INTERNATIONAL STANDARD

ISO 7779

Fourth edition
2018-11

Acoustics — Measurement of airborne noise emitted by information technology and telecommunications equipment

Acoustique — Mesurage du bruit aérien émis par les équipements liés aux technologies de l'information et aux télécommunications

Reference number
ISO 7779:2018(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ... **vi**

Introduction ... **viii**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms and definitions ... **2**
3.1 General definitions ... 2
3.2 Acoustical definitions ... 4
3.3 Statistical definitions ... 7

4 Conformity requirements ... **7**

5 Installation and operating conditions ... **8**
5.1 Equipment installation ... 8
5.1.1 General ... 8
5.1.2 Floor-standing equipment ... 8
5.1.3 Table-top equipment ... 9
5.1.4 Wall-mounted equipment ... 9
5.1.5 Rack-mounted equipment ... 9
5.1.6 Hand-held equipment ... 9
5.1.7 Sub-assemblies ... 9
5.2 Input voltage and frequency ... 10
5.3 Equipment operation ... 10

6 Method for determination of sound power levels of equipment in reverberation test rooms ... **11**
6.1 General ... 11
6.2 Measurement uncertainty ... 11
6.3 Test environment ... 12
6.3.1 General ... 12
6.3.2 Meteorological conditions ... 12
6.4 Instrumentation ... 12
6.4.1 General ... 12
6.4.2 The microphone and its associated cable ... 12
6.4.3 Frequency response of the instrumentation system ... 12
6.4.4 Reference sound source ... 13
6.4.5 Filter characteristics ... 13
6.4.6 Calibration ... 13
6.5 Installation and operation of equipment: general requirements ... 13
6.6 Microphone positions and source locations ... 13
6.6.1 General ... 13
6.6.2 Number of microphone positions, reference sound source locations and equipment locations ... 14
6.6.3 Microphone arrangement ... 14
6.7 Measurement of sound pressure level ... 14
6.7.1 General ... 14
6.7.2 Measurement duration ... 14
6.7.3 Corrections for background noise ... 14
6.8 Measurement of the sound pressure level of the reference sound source ... 14
6.9 Calculation of mean time-averaged band sound pressure level ... 14
6.10 Determination of sound power level ... 14
6.10.1 Calculation of band sound power levels ... 14
6.10.2 Calculation of A-weighted sound power level ... 15

7 Method for determination of sound power levels of equipment under essentially free-field conditions over a reflecting plane ... **17**
7.1 General ... 17

7.2 Measurement uncertainty ... 17
7.3 Test environment ... 18
7.3.1 Essentially free field over a reflecting plane ... 18
7.3.2 Meteorological conditions ... 19
7.4 Instrumentation ... 20
7.4.1 General ... 20
7.4.2 The microphone and its associated cable ... 20
7.4.3 Frequency response of the instrumentation system ... 20
7.4.4 Reference sound source ... 20
7.4.5 Filter characteristics ... 20
7.4.6 Calibration ... 20
7.5 Installation and operation of equipment: General requirements ... 20
7.6 Measurement surface and microphone positions ... 21
7.6.1 General ... 21
7.6.2 Microphone positions on the measurement surface ... 22
7.7 Measurement of sound pressure levels ... 22
7.7.1 General ... 22
7.7.2 Measurement duration ... 22
7.7.3 Corrections for background noise ... 22
7.8 Calculation of surface sound pressure level ... 22
7.9 Determination of sound power levels ... 23
7.9.1 Calculation of band sound power levels ... 23
7.9.2 Calculation of A-weighted sound power level ... 23

8 Method for determination of emission sound pressure levels at defined operator and bystander positions ... 23
8.1 General ... 23
8.2 Measurement uncertainty ... 24
8.3 Test environment ... 24
8.3.1 General ... 24
8.3.2 Meteorological conditions ... 24
8.4 Instrumentation ... 25
8.5 Installation and operation of equipment ... 25
8.6 Microphone positions ... 25
8.6.1 General ... 25
8.6.2 At the operator position(s) ... 25
8.6.3 At the bystander positions ... 28
8.6.4 Microphone orientation ... 28
8.7 Measurement of sound pressure levels ... 28
8.7.1 General ... 28
8.7.2 Measurement duration ... 29
8.7.3 Corrections for background noise ... 29
8.8 Determination of emission sound pressure levels ... 29
8.8.1 Calculation of band emission sound pressure levels ... 29
8.8.2 Calculation of A-weighted emission sound pressure levels from band levels ... 29
8.8.3 Calculation of the mean emission sound pressure level at the bystander positions ... 30

9 Measurement uncertainty ... 30

10 Information to be recorded and reported ... 32
10.1 Information to be recorded ... 32
10.1.1 General ... 32
10.1.2 Equipment under test ... 32
10.1.3 Acoustical environment ... 32
10.1.4 Instrumentation ... 33
10.1.5 Acoustical data ... 34
10.2 Test report ... 35

Annex A (normative) **Test accessories ... 37**

Annex B (normative) **Measurement surfaces** **40**
Annex C (normative) **Installation and operating conditions for specific equipment categories** **46**
Annex D (informative) **Identification and evaluation of prominent discrete tones** **47**
Annex E (informative) **Background information on the method formerly used for the detection of impulsive noise** **67**
Bibliography **68**

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This fourth edition cancels and replaces the third edition (ISO 7779:2010), which has been technically revised. The main changes compared to the previous edition are as follows:

— Clause 3:

  — Updates of many items in 3.1 and 3.2 to be consistent with basic standards, such as ISO/TR 25417, ISO 3744, etc.

  — Addition of new 3.3 corresponding to new Clause 9.

— Clause 6:

  — In 6.4.6, the microphone calibration procedures were amended to be consistent with those of industrial counterpart, ECMA-74.

— Clause 7:

  — In 7.3 (7.3.1), the procedure for test environment qualification was amended to clarify that any frequency bands, typically low in frequency, not significantly affecting A-weighted sound power level need not meet the hemi-anechoic room qualification criteria for the purposes of determining A-weighted sound power level.

  - In 7.4.6, the microphone calibration procedures were amended to be consistent with those of industrial counterpart, ECMA-74.

- Clause 8:
  - In 8.6, new 8.6.1 was inserted to clarify the method of defining operator position and bystander positions.

- Clause 9:
  - Clause 9 was newly inserted.
  - In relation to Clause 9, 3.3 was also added, and the descriptions of Tables 1, 5 and 6 (in 6.2, 7.2 and 8.2 respectively) were amended.

- Annex B:
  - B.2.2 and B.2.3 were amended to clarify the section of size and microphone positions on the cylindrical measurement surface, respectively.

- Annex D:
  - In D.1, D.8, D.9.5, D.10.3 and D.10.4, descriptions were amended to clarify that Annex D permits to use FFT data below 89,1 Hz and above 11 200 Hz to calculate tone-to-noise ratio and prominence ratio.
  - In D.9.7 and D.10.7, notes were added to mention that new metrics for detecting prominent discrete tone, (1) total tone-to-noise ratio and (2) total prominence ratio are under development.

- Annex E:
  - The measurement method stated in Annex E became out of date and was removed. But the annex structure is still maintained for the possible development of a new method (the title of the annex was amended accordingly).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document specifies methods for the measurement of airborne noise emitted by information technology and telecommunications (ITT) equipment. Hitherto, a wide variety of methods have been applied by individual manufacturers and users to satisfy particular equipment or application needs. These diverse practices have, in many cases, made comparison of noise emission difficult. This document simplifies such comparisons and is the basis for the declaration of the noise emission levels of ITT equipment.

In order to ensure accuracy, validity and acceptability, this document is based on the basic International Standards for determination of the sound power level and for determination of the emission sound pressure level at the operator position and bystander positions. Furthermore, implementation is simplified by conformity with these International Standards.

In many cases, free-field conditions over a reflecting plane are realised by hemi-anechoic rooms. These rooms can be particularly useful during product design to locate and to improve individual contributing noise sources. Reverberation test rooms can be more economical for production control and for obtaining sound power levels for noise emission declaration purposes.

The method for measuring the emission sound pressure level at the operator or bystander positions (based on ISO 11201) is specified in a separate clause, as this level is not considered to be primary noise emission declaration information. The measurements can, however, be carried out in conjunction with those for sound power determination in a free field over a reflecting plane.

For comparison of similar equipment, it is essential that the installation conditions and mode of operation be the same. In Annex C, these parameters are standardized for many categories of equipment.

This document is based on ECMA-74.