

Specification for

Occluded-ear simulator for the measurement of earphones coupled to the ear by ear inserts —

(Implementation of CENELEC
HD 443 S1)

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- Institute of Acoustics
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- Manchester Area Health Authority
- Medical Research Council
- Ministry of Defence
- Royal Aeronautical Society
- Royal National Institute for the Deaf
- Royal Society of Medicine
- Society of Hearing Aid Audiologists Limited

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National foreword

This British Standard has been prepared under the direction of the Electronic Equipment Standards Policy Committee and is identical with IEC 711:1981 “Occluded-ear simulator for the measurement of earphones coupled to the ear by ear inserts”, published by the International Electrotechnical Commission (IEC). This British Standard is also in agreement with Harmonization Document HD 443 S1 published by the European Committee for Electrotechnical Standardization (CENELEC).

The note to clause 9 contains a requirement and should therefore be regarded as being part of the main text.

Cross-reference

International Standard	Corresponding British Standard
IEC 126:1973	BS 6111:1981 <i>Specification for reference coupler for the measurement of hearing aids using earphones coupled to the ear by means of ear inserts</i> (Identical)

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This standard specifies an occluded-ear simulator intended for the calibration of insert earphones in the frequency range 100 Hz to 10 000 Hz in terms of the sound pressure at the eardrum.

The occluded-ear simulator is also designed as the basis for a later extension intended to simulate the complete ear canal for the calibration of earphones coupled to the ear by means of open mould fittings or similar devices. A document for such a device is under consideration.

2 Object

The occluded-ear simulator simulates the median values of relevant acoustical characteristics of adult normal human ears.

The occluded-ear simulator does not simulate the leakage between an earmould and a human ear canal; therefore, the results obtained with the simulator may deviate from the performance of an insert earphone on a real ear, especially at low frequencies.

Moreover, large performance variations among individual ears will occur and this should be borne in mind when employing results obtained with the simulator.

3 Definitions

For the purpose of this standard, the following definitions apply:

3.1

ear insert

an ear insert is a device used to provide the acoustic coupling between an earphone and the ear canal (e.g. an earmould or a similar device with or without a connecting tube)

3.2

insert earphone

an insert earphone is a small earphone coupled to the ear canal by means of an ear insert or attached to a connecting element which is inserted into the ear canal. This ear insert may be a part of the insert earphone

3.3

ear insert simulator

an ear insert simulator (e.g. earmould simulator) is an insert which terminates the entrance of the ear simulator and provides for passage of sound into the occluded-ear simulator through an opening on its axis

3.4

ear simulator

an ear simulator is a device for measuring the output sound pressure of an earphone under well-defined loading conditions in a specified frequency range. It consists essentially of a principal cavity, acoustic load networks, and a calibrated microphone. The location of the microphone is chosen so that the sound pressure at the microphone corresponds approximately to the sound pressure existing at the human eardrum

3.5

occluded-ear simulator

an occluded-ear simulator is an ear simulator which simulates the inner part of the ear canal, from the tip of an ear insert to the eardrum

3.6

reference plane

the reference plane of the occluded-ear simulator is a plane perpendicular to the axis of the cavity of the simulator, chosen to pass through the position normally occupied by the tip of the earmould

3.7

acoustic transfer impedance of the occluded-ear simulator

the acoustic transfer impedance of the occluded-ear simulator is the quotient of the sound pressure at the diaphragm of its microphone by the volume velocity through the reference plane

4 General requirements

4.1 Material and external dimensions

The occluded-ear simulator shall be constructed of non-magnetic and stable materials and shall have sufficient mass to minimize response to vibration. The external dimensions of the occluded-ear simulator shall be as small as possible to minimize the disturbance when the simulator is inserted into a sound field.

4.2 Locating a calibrating transducer

The construction of the occluded-ear simulator shall permit the location of a transducer at the reference plane for calibrating the simulator.

4.3 Microphone

The type of microphone shall be stated by the manufacturer of the occluded-ear simulator.

The pressure sensitivity level of the microphone shall be known within an accuracy of ± 0.3 dB or better at 250 Hz. Relative to its value at 250 Hz, this level shall not vary by more than ± 0.5 dB in the frequency range 100 Hz to 5 kHz, and $+ 1.5$ dB, $- 0.5$ dB in the range 5 kHz to 10 kHz.