Estimation of optical wireless link attenuation based on rain rate and visibility measurement in Czech Republic

O. Fiser (1) and O. Wilfert (2)

1. Institute of Atmospheric Physics, Prague, Czech Republic, ondrej@ufa.cas.cz / Phone: +420272016038

2. Institute of Radio Electronics, University of Technology, Brno, Czech Republic, wilfert@feec.vutbr.cz / Phone: +420541149130

The wireless optical links are broadly used as an additional short-range communication means. The optical signal passes the atmosphere and is randomly attenuated first of all by fog and rain.

The estimation of optical wireless link reliability is based on combination of rain and prevailing fog attenuation and their statistics. From statistical point of view, it is necessary to estimate the cumulative distribution of both fog and rain whole path attenuation and their correlation as well as combination. While the measurement of the attenuation is rather complicated and expensive, other solution could be selected. The long term measurement of rain rate as well as of the visibility is often at disposal. If we accept a model of the conversion of the visibility (it describes fog) into the optical link specific attenuation on one hand and the conversion of rain rate (it describes rain) into the specific attenuation of the optical link on second hand, we can compute both fog as well as rain specific attenuation of the optical link. From the statistical behaviour of both visibility and rain rate we can estimate the distribution of the whole optical link attenuation.

It was found that the rain rate distribution is very close to the log-normal one while the visibility distribution is well described by the Weibul one. In the contribution there is shown the distribution of rain rate, visibility and their mutual correlation (all derived from a measurement in the Czech Republic); the transformation of these parameters into the optical link attenuation distribution is added**.**