Data Digital Communications by Fiber Optics

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Abstract- This work shows a data synchronous communication system by fiber optic, with relevance for the synchronizer. The fiber optic is a transmission channel with low attenuation and large bandwidth. These characteristics allow to achieve a great distance and a high data rate. The synchronizer main function is to sample and to retime the data bits. The objective is to study the synchronizer performance in the global system in the presence of noise.
Keywords: Digital communication, fiber optic, synchronizer

Introduction – This work presents a data digital communication system, where the transmission channel is the fiber optic.
In the 19'80's, the cooper stocks began to decline and to become increasingly scarce. On the other hand, there was a growing need to increase the rate of data transmission. So, the development of the fiber optic, that uses the light as communication agent, would be the future bet.
The fiber optic has wavelength windows λ of very low attenuation (1st in 850nm with attenuation 2dB/km, 2nd in 1310nm with attenuation 0.5dB/km and 3rd in 1550nm with attenuation 0.25dB/km).
Fig.1a,b shows the aspect of the fiber optic with their transmission windows of low attenuation.

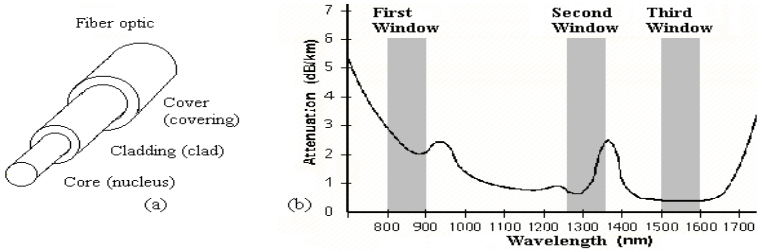

Fig1: Fiber optic aspect (a) and their three transmission windows (b)

The fiber optic has low attenuation, so the optical signal reaches great distance without repeater. Also, the fiber optic has a very large bandwidth (1000 times greater than cooper), so provides high speed and high information density [1].

Data digital communication system - The communication system has an emitter, a receiver and a transmission channel. The emitter has various blocs, namely the data source, scrambler, coder and electro-optic converter. The receiver has also various blocks namely the front-end (optic-electric converter and pre-amplifier), the amplifier with AGC (Automatic Gain Control), the synchronizer with AFC (Automatic Frequency Control), the decoder, the descrambler and the data destination.

1. Synchronizer task - Here, we give special relevance to the synchronizer. The synchronizer extracts the clock to make two essential functions. The 1st is to sample the data in the maximum eye diagram to minimize the bit error rate. The 2nd is to retime the data bits to the bit original duration. The clock is also used by other blocks of the receiver.

2. Results, discussion and conclusions

The fiber optics allow communications at great distances without repeater, with high speed and with high information density. The synchronizer extracts the clock and with it samples and retimes the data.

References

[1] A. D. Reis, J. F. Rocha, A. S. Gameiro, J. P. Carvalho, "Digital Communication Systems by Fiber Optic and Synchronism", Proc. ICEUBI_2015- 8ª International Conference on Engineering for Economic Development, pp. 12.07 (8pages), Covilhã-PT 2 - 4 Dec. 2015.