ANSI/ASA S1.13-2020

(Revision of ANSI S1.13-2005)

AMERICAN NATIONAL STANDARD

Measurement of Sound Pressure Levels in Air

Secretariat:

Acoustical Society of America

Approved on July 28, 2020 by:

American National Standards Institute, Inc.

Abstract

This standard specifies requirements and describes procedures for the measurement of sound pressure levels in air at a single point in space. These requirements and procedures apply primarily to measurements performed indoors but may be utilized in outdoor measurements under specified conditions. This is a standard applicable to a wide range of measurements and to sounds that may differ widely in temporal and spectral characteristics; more specific American National Standards complement its requirements. This standard applies only to the measurement of continuous sounds, those whose duration is 1 second or greater and does not apply to the measurement of impulsive sounds whose duration is less than 1 second. This standard is intended to be used by practitioners in the field. This is a replacement for a previous version of ANSI S1.13.

AMERICAN NATIONAL STANDARDS ON ACOUSTICS

The Acoustical Society of America (ASA) provides the Secretariat for Accredited Standards Committees S1 on Acoustics, S2 on Mechanical Vibration and Shock, S3 on Bioacoustics, S3/SC 1 on Animal Bioacoustics, and S12 on Noise. These committees have wide representation from the technical community (manufacturers, consumers, trade associations, organizations with a general interest, and government representatives). The standards are published by the Acoustical Society of America as American National Standards after approval by their respective Standards Committees and the American National Standards Institute (ANSI).

These standards are developed and published as a public service to provide standards useful to the public, industry, and consumers, and to Federal, State, and local governments.

Each of the Accredited Standards Committees (operating in accordance with procedures approved by ANSI) is responsible for developing, voting upon, and maintaining or revising its own Standards. The ASA Standards Secretariat administers Committee organization and activity and provides liaison between the Accredited Standards Committees and ANSI. After the Standards have been produced and adopted by the Accredited Standards Committees, and approved as American National Standards by ANSI, the ASA Standards Secretariat arranges for their publication and distribution.

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.

The use of an American National Standard is completely voluntary. Their existence does not in any respect preclude anyone, whether he or she has approved the Standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the Standards.

NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this Standard.

Acoustical Society of America
Standards Secretariat
1305 Walt Whitman Road, Suite 300
Melville, New York 11747
Telephone: +1 (516) 576-2341
Email: standards@acousticalsociety.org

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Foreword

[*This Foreword is for information only and is not a part of the American National Standard ANSI/ASA S1.13-2020 American National Standard Measurement of Sound Pressure Levels in Air. 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 acoustics. It was developed and approved by Accredited Standards Committee S1 Acoustics, under its approved operating procedures. Those procedures have been accredited by the American National Standards Institute (ANSI). The Scope of Accredited Standards Committee S1 is as follows:

> *Standards, specifications, methods of measurement and test, and terminology in the field of physical acoustics, including architectural acoustics, electroacoustics, sonics and ultrasonics, and underwater sound, but excluding those aspects which pertain to biological safety, tolerances, and comfort.*

This standard is a limited revision of ANSI/ASA S1.13-2005, which incorporates the following changes:

- Editorial updates
- In 8.3 through 8.6, the low frequency limit of 87.1 was added.
- In Annex A, the threshold (quiet) criterion referenced is found in ECMA 74-2015, Annex D, 10.8 “Audibility Requirements.”
- Updated references to their most recent issue

This standard is not comparable to any existing ISO Standard.

At the time this Standard was submitted to Accredited Standards Committee S1, Acoustics for approval, the membership was as follows:

Angelique Scharine, *Chair*
Richard J. Peppin, *Vice-Chair*

Nancy A. Blair-DeLeon, *Secretary*

Acoustical Society of America ..... R.J. Peppin
..... R.D. Hellweg (Alt.)

Air-Conditioning, Heating and Refrigeration Institute ..... S.J. Lind

ETS-Lindgren Acoustic Systems ..... D. Winker
..... M. Black (Alt.)

G.R.A.S. Sound & Vibration ..... B. O’Neil
..... E. O’Korn (Alt.)
Information Technology Industry Council ..... W.M. Beltman
..... Barrett (Alt.)

Josephson Engineering, Inc. ..... D.L. Josephson

National Council of Acoustical Consultants ..... A.P. Nash

National Institute of Standards & Technology (NIST) ..... R.P. Wagner
..... S. Fick (Alt.)

National Instruments ..... M. Denton
..... D. Bendele (Alt.)

OTOjOY ..... T. Kaufmann

PCB Group ..... K. Cox
..... C.M. Walber (Alt.)

Scantek, Inc. ..... S. Marshall
..... W. Gallagher (Alt.)

TSI, Incorporated. ..... P.J. Battenberg
..... S. Michalski (Alt.)

U.S. Air Force ..... R.L. McKinley
..... F. Mobley (Alt.)

U.S. Army Construction Engineering Research Laboratory ..... M. Swearingen
..... M.J. White (Alt.)

U.S. Army Research Laboratory, Human Research and Engineering Directorate ..... A.A. Scharine
..... M.A. Ericson (Alt.)

U.S. Naval Surface Warfare Center - Carderock ..... K. Wu
..... D. Gilmer (Alt.)

Individual Experts of Accredited Standards Committee S1, Acoustics, were:

W.D. Gallagher	P. Hanes	C.J. Struck
K. Peterman	T.R. Letwoski	C.M. Walber
P.D. Schomer	R. Mackenzie	L. Wu
	R. McKinley	

Working Group S1/WG 4, Measurement of Sound Pressure Levels in Air, which assisted Accredited Standards Committee S1, Acoustics, in the development of this standard, had the following membership.

R.L. McKinley, Chair
A.J. Campanella, Former Chair (deceased)

Seth. Bard	David L. Josephson	Jennifer A. Shaw
Bennett M. Brooks	Frank Mobley	Karl Washburn
Robert D.Hellweg		

Suggestions for improvements to this standard will be welcomed. They should be sent to Accredited Standards Committee S1, Acoustics, in care of the Standards Secretariat of the Acoustical Society of America, 1305 Walt Whitman Road, Suite 300, Melville, New York 11747.
Telephone: +1 (516) 576-2341; Email: standards@acousticalsociety.org

Introduction

Sound is a pressure fluctuation in the air. In general, the greater the amplitude of the pressure fluctuation, the "louder" the sound will be perceived by people. But loudness is a *subjective* measure of the amplitude that varies from one person to the next and will depend on many parameters, some of which are nonphysical. Sound pressure level is the objective measure of the amplitude of the pressure fluctuations, a measure that depends solely on physical parameters and that is not subject to interpretation or opinion. This standard gives requirements and guidelines for measuring the sound pressure level in air at a single point in space.

This standard (ANSI/ASA S1.13-2020 Measurement of Sound Pressure Levels in Air) is a fundamental standard giving basic information and requirements for a wide range of measurements. Other American National Standards provide more specialized information and requirements.

There are many reasons for measuring sound pressure levels. However, most purposes for sound pressure level measurements fall into two groups: sound pressure levels measured in order to characterize a source, and sound pressure levels measured in order to characterize an environment. Regardless of the reasons, or whether one is trying to characterize a source or an environment, the process will involve individual measurements of the sound pressure level at one or more specific points in space. This is the focus of this standard.

American National Standard

Measurement of Sound Pressure Levels in Air

1 Scope

This standard specifies requirements and procedures for the measurement of sound pressure levels in air. These requirements and procedures apply primarily to measurements performed under normal, relatively quiescent meteorological conditions. Nearly all measurements made indoors will fall under such conditions, but outdoor measurements may also be made, and may remain in conformance with this standard provided the ranges of certain environmental variables are restricted, as described herein.

The type of sounds measured using methods described in this standard may differ widely in temporal and spectral characteristics but do not include impulsive sounds, those whose duration is less than 1 second. The sound to be measured may be continuous or intermittent; it may be steady or fluctuating; and it may be essentially broad band or contain discrete tones or narrow bands of noise.

The frequency range covered by the requirements of this standard depends on the specific type of sound level meter or instrumentation being used, but, in general, the frequency content of the sound being measured should be contained within the range from 20 Hz to 20 kHz. The sound pressure levels of sounds whose energy is concentrated outside of this range may not be measured accurately according to the procedures of this standard.

In some cases, the sound of interest being measured may also be classified according to its spatial characteristics, that is, how the level varies from one point to another in the sound field. This standard, however, does not address the measurement of the spatial characteristics of the sound field.

This standard does not address the measurement of sound pressure levels in environments other than air (such as other gases, liquids, or solids), the measurement of infrasonic or ultrasonic sounds, the measurement of impulsive sounds (see ANSI S12.7 for methods) whose durations are typically less than 1 second, the measurement of spatial characteristics of sound fields, or (generally) the measurement of sound pressure levels outdoors in nonquiescent conditions.

2 Purpose

- The purpose of this standard is several-fold: To establish uniform procedures for measuring the sound pressure level in air at a single point in space.
- To standardize the basic requirements of sound pressure level measurements.
- To help make the procedures of acoustical measurements more accessible to practitioners in the field through clearly defining the steps and types of required instrumentation.

3 Applications

This is a fundamental standard and is applicable to the acquisition of sound pressure level for a wide range of purposes. A few possible applications of this standard:

- Measurement of the sound pressure level at a certain point in or around the home, at a concert, or at a work environment.