



BSI Standards Publication

Electroacoustics — Hearing aids — Method for measuring electroacoustic performance up to 16 kHz

National foreword

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Electroacoustics – Hearing aids – Method for measuring electroacoustic performance up to 16 kHz

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references.....	8
3 Terms, definitions and abbreviated terms	8
3.1 Terms and definitions	8
3.2 Abbreviated terms	9
4 Mechanical design of the 0,4 cm ³ coupler	9
4.1 General.....	9
4.2 Cavity dimensions	10
4.2.1 Critical dimensions.....	10
4.2.2 Effective coupler volume	10
4.2.3 Diameter of the coupler cavity	11
4.3 Verification procedure of the effective coupler volume.....	11
4.3.1 General	11
4.3.2 Test set-up	11
4.3.3 Effective volume of the coupler under test	11
4.4 Measuring microphone	12
4.4.1 General	12
4.4.2 Preferred microphone.....	12
4.4.3 Alternative microphones	12
4.5 Static pressure equalisation vent	12
5 Calibration.....	12
5.1 Reference environmental conditions	12
5.2 Calibration procedure	13
6 Coupling of receivers and hearing aids to the coupler.....	13
6.1 Coupling to a hearing aid receiver by means of tubing	13
6.2 Coupling to a hearing aid embedded in or connected to an earmould.....	13
6.3 Coupling to a receiver in the canal (RIC hearing aid).....	14
6.4 Coupling to a BTE hearing aid with 2 mm continuous internal diameter tubing	15
6.5 Coupling to a BTE hearing aid with earmould simulator	16
6.6 Coupling to a BTE hearing aid with thin tubing	17
7 Transfer impedance of the 0,4 cm ³ coupler	18
8 Comparison of the 0,4 cm ³ , the 2 cm ³ coupler and the occluded-ear simulator	19
8.1 Sound pressure level frequency response curves.....	19
8.2 Comparison of the coupler impedance with typical source impedances	20
8.3 Influence of sound source impedance on measured level difference between the 0,4 cm ³ coupler and the 2 cm ³ coupler	21
9 Maximum permitted expanded uncertainty for coupler conformance testing	22
10 Measurements using the 0,4 cm ³ coupler.....	23
10.1 General.....	23
10.2 Test enclosure and test equipment	23
10.3 Extended frequency range for total harmonic distortion measurements	23
10.4 Presentation of data	24
10.4.1 General	24

10.4.2	Presentation as 0,4 cm ³ coupler data	24
10.4.3	Presentation as normalised to 2 cm ³ coupler data	24
10.5	Maximum permitted expanded uncertainty of measurements performed using the 0,4 cm ³ coupler	24
Annex A (informative)	Response transforms between the 0,4 cm ³ coupler and the occluded-ear simulator	26
A.1	General	26
A.2	Simulation model of the human ear and approximation of $\lambda/2$ resonances	26
A.3	Measured and simulated transform responses of a standard-fitting	28
A.4	Transform curves for CIC-fitting and deep-insertion-fitting	29
Annex B (informative)	Measurement and modelling of the transfer impedance of the 0,4 cm ³ coupler	33
B.1	Measurement procedure	33
B.1.1	Transfer impedance	33
B.1.2	Calibration of the volume velocity source at 250 Hz	33
B.1.3	Calibration of the volume velocity source over the frequency range from 100 Hz to 60 kHz	34
B.1.4	Test set-up for measuring the coupler transfer impedance	34
B.2	Measurement of the coupler transfer impedance	35
B.3	Electrical analogue representation of the coupler as a tube model	38
Bibliography	41
Figure 1	Mechanical design of the 0,4 cm ³ coupler, shown with removable coupling plate with a nipple for the attachment of coupling tubing	10
Figure 2	Coupling to a hearing aid receiver by means of coupling tubing	13
Figure 3	Coupling to an ITE hearing aid	14
Figure 4	Coupling to a receiver in the canal (RIC hearing aid)	15
Figure 5	Coupling to a BTE hearing aid with 2 mm continuous internal diameter tubing	16
Figure 6	Coupling to a BTE hearing aid with earmould simulator	17
Figure 7	Coupling to a BTE hearing aid with thin coupling tubing	18
Figure 8	Magnitude frequency response of the transfer impedance \times frequency and the related equivalent volume	19
Figure 9	Comparative measurement of the 0,4 cm ³ coupler, the 2 cm ³ coupler and the occluded-ear simulator frequency responses	20
Figure 10	Magnitude frequency responses of acoustic impedance of the 2 cm ³ , the 0,4 cm ³ coupler and various hearing aid types	21
Figure 11	Deviation from the normalized coupler volume ratio as a function of the effective volume of the sound source V_s	22
Figure A.1	Electrical analogue model of the human ear	27
Figure A.2	Measured transform response of a standard-fitting	28
Figure A.3	Comparison between the measured and the simulated standard-fitting transform response	29
Figure A.4	Transform responses for (a) standard-fitting, b) CIC-fitting and (c) deep-insertion-fitting	30
Figure B.1	Test set-up for measuring the coupler transfer impedance	35
Figure B.2	Average frequency response of 8 coupler measurements	35
Figure B.3	Average transfer impedance of the 0,4 cm ³ coupler	36

Figure B.4 – Transfer impedance times frequency re 1 Pa/m ³ in dB and as equivalent volume in mm ³ in the frequency range 100 Hz to 60 kHz	36
Figure B.5 – Electrical analogue model based on a tube model	39
Figure B.6 – Comparison between the measured (solid line) and the simulated (dashed line) transfer impedance	39
Figure B.7 – Frequency responses of simulated 0,4 cm ³ coupler input and transfer impedances	40
Table 1 – Values of U_{\max} for basic measurements	23
Table 2 – Distortion test frequencies and input sound pressure levels	24
Table 3 – Values of U_{\max} for basic measurements	25
Table A.1 – Transform data for standard-fitting (fitting at reference plane), CIC-fitting and deep-insertion-fitting	31
Table B.1 – Transfer impedance of the 0,4 cm ³ coupler in the frequency range from 100 Hz to 60 kHz	37

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROACOUSTICS – HEARING AIDS –
METHOD FOR MEASURING ELECTROACOUSTIC
PERFORMANCE UP TO 16 kHz**

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62886, which is a Technical Specification, has been prepared by IEC technical committee 29: Electroacoustics.

The text of this Technical Specification is based on the following documents:

Enquiry draft	Report on voting
29/897/DTS	29/902A/RVC

Full information on the voting for the approval of this Technical Specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

Advancement in hearing aid design makes it possible to increase the bandwidth of hearing aids up to 16 kHz. Accordingly, there is a need for an accurate and yet robust measurement method for the transducer (receiver, earphone) designer, the hearing aid designer, and the fitter of hearing aids.

The 2 cm³ coupler as described in IEC 60318-5 is only suitable for measurements up to 8 kHz. The limitation is caused by unfavourable acoustic modes of the coupler.

The occluded-ear simulator as described in IEC 60318-4 simulates the average human external ear up to 8 kHz, and can be used as a test coupler up to 16 kHz. The occluded ear-simulator is designed for a specific insertion depth of the earmould, which is associated with a half-wavelength $\lambda/2$ resonance at about 13,5 kHz. This half-wavelength resonance degrades the reproducibility of measurement results in that frequency range and harmonic distortion measurements made at corresponding multiples of the resonance frequency. Also, this resonance represents a complex load to the hearing aid transducer, which makes it more difficult to differentiate between transducer and load related effects.

The effective internal volume of the coupler described in this Technical Specification is 0,4 cm³, which is small enough not to produce any resonance in the frequency range below 16 kHz. The frequency response of the magnitude of acoustic impedance follows a pattern of a capacitive load up to about 30 kHz. With a sufficiently high source impedance and a sufficiently small coupling volume, the 0,4 cm³ coupler produces an approximately 14 dB higher output at 1 kHz in comparison to data obtained with the 2 cm³ coupler.

The coupler described in this document will allow the characterisation of hearing aids and transducers, including the verification of simulation models, up to 16 kHz.

0,4 cm³ is also approximately the residual volume of the ear canal when fitted with a CIC hearing aid (completely-in-the-canal) hearing aid, making this coupler particularly useful for this application.

In combination with an appropriate real-ear probe microphone measurement, the 0,4 cm³ coupler will enable the derivation of real-ear to coupler difference (RECD) up to 16 kHz.

ELECTROACOUSTICS – HEARING AIDS – METHOD FOR MEASURING ELECTROACOUSTIC PERFORMANCE UP TO 16 kHz

1 Scope

IEC TS 62886, which is a Technical Specification, describes a coupler and measurement methods to characterise the electroacoustic performance of hearing aids and insert earphones primarily in the range of 8 kHz to 16 kHz.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60118-0, *Electroacoustics – Hearing aids – Part 0: Measurement of the performance characteristics of hearing aids*

IEC 60318-4, *Electroacoustics – Simulators of human head and ear – Part 4: Occluded-ear simulator for the measurement of earphones coupled to the ear by means of ear inserts*

IEC 60318-5, *Electroacoustics – Simulators of human head and ear – Part 5: 2 cm³ coupler for the measurement of hearing aids and earphones coupled to the ear by means of ear inserts*

IEC 61094-4, *Measurement microphones – Part 4: Specifications for working standard microphones*

IEC 60263, *Scales and sizes for plotting frequency characteristics and polar diagrams*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1.1

reference cavity

simple cylindrical cavity with the same nominal diameter and height as the coupler under test, establishing a volume that can be measured using precision dimensional metrology

Note 1 to entry: In the context of this document, the reference cavity is 400 mm³ ± 3 mm³, with a diameter of 9,45 mm ± 0,02 mm and a height of 5,70 mm ± 0,02 mm.