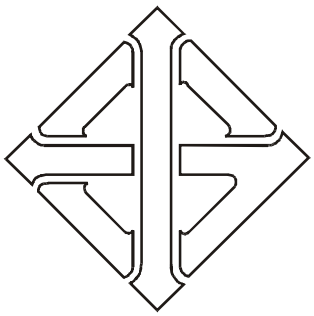

มาตรฐานผลิตภัณฑ์อุตสาหกรรม

THAI INDUSTRIAL STANDARD

มอก. 1784 – 2552

IEC 60107 – 3(1998)

(Amendment 1 : 1999)

วิธีวัดที่แนะนำซึ่งทำกับเครื่องรับสำหรับการส่งกระจายสัญญาณโทรทัศน์

เล่ม 3 การวัดทางไฟฟ้าบนเครื่องรับโทรทัศน์หลายช่องสัญญาณเสียงโดยใช้ระบบคลื่นพาห์ย่อย

RECOMMENDED METHODS OF MEASUREMENT ON RECEIVERS FOR TELEVISION BROADCAST TRANSMISSIONS

PART 3 : ELECTRICAL MEASUREMENTS ON MULTICHANNEL SOUND TELEVISION RECEIVERS USING SUBCARRIER SYSTEMS

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

กระทรวงอุตสาหกรรม

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มาตรฐานผลิตภัณฑ์อุตสาหกรรม
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มอก. 1784 – 2552

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
กระทรวงอุตสาหกรรม ถนนพระรามที่ 6 กรุงเทพฯ 10400
โทรศัพท์ 02 202 3300

ประกาศในราชกิจจานุเบกษา ฉบับประกาศและงานทั่วไป เล่ม 127 ตอนพิเศษ 28ง
วันที่ 2 มีนาคม พุทธศักราช 2553

มาตรฐานผลิตภัณฑ์อุตสาหกรรมวิธีวัดที่แนะนำซึ่งทำกับเครื่องรับสำหรับการส่งกระจายสัญญาณโทรทัศน์ เล่ม 3 การวัดทางไฟฟ้าบนเครื่องรับโทรทัศน์หลายช่องสัญญาณเสียงโดยใช้ระบบคลื่นพาห์ย่อย ได้ประกาศใช้ครั้งแรกโดยรับ IEC 60107-3 (1988-12) Recommended methods of measurement on receivers for television broadcast transmissions - Part 3: Electrical measurements on multichannel sound television receivers using subcarrier systems มาใช้ในระดับเหมือนกันทุกประการ(Identical) โดยใช้ IEC ฉบับภาษาอังกฤษเป็นหลัก โดยประกาศในราชกิจจานุเบกษา ฉบับประกาศทั่วไป เล่มที่ 117 ตอนที่ 104ง วันที่ 28 ธันวาคม พุทธศักราช 2543

เนื่องจาก IEC ได้แก้ไขปรับปรุงมาตรฐาน IEC 60107-3 (1988-12) เป็น IEC 60107-3 (1999-05) จึงได้ยกเลิกมาตรฐานเดิมและกำหนดมาตรฐานใหม่โดยรับ IEC 60107-3 (1999-05) Recommended methods of measurement on receivers for television broadcast transmissions- Part 3: Electrical measurements on multichannel sound television receivers using subcarrier systems มาใช้ในระดับเหมือนกันทุกประการโดยใช้มาตรฐาน IEC ฉบับภาษาอังกฤษเป็นหลัก

คณะกรรมการมาตรฐานผลิตภัณฑ์อุตสาหกรรมได้พิจารณามาตรฐานนี้แล้ว เห็นสมควรเสนอรัฐมนตรีประกาศตามมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511

ประกาศกระทรวงอุตสาหกรรม

ฉบับที่ 4090 (พ.ศ. 2552)

ออกตามความในพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม

พ.ศ. 2511

เรื่อง ยกเลิกและกำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม

วิธีวัดที่แนะนำซึ่งทำกับเครื่องรับสำหรับการส่งกระจายสัญญาณโทรทัศน์

เล่ม 3 การวัดทางไฟฟ้าบนเครื่องรับโทรทัศน์หลายช่องสัญญาณเสียง โดยใช้ระบบคลื่นพาห์ย่อย

โดยที่เป็นการสมควรปรับปรุงมาตรฐานผลิตภัณฑ์อุตสาหกรรม วิธีวัดที่แนะนำซึ่งทำกับเครื่องรับสำหรับการส่งกระจายสัญญาณโทรทัศน์ เล่ม 3 การวัดทางไฟฟ้าบนเครื่องรับโทรทัศน์หลายช่องสัญญาณเสียง โดยใช้ระบบคลื่นพาห์ย่อย มาตรฐานเลขที่ มอก.1784-2542

อาศัยอำนาจตามความในมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511 รัฐมนตรีว่าการกระทรวงอุตสาหกรรมออกประกาศยกเลิกประกาศกระทรวงอุตสาหกรรม ฉบับที่ 2739 (พ.ศ.2543) ออกตามความในพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ.2511 เรื่อง กำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม วิธีวัดที่แนะนำซึ่งทำกับเครื่องรับสำหรับการส่งกระจายสัญญาณโทรทัศน์ เล่ม 3 การวัดทางไฟฟ้าบนเครื่องรับโทรทัศน์หลายช่องสัญญาณเสียง โดยใช้ระบบคลื่นพาห์ย่อย ลงวันที่ 9 ตุลาคม พ.ศ.2543 และออกประกาศกำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม วิธีวัดที่แนะนำซึ่งทำกับเครื่องรับสำหรับการส่งกระจายสัญญาณโทรทัศน์ เล่ม 3 การวัดทางไฟฟ้าบนเครื่องรับโทรทัศน์หลายช่องสัญญาณเสียง โดยใช้ระบบคลื่นพาห์ย่อย มาตรฐานเลขที่ มอก.1784-2552 ขึ้นใหม่ ดังมีรายละเอียดต่อท้ายประกาศนี้

ทั้งนี้ ให้มีผลตั้งแต่วันถัดจากวันที่ประกาศในราชกิจจานุเบกษา เป็นต้นไป

ประกาศ ณ วันที่ 1 กันยายน พ.ศ. 2552

ชาญชัย ชัยรุ่งเรือง

รัฐมนตรีว่าการกระทรวงอุตสาหกรรม

มอก. 1784–2552
IEC 60107–3(1998)
(Amendment 1 : 1999)

มาตรฐานผลิตภัณฑ์อุตสาหกรรม
วิธีวัดที่แนะนำซึ่งทำกับเครื่องรับสำหรับการส่งกระจายสัญญาณโทรทัศน์
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มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นโดยรับ IEC 60107-3 (1998 - Amendment 1:1999) Recommended methods of measurement on receivers for television broadcast transmissions -Part 3: Electrical measurements on multichannel sound television receivers using subcarrier systems มาใช้ในระดับเหมือนกันทุกประการ (identical) โดยใช้ IEC ฉบับภาษาอังกฤษเป็นหลัก

วิธีวัดลักษณะสมบัติทางไฟฟ้าในมาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ใช้เป็นการเฉพาะกับเครื่องรับกระจายสัญญาณโทรทัศน์ซึ่งออกแบบไว้สำหรับการรับของระบบหลายช่องสัญญาณเสียงโดยใช้คลื่นพาห์ย่อย

รายละเอียดให้เป็นไปตาม IEC 60107-3 (1999)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RECOMMENDED METHODS OF MEASUREMENT ON RECEIVERS FOR TELEVISION BROADCAST TRANSMISSIONS –

Part 3: Electrical measurements on multichannel sound television receivers using subcarrier systems

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
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This standard has been prepared by subcommittee 12A: Receiving equipment, of IEC technical committee 12: Radiocommunications.

This consolidated version of IEC 60107-3 consists of the first edition (1988) [documents 12A(CO)122 and 12A(CO)128] and its amendment 1 (1999) [documents 100A/111/FDIS and 100A/119/RVD].

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience.

It bears the edition number 1.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

The following IEC publications are quoted in this standard.

IEC 60107-1:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies*

IEC 60107-2:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 2: Audio channels – General methods and methods for monophonic channels*

IEC 60315-4:1997, *Methods of measurement on radio receivers for various classes of emission – Part 4: Receivers for frequency-modulated sound broadcasting emissions*

Other publications quoted:

ITU-R Report BS.795-3

ITU-R Recommendations BS.468-4, BS.559-2 and BT.470-5

RECOMMENDED METHODS OF MEASUREMENT ON RECEIVERS FOR TELEVISION BROADCAST TRANSMISSIONS –

Part 3: Electrical measurements on multichannel sound television receivers using subcarrier systems

CHAPTER I: GENERAL

SECTION ONE – INTRODUCTION

1 Scope

The methods of measuring the electrical characteristics described in this standard apply particularly to broadcast television receivers designed for the reception of multichannel sound systems using subcarriers.

NOTE – Currently two systems are in operation: The FM-FM and BTSC systems, which are described in ITU-R Report BS.795-3*

2 Object

The object of this standard is to standardize the methods of measurement for the more important electrical characteristics of receivers, within the scope of this part of the standard.

SECTION TWO – GENERAL EXPLANATION OF TERMS

3 Definitions

The following definitions apply for the purpose of this standard.

3.1
main channel
the main channel is an audio channel which carries the main audio signal directly by frequency-modulating the main sound carrier of a television system

NOTE – This channel is compatible with the audio channel in the related monophonic television broadcasting system.

3.2
left (right) channel
the left (right) channel is an audio channel which carries the left (right) audio signal in the stereophonic transmission

3.3
stereo sum channel
the stereo sum channel is a channel which carries the sum signal (L + R) of the left audio signal (L) and the right audio signal (R)

The main channel is used for the stereo sum channel

* ITU-R: International Telecommunication Union Radiocommunication Sector.

3.4
stereo subchannel
the stereo subchannel is a channel which carries the difference signal (L – R) of the left audio signal and the right audio signal on a subcarrier, the frequency of which is equal to twice the line-scan frequency. Modulation of the subcarrier is FM in the FM-FM system, and AM-DSB-SC with a pilot signal at the line-frequency in the BTSC system

3.5
the second channel
the second channel is an additional audio channel which carries a second audio signal on a FM subcarrier. In the FM-FM system, the same subcarrier is used for both the stereo subchannel and the second channel

3.6
SAP (Second Audio Programme) subchannel
the SAP subchannel is the second channel in the BTSC system. The subcarrier frequency is equal to five times the line-scan frequency

3.7
dual-sound mode
the dual-sound mode is a transmission mode in which one audio signal S is carried by the main channel and another by the second (SAP) channel

3.8
stereo mode
the stereo mode is a transmission mode in which the left and right audio signals are carried by the stereo sum channel and the stereo subchannel

3.9
stereo and SAP mode
the stereo and SAP mode is a transmission mode in which the left and right audio signals and the second audio programme signal are carried simultaneously. This mode is used only in the BTSC system

3.10
mode identification
mode identification is a function which identifies the transmission modes

The mode identification is performed by using the control signal in the FM-FM system and the pilot signal and the amplitude of the second subcarrier in the BTSC system

3.11
compander
the compander is a noise reduction system in which programme signals are compressed by a compressor at the input of the sound modulator and expanded by an expander at the output of the sound demodulator

In the BTSC system, compressors (encoders) are mandatorily used in the stereo subchannel and the SAP subchannel.

SECTION THREE – GENERAL NOTES ON MEASUREMENTS

4 General conditions

Unless otherwise specified, measurements shall be carried out under the conditions described in IEC 60107-1 and IEC 60107-2.

5 Reference frequency and reference modulation factor

The reference frequency for measurements and adjustments of audio channels shall be 1 000 Hz in the FM-FM system and 300 Hz in the BTSC system.

The modulation factor is defined as the frequency deviation of the main sound carrier or a subcarrier referred to the rated maximum system deviation and expressed in percentage.

The rated maximum system deviations for both the systems are given in Appendix A.

The following modulation factors shall be used for measurements and adjustments of audio channels as the reference:

Main channel:	FM-FM system	30 %
	BTSC system	14 %
Left (right) channel:	FM-FM system	30 %
Stereo sum channel:	BTSC system	14 % by L or R signal 14 % by L and R signals
	FM-FM system	15 % by L or R signal
Stereo subchannel:	BTSC system	14 % by L or R signal at 300 Hz 14 % by L and –R signals at 300 Hz
	FM-FM system	15 %, L or R signal
The second channel:	FM-FM system	30 %
	BTSC system	14 % at 300 Hz

NOTE 1 – In the FM-FM system, the left (right) input signal determines the modulation factor for a stereo signal.

The encoder (compressor) included in the stereo subchannel of the BTSC system causes the subchannel modulation factor to be frequency dependent as well as disproportionately level dependent. As a result, the modulation factor for a stereo signal is determined by both the stereo sum-signal and the stereo subchannel signal.

NOTE 2 – In the BTSC stereo and SAP subchannels, at 300 Hz modulating frequency, the modulation factor corresponding to an unaffected encoder level is 14,1 % (–17,0 dB). Stereo modulation (L, R or L and R) at frequencies other than 300 Hz should be monitored by the modulation factor of the stereo sum-signal. The same sum-signal modulation factor should be maintained at other frequencies.

Stereo modulation (L = –R) or SAP modulation at frequencies other than 300 Hz should be maintained at an input signal to the encoder equal to that at 300 Hz.

6 Standard output power and voltage

6.1 Standard output power for loudspeakers

The standard output power shall be 10 dB below the rated output power (see 3.1 of IEC 60107-2). Alternatively, a stated, preferred value of output power, not directly related to the rated value, may be used; the preferred values are 500 mW, 50 mW and 5 mW. The corresponding levels are 27 dB(mW), 17 dB(mW) and 7 dB(mW), respectively. In all cases, the value chosen shall be stated with the results.

6.2 Standard line output voltage

The standard output voltage at a line output terminal shall be 500 mV r.m.s. at 1 kHz when terminated with a resistor equal to the rated load impedance.

NOTE – If the output is not adjustable, the output voltage when the standard r.f. television signal is applied to the receiver at the r.f. input signal level specified in clause 11, should be used as the standard output voltage.

7 Setting of tone controls

Unless otherwise specified, the tone controls or other controls that have an influence on the frequency response characteristics shall be adjusted for a practically flat response characteristic at the volume control position specified for the measurement. If the volume control is physiologically weighted (loudness control) and the compensation cannot be switched off, it shall be set for minimum compensation effect and the standard output power obtained by adjusting the modulation input level and this value stated with the results.

Switchable noise reduction and stereo base-width variation circuits or the like shall be switched off. If the tone controls are neither switchable nor adjustable, this shall be indicated with the results.

8 Setting of stereo balance control

Unless otherwise specified, the balance control shall be adjusted so that the output powers of the two channels are of the same value at the volume control position specified for the measurement.

9 Setting of compressor

Setting of the compressor that is part of a BTSC stereo generator is the responsibility of its manufacturer. Validation of a generator's stereo separation requires a precision expander (decoder), because measurement of a compressor alone is not practical. The procedure for validating the separation of an expander as well as a complete explanation of the compression/expansion process is described in the bibliographical reference below*.

* BTSC System Recommended Practices, EIA Television Systems Bulletin No. 5 (July 1985), Electronic Industries Association, Arlington, VA, USA.

10 Receiver tuning

Tuning shall be done in accordance with 3.6.3 of IEC 60107-1, and shall remain unaltered during the whole series of measurements. The criteria used according to 3.6.3 shall be stated.

11 Radio-frequency signals

Unless otherwise stated, a standardized colour television signal (ITU-R Recommendation BT.470-5) with fully black picture modulation shall be used for the picture carrier and the multichannel sound signal for the sound carrier. The r.f. input signal level of the receiver shall be set at 70 dB(μV) across 75 Ω (the r.m.s. value of the picture carrier during the sync pulse interval).

The BTSC system requires a multichannel sound signal modulator based on the description in the ITU-R Report BS.795-3. It is recommended that a BTSC stereo generator comply with the requirements given in Appendix B.

In multichannel sound systems, the effect of buzz due to picture modulation may be substantial. For this reason, a picture modulator compensating for buzz shall be used and special care shall be taken against over-modulation when modulating with a picture signal containing peak white.

The amplitude of the residual carrier at peak white level shall be between 10 % and 12,5 % of the picture carrier amplitude.

Non-linearities in a picture modulator can cause third order intermodulation which results in spurious components near to the associated sound carrier frequency. These components can contribute to buzz interference and thus should be controlled. They can be filtered out from the picture modulator output if the sound carrier is not present at the location where these components are generated. This is the case when a separate sound modulator is used.

12 Weighted and unweighted audio noise and interface measurements

All measurements, except where stated, are made using a band limiting filter having a trap at the line scanning frequency, as shown in figure 1.

Weighted measurements shall be carried out using a weighting network according to ITU-R Recommendation BS.468-4 and a quasi-peak meter.

Unweighted measurements shall be made using an r.m.s. meter.

13 Coloured noise

The coloured noise specified in ITU-R Recommendation BS.559-2 shall be used to measure crosstalk between the audio channels by the weighted measuring method (see 30.2).

14 Standard measuring conditions

Under standard measuring condition is, the receiver is provided with the radio-frequency input signal described in clause 11 and is tuned as described in clause 10. The tone control and the balance control are placed in the position specified in clauses 7 and 8. The output is set at the standard output power described in clause 6 by adjusting the volume controls.

In the BTSC system, the compressors are set in accordance with clause 9.

SECTION FOUR – SUPPRESSION OF LINE-SCAN FREQUENCY INTERFERENCE AT THE AUDIO OUTPUTS

15 Introduction

The performance of decoders for multi-channel sound systems may be affected by interference generated within the television receiver. When the resulting signal-to-interference ratio is poor, other characteristics of the sound system may be severely influenced, to the extent that subsequent measurements are made invalid. The most common source of such interference is the line scanning circuit. Therefore, the measurement described in clause 17 should be made first.

16 Definition

Line-scan frequency suppression is the ratio of the voltage due to the wanted audio signal to the voltage caused by spurious line-scan frequency signals measured at the output of an audio channel.

17 Method of measurement

The receiver is brought under the standard conditions specified in clause 14. The filters specified in clause 12 are not used for this measurement. The volume control of the channel under test is adjusted to obtain the reference output at the reference frequency and the reference modulation factor (see clause 5).

The output voltage U_A due to the audio modulation is measured and then, with the audio modulation switched off, a measurement is made of the output voltage U_Z due to line-scan frequency interference. The measurements are made with a selective voltmeter or similar equipment.

In stereophonic reception, the left and the right channels shall be measured in turn in the stereo mode.

In dual-sound reception, each channel shall be measured in the dual-sound mode.

18 Presentation of results

The line-scan suppression ratio is expressed as:

$$20 \lg \frac{U_A}{U_Z} \quad \text{(dB)}$$

CHAPTER II: ELECTRICAL RESPONSE MEASUREMENTS

SECTION FIVE – AUDIO-FREQUENCY RESPONSE CHARACTERISTICS

19 Definition

See 4.1.1.1 of IEC 60107-2.

20 Method of measurement

The receiver is brought under the standard measuring conditions described in clause 14. The volume control of the audio channel under test is so adjusted that the standard output power (clause 6) is obtained at the reference frequency and reference modulation factor (see clause 5). Other audio channels remain unmodulated.

For the main, the second and the left (right) channels of the FM-FM system and the main channel of the BTSC system, the output power or voltage is then measured at several frequencies within the range of 50 Hz to 15 kHz by keeping the modulation factor at the reference value (FM-FM: 30 %, BTSC: 14 %) and allowing for the effect of de-emphasis in the receiver. The results are corrected according to the 75 μs pre-emphasis.

For the left or right channel of the BTSC system, the output is measured with several frequencies within the range of 50 Hz to 15 kHz by changing the input signal level so as to keep the modulation of the stereo subchannel at 14 %. This can be attained by attaching a 75 μs de-emphasis network at the input terminal of the left (right) channel in the stereo generator and feeding a constant-level audio signal into this de-emphasis network. (The modulation factor of the stereo subchannel varies with frequency due to the compressor.) The results are corrected according to the 75 μs pre-emphasis.

For the SAP subchannel of the BTS system, the output is measured with several frequencies within the range of 50 Hz to 10 kHz by keeping a constant audio input signal level. This level is equal to the level of a 300 Hz signal that causes a modulation factor of 14 % at 300 Hz. No corrections for the de-emphasis are necessary.

In stereophonic reception, the left and the right channels shall be measured in turn in the stereo mode.

In dual-sound reception, each channel shall be measured in the dual-sound mode.

21 Presentation of results

Curves showing the audio-frequency response characteristics are plotted with the modulation frequency as the abscissa on a logarithmic scale, and the output level, expressed in decibels with respect to that at the reference frequency, as the ordinate on a linear scale.

For stereo reception, curves for the two channels may be plotted on the same graph, the channels being clearly identified.

SECTION SIX – AUDIO-FREQUENCY RESPONSE CHARACTERISTICS OF TONE CONTROLS

22 Definition

See 4.1.2.1 of IEC 60107-2.

23 Method of measurement

The measurement according to clause 20 is repeated for various adjustments of the tone controls, including at least their extreme positions. The output levels of these measurements are compared with the results obtained from the measurements according to clause 20. The difference in the levels, expressed in decibels, at various frequencies, shall be noted. A clear statement of the relevant adjustments of the tone controls shall be included in the results.

24 Presentation of results

Curves showing the audio-frequency response characteristics of tone controls are plotted with the frequency as the abscissa on a logarithmic scale, and the level difference expressed in decibels as the ordinate on a linear scale.

CHAPTER III: AUDIO-FREQUENCY NON-LINEAR DISTORTION

SECTION SEVEN – DISTORTION IN THE PRESENCE OF A SINGLE SIGNAL, HARMONIC DISTORTION

25 Definition

See 4.2.2.1 of IEC 60107-2.

26 Method of measurement

26.1 Measurement of distortion as a function of output power

The receivers is brought under the standard measuring conditions described in clause 14. The audio-frequency modulating signal for the audio channel under test, at the reference frequency, is adjusted for the reference modulation factor (see clause 5). The output voltage is measured with the bandpass filter defined in figure 1 and an r.m.s. meter. From this voltage and the resistance of the a.f. substitute load, the output power is calculated. Other audio channels remain unmodulated.

The setting of the volume control is varied and the harmonic distortion is measured with a distortion meter or selective voltmeter as a function of the audio-frequency output power. If required, the measurement may be repeated at other modulating frequencies. Attention should be given to the value of modulation factor, which varies with the modulating frequency due to the presence of pre-emphasis and/or a compressor (see clause 5).

In stereophonic reception, the left and the right channels shall be measured in turn in the stereo mode.

In dual-sound reception, each channel shall be measured in the dual-sound mode.

26.2 Measurement of distortion as a function of modulation factor

The receiver is brought under the standard measuring conditions described in clause 14. The audio-frequency modulating signal for the audio channel under test, at the reference frequency, is adjusted for the reference modulation factor (see clause 5). The volume control is adjusted to obtain a standard output power for which distortion is negligible. Other audio channels remain unmodulated.

The modulation factor is varied from 10 % to 100 %, the volume control being adjusted in each case to obtain the standard output power chosen, and the harmonic distortion is measured. If required, the measurement may be repeated at other modulating frequencies. Attention should be given to the value of the modulation factor which varies with modulating frequency due to the presence of pre-emphasis and/or a compressor (see clause 5).

In stereophonic reception, the left and the right channels shall be measured in turn in the stereo mode.

In dual-sound reception, each channel shall be measured in the dual-sound mode.

27 Presentation of results

Curves showing audio-frequency distortion at a single audio-frequency as a function of the output power are plotted with the output power in watts as the abscissa on a logarithmic scale, and the distortion in percentage as the ordinate on a linear scale.

Curves showing audio-frequency distortion as a function of the audio-frequency with a constant output power are plotted with the frequency as the abscissa on a logarithmic scale, and the distortion in percentage as the ordinate on a linear scale.

Curves showing audio-frequency distortion as a function of the modulation factor are plotted with the modulation factor as the abscissa on a linear scale and the distortion in percentage as the ordinate on a linear scale.

The chosen standard output power shall be stated.

SECTION EIGHT – INTERMODULATION

28 General

Methods of measurement of intermodulation are under consideration. See IEC 60268-2 and IEC 60268-3.

CHAPTER IV: AUDIO CHANNEL SEPARATION

SECTION NINE – CROSSTALK

29 Definition

Crosstalk between audio channels exists when signals applied to one channel give rise to components in the output of the other audio channels.

The crosstalk is the ratio expressed in decibels of the output of channel A due to an input signal intended for this channel to the output of channel A due to an input signal intended for channel B.

The crosstalk from channel B to channel A is then defined as:

$$20 \lg \frac{(U_A)_A}{(U_A)_B} \quad \text{(dB)}$$

where

$(U_A)_A$ is the output of channel A due to an input intended for channel A;

$(U_A)_B$ is the output of channel A due to an input intended for channel B.

NOTE – This definition complies with the standards for the FM-FM and the BTSC systems, but differs from the definitions given in IEC 60268-2 and IEC 60315-4.

30 Method of measurement

30.1 Sine wave method

The measurement set-up is shown in figure 2. The output meter connected to the output terminal of the desired audio channel consists of the bandpass filter shown in figure 1 and an r.m.s. meter (unweighted measurement).

The receiver is brought under the standard measuring conditions described in clause 14. The volume control of the desired audio channel is adjusted so that at the reference frequency and the reference modulation factor (see clause 5) the voltage indication of the r.m.s. meter corresponds to that obtained with the standard output power (see clause 6).

Modulation of the desired channel A is then switched off, and the output of the channel measured in the presence of modulation of the undesired channel(s) B. The measurement is repeated as the modulating frequency of the undesired channels is varied within the range of 50 Hz to 15 kHz (50 Hz to 10 kHz for the SAP subchannel). The modulation factor is kept at the reference modulation factor for the main and the second channels in the FM-FM system and the stereo sum channel in the BTSC system. Modulation of the SAP subchannel is kept at a constant audio input signal level which causes a modulation factor of 14 % at 300 Hz.

In the FM-FM system, crosstalk between the main and the second channels shall be measured in the dual-sound mode.

In the BTSC system, crosstalk between the main channel and the SAP subchannel shall be measured in the dual-sound mode, and crosstalk between the stereo channel and the SAP subchannel shall be measured in the stereo and SAP mode. When the stereo channel is the undesired channel, the measurements are made in the presence of the left or the right channel modulation only and by the modulation of both channels (in phase and out of phase).

30.2 Coloured noise method

The measurement set-up is shown in figure 2. The output meter connected to the output terminal of the desired audio channel consists of the bandpass filter shown in figure 1, a noise weighting filter and a quasi-peak meter (see clause 12, weighted measurement).

The receiver is brought under the standard measuring conditions specified in clause 14. The volume control of the desired audio channel A is adjusted so that at the reference frequency and the reference modulation factor (see clause 5) the voltage indication of the quasi-peak meter corresponds to that obtained with standard output power (see clause 6).

The modulation of the desired audio channel is then switched off and the output of this channel is measured in the presence of the modulation of the undesired channel(s) B. The undesired audio channel is modulated with coloured noise. The level of the coloured noise is set to give the same level as a 500 Hz sine wave signal which modulates the sound carrier or subcarrier at a modulation factor of 43 % measured with a quasi-peak meter without a noise weighting filter.

In the FM-FM system, crosstalk between the main and the second channels shall be measured in the dual-sound mode.

In the BTSC system, the desired channel is modulated with the coloured noise at the same modulation factor as that of the undesired channel and the output is taken as the reference output, instead of the output of the reference frequency signal. Crosstalk between the main channel and the SAP subchannel shall be measured in the dual-sound mode, and crosstalk between the stereo channel and the SAP subchannel shall be measured in the stereo and SAP mode. When the stereo channel is the undesired channel, the measurements are made in the presence of the left or the right channel modulation only and by the modulation of both channels (in phase and out of phase).

NOTE – This method gives the crosstalk level similar to that due to actual programme signals, if the level is higher than that of residual noise.

31 Presentation of results

The crosstalk from channel B into channel A is expressed in decibels and calculated from the measured voltage ratios of $(U_A)_A$ and $(U_A)_B$.

The results of measurements by the sine wave method shall be presented graphically with the modulation frequency as the abscissa on a logarithmic scale and the crosstalk in decibels as the ordinate on a linear scale.

The results of measurements by the coloured noise method give a single figure for each channel.

The method used shall be clearly stated with the results.

SECTION TEN – STEREOPHONIC SEPARATION

32 Definition

The stereophonic separation is the ratio expressed in decibels of the output of the left (or right) channel to the output signal of the right (or left) channel due to an input signal intended for the left (or right) channel.

The separation of the left channel from the right channel is defined as:

$$20 \lg \frac{(U_L)_L}{(U_R)_L} \quad \text{(dB)}$$

where

$(U_L)_L$ is the output of the left channel due to the left input signal;

$(U_R)_L$ is the output of the right channel due to the left input signal.

NOTE – This definition complies with the standards for the FM-FM and the BTSC systems, but differs from the definitions given in IEC 60268-2 and IEC 60315-4.

33 Method of measurement

The measurement set-up is shown in figure 3. The bandpass filter specified in figure 1 and an r.m.s. meter are used for the output measurements.

The receiver is brought under the standard measuring conditions specified in clause 14. The volume control of both the left and the right channels is adjusted so that at the reference frequency and the reference modulation factor the voltage reading of the r.m.s. meter corresponds to that obtained with standard output power. In the BTSC system, the adjustment is made by modulating each channel in turn and the SAP channel is set at no modulation.

Modulation of the right channel is then switched off, and the output of the channel is measured in the presence of modulation of the left channel. The modulating frequency of both the left and right channels is varied within the range of 50 Hz to 15 kHz and the measurement is repeated by keeping a constant modulation factor (FM-FM: 30 %, BTSC: 14 % for the stereo sum channel) (see clause 5).

The same measurement is made on the right channel.

If required, the measurement is made at other r.f. input signal levels.

34 Presentation of results

Curves showing stereophonic separation as a function of modulation frequency are plotted with the modulation frequency as the abscissa on a logarithmic scale, and the ratio of the output of the left (right) channel with a modulation $(U_L)_L$, or $(U_R)_R$, to that of the right (left) channel without modulation $(U_R)_L$, or $(U_L)_R$, expressed in decibels as the ordinate on a linear scale.

Examples of the curves are given in figure 4.

CHAPTER V: INTERNALLY GENERATED INTERFERENCE

SECTION ELEVEN – NOISE FLOOR AND SIGNAL-TO-BUZZ RATIO

35 Definition

Noise floor is a signal-to-noise ratio due to the residual noise in an audio channel when the r.f. input signal level is large enough to overcome the noise generated at the front end of the receiver and buzz and crosstalk components are negligible. Hum is included in the noise floor.

Buzz is interference due to cross-modulation components of picture signals into the audio channels. It occurs mainly in intercarrier type receivers and largely depends on the picture contents.

36 Method of measurement

36.1 Noise floor

The measurement set-up is shown in figure 5. The bandpass filter specified in figure 1 and an r.m.s. meter are used for the output measurements (unweighted measurement).

The receiver is brought under the standard measuring conditions specified in clause 14. The volume control of the audio channel under test is adjusted to obtain at the reference frequency and the reference modulation factor (see clause 5) a voltage reading on the r.m.s. meter corresponding to that obtained with standard output power (see clause 6).

The audio modulation is then switched off and the output is measured.

In stereophonic reception, the left and the right channels shall be measured in turn in the stereo mode.

In dual-sound reception, each channel shall be measured in the dual-sound mode.

36.2 Signal-to-buzz ratio

Weighted measurements are made using the set-up shown in figure 5. The bandpass filter, weighting filter and quasi-peak meter are specified in clause 12.

The receiver is brought under the standard measuring conditions specified in clause 14. The volume control of the audio channel under test is adjusted to obtain at the reference frequency and the reference modulation factor (see clause 5) a voltage indication on the quasi-peak meter corresponding to that obtained with standard output power. Other audio channels are unmodulated.

The audio modulation is then switched off, and the output is measured using the following picture signals for picture modulation:

– white picture (APL: 50 %);
– colour bar;
– other critical electronic test patterns (sub-harmonics of intercarrier frequency, etc.).

In stereophonic reception, the left and the right channels shall be measured in turn in the stereo mode.

In dual-sound reception, each channel shall be measured in the dual-sound mode.

37 Presentation of results

The noise floor and signal-to-buzz ratios are expressed in decibels relative to the reference output voltage. In the case of the signal-to-buzz ratio, the type of picture signal shall be clearly stated in the results.

SECTION TWELVE – SIGNAL-TO-BUZZ-BEAT RATIO IN THE AUDIO CHANNEL TRANSMITTED BY AN FM SUBCARRIER

38 Definition

Buzz-beat is interference due to undesired components caused by the modulation of a frequency-modulated subcarrier, which is a harmonic of the line-scan frequency. It occurs in intercarrier receivers when the buzz component on the subcarrier is large and the modulating audio signal contains low frequency components. It is intermodulation between modulated sideband components and a buzz component at the subcarrier frequency.

In the FM-FM system, the interference will be present in the stereo subchannel or the second channel. In the BTSC system, the interference will be present in the SAP channel.

39 Method of measurement

The receiver is brought under the standard measuring conditions specified in clause 14. The picture channel is modulated with one of the picture signals specified in 36.2. The volume control of the audio channel under test is adjusted to obtain the standard output power at an audio-frequency of 200 Hz and the reference modulation factor (FM-FM: 30 %, BTSC: 14 %) (see clause 5). The output due to the undesired components in the output signal is then measured by an audio distortion meter. The bandpass filter specified in clause 12 and figure 1 shall be used.

In stereophonic reception of the FM-FM system, the left and the right channels shall be measured in turn in the stereo mode.

In dual-sound reception of the FM-FM system, the second audio channel shall be measured in the dual-sound mode.

In the BTSC system, the measurement shall be made for the SAP channel in the dual-sound mode.

40 Presentation of results

The signal-to-buzz-beat ratio is expressed in decibels relative to the standard output power.

CHAPTER VI: SENSITIVITY

SECTION THIRTEEN – SIGNAL-TO-NOISE RATIO

41 Definition

Refer to 6.1.1 of IEC 60107-2.

42 Method of measurement

Refer to 6.1.2 of IEC 60107-2.

In the BTSC system, the modulation factor is set at 14 % at 300 Hz (see clause 5).

In stereophonic reception, the left and the right channels shall be measured in turn in the stereo mode.

In dual-sound reception, each channel shall be measured in dual-sound mode.

43 Presentation of results

Refer to 6.1.3 of IEC 60107-2.

SECTION FOURTEEN – NOISE-LIMITED SENSITIVITY

44 Definition

Refer to 6.3.1 of IEC 60107-2.

45 Method of measurement

Refer to 6.3.2 of IEC 60107-2.

In the BTSC system, the modulation factor is set at 14 % at 300 Hz (see clause 5).

In stereophonic reception, the left and the right channels shall be measured in turn in the stereo mode.

In dual-sound reception, each channel shall be measured in the dual-sound mode.

46 Presentation of results

Refer to 6.3.3 of IEC 60107-2.

SECTION FIFTEEN – MODE IDENTIFICATION SENSITIVITY

47 Definition

Identification sensitivity is defined as the lowest r.f. input signal level at which the receiver can maintain the function of mode identification.

For the BTSC system, mode identification may include the lowest pilot modulation for stereo and the lowest modulation for SAP subchannel.

48 Method of measurement

The receiver is brought under the standard measuring conditions specified in clause 14. The channels of the mode under test are modulated with different audio-frequencies such as 400 Hz and 1 000 Hz at the same modulation factor (FM-FM system: 30 %, BTSC system: 14 %). The volume controls of the channels are adjusted to obtain the standard output power. The picture channel is modulated with one of the picture signals specified in 36.2.

The r.f. input signal level is then reduced until the mode of operation is interrupted or in an unstable state. Then the r.f. input signal is increased again, beginning at a low level, until the audio signals are reproduced again in a stable manner. The two values found through the measurement are recorded.

The measurement shall be carried out on several r.f. channels.

For the BTSC system, measurement may also be repeated in the stereo mode for reduced pilot modulation and the SAP mode, with reduced subcarrier modulation, at the r.f. input signal level specified in clause 11.

49 Presentation of results

The results shall be listed in a table together with the type of picture signal used. An example of the format is shown in table 1.

Table 1 – Sensitivity of mode identification (dB(μV))

Television channel	Dual-sound mode		Stereophonic mode	
	Identification		Identification	
	disturbed ≤	stable ≥	disturbed ≤	stable ≥

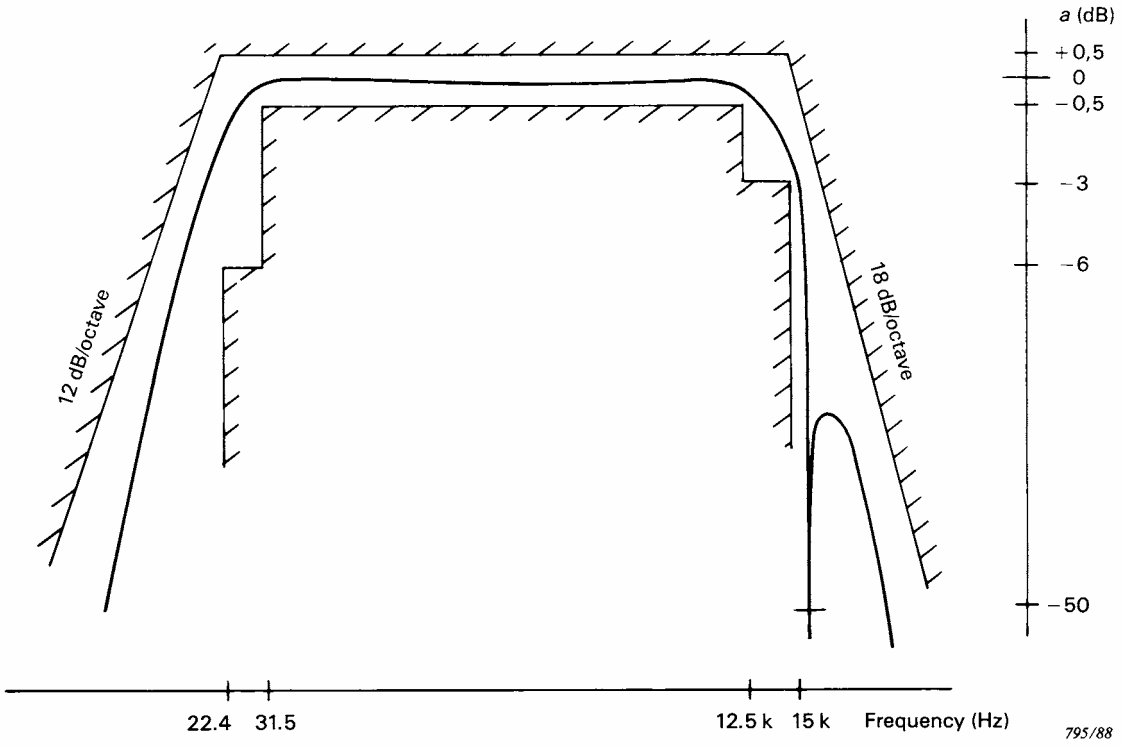


Figure 1 – 22,4 Hz to 15 kHz bandpass filter with trap for line-scan frequency

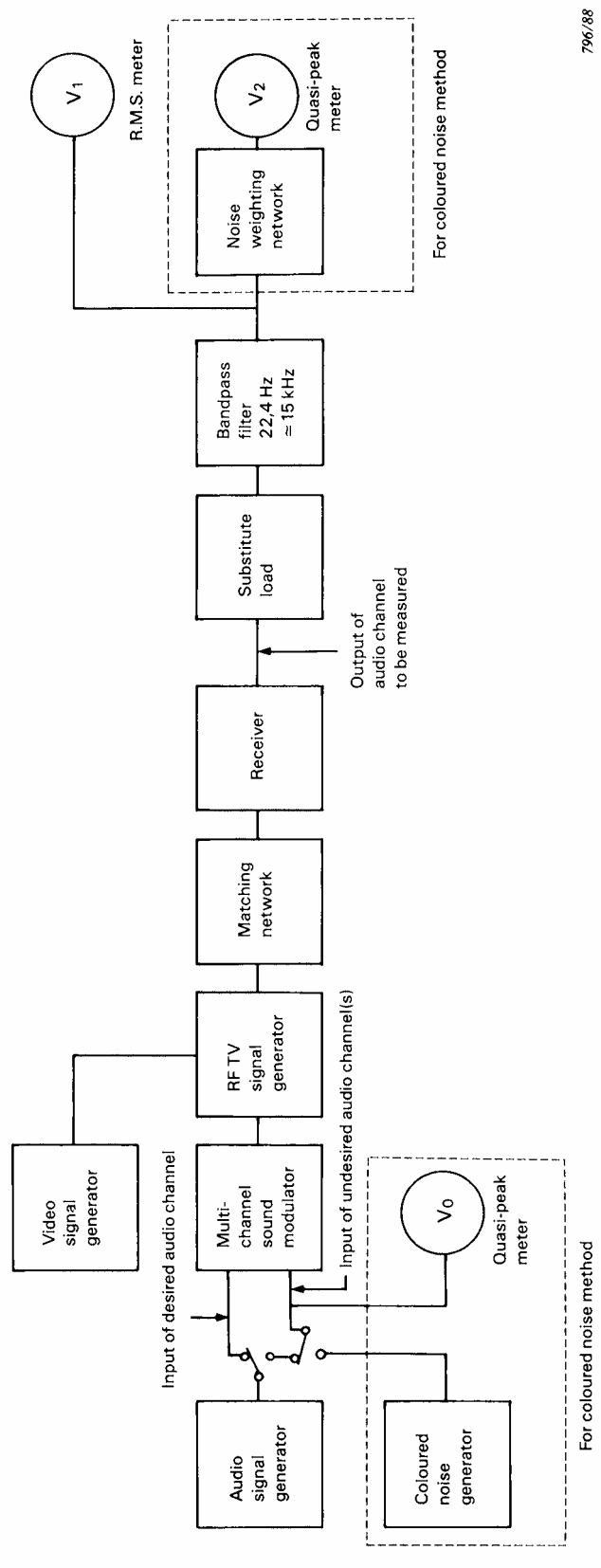
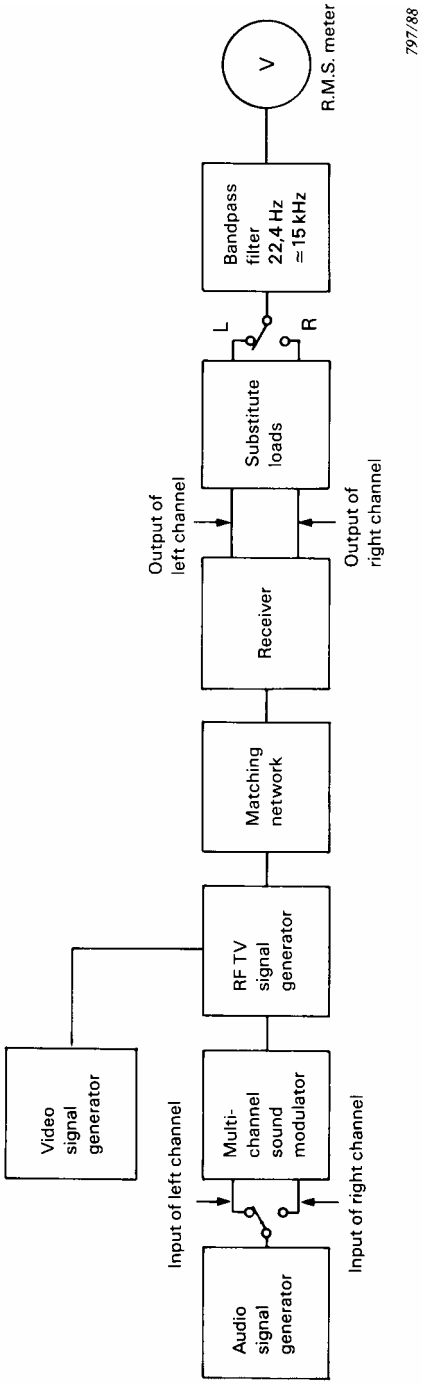


Figure 2 – Arrangement for signal-to-noise ratio, crosstalk and separation measurements



Not needed if figure 2 changed as shown.

Figure 3 – Arrangement for measuring stereophonic separation

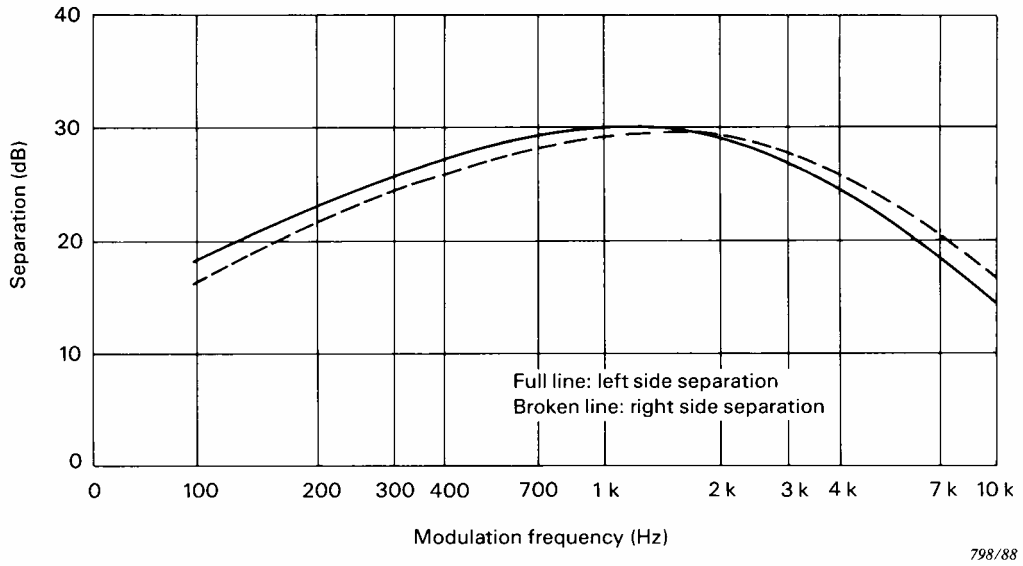


Figure 4 – Example of stereophonic separation (FM-FM system)

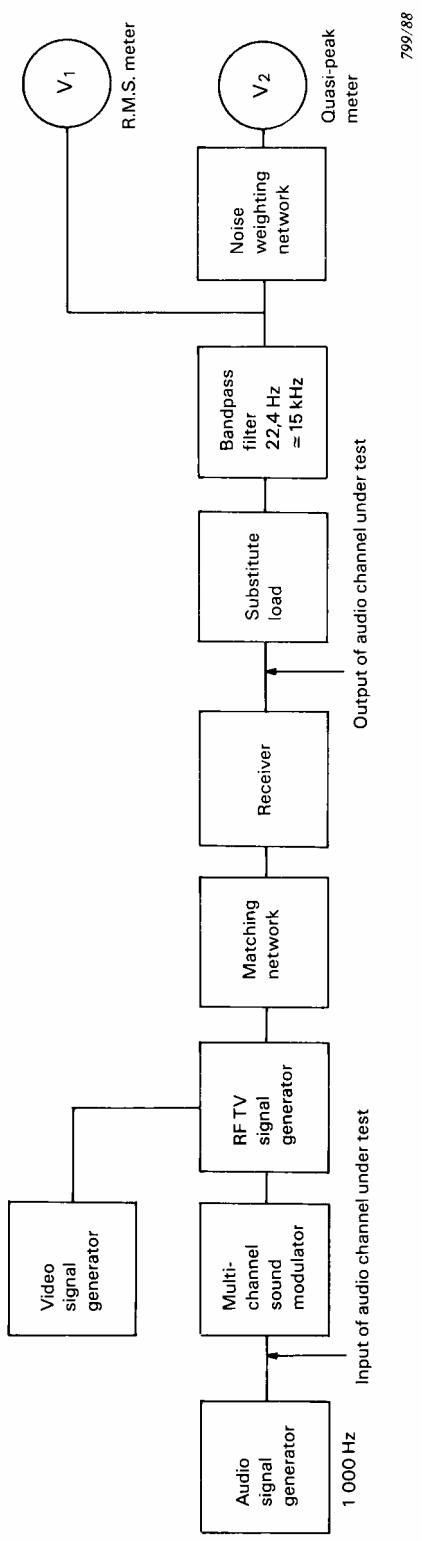


Figure 5 – Arrangement for measuring noise floor and signal-to-buzz ratio

Appendix A

Modulation parameters for the FM-FM and BTSC systems

The following tables show the rated maximum (peak) frequency deviations (corresponding to 100 % modulation). Figures in parentheses show these deviations at the reference modulation factor.

a) FM-FM system

Audio channel	Deviation of main carrier by main or stereo sum channel kHz	Deviation of main carrier by subcarrier kHz	Deviation of subcarrier by second or stereo subchannel kHz
Main and second	25 (7,5)	15	10 (3)
Left	12,5 (3,75)	20	5 (1,5)
Right	12,5 (3,75)	20	5 (1,5)
L and R	25 (7,5)	20	0
L and –R	0	20	10 (3)

b) BTSC system

Audio channel	Deviation of main carrier by main or stereo sum channel kHz	Deviation of main carrier by stereo subchannel kHz	Deviation of main carrier by second subcarrier kHz	Deviation of second subcarrier by SAP signal kHz
Main and second	25 (3,5)		15	10 (1,4)
Left	12,5 (3,5)	25* (7)		
Right	12,5 (3,5)	25* (7)		
L and R	25 (3,5)	0		
L and –R	0	50* (7)		
* Without encoder.				

NOTE – Modulation factor of 100 % corresponds to 25 kHz main carrier deviation by the main channel, to 50 kHz main carrier deviation by the stereo subchannel and to 15 kHz main carrier deviation by the SAP subchannel.

Appendix B

Requirements for BTSC stereo generator control and test capability

1. The BTSC compressor and the sum-channel compensator are simultaneously switched in or out.
2. The 75 μs pre-emphasis network in both sum-channel and difference channel are switched in or out, provided that both compressor and pre-emphasis network in the difference channel are not in at the same time.
3. The BTSC compressor has built-in doubling of the sound carrier deviation by the stereo difference signal. This facilitates testing without the compressor, since the composite stereo signal display on an oscilloscope is now identical to the one obtained from an FM stereo modulation signal.
4. The BTSC stereo generator output should have a level control for calibration of the sound carrier deviation in response to a BTSC stereo baseband signal. It is recommended that this control have limited access, since it is used for calibration only and its setting is critical.
5. The BTSC stereo signal level that causes reference deviation of the sound carrier is not necessarily the same level as that required by the baseband input of the second M and M equipment. It is recommended that level adjustments for back-to-back operation be made at the sound M and M equipment and not with the stereo level control. (M and M – monitoring and measuring.)