



Prague-Ruzyne airport visibility data processing results

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Experimental research in the Department of Frequency Engineering in the Czech Metrology Institute (CMI) in Prague, the Czech Republic, is focused on stability of received signal on terrestrial radio and optical communication links. A free space optical (FSO) communication system can provide a high bandwidth solution to last mile broadband access. Dense fog events can cause serious attenuation of optical waves. The availability performances of FSO links are seriously affected by lower atmospheric visibility. Fog seems to be the most important impairment factor for FSO communication links. Therefore, our experimental research is also focused on processing meteorological data to obtain basic information for the assessment of availability performances of FSO links. The visibility measured at airports provides a good estimate for the assessment of fog impairment.

The visibility data that is measured and stored in meteorological stations or airports is usually used for the calculation of specific attenuation due to fog in accordance with either the relevant ITU-R Recommendation or other common methods. Fog visibility data obtained by the Vaisala transmissometer at the Prague-Ruzyne airport from January 1996 to December 2008 (13 years of observation) was statistically processed over the individual years, the individual months and the individual hours and the following cumulative distributions (CDs) of visibility were obtained:

- 1) CDs of visibility for individual years,
- 2) CDs of visibility for individual months over the whole period of processing,
- 3) CDs of visibility for the worst hour over the whole period of processing, and
- 4) CDs of visibility for the average year and the average worst month over the entire 13 year period of processing.

It can be concluded that the frequency of fog events shows a great year-to-year variability in accordance with the frequency of individual synoptic situations occurring during the year. Fog occurred most frequently in November and January due to frequent temperature inversion situations. Fog events occur sporadically during the spring and summer months. The reduced visibility most frequently occurs during the sunrise due to the fact that the radiation can cause dense fog events.

The obtained CDs of visibility for the average year and the average worst month over the entire 13 year period of processing can be converted to CDs of attenuation due to fog by some relevant method. The obtained CDs can be used for the assessment of availability performances of the FSO communication links in the climatic region of fog visibility measurement.

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