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BSI Standards Publication

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

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee EPL/29, Electroacoustics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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

FOREWORD

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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- withdrawn,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 cm^3 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 cm^3, 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 cm^3 coupler produces an approximately 14 dB higher output at 1 kHz in comparison to data obtained with the 2 cm^3 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 cm^3 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 cm^3 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 cm^3 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 mm^3 ± 3 mm^3, with a diameter of 9,45 mm ± 0,02 mm and a height of 5,70 mm ± 0,02 mm.