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# Cumulative Distributions of Rain Intensities Obtained from Different Types of Raingauges

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Experimental research in the Department of Microwave Communications in TESTCOM– Technical Centre of Telecommunications and Post Prague – is focused on the stability of a received signal on terrestrial radio and optical paths. Hydrometeors, i.e. rain, snow, hail, and fog can cause serious attenuation of electromagnetic waves in the frequency bands over 10 GHz. In accordance with Rec. ITU-R P.530-11, attenuation due to rain on terrestrial path can be calculated from measured rain intensities with an integration time of 1 min (average 1-minute rain intensities). Therefore, our experimental research is also focused on our own measurement of radiometeorological parameters of air in the vicinity of experimental paths. The meteorological conditions on experimental paths are identified by means of both video bw camera images of the space between the transmitter site and the receiver site and data obtained from an automatic meteorological station located near the receiver site. VAISALA sensors are used for measurement of temperature, humidity, and pressure of air, velocity and direction of wind. One siphon raingauge and two tipping-bucket raingauges with different collecting areas are used for measurement of rain intensities. The VAISALA PWD 11 equipment is used for the visibility measurement. All meteorological data are recorded.

Rain intensities have been measured since February 1992 by means of a heated siphon raingauge produced by METRA having the collecting area of 250 $cm^2$. Results obtained over 11-year period were presented in RADIOENGINEERING, June 2004, Vol. 13, No. 2, pp.1-2. Since December 2002, rain intensities have also been measured by means of another two heated tipping-bucket raingauges. One of them has the collecting area of 500 $cm^2$, and the rain amount per one tip is 0.1 mm. The other one has the collecting area of 200 $cm^2$, and the rain amount per one tip is 0.2 mm. Both of

them will be dynamically calibrated in early spring 2006. These three raingauges are located very close to each other to avoid the influence of space inhomogeneity of rain events. Since June 2003, rain intensities have also been measured by means of a rain detector of the Present Weather Detector PWD11 of the VAISALA equipment that is located about 5 m apart from the above mentioned three raingauges.

Data obtained from these three raingauges and from the rain detector were statistically processed over single months and the whole year period from August 2004 to July 2005. The method of dynamic calibration of tipping-bucket raingauges will be described. The methods of data processing will be described and the obtained cumulative distributions of average 1-minute rain intensities from individual raingauges will be presented. The results obtained will be compared and broadly discussed.

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