ASA/ANSI S3.52-2016

Reaffirmed by ANSI June 5, 2020

AMERICAN NATIONAL STANDARD

Measurements of the Threshold of Hearing and Signal Detectability in a Sound Field

Secretariat:

Acoustical Society of America

Approved on January 6, 2016

American National Standards Institute, Inc.

Abstract

The standard covers requirements, conditions, and procedures for threshold-of-hearing measurements in a sound field. However, the standard may also be used for conducting other sound-field hearing tests and as a research tool for assessing the effects of listening conditions and headgear worn by the listener on detectability of various test signals. Three sound fields are referenced in the standard: the free sound field, the quasi-free sound field, and the diffuse sound field. The test signals covered by the standard are frequency-modulated tones (warble tones) and narrow-band noises. However, other calibrated signals that meet requirements of this standard may also be used. The standard applies to binaural listening to test signals presented by one or more loudspeakers in a test room. Monaural air conduction hearing thresholds may also be determined if the opposite ear can be properly occluded. Special application of the standard to the assessment of spatial hearing is presented in Annex B.

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Accredited Standards Committee S3, Bioacoustics

Standards Secretariat
Acoustical Society of America
1305 Walt Whitman Road, Suite 300
Melville, NY 11747

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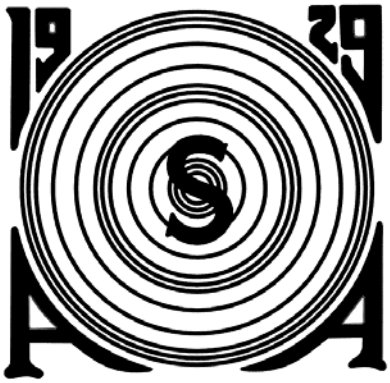

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Foreword

[*This Foreword is for information only and is not a part of the American National Standard* ANSI/ASA S3.52-2016 American National Standard Measurements of the Threshold of Hearing and Signal Detectability in a Sound Field. *As such, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the standard.*]

This standard comprises a 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, specification, methods of measurements and test, and terminology in the fields of mechanical shock, and physical acoustics, including aspects of general acoustics, shock, and vibration that pertain to biological safety, tolerance, and comfort.*

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

C.J. Struck, *Chair*
P.B. Nelson, *Vice-Chair*

S.B. Blaeser, *Secretary*

Acoustical Society of America ..... C.J. Struck
..... P.B. Nelson (Alt.)

American Academy of Audiology ..... C. Schweitzer
..... T. Ricketts (Alt.)

American Academy of Otolaryngology, Head and Neck Surgery, Inc. ..... R.A. Dobie
..... A. Kim (Alt.)

American Industrial Hygiene Association ..... T.K. Madison
..... D. Driscoll (Alt.)

American Speech-Language-Hearing Association (ASHA) ..... L.A. Wilber
..... N. DiSarno (Alt.)

Beltone/GN Resound ..... S. Petrovic

Council for Accreditation in Occupational Hearing Conservation (CAOHC) ..... B. Charlton
..... B. Kirchner (Alt.)

Diagnostic Group ..... T. McColley
..... P. Dobrowski (Alt.)

ETS – Lindgren Acoustic Systems ..... S. Dunlap
..... D. Winker (Alt.)

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..... J.K. Stewart (Alt.)

Food and Drug Administration ..... S-C Peng

G.R.A.S. Sound & Vibration ..... B. Schustrich
..... J. Soendergaard (Alt.)

Hearing Industries Association ..... A. Bopp
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National Electrical Manufacturers Association,
Signaling Protection & Communication Section (NEMA – 3SB) ..... J. McNamara
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National Hearing Conservation Association ..... G.L. Poling
..... R. Danielson (Alt.)

National Institute for Occupational Safety and Health (NIOSH) ..... M.R. Stephenson
..... W.J. Murphy (Alt.)

National Institute of Standards and Technology ..... R.P. Wagner
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National Park Service ..... M. McKenna
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Starkey Hearing Technologies ..... D.A. Preves

U.S. Air Force ..... R.L. McKinley
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U.S. Army CERL ..... D.K. Delaney
..... M.J. White (Alt.)

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..... A. Foots (Alt.)

University of Cincinnati Animal Audiology Clinic/Bioacoustics Lab ..... P.M. Scheifele
..... D.K. Brown (Alt.)

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

R.F. Burkard	R.L. McKinley	P.D. Schomer
M. Burkhard	V. Nedzelnitsky	C.J. Struck
A.J. Campanella		L.A. Wilber

Working Group S3/WG83, Sound Field Audiometry, which assisted Accredited Standards Committee S3, Bioacoustics, in the development of this standard, had the following membership.

T.R. Letowski, Chair

K. Abouchacra	R.L. Grason	C.J Struck
D. C. Emanuel	K. Michael	L.A. Wilber

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, 1305 Walt Whitman Road, Suite 300, Melville, New York 11747. Telephone: 631-390-0215; FAX: 631-923-2875; E-mail: asastds@acousticalsociety.org.

American National Standard

Measurements of the Threshold of Hearing and Signal Detectability in a Sound Field

1 Scope

1.1 General

This standard specifies relevant requirements for sound-field hearing tests conducted with the signals presented by means of loudspeakers in free, quasi-free, and diffuse sound fields. The requirements and conditions described in this standard are suitable for both frequency-specific hearing tests and assessment of detectability of wide-band signals. Two types of frequency-specific test signals—frequency-modulated tones and narrow-band noises—are described in the standard but other well-defined narrow- and wide-band test signals may also be used if the test conditions described in the standard are met. The main body of the standard specifies requirements for the measurement of the threshold of hearing. In addition, Annex B provides information about extending requirements of this standard to spatial hearing audiometry and directional hearing tests conducted for research purposes.

The requirements of the standard apply to hearing tests conducted in quiet. However, they also may serve as guidelines for similar sound tests conducted in the presence of other acoustic signals. If any form of acoustic masking or interference is introduced in the test, all specific information about the masking signals, their levels, and the delivery conditions shall be recorded and included with the test results.

1.2 Purpose

The purpose of ANSI/ASA S3.52 is to ensure that sound field tests of hearing, and particularly tests of hearing threshold, performed on the same individual in various clinics and laboratories shall give accurate and reproducible results. The test conditions and test stimuli described in the standard are applicable to all populations of subjects including children (play audiometry, visual-reinforced audiometry, and conditioned orientation reflex audiometry) and special listeners who do not tolerate earphones.

1.3 Applications

The main application of the standard is determination of hearing threshold levels in the frequency range from the 125 Hz to 12500 Hz range with possible extension to the 20 Hz to 18000 Hz range. The standard applies to both sound field audiometry and sound field research studies based on measurement of hearing threshold. The requirements of the standard apply to measurements made with stationary systems consisting of signal-generating circuitry, such as an audiometer, and one or more loudspeakers. In addition to threshold of hearing measurements, the standard may be used to determine the effects of hearing aids (e.g., functional gain), assistive listening devices, and various types of headgear on audibility of the test signals. The standard does not apply to sound field tests conducted with a handheld loudspeaker or conducted in virtual reality environments. Qualification tests for hearing protection devices should be made in accordance with ANSI/ASA S12.6 and ANSI/ASA S12.42 standards.

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.