EN 55024/IS1

Interpretation Sheet 1

EN 55024:1998

English version

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Foreword

This Interpretation Sheet to the European Standard EN 55024:1998 + A1:2001 + A2:2003 was prepared by the Interpretation Panel of the Technical Committee CENELEC TC 210, Electromagnetic compatibility (EMC). The text of the draft was submitted to the Unique Acceptance Procedure (as prISA to prISE) and was approved by CENELEC on 2007-06-22.

Annex A Telecommunications terminal equipment

Application of Annex A to personal computers used as TTE.

PCs are multi-function equipment by nature. EN 55024 requires the testing of all functions of multi-function equipment in order to establish compliance. Modern PCs have the capability of being used as VoIP or video TTE.

Question 1:

How should the testing be performed when PCs are used in this mode ?

Interpretation 1:

As the standard modern PC will support VoIP and video conferencing, it has several functions as TTE in addition to its functions as self-contained ITE. Compliance with EN 55024 is dependent on all functions of a product being compliant.

The interpretations given for questions 4 and 5 on the testing of VoIP telephony products and video conferencing systems to EN 55024 can equally be applied to these functions of PCs.

Clause A.1 Telecommunications terminal equipment (TTE) having an analogue interface
Clause A.2 Telecommunications terminal equipment (TTE) having a digital interface

Dealing with echo-cancelling within TTE products.

Question 2:

The requirements for acoustic and line noise measurements assume that the emitted tone and the line noise signal are at a constant level over time. In practice echo-cancelling functions have been observed to recognise a 1 kHz audio tone as an echo and hence attenuate it, sometimes with several stages of attenuation. Should echo-cancelling be turned off ? If not, what is timing of the measurements from the application of the AM to the CW?

Interpretation 2:

Where echo-cancelling is employed, turning it off may not always be possible. Echo-cancelling would potentially provide a benefit the TTE in real-life performance by attenuating any demodulated noise. As generally stated in EMC performance criteria the compliance of the EUT must be assessed when “operated as intended”. Also, Article 4 (b) of 89/336/EEC states that apparatus shall be so constructed that “the apparatus has an adequate level of intrinsic immunity to electromagnetic disturbance to enable it to operate as intended.”

For these reasons, echo-cancelling functions shall not be turned off during testing. (Due consideration has been given to similar standards, such as ETSI 301 489-7, where there is a requirement to turn off echo-cancelling prior to testing, but it considered that for apparatus covered by EN 55024, this is not appropriate.)

Reference levels shall be established before the echo-cancelling function operates. If this is difficult to observe due to the speed of the echo-cancellation, then acoustic measurement equipment shall be set to record the maximum acoustic level from the instant of the -40 dBm/dBm0 injection on the line.

Good echo-cancelling attenuates a demodulated signal rapidly, and is desirable. Echo-cancelling that takes some time to become effective would cause annoyance. The dwell time typically used for 1 % steps at a sweep rate of $1{,}5 \times 10^{-3}$ decades/second is approximately 3 s, and this offers a practical solution for determining the appropriate time of measurement.

Therefore in order to assess the effectiveness of the echo-cancelling and to establish compliance, the dwell time (i.e. the time during which the carrier frequency is amplitude modulated with 1 kHz prior to measurement) shall be 3 s. The end of the dwell time indicates the start time of the demodulation measurements (in both directions). The amplitude modulation shall remain on during the demodulation measurements.

Test laboratories are encouraged to ensure the time taken to make the demodulation measurements is as short as possible (less than one second) and they shall record and report the time taken for the measurements. The total dwell at each test frequency is therefore 3 s plus the demodulation measurement time.

Clause A.1 Telecommunications terminal equipment (TTE) having an analogue interface
Clause A.2 Telecommunications terminal equipment (TTE) having a digital interface

Dealing with the mute function within TTE products.

Question 3:

One of the functions of a typical conference/speaker phone is the ability to mute the near end microphone. If a TTE product has a mute function then it has two modes of operation; “muted” and “un-muted”.

A mute function could be implemented by a switch on the microphone wire, or by a software instruction to the DSP within the TTE to produce and maintain a degree of isolation.

If TTE is to be tested with the mute function on, then circuitry which could cause a demodulation failure may actually be isolated.

If TTE is to be tested with the mute function off, then the audio tone from the speaker is typically less stable than with mute on. This sometimes makes the establishment of the audio reference level of method 2 difficult.

What modes of operation should be tested and what can be done to establish a constant reference level when a product has a mute function?

Interpretation 3:

There are clearly two operation modes to consider when a call is established - “Muted” and “Un-muted”.

When testing “Muted” then mute should be on throughout the test and during the establishment of any reference level.

When testing “Un-muted” then mute should be off throughout the test and during the establishment of any reference level. If the establishment of any reference level is not possible in “un-muted” because of an unstable level, then it shall be done with mute on and this detail shall be recorded in the test results and the test report.

Where either method 1 or method 2 applies and an auxiliary TTE is used to receive the telephony call of the EUT, the auxiliary TTE shall be muted for all operation modes of the EUT to avoid influencing the test results.

Due to testing cost implications the manufacturer may decide to test when operated in the worst case only. This is likely to be the “Un-muted” operation mode as muting will typically isolate a part of the TTE circuitry. Where testing in all modes is not performed, this shall be recorded in the test results and the test report.

Clause A.1 Telecommunications terminal equipment (TTE) having an analogue interface
Clause A.2 Telecommunications terminal equipment (TTE) having a digital interface

Clauses A.1 and A.2 do not describe a test method for video conference systems. Such systems typically communicate using transfer of both audio and video signals. Where audio is involved, then the demodulation measurements apply, as this is a TTE product where offering a “telephony service”.

Extracting the line noise signals of the 1 kHz audio signal is often not possible when the video and audio are mixed in the same telecoms protocol.

Question 4:

Which modes of operation should be used when testing video conferencing systems ?

Interpretation 4:

As a minimum, observation of the displayed video quality on the EUT, and the transmitted video quality from the camera (by observation at the auxiliary equipment) shall be made on video conference systems.

Where a video conference system also supports speech, but where that speech is encoded in a mixed audio/video protocol, it cannot be tested to the demodulation requirements of Annex A. In such cases the interpretation given for the testing of VoIP telephony products (see Interpretation 5) shall be applied.

If the video conference system can support a real-time two-way speech only call (i.e. offer a telephony service) then Annex A shall be applied with the required acoustic and line noise measurements.

Clause A.2 Telecommunications terminal equipment (TTE) having a digital interface

Applicability to VoIP telephony products and similar, where measurement of the line noise signal in dBm or dBm0 is not possible (in both Measurement methods 1 and 2), and for where the injection of -40 dBm or dBm0 is not possible for establishing the reference level of Measurement method 2.

Question 5:

How is it possible to determine the level of demodulation that is sent down the line as an intended signal ?

Interpretation 5:

Where measurement methods 1 and 2 cannot be used to determine the level of demodulation sent from the EUT down the line (e.g. on products such as VoIP phones) then the following interpretations – see below – can be used as practical interpretations in order to establish compliance. Both interpretations uphold the intention of Methods 1 and 2 by monitoring the level of 1 kHz demodulation within the EUT which is sent in both transmit and receive directions.

Testing is performed using two identical samples of the same telephony product along with the means to establish a point-to-point call between them. One sample is the EUT and the other is employed as auxiliary equipment as described in A.2.1. Acoustic measurements shall be made on both samples in order to assess the level of demodulation in each direction No line noise measurements will be required, neglecting any requirement to break-out or break-into the telecoms line. This allows all kinds of telecoms lines, even future protocols, to be tested. Acoustic measurements shall be made from both the EUT and the auxiliary equipment during exposure of the EUT to the applied stress.

Interpretation of method 1

This method is intended for “handset TTE” (i.e. those products where the artificial ear can be acoustically coupled without loss). The absolute acoustic measurements from both samples are compared to the limits specified in method 1 of A.2. Both TTE samples shall be set to the same nominal receive volume. The manufacturer shall provide details of the nominal receive volume setting. The volume setting is critical to the test results produced and shall be recorded and reported. Acoustic measurements shall be made using an IEC 60318 compliant artificial ear.

Interpretation of method 2

This method is intended for “speaker/conference TTE” (i.e. those products where coupling without loss is not achievable) where upon relative acoustic measurements are made.

A 1 kHz Reference Noise Source (RNS) (IEEE-269, IEEE-661 and ITU-T P.51 artificial mouth) generating a known sound pressure level of 65 dBspl shall be used to establish the reference level with the acoustic receiving device set up at the ITU Recommended “Hands-Free Reference Point” from the RNS. The background noise shall be at least 15 dB below the RNS level. The EUT is then positioned in place of the RNS and set at nominal receive volume (established as in the interpretation of method 1). Care must be taken when positioning the EUT in place of the RNS as it is critical to the test results produced. The RNS shall be used to set up the auxiliary TTE in the same way. The acoustic measurements are relative to reference level established with the RNS.

NOTE The figure of 65 dBspl is appropriate for the following reason. When -40 dBm at 1 kHz is injected onto the line of a standard non-gain phone, it produces 65 dBspl at the speaker. This can be demonstrated with handset TTE, but not with speaker/conference TTE because large speakers cannot be coupled without loss to make that measurement. Therefore, the establishment of 65 dBspl at the TTE speaker is the Reference Level of method 2.

Validity:

These interpretations remain valid until amendment(s) or an updated standard dealing with these issues is published by CENELEC.

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