RECOMMENDATION ITU-R SM.443-2

BANDWIDTH MEASUREMENT AT MONITORING STATIONS

(Question ITU-R 26/1)

(1966-1978-1995)

The ITU Radiocommunication Assembly,

considering

a) the need for the measurement of bandwidths of emissions at monitoring stations to promote efficient use of the radio-frequency spectrum;

b) that the equipment for measuring occupied bandwidths in terms of the definition in the Radio Regulations (RR) (Article 1, No. 147, § 1.13 of Recommendation ITU-R SM.328) by comparison of the total power of the emission with the out-of-band power remaining after filtration, does not produce accurate measurements when employed at monitoring stations due to the significant influence of interferences and noises;

c) the slow progress of studies concerning the best equipment and methods for occupied bandwidth measurements including those which could be provided by techniques using digital signal processing (dsp) and computer-aided processing of the signal;

d) the need for uniform estimates of bandwidth at monitoring stations, to enable a comparison of the results obtained by different monitoring stations;

e) the *x* dB bandwidth method gives a result equal to the 99% power bandwidth as defined in RR Article 1, No. 147 under appropriate choice of *x* dB and 0 dB reference level. However, the values of *x* and 0 dB level have not been calculated for all classes of emission. Also it may require measurement too close to the noise floor for practical purposes at monitoring stations;

f) Recommendation ITU-R SM.328 and the Handbook on Spectrum Monitoring,

recommends

1 that, until occupied bandwidth measurement methods have been developed making full allowance for the specific character of the activities of monitoring stations, these stations should continue to use the *x* dB method as specified to perform the measurement at –26 dB and apply a correction factor for the appropriate class of emission, to determine the occupied bandwidth;

1.1 the *x* dB bandwidth is defined in § 1.14 of Recommendation ITU-R SM.328. The *x* dB bandwidth measurement procedures are described in the Handbook of Spectrum Monitoring. The Handbook also describes various methods of establishing the 0 dB reference levels;

1.2 correction factors for the 26 dB bandwidth and the necessary bandwidth for some classes of emissions, when these emissions are “optimum” in terms of § 2 of Recommendation ITU-R SM.328, under specific conditions of measurements, are presented in Annex 1;

2 that administrations and other entities of the ITU-R should be encouraged to study, including by testing, the extension of the *x* dB method to other classes of emission and development of appropriate correction factors for $x = -26$ dB;

3 that administrations and other entities of the ITU-R study new methods of signal processing, in particular dsp and computer-aided techniques, to occupied bandwidth measurement taking into account the specific character of the activities of monitoring stations.

ANNEX 1

Correspondence of values of the 26 dB and the necessary bandwidth of emissions for some types of telegraph signal

Correspondence of values of the 26 dB bandwidth, B_{26} and the necessary bandwidth, B_n, of emissions, which are "optimum" in terms of § 2 of Recommendation ITU-R SM.328, is given in Table 1. B_n values correspond to those given in RR Appendix 6.

TABLE 1

Class of emission	Relationship between B_{26} and B_n
A1A, A1B, A2A, A2B	$B_{26} = 0.9\ B_n$
F1B	$B_{26} = B_n$
F3C	$B_{26} = B_n$
F7BDX	$B_{26} = 0.9\ B_n$

The conversion factors between B_{26} and B_n are valid for the classes of emission shown in column 1 and for the following measurement conditions:

– A voltage spectrum analyser is used with a short time-constant peak detector.

– The resolution bandwidth is set to approximately the modulation rate of the signal. 3-5 sweeps should be taken on "max hold" to allow the trace to build up. The 0 dB "reference level" for this measurement procedure is the maximum amplitude of the resulting trace.

It is assumed, and care should be taken to ensure, that interferences and noise do not influence the shape of the analysed spectrum at the –26 dB measurement level.

Under these conditions, the envelopes of the reproduced spectra, except for relatively narrow sectors contiguous to the carrier, the mark and space frequencies or the nominal transmitted frequencies, whichever is applicable, coincide with the spectrum envelope of these classes of emission when transmitting telegraph signals with equal marks and spaces.

The spectra of actual traffic signals measured in this way differ in detail from actual power spectra, since their structure is not reproduced, but their envelopes are smoothed out. Nevertheless, the method can be used to measure occupied bandwidths, *x* dB bandwidths and the decay rates of out-of-band spectra, since for the purpose of such measurements the envelope of a spectrum is of greater interest than its details.