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Recommendation ITU-R SM.1839-1
(09/2011)

Test procedure for measuring the scanning speed of radio monitoring receivers

SM Series
Spectrum management

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Note: *This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.*

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RECOMMENDATION ITU-R SM.1839-1

Test procedure for measuring the scanning speed of radio monitoring receivers

(2007-2011)

Scope

This Recommendation belongs to a set of Recommendations describing the test methods to determine technical parameters of radio monitoring receivers that are important for the users of these receivers. When the described methods are followed by manufacturers, comparing different receivers is made easier. This Recommendation specifies the test procedure for the determination of the scanning speed of a monitoring receiver. This test procedure definition is recommended to all the manufacturers with the advantage for the users of such receivers that an easier and more objective assessment of product quality is possible. The scanning speed depends on the purpose or intent of the measurement.

The ITU Radiocommunication Assembly,

considering

a) that the ITU-R Handbook on Spectrum Monitoring (Edition 2011) makes several references to the scanning speed of radio monitoring receivers, but that nothing is said about the definition or test procedures for scanning speed;

b) that the specification of the scanning speed strongly depends on the test procedures applied and on the purpose or intent of measurements made during the scanning;

c) that the scanning speed has a direct influence on the suitability of a receiver for certain monitoring tasks;

d) that a defined test procedure for scanning speed must be independent of the receiver design;

e) that a well-defined test procedure for scanning speed, if adopted by all the manufacturers of radio monitoring receivers, will have the advantage for the users of such receivers, that an easier and more objective assessment of products from different manufacturers is possible;

f) that supplementary information about these scanning speed measurements can be found in Report ITU-R SM.2125 – Parameters of and measurement procedures on H/V/UHF monitoring receivers and stations,

recommends

1 that the measurement method in Annex 1 should be used to determine the scanning speed.

Annex 1

Test procedure for measuring the scanning speed of radio monitoring receivers

1 General aspects

The scanning speed (sometimes called sweep speed) specifies how quickly a receiver can provide signal level values on a number of frequencies within a given frequency band. It is measured in MHz/s. As used in this Recommendation, the scanning speed refers to scanning for the purpose of providing signal level values, such as would be used for spectrum occupancy measurements. Scanning for other purposes, such as measurement of signal parameters or DF, requires longer times than measurements for occupancy, and therefore the corresponding scanning speed would be slower.

Scanning speed should include the effect of any band switching time, end-of-sweep retrace time, local oscillator settling time and any computation time. In other words, the scanning speed parameter can be used to compute the revisit time. Optionally, the individual elements that affect scanning speed can be listed separately, so the user can determine the revisit time for any arbitrary frequency range.

2 Principle of monitoring receiver scanning speed measurement

Scanning speed is an important parameter for a monitoring receiver. It characterizes the number of signals a monitoring receiver can detect and/or analyse in a given period of time. This parameter depends on two factors:

– the monitoring receiver speed (settling time of the local oscillators, filters …)

– the digital processing speed (FFT, direction finding …).

The scanning speed is the capability of the monitoring receiver to characterize one or more burst signals in a given frequency band between f_{min} and f_{max}. The scanning speed is given in MHz/s.

The performance is evaluated by two measurements:

– valid characterization of one burst which proves the speed at which the band is scanned,

– valid characterization of several simultaneous bursts with no impact on the speed at which the band is scanned.

Only valid characterizations are to be taken into account for scanning speed measurement.

Goal of the measurement procedure described in this Recommendation is to verify the scanning speed performance. It is not intended to measure the scanning speed limit of the receiver.

2.1 Measurement set-up

The measurement set-up in Fig. 1 should be used.

FIGURE 1

SM.1839-01

Measurement procedure

Step 1: The monitoring receiver should be set to scan the frequency range with the specified channel resolution and valid characterization rate. The scanned frequency range value is:

$$B\ (\text{MHz}) = f_{max} - f_{min}.$$

The parameters f_{min} and f_{max} should be selected so that the scanned frequency range contains at least two channels with the specified channel resolution.

Step 2: The generator generates a burst signal with the length:

$$T_0 = B/S_s$$

with:

T_0: time duration of the burst (s)

B: scanned frequency range (MHz) ($B = N$ * instantaneous bandwidth)

S_s: scanning speed performance for the monitoring receiver (MHz/s).

The generator level is to be adjusted to obtain an SNR > 30 dB as indicated on the receiver.

The generator frequencies are to be selected within the scanned frequency range of the monitoring receiver.

Step 3: Set the level threshold to ensure that the channel is well detected and characterized (valid characterization).

Step 4: Trigger the generator to deliver a single shot.

Step 5: Verify if the signal has been detected and characterized, (the probability of detection of the signals during a subsequent number of tests should be better than 95%):

– a level error of 5 dB more than the specified amplitude accuracy is allowed,

– a frequency error of one resolution bandwidth more than the non-scanning frequency accuracy is allowed.

The level of the signal is to be measured at the antenna input terminal of the monitoring receiver.

Step 6: Programme the generator to provide several bursts. A minimum of 50 frequencies are to be programmed.

Step 7: Trigger the generator to deliver all the CW signals with T_0 duration.

Step 8: Verify that:

– the correct number of frequencies have been detected (the probability of detection of the signals during a subsequent number of tests should be better than 95%),

– the level and the frequency errors should meet the same requirements as in the single burst measurement.

Step 9: Repeat the procedure in such a way that all channels are occupied and have to be processed and measured according to Step 5.

2.2 Measurement parameters

2.2.1 Monitoring receivers parameters

The choice of the monitoring receiver parameters (AGC (amplifier and attenuator)) is free.

2.2.2 Resolution bandwidth

The resolution bandwidth characterizes the ability of a scanning monitoring receiver to distinguish between two different signals with a particular frequency separation.

The scanning speed depends on the resolution bandwidth (rbw). It must be tested with:

– rbw = 5 kHz (or the nearest lower setting) in the range 9 kHz-30 MHz;

– rbw = 25 kHz (or the nearest lower setting) in the range 20-3 000 MHz.

The scanning speed for other rbws may be provided optionally. In all cases, the rbw has to be specified along with the scanning speed value.

2.2.3 Frequency span

If possible, the scanning speed is measured with the monitoring receiver scanning over its maximum frequency span allowed by the receiver. If the scanning speed is different in different frequency bands, the scanning speed may be reported for each frequency band.

3 Presentation of the results

The published scanning speed values have to be valid over the entire temperature range indicated. Limitations, if any, have also to be stated.

If the value obtained in Step 9 of the measurement procedure differs from the other obtained value it has also to be stated.