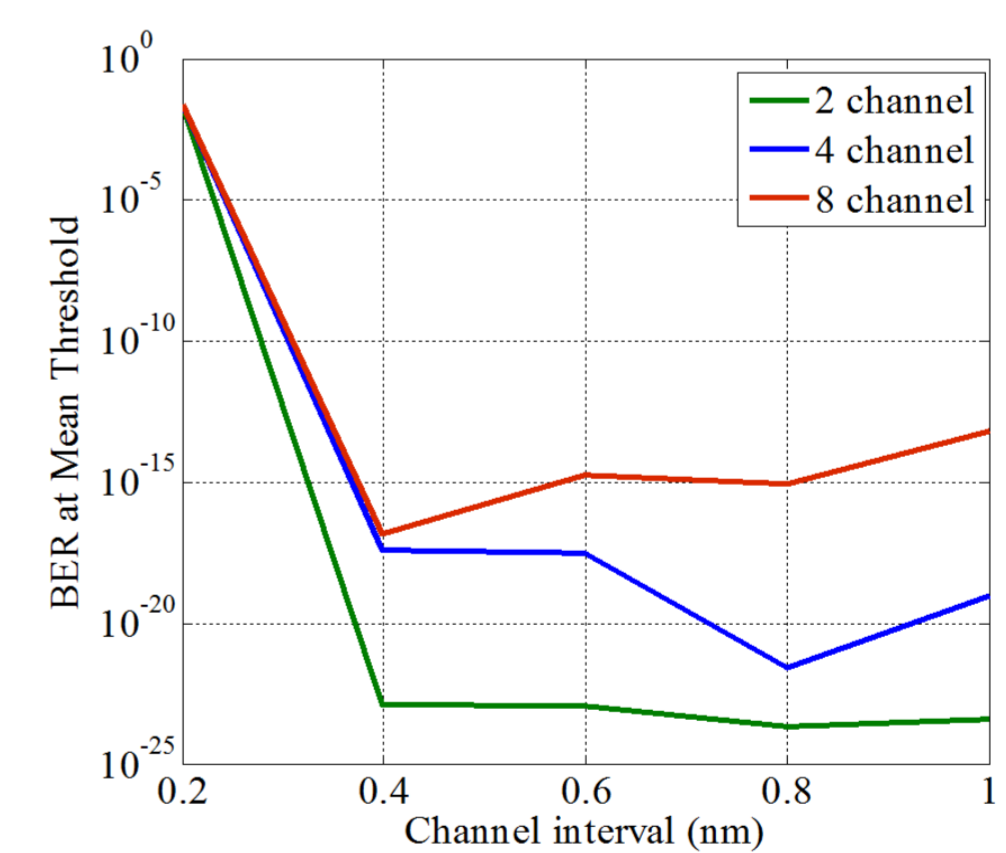


Fig. 7 Bit error ratio vs. Channel interval of 2.5 Gbit/s DWDM direct a) two channels, b) four channels, c) eight channels system after 20 km of SSMF with 50 GHz FBG optical filter. Results obtained at the worst channel.

Conclusion

For the DWDM-direct system for broadband access with 55 GHz FBG a satisfactory performance is achieved with a 50 GHz channel interval at the 2.5 Gbit/s data transmission speed. These results provide limitations which are required to take into consideration for realization of DWDM-direct system for broadband access with FBG technology.

References

- Miyazawa T., Harai H. (2010) Optical access architecture designs based on WDM-direct toward new generation networks. IEICE Transactions on Communications, E93-B(2), 236-245.
- Agilent Technologies (2006) Agilent 86038B Photonic Dispersion and Loss Analyzer. (2nd ed-n) Germany: Agilent Technologies Manufacturing GmbH, 350.