OPTICAL FREE-SPACE COMMUNICATION LINK

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Introduction

Optical free-space communication links (*OFSLs*) developed by teachers and students in Brno University of Technology use the narrow optical beam for the communication connection. *OFSLs* are transparent for these protocols: Ethernet, Token Ring, FDDI-II, ATM/SDH. The corresponding transmission rates are 10 Mbit/s, 16 Mbit/s, 100 Mbit/s and 155 Mbit/s. Depending on the type, *OFSL* ranges are 300 m, 500 m and 2000 m.

Statistical Model of the Link

In order to study the influence of atmospheric phenomena upon the function of the *OFSL*, a testing *OFSL* has been set up at the Institute of Radio Electronics (IREL) at the Brno University of Technology. The testing link is a full duplex digital *OFSL* whose heads are connected to the ATM/SDH metropolitan academic computer network (155 Mbit/s). Bit error maximum under good weather conditions, residual bit error, maximum atmospheric attenuation (without signal interruption) and the probability of link interruption due to atmospheric effects are tested. The distance between heads of the link is 750 m. The level of the internal receiver noise corresponds with a relative monitoring signal quanity of 20 mV. The maximum value is 400 mV, which corresponds to good weather conditions.

The building site is below the optical beam and some other operations that produce typical aerosols into the atmosphere. The testing *OFSL* has been set in particular conditions that need to be measured currently by link testing. The testing *OFSL* is used for constant measurement of: bit error of the link in both directions, level of the received signal in both heads, illumination of the heads by the Sun, and the basic parameters of the atmosphere inclusive of wind velocity and rain intensity.

The testing *OFSL* that has been put together enables long-term observations (even a couple of years) of the link parameters and weather conditions and perform computer processing of the recorded results.

All recorded signals are analyzed and evaluated by the Matlab program and the results are applied to determine the link margin. The testing *OFSL* will allow us to determine the percentage of the time for which the *OFSL* is available. We can analyze both the atmospheric phenomena that affect the *OFSL* operation and the way of reducing or removing these phenomena.

Applications of the Link

OFSLs were installed in several locations (universities, hospitals, observatory, etc.). The significance of this *OFSL* for the staff of the hospitals consists in the possibility of taking advantage of their own as well as international toxicological and pharmaceutical databases.

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References

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