

## CP.1

## RESEARCH OF FIBER BRAGG GRATINGS IN WDM TECHNOLOGIES FOR BROADBAND ACCESS

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The research is performed in field of fiber optic (FO) wavelength division multiplexing (WDM) transmission systems for broadband access. In this paper we demonstrate performance of two different fiber Bragg gratings (FBG) in WDM transmission system.

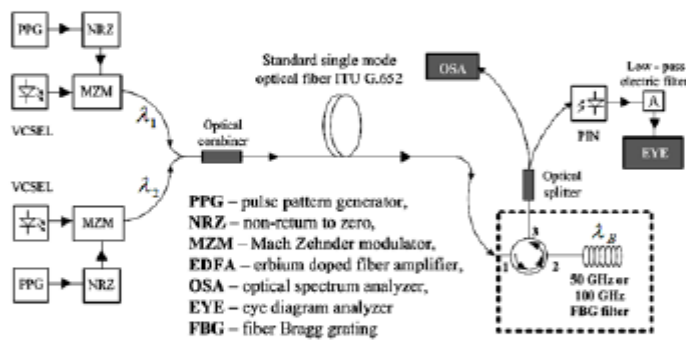


Fig.1. Experimental setup

Our experimental two channel scheme consists of three parts (see Fig.1.): transmitter, optical fiber and receiver. The transmitter consists of pseudo-random data source with 231-1 bit sequence, NRZ code former, vertical cavity surface emitting laser (VCSEL) source and LiNbO<sub>3</sub> – based external Mach Zehnder modulator (MZM). The data source produces a pseudo-random 2.5 Gbit/s or 10 Gbit/s electrical signals, which represents transmitted information. Then a code former is used to realize NRZ code from incoming bit sequence. The optical pulses are obtained by modulating VCSEL irradiation in MZM with previously mentioned bit sequence. Then formed optical pulses are sent directly to a 20 km (typical maximum length for access systems) long standard single mode fiber (SSMF) defined by ITU G.652. Receiver block consists of optical filter (circulator combined with FBG with different full width half maximum (FWHM) parameter: 50 GHz or 100 GHz), optical splitter, PIN photodiode (typical sensitivity -17 dBm), low – pass Bessel – Thomson electrical filter (4 poles, 7.5 GHz -3 dB bandwidth).

Measurements are performed with optical spectrum analyzer and electrical eye diagram analyzer. In the experimental results are shown power spectrum and eye diagrams for different measurement setups. An eye diagram has to be opened wide and power spectrum diagrams should be regular without multi-peak structure for systems stable performance. The main idea of measurements is to evaluate performance of two different FBG in 2.5 Gbit/s and 10 Gbit/s WDM systems for broadband access. Results indicate that realization of 20 km transmission is possible only at 2.5 Gbit/s data transmission speed and channel interval must be greater than 50 GHz for FBG with 50 GHz FWHM parameter and 100 GHz for FBG with 100 GHz FWHM parameter. At 10 Gbit/s data transmission speed case FBG induced dispersion degrades signal quality. Therefore it is important to choose optical filter with relatively low dispersion parameter to avoid

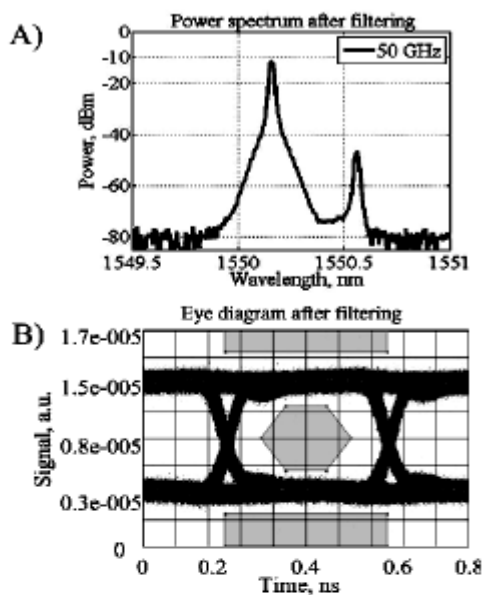


Fig.2. A) power spectrum and B) eye diagram of 2.5 Gbit/s received signal after FBG with 50 GHz

signal degradation at higher data transmission speed.

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