**ANSI/ASA S3.35-2010**
**(Revision of ANSI S3.35-2004)**

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# AMERICAN NATIONAL STANDARD

# Method of Measurement of Performance Characteristics of Hearing Aids Under Simulated Real-Ear Working Conditions

ANSI/ASA S3.35-2010

Accredited Standards Committee S3, Bioacoustics

Standards Secretariat
Acoustical Society of America
35 Pinelawn Road, Suite 114 E
Melville, NY 11747-3177

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# Method of Measurement of Performance Characteristics of Hearing Aids Under Simulated Real-Ear Working Conditions

Secretariat
**Acoustical Society of America**

Approved February 25, 2010 by:
**American National Standards Institute, Inc.**

**Abstract**
This standard describes techniques used to measure hearing aids under simulated conditions of real ear use. The need for such a standard arises from the importance of including the acoustical variations in the performance data that are caused when hearing aids are worn. For example, the diffraction of the body and head of a hearing aid wearer on incident sound can significantly change the input sound pressure to a hearing aid microphone. For the purpose of these measurements, a suitable manikin and ear simulator are used to represent a typical hearing aid wearer. Acoustical requirements of the test space as well as how the manikin is positioned with respect to the sound source are given. Two methods are presented by which to control the level of the incident sound field at the location of the hearing aid on the manikin during the testing. Procedures are provided to obtain the insertion gain, or the amount by which the hearing aid changes the eardrum sound pressure in the ear simulator of the manikin relative to that in the unaided condition. Procedures are also provided to obtain the directional response of the manikin as a function of azimuth and elevation of the sound source, with and without the assistance of a hearing aid, and to calculate the directivity index from the directional response. The gains obtained with a hearing aid are distinguished by whether the unaided manikin gain is included in (simulated real-ear aided gain) or subtracted from (simulated insertion gain) the aided gain.

## AMERICAN NATIONAL STANDARDS ON ACOUSTICS

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An American National Standard implies a consensus of those substantially concerned with its scope and provisions. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered and that a concerted effort be made towards their resolution.

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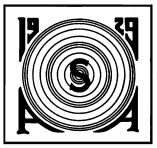

Acoustical Society of America
ASA Secretariat
35 Pinelawn Road, Suite 114E
Melville, New York 11747-3177
Telephone: 1 (631) 390-0215
Fax: 1 (631) 390-0217
E-mail: asastds@aip.org

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## Foreword

[*This Foreword is for information only, and is not a part of the American National Standard ANSI/ASA S3.35 – 2010 American National Standard Method of Measurement of Performance Characteristics of Hearing Aids Under Simulated Real-Ear Working Conditions*].

This standard comprises one part of a group of definitions, standards, and specifications for use in bioacoustics. It was developed and approved by Accredited Standards Committee S3 Bioacoustics, under its approved operating procedures. Those procedures have been accredited by the American National Standards Institute (ANSI). The Scope of Accredited Standards Committee S3 is as follows:

> *Standards, specifications, methods of measurement and test, and terminology in the fields of psychological and physiological acoustics, including aspects of general acoustics, shock and vibration, which pertain to biological safety, tolerance and comfort.*

This standard is a revision of ANSI S3.35-2004, which has been technically revised. The 2004 edition was amended to include methods of measuring the directional response due to sound from various elevation and azimuth angles of incidence, both in an unaided manikin ear and in a simulated aided real ear, and the calculation of the directivity index from a spherical integration of the directional response. The directivity index is considered to be of value in predicting the speech intelligibility performance of hearing aids in noisy situations. This 20XX edition has been revised in Annex B to describe the directional arrays used to justify the directivity index measurement method specified in this standard and to improve some graphics.

This standard is comparable to IEC/TR 60118-8:2003.

At the time this Standard was submitted to Accredited Standards Committee S3, Bioacoustics for approval, the membership was as follows:

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D.A. Preves, *Vice-Chair*

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Individual Experts of the Accredited Standards Committee S3, Bioacoustics, were:

| | | |
|---|---|---|
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Members of S3/WG48, Hearing Aids, who actively assisted Accredited Standards Committee S3, Bioacoustics, in the development of this standard, were:

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D. Warren, S3.35 Sub-group Co-Chair

O. Saltykov, Sub-group Co-Chair

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| B. Fedor | V. Nedzelnitsky | R. Wagner |
| G.J. Frye | S. Petrovic | |

Suggestions for improvements of this standard will be welcomed. They should be sent to Accredited Standards Committee S3, Bioacoustics, in care of the Standards Secretariat of the Acoustical Society of America, 35 Pinelawn Road, Suite 114E, Melville, New York 11747-3177. Telephone: 631-390-0215; FAX: 631-390-0217; E-mail: asastds@aip.org

## Introduction

Measuring methods that take into account the acoustical influence of the wearer on the performance of hearing aids are important, particularly when the results are to be used to assist in the fitting of hearing aids. The information obtained using this document is likely to be more relevant to the fitting of hearing aids than that provided by specification documents such as ANSI/ASA S3.22-2009.

The methods specified in this document require a device such as a manikin to simulate the presence of the wearer.

## American National Standard

# Method of Measurement of Performance Characteristics of Hearing Aids Under Simulated Real-Ear Working Conditions

## 1 Scope

The purpose of this standard is to describe test methods which include the acoustical effects of a simulated median adult wearer on the performance of a hearing aid.

Measurements made under simulated real-ear aided working conditions may be divided into two classes:

- Direct simulated real-ear aided measurements, which determine the sound pressure developed by a hearing aid in an ear simulator for a given free-field input sound pressure.

- Insertion measurements, which determine the difference between the sound pressures developed in the ear simulator with and without a hearing aid in place.

Such measurements attempt to determine the actual acoustical assistance that a hearing aid gives to a user.

The test methods described in this document are not intended for quality control.

The results obtained under simulated real-ear aided conditions may differ substantially from results obtained on an individual person due to anatomical and physiological variations of heads, torsos, pinnae, ear canals, and eardrums.

The methods recommended in this standard give information on the measurement of the following parameters that are considered important for the evaluation of the performance of a hearing aid as normally worn, and for which simulated real-ear aided conditions are considered essential:

- insertion gain

- real-ear aided output sound-pressure level for 90 dB input sound-pressure level

- directional characteristics.

Test methods described in this standard are conducted with hearing aids set in linear, non-adaptive, mode.

## 2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.