RESEARCH ON INTEGRATED PLATFORM FOR MULTIPLE PARAMETERS INTELLIGENT MONITORING OF DWDM OPTICAL FIBER SIGNAL

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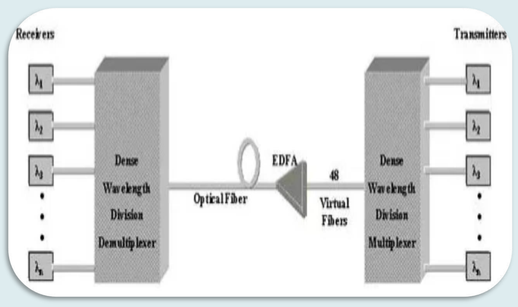
Introduction

In recent years, with the rapid development of high-definition video, social networking, 5G communications, cloud computing, virtual reality VR and other high-speed and large-bandwidth data services, the demand for high-speed and high-bandwidth data is increasing rapidly.

The use of DWDM technology ensures that data service providers can provide more fiber network bandwidth and help flexibly expand the capacity of existing fiber backbone networks. But on the other hand, it poses great challenges to the monitoring of optical fiber networks, due to the demand of complex hybrid transmission systems and flexible switching optical transmission links.



At present, there have been many research achievements on single parameter monitoring. However, the traditional single parameter monitoring is usually unable to support the implementation of intelligent sensing optical network in the current complex DWDM network. Therefore, we propose and design an integrated monitoring platform for DWDM optical fiber signal multiple parameter, which is able to simultaneously measure optical power, optical wavelength, CD and BER.

Method

HARDWARE ACHITECTURE SECTION

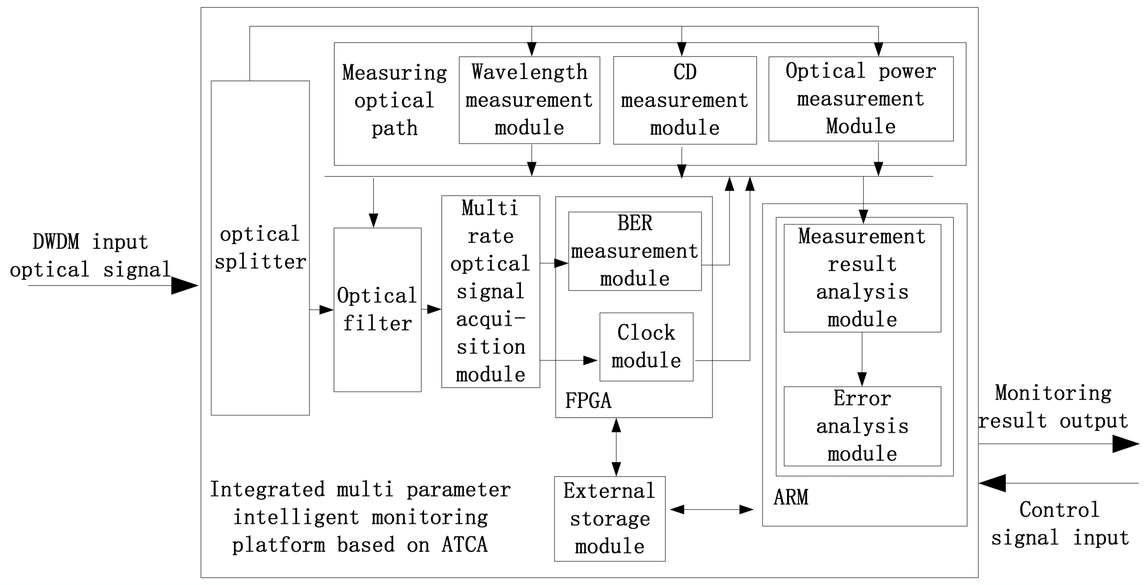


Figure 1. The hardware architecture of the integrated multiple parameter intelligent monitoring platform based on modularization.

Firstly, the input optical signal is divided into wavelength measurement module, CD measurement module and optical power measurement module through the splitter. Secondly, the high-precision optical filter is controlled by the wavelength measurement results to select the wavelength of the demand optical signal in DWDM for BER measurement. Using the multiple rate optical signal acquisition module and the reference code digital signal in the external storage module, the BER module judges and counts the error bit for the received signal in the electrical domain. Finally, the obtained measurement results of each parameter are sent into the analysis module for error analysis.

SOFT CONTOROL SECTION

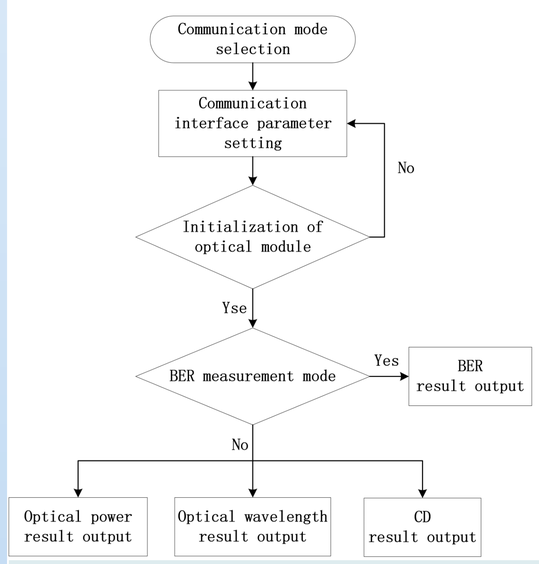


Figure 2. The main operation process of the control software.

The Man-Machine interaction part of the DWDM optical fiber signal multiple parameter intelligent monitoring platform is based on the host computer software, whose functions include the optical module initialization of the integrated platform hardware, the parameters setting of communication interface and every individual measurement module. BER is digital parameter, but the wavelength, optical power and CD are analog parameters.

Thus, BER measurement mode is designed for different types of monitoring parameters selection. When it is determined to be BER measurement mode, the BER is computed and the transmission data frame is analyzed by using PRBS as a reference signal. Otherwise, the real-time monitoring function of wavelength, optical power and CD are operated.

Experiments & Result

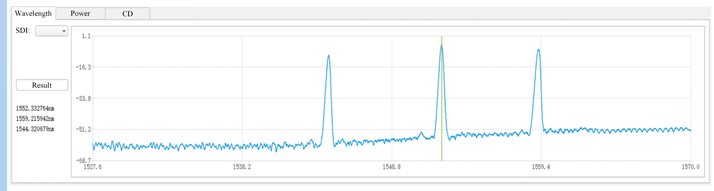


Figure 3. The wavelength monitoring results.

Optical Wavelength:

The test results are 1544.3nm, 1552.33nm and 1559.19nm without the influence factors of CD and optical attenuation, and the average error is 0.19nm.

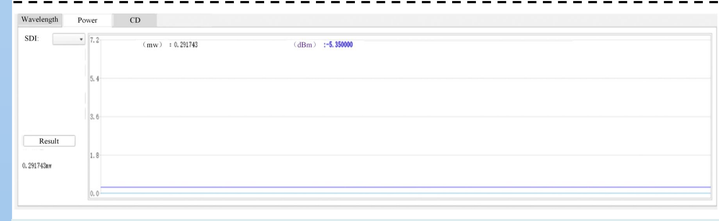


Figure 4. The optical power monitoring results.

optical power	optical attenuation	result
1.7dBm	1dBm	0.41dBm
	7dBm	-5.35dBm
	12dBm	-9.94dBm

Optical Power:

The average error is 0.0833dBm. The main reasons of optical power measurement errors include the insertion loss of optical fiber flange, the thermal drift of photoelectric device and so on.

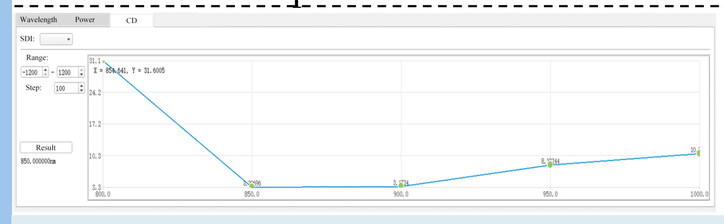


Figure 5. The cd monitoring results.

CD:

The CD value of 820 ps/nm is randomly set by using the TDC in DWDM optical fiber transmission system. The CD value of 850ps/nm is the monitoring result, and the monitoring error is 30ps/nm.

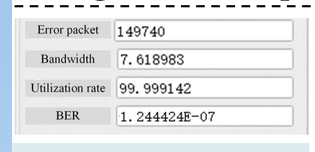


Figure 6. The BER monitoring results.

BER:

In this test, the received optical power of the receiver is adjusted to -9.97dBm, the cumulative dispersion of the system is set to 1100ps / nm. The BER is 1.244424E10-7. The actual utilization is 99.999142%.

Conclusion

Compared with the traditional optical fiber parameter monitoring method, the proposed system has the advantages of simple structure and realization measurement for multiple parameters. It can effectively improve the DWDM optical fiber signal quality monitoring and support the rapid development of transparent optical fiber network in the future.