

**ANSI S12.42-1995
(ASA 116-1995)**

AMERICAN NATIONAL STANDARD

**Microphone-in-Real-Ear and Acoustic Test Fixture
Methods for the Measurement of Insertion Loss of
Circumaural Hearing Protection Devices**

Secretariat
Acoustical Society of America

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American National Standards Institute, Inc.

ABSTRACT

This Standard describes the microphone-in-real-ear and the acoustic test fixture methods for the measurement of the insertion loss of circumaural earmuffs, helmets, and communications headsets. The standard contains information on instrumentation, calibration, and electroacoustic requirements, as well as procedures for determining sound pressure levels at the ear with and without the hearing protection devices in place and for calculating and reporting the insertion loss values.

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Foreword

[This Foreword is not part of American National Standard Microphone-in-Real-Ear and Acoustic Test Fixture Methods for the Measurement of Insertion Loss of Circumaural Hearing Protection Devices, ANSI S12.42-1995 (ASA Catalog No. 116-1995).]

Accredited Standards Committee S12, Noise, under whose jurisdiction this standard was developed, has the following scope:

Standards, specifications, and terminology in the field of acoustical noise pertaining to methods of measurement, evaluation, and control, including biological safety, tolerance and comfort, and physical acoustics as related to environmental and occupational noise.

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American National Standard

Microphone-in-Real-Ear and Acoustic Test Fixture Methods for the Measurement of Insertion Loss of Circumaural Hearing Protection Devices

0 Introduction

0.1 General

0.1.1

This Standard contains two objective procedures, a microphone-in-ear (MIRE) method and an acoustic test fixture (ATF) method, for the measurement of insertion loss of circumaural hearing protection devices. The methods are very similar except for differences in the test fixtures and measurement sequences. The MIRE method utilizes human subjects with microphones positioned in their ears who act as test fixtures. The ATF method utilizes a dummy head test fixture with an imbedded measurement microphone at one or both ear positions on the fixture. Insertion loss is the difference between sound pressure levels measured with the test microphones uncovered and with the microphones covered by the hearing protection device under evaluation.

NOTE—Circumaural hearing protection devices as used in this Standard include earmuffs, helmets, and communication headset devices that enclose the ears.

0.1.2

The MIRE method was developed in response to a need for standard procedures when miniature microphones at the ear are used to measure insertion loss of hearing protection devices. The miniature microphone procedure is relatively simple and has gained widespread use; however, the data have not been comparable because of variations in the individual insertion loss measurement procedures. This Standard procedure will allow objective insertion loss data for circumaural hearing protection devices

to be measured and compared. The procedure is not limited to linear attenuation hearing protection devices and can be used to evaluate level-dependent (nonlinear) devices.

0.1.3

The ATF method replaces the objective dummy head method in ANSI S3.19-1974, Method for the Measurement of Real-Ear Protection of Hearing Protectors and Physical Attenuation of Earmuffs. The requirements and specifications of the ATF method are essentially the same as those of the former dummy head method.

NOTE—ANSI S3.19-1974 (R1990), Method for the Measurement of Real-Ear Protection of Hearing Protectors and Physical Attenuation of Earmuffs (1974), contained both a subjective real-ear at threshold method for measuring sound attenuation and an objective dummy head method for measuring insertion loss of hearing protection devices. The subjective method became obsolete with the publication of ANSI S12.6-1984 (R1990), Method for the Measurement of Real-Ear Attenuation of Hearing Protectors. The objective dummy head method remained current in S3.19-1974 (R1990). Also, the responsibility for hearing protection standards was transferred from ANSI Committee S3, Bioacoustics, to Committee S12, Noise. All hearing protection standards will reside in Committee S12, Noise and ANSI S3.19-1974 (R1990) will become obsolete with the publication of this MIRE and ATF standard.

1 Scope

This Standard provides methods for the measurement of the insertion loss of any hearing protection device that encloses the ears and makes circumaural contact with the head. One method (MIRE) for determining insertion loss involves real-ear measurements on humans, whereas the other (ATF) employs an acoustic test fixture. The Standard contains information on instrumentation, calibration, and electroacoustic requirements. Procedures are provided for locating ear-mounted microphones and hearing protection devices to measure sound pressure levels at the ear, and methods are specified for reporting the calculated insertion loss values.

2 Purpose

The purpose of this Standard is to establish uniform instrumentation and procedures for the measurement of insertion loss at supra-threshold levels of