

Methods of

Measuring and expressing the performance of television receivers —

Part 2: Electrical and acoustic measurements at audio-frequencies

[IEC title: Recommended methods of measurement on receivers
for television broadcast transmissions

Part 2: Electrical and acoustic measurements at audio
frequencies]

UDC 621.397.62.004.15:[534.6-7 + 621.317]

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents

AVA

Document Sharing Hub

Cooperating organizations

The Electronic Equipment Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following:

- British Broadcasting Corporation*
- British Electrical and Allied Manufacturers' Association (BEAMA)
- British Radio Equipment Manufacturers' Association*
- Cable and Wireless Limited
- Cable Television Association of Great Britain*
- Electrical, Electronic, Telecommunications and Plumbing Union
- Electricity Supply Industry in England and Wales
- Electronic Components Industry Federation*
- Electronic Engineering Association*
- Institution of Electronic and Radio Engineers*
- Post Office*
- Post Office Engineering Union
- Scientific Instrument Manufacturers' Association

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

- Consumer Standards Advisory Committee of BSI
- Consumers' Association
- Home Office
- Radio, Electrical and Television Retailers' Association
- Radio Society of Great Britain

This British Standard, having been prepared under the direction of the Electronic Equipment Standards Committee, was published under the authority of the Executive Board and comes into effect on 31 July 1981

© BSI 10-1999

First published January 1963
First revision July 1981

The following BSI references relate to the work on this standard:
Committee reference EEL/25
Draft for comment 75/28164 DC

ISBN 0 580 12222 0

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

	Page
Cooperating organizations	Inside front cover
National foreword	ii
Chapter I: General	
Section 1. Introduction	
1 Object	1
2 Scope	1
Chapter II: General notes on measurements	
Section 2. General conditions	
3 Introduction	1
4 Environmental conditions	1
5 Precautions during measurements	1
6 Setting of tone controls	1
Section 3. Audio-frequency input signal	
7 Introduction	1
8 Combining networks	2
9 Standard reference frequency	2
10 Modulation factor	2
11 Recommended audio-frequencies for measurements	2
12 Table of preferred frequencies	3
Section 4. Audio-frequency output power	
13 Definition	4
14 Audio-frequency substitute load	4
15 Audio-frequency output power, method of measurement	5
16 Standard output power	5
17 Maximum useful electrical output power	5
18 Method of measurement	5
19 Presentation of results	5
Chapter III: Acoustic measurements	
Section 5. Acoustic frequency response characteristic	
20 Definition	5
21 Method of measurement	5
22 Presentation of results	6
Section 6. Acoustic polar diagram	
23 Definition	6
24 Method of measurement	6
25 Presentation of results	6
Chapter IV: Electrical response measurements	
Section 7. Electrical audio-frequency response characteristic	
26 Definition	7
27 Method of measurement	7
28 Presentation of results	8
Section 8. Electrical audio-frequency response characteristics of tone controls	
29 Definition	8
30 Method of measurement	8
31 Presentation of results	8

	Page
Section 9. Electrical audio-frequency response characteristics of loudness controls	
32 Definition	8
33 Method of measurement	8
34 Presentation of results	8
Section 10. Volume control characteristic	
35 Definition	8
36 Method of measurement	9
37 Presentation of results	9
Chapter V: Audio-frequency non-linearity distortion	
Section 11. General	
38 Introduction	9
39 Measurements in case of more than one set of output terminals	9
Section 12. Distortion in the presence of a single signal, harmonic distortion	
40 Introduction	9
41 Method of measurement	9
42 Presentation of results	10
43 Distortion under dynamic conditions (<i>under consideration</i>)	10
Section 13. Distortion in the presence of two simultaneous signals (Intermodulation)	
44 General	10
Chapter VI: Internally generated interference	
Section 14. Signal-to-noise ratio due to picture signal cross-modulation	
45 Introduction	10
46 Method of measurement	11
47 Presentation of results	11
Section 15. Amplitude modulation suppression ratio	
48 Definition	11
49 Method of measurement	12
50 Presentation of results	12
Section 16. Amplitude-modulated sound reception signal-to-noise ratio due to picture signal interference	
51 Introduction	12
52 Method of measurement	12
53 Presentation of results	13
Section 17. Hum	
54 Definition	13
55 Method of measurement	13
56 Measurement of hum as a function of input signal level	14
57 Hum as a function of volume control adjustment	14
58 Hum as a function of tone control adjustment	15
59 Presentation of results	15
Chapter VII: Sensitivity	
Section 18. Signal-to-noise ratio	
60 Definition	15
61 Method of measurement	15

	Page
62 Presentation of results	16
Section 19. Noise limited sensitivity	
63 Definition	16
64 Method of measurement	16
65 Presentation of results	16
Section 20. Gain limited sensitivity	
66 Definition	16
67 Method of measurement	16
68 Presentation of results	16
Section 21. Deviation sensitivity	
69 Definition	16
70 Method of measurement	16
71 Presentation of results	16
Section 22. Distortion-limited deviation sensitivity	
72 Under consideration	16
Figure 1 — Example of passive combining network	3
Figure 2 — Example of acoustic polar diagram	7
Figure 3 — Measurement of amplitude modulation suppression ratio	13
Figure 4 — Circuit arrangement for measuring hum introduced from a.c. mains	14
Figure 5 — Circuit arrangement for measuring hum introduced from d.c. mains	14
Figure 6 — Measurement of signal-to-noise ratio	15
Table I — Preferred frequencies in hertz	4
Table II	11
Publications referred to	Inside back cover

National foreword

This Part of this British Standard has been prepared under the direction of the Electronic Equipment Standards Committee and is Part 2 of a revision of BS 3549 which was first published in 1963. It is identical with IEC Publication 107-2:1980 *“Recommended methods of measurement on receivers for television broadcast transmissions”* Part 2 *“Electrical and acoustic measurements at audio-frequencies”* published by the International Electrotechnical Commission (IEC).

BS 3549 will be divided into four Parts. The other Parts will be as follows.

- *Part 1: General considerations and electrical measurements other than those at audio-frequencies¹⁾*;
- *Part 3: Colorimetric and photometric measurements*;
- *Part 4: Additional measurements*.

Terminology and conventions. The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards.

Cross-references

International Standard	Corresponding British Standard
IEC 107	BS 3549 <i>Methods of measuring and expressing the performance of television receivers</i>
Part 1:1977	Part 1:1979 <i>General considerations and electrical measurements other than those at audio-frequencies</i> (Identical)
Part 4 ^a	Part 4 <i>Additional measurements^a</i>
IEC 268	BS 5428 <i>Methods for specifying and measuring the characteristics of sound system equipment</i>
Part 5:1972	Part 11:1977 <i>Loudspeakers</i> (Identical)
Part 14:1971	Part 5 <i>Mechanical design features</i> Section 5.1:1981 <i>Dimensional characteristics of single moving coil (dynamic) loudspeakers</i> (Identical)
ISO 266:1975	BS 3593:1963 <i>Recommendation on preferred frequencies for acoustical measurements</i> (Technically equivalent)

^a In course of preparation. It is expected that IEC 107-4 and BS 3549-4 will be identical.

Copies of the CCIR publications referred to in this British Standard are available for consultation in the BSI Library, 2 Park Street, London W1A 2BS. Copies of CCIR publications can be purchased from the International Telecommunications Union, Place des Nations, 1211 — Geneva — Switzerland.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 16, 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⁾ Already published (1979).

Section 1. Introduction

1 Object

The object of this standard is to standardize the conditions and methods for the measurements to be used for the study of a receiver for television broadcasting so as to make possible the comparison of the results of measurements. Specifying limiting values of the various quantities for acceptable performance is not an object of this standard.

The standard constitutes a catalogue of selected measurements recommended for assessing the essential properties of receivers of a given type. It is neither mandatory nor limiting; a choice of measurements can be made in each particular case and, if necessary, additional measurements may be carried out.

The recommended methods are designed to make possible the assessment of the performance of the complete receiver, without going into more than a minimum of detail and without giving its components separate consideration.

It should be realized that the measurements proposed are subject to future improvements as methods are refined and with the development of receiver techniques.

2 Scope

The methods of measuring the electrical, acoustic and optical properties described in this standard apply more particularly to broadcast television receivers designed for monochrome and colour vision reception with accompanying sound of the systems of the C.C.I.R.²⁾ recommendations and reports, due regard being given to national transmission standards.

Chapter II: General notes on measurements

Section 2. General conditions

3 Introduction

Ideally, the measurements of the sound section should be carried out using acoustic techniques. Due to the nature of the measurements and to simplify interpretation of the results, purely electrical measurements are recommended where possible, since the interpretation of acoustic measurements remains difficult and a subjective aspect is commonly present in their evaluation. All measurements shall, unless otherwise specified, be carried out under the conditions specified in IEC Publication 107-1. Care shall be taken that no infringement is made of the requirements of Clause 14 of Publication 107-1.

²⁾ C.C.I.R.: International Radio Consultative Committee.

4 Environmental conditions

See Publication 107-1, Section 4.

5 Precautions during measurements

See Publication 107-1, Section 5.

6 Setting of tone controls

Unless otherwise stated, the tone controls shall be set to give the most uniform response over the greatest part of the audio-frequency range. The response referred to is either the electrical or the acoustic response depending on how the output is prescribed to be measured. The method used shall be stated with the results. Once established, this reference setting shall be designated as the "normal setting of the tone controls" for all measurements unless the manufacturer has specified another normal setting of the tone controls to be used as a reference.

Section 3. Audio-frequency input signal

7 Introduction

For the purpose of audio-frequency measurements on television receivers the audio-frequency signal shall be applied in the form of a suitable modulated radio-frequency signal together with the associated picture signal. The audio-frequency signal is defined in terms of its frequency (see Clauses 9 and 12) and its modulation factor (see Clause 10).

Unless otherwise stated, the picture modulation should consist of a mid-grey raster. Some receivers that give satisfactory sound reproduction on normal programme transmissions may operate anomalously giving rise to buzz when operated from certain types of electronically generated test patterns having a wide picture signal spectrum and, or alternatively, strong components at sub-harmonics of the intercarrier frequency. In such cases, precautions must be taken in order that the accuracy of the measurements is not affected. The characteristics of the picture and sound signals, including any audio-frequency pre-emphasis are those defined for the system in use (see C.C.I.R. Report 624), due regard being given to national transmission standards. These signals shall be applied to the radio-frequency input circuit and the receiver tuned to a stated channel in accordance with Publication 107-1, Sections 7, 8, 9 and 10. Where the receiver has audio-frequency input or output terminals, is equipped for stereophonic reproduction or for the reproduction of more than one sound channel from a single received transmission, additional measurements shall be made. These additional measurements will be described in IEC Publication 107-4.

NOTE Considering that television receivers may be used on cabled distribution systems having reduced sound carrier levels, it may be useful to make additional measurements at the appropriate levels.

8 Combining networks

When two audio-frequency signals are to be applied simultaneously, suitable combining networks or circuits shall be employed, in order to avoid intermodulation in the two signal generators as a result of interaction.

A simple passive network is normally adequate for this purpose. In the example shown in Figure 1, page 3, the generators are connected through series resistors to provide current sources that can be summed in a third resistor of comparatively low value. If required, a matching pad or resistor may be connected between the combining network and the external load.

9 Standard reference frequency

The standard reference frequency for audio-frequency measurements and for adjustment purposes is 1 000 Hz.

10 Modulation factor

The audio-frequency input level shall be expressed in terms of the modulation factor of the radio-frequency input signal in the case of sinusoidal modulation:

- a) for systems using amplitude modulated sound, the modulation percentage;
- b) for systems using frequency modulated sound, the ratio of the actual frequency deviation to the maximum deviation as defined for the system in use.

11 Recommended audio-frequencies for measurements

To facilitate the comparison of results, the selection of audio-frequencies for receiver measurements shall preferably be restricted to a minimum as stated in ISO Standard 266, dealing with acoustics. If a continuous record is not required, measurements shall be made at one of these preferred frequencies. The degree of preference is indicated by the type of printing character shown in Table I, page 4, except that the use of frequencies other than those indicated in the table may be necessary for certain purposes, for example at frequencies at which anomalies are observed.