

Wideband cabled distribution systems —

Part 2: Methods of measurement

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- British Broadcasting Corporation
- British Radio and Electronic Equipment Manufacturers' Association
- British Telecommunications
- Department of Trade and Industry, Directorate of Radio Technology
- Institution of Electronic and Radio Engineers
- Radio, Electrical and Television Retailers' Association

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- British Kinematograph, Sound and Television Society
- Cable Television Association of Great Britain
- Consumer Standards Advisory Committee of BSI
- Consumers' Association
- Electric Cable Makers' Confederation
- Electronic Components Industry Federation
- Electronic Engineering Association
- Independent Broadcasting Authority
- Institution of Electrical Engineers
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- Telecommunication Engineering and Manufacturing Association

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Foreword

This Part of BS 6513 has been prepared under the direction of the Electronic Equipment Standards Committee. It is based on a draft provided by the Department of Trade and Industry. It forms Part 2 of a multipart standard for wideband cabled distribution systems; the other Parts to date are as follows:

- *Part 1: Glossary of terms;*
- *Part 3: Specification for performance requirements, including system safety, for downstream television and f.m. sound radio signals;*
- *Part 4: Specification for performance requirements, including system safety, for upstream television.*

Details of the characteristics of the various signals referred to in this standard are given in the following International Radio Consultative Committee (CCIR) publications:

- television, 625-line, PAL, system I:
CCIR Report 624-2 (1982);
- stereo radio, band II f.m.:
CCIR Recommendation 450-1 (1982);
- teletext: CCIR Report 957 (1982).

The following subjects relative to this Part will be included as additional clauses or supplements at a later date.

Test methods for f.m. sound radio signals:

- echo rating;
- hum modulation;
- single and multiple frequency interference;
- data signals within the channel.

Test methods for television signals:

- signals received via earth-orbiting satellites;
- teletext;
- crossview ratio.

General test methods:

- immunity of system components;
- immunity of complete systems;
- radiation from complete systems.

Test methods for digital signals.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 50, 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.

Section 1. General

1.1 Scope

This Part of BS 6513 describes methods of measuring the performance of wideband cabled distribution systems for downstream and upstream television signals and f.m. sound radio signals.

A method of monitoring and assessing system radiation is described in Appendix A.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

1.2 Definitions, designations and abbreviations

1.2.1 Definitions. For the purposes of this Part of BS 6513, the definitions given in Part 1 apply.

1.2.2 Designations and abbreviations. For the purposes of this Part of BS 6513, the frequency band designations and abbreviations given in BS 4727-3:Group 07 apply.

Section 2. Methods of measurement applicable to both television and f.m. sound radio signals

2.1 Mutual isolation between system outlets

2.1.1 Principle. The method describes the measurement of the attenuation between two system outlets at any frequency within the range of a cabled distribution system. Usually this is specified as the minimum value obtained and isolation is measured between any combination of the following:

- a) system outlets connected to adjacent subscribers' taps;
- b) system outlets connected to the same multiple subscribers' taps;
- c) adjacent looped system outlets.

2.1.2 Equipment

NOTE It is essential that the test set-up is well-matched.

2.1.2.1 Sweep frequency generator, with frequency range or ranges to suit the system to be examined, equipped with a frequency marking system.

2.1.2.2 Terminating wideband detector, with sensibly flat response.

NOTE 1 Any departures from a flat response will be compensated by calibration of the test equipment (see 2.1.3.1 to 2.1.3.3).

NOTE 2 In this context, "wideband" means of sufficient bandwidth to cover the full frequency range of the system under investigation.

NOTE 3 This device may be included in some sweep frequency generators.

2.1.2.3 Variable attenuator, adjustable in steps of not more than 1 dB up to a value greater than the maximum mutual isolation to be measured.

2.1.2.4 Wideband amplifier, with a sensibly flat amplitude/frequency characteristic (see notes 1 and 2 of 2.1.2.2) and sufficient gain to raise the signal level at the system outlet to a level suitable to drive the detector.

2.1.2.5 Oscilloscope or other display unit, suitable for operation with the sweep frequency generator.

2.1.2.6 Appropriate coaxial cable, of sufficient length to reach from one system outlet to the other selected outlet in the cabled distribution system.

2.1.3 Procedure

2.1.3.1 With the equipment connected as shown in Figure 1(a), set the variable attenuator to a value just greater than the maximum value of mutual isolation expected to be measured.

Record this value of the attenuator as a_1 .

2.1.3.2 Adjust the output level of the sweep generator to give a level at the input to the amplifier approximately equal to that available at a system outlet.

2.1.3.3 Adjust the oscilloscope and amplifier gain controls to produce a display and note the amplitude of the display over the frequency range under inspection.

2.1.3.4 Remove from the section under test the signals normally distributed on the system whilst maintaining the correct terminating conditions. Connect the equipment as shown in Figure 1(b).

NOTE The output from the sweep generator is connected to the local system outlet and the long cable (2.1.2.6) is used to connect to the remote outlet.

2.1.3.5 Reduce the attenuator setting until the peak of the display just reaches the same amplitude as that noted in 2.1.3.3 for the frequency at which peak occurs.

Record the new value of the attenuator as a_2 .

2.1.3.6 If the system outlets are of dual socket design, for example, television/radio, the mutual isolation should also be measured at the appropriate frequencies between one socket, for example television, of the local system outlet and the alternate socket, for example, radio, of the remote system outlet and vice versa. In these cases, it will also be necessary to measure mutual isolation with the unused sockets in both terminated and open-circuit conditions. The conditions of measurement should be stated when tabulating results.

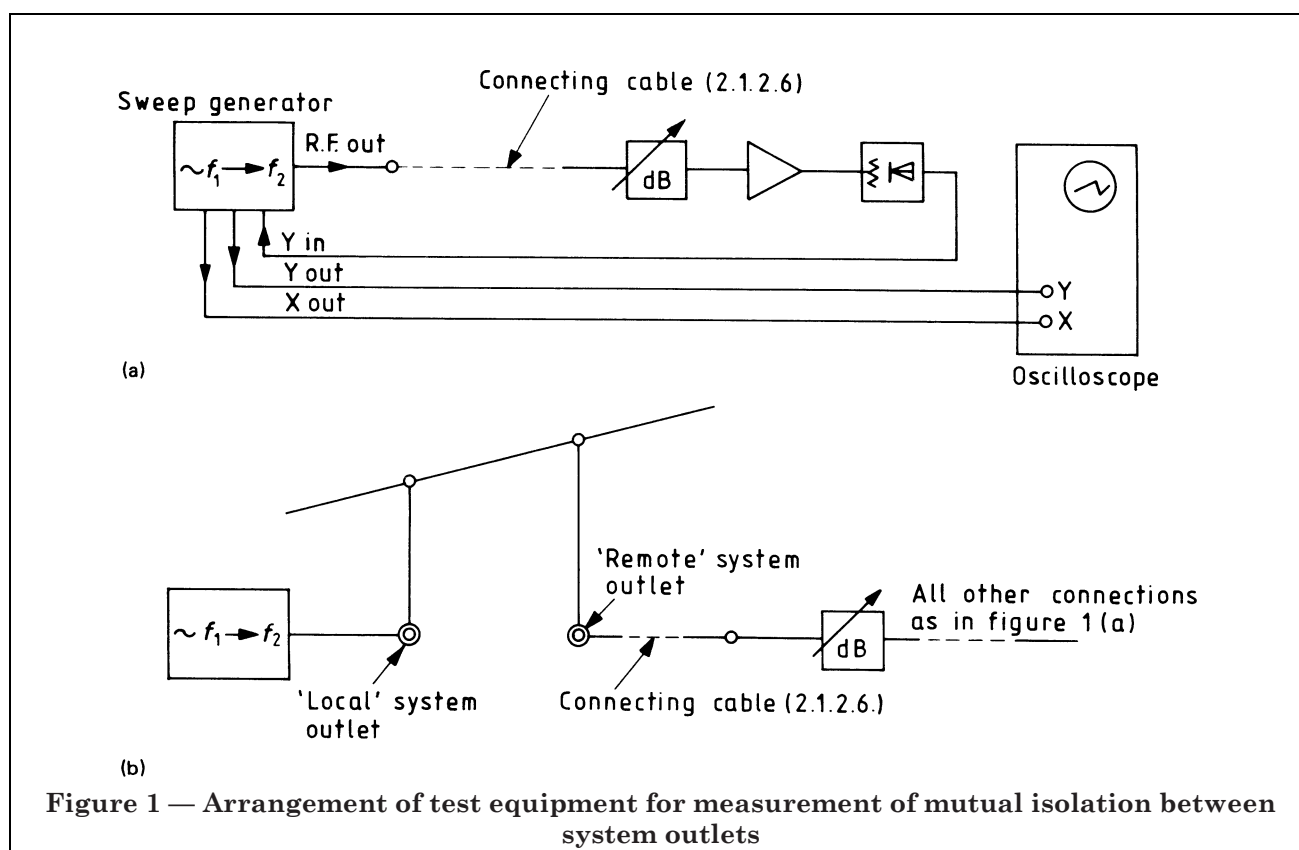


Figure 1 — Arrangement of test equipment for measurement of mutual isolation between system outlets

2.1.4 Expression of results. Mutual isolation is given by $a_1 - a_2$.

Where the measurement is made within a number of discrete frequency bands, take the lowest result obtained as the mutual isolation between the two system outlets under investigation.

2.2 Amplitude/frequency response within a channel

2.2.1 Principle. The method describes the measurement of the frequency response of cabled distribution systems over the frequency range of an individual channel between two specified points within the system. However, where input signals to the system are received at, or are reduced to, baseband, and modulated on to the system carrier frequencies, the response of any demodulator and modulator is not included. If it is required to include the characteristics of these items, a separate assessment should be made using test techniques applicable to such equipment.

Where the system contains frequency changing equipment between the antenna input and the system outlet at which the tests are to be made, the calibration of the equipment is carried out at the output frequencies, having first checked that the output of the sweep frequency generator is also flat over the input channel.

2.2.2 Equipment

NOTE It is essential that the test set-up is well-matched.

2.2.2.1 *Sweep frequency generator*, adjustable to cover the frequency range of the channel to be measured.

2.2.2.2 *Terminating r.f. detector*, with a sensibly flat response over the channel to be measured.

NOTE Any departures from a flat response will be compensated by calibration of the test equipment (see 2.2.3.1 to 2.2.3.5).

2.2.2.3 *Two variable attenuators*, adjustable in steps of not more than 1 dB.

2.2.2.4 *Amplifier*, with a sensibly flat response over the channel to be measured (see note to 2.2.2.2) and sufficient gain to raise the signal level at the output test point to a level suitable to drive the detector.

2.2.2.5 *Dual trace oscilloscope*, having sufficient sensitivity to produce a satisfactory display from the output signal available from the detector.

2.2.2.6 *High output signal generator* (having an output of at least 300 mV r.m.s. terminated), of known frequency calibration over the frequency range of the channel to be tested.

2.2.2.7 *Balanced mixer*, suitable for use in the frequency range of the channel to be tested.

2.2.2.8 *Low-pass filter*, with cut-off at approximately 200 kHz (for television channels) or 10 kHz (for f.m. sound radio channels).

2.2.2.9 *Directional coupler*, suitable for use in the frequency range of the channel to be tested.

2.2.2.10 *Termination*, to match the output of the filter (2.2.2.8).

2.2.2.11 *Filter*, if necessary, that matches the system correctly over the channel to be tested, with a sensibly flat response and of sufficient attenuation at the frequencies of other signals on the system to reduce them to approximately 20 dB below the level of the swept test signal.

NOTE This filter may be necessary at the input of the amplifier to prevent distortion of the display if the tests are to be carried out in the presence of other signals on the system.

2.2.3 Procedure

2.2.3.1 Connect the equipment as shown in Figure 2(a) including the filter (2.2.2.11) if necessary. Adjust the output frequencies of the sweep generator to cover the channel to be tested and set the variable attenuator A_1 , so that the level of the signal at its output is that which will be required when connected to the system input.

2.2.3.2 Set the variable attenuator A_2 , so that the level of the signal at the input to the amplifier is about 3 dB to 4 dB below that expected at the system outlet at which the test will be made.

2.2.3.3 Adjust the oscilloscope controls to obtain a satisfactory display on the Y_1 channel, which shall be d.c. coupled, locking the timebase to the leading edge of the display.

NOTE It may be necessary to operate the oscilloscope at a repetition rate equal to half that of the sweep generator and examine the "second" displayed response.

2.2.3.4 Adjust the frequency of the signal generator to that of the lower limit of the channel under investigation and arrange the level of this signal and the gain and shift controls of the Y_2 channel of the oscilloscope to produce a satisfactory marker.

2.2.3.5 Move the marker to the upper frequency limit of the channel and carefully note the amplitude of the display between the two marks (see reference in Figure 3), and the level of the display during the blanking period.

2.2.3.6 Adjust the attenuator A_2 to the values 3 dB either side of that set as described in 2.2.3.2 and check that the shape of the reference curve does not alter significantly.

2.2.3.7 Connect the equipment to the cabled distribution system as shown in Figure 2(b), removing the normal signal input to the channel under test, but retaining any pilot signals which may be necessary to maintain correct operation of the system.

NOTE Signal-operated automatic gain control (A.G.C.) systems may not function correctly on swept input signals and may have to be rendered inoperative and manual gain control used during these tests.

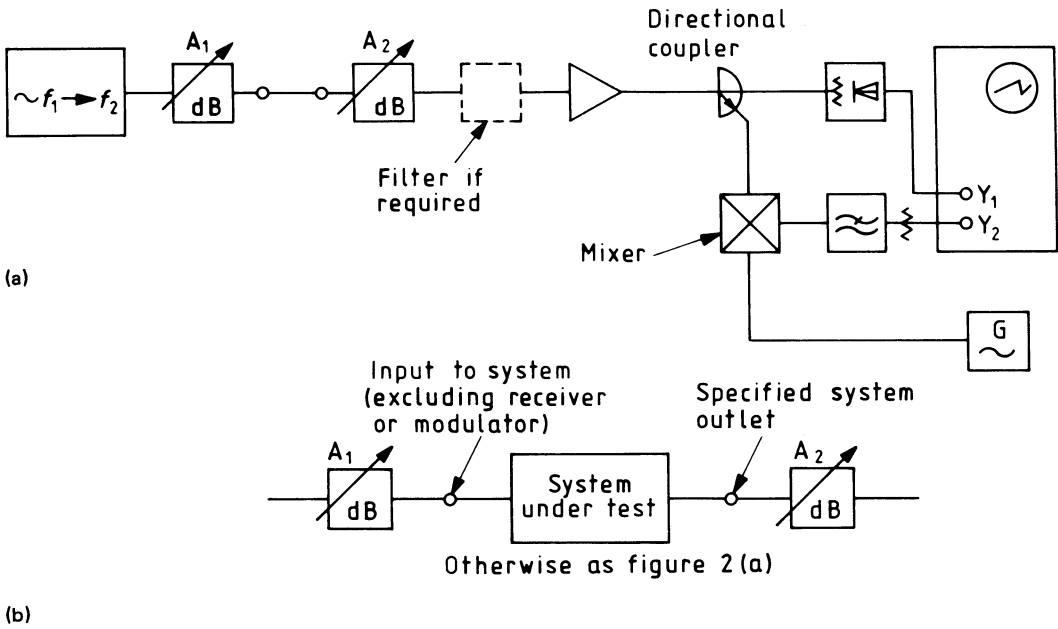


Figure 2 — Arrangement of test equipment for measurement of frequency response within a channel

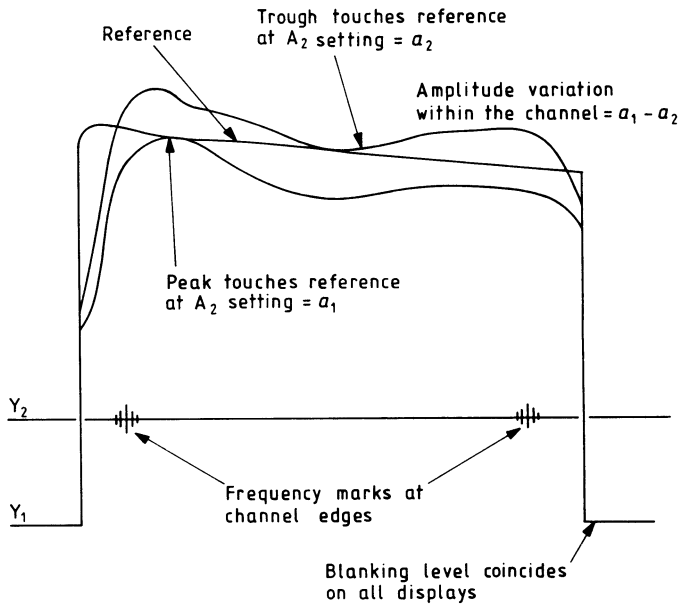


Figure 3 — Interpretation of displays for measurement of frequency response within a channel

2.2.3.8 Adjust the attenuator A_2 to produce the same general amplitude of display as obtained in **2.2.3.3**, using the reference curve, carefully aligning the blanking level with that obtained as described in **2.2.3.5**.

2.2.3.9 Mark the frequency limits of the channel as described in **2.2.3.4** and **2.2.3.5**.

2.2.3.10 Using the attenuator A_2 , set up the display so that, within the frequency limits marked as described in **2.2.3.9**:

- a) the “peak” of the response touches the “reference”, interpolating if necessary;
- b) the “trough” of the response touches the “reference”, interpolating if necessary.

Record the values of a) and b) as a_1 and a_2 respectively, with correction for interpolation.

2.2.4 Expression of results. The variation of amplitude/frequency response within the channel is given by $a_1 - a_2$.

2.3 Single intermodulation product

2.3.1 Principle

NOTE General information on non-linear distortion is given in Appendix B.

The method describes the measurement of the ratio of the carrier to a single intermodulation product at a specified point within a cabled distribution system using two or three carriers. The method can also be used to determine the intermodulation performance of individual items of equipment.

The simultaneous use of many channels spaced by the same nominal frequency interval results in a large number of intermodulation products (particularly those of the third order) falling near the vision carrier of a wanted television channel.

As, in these cases, the resultant interference is of an extremely complex nature, the method described in **3.2** should be used.

2.3.2 Equipment

2.3.2.1 Selective voltmeter, covering the frequency range of the equipment or system to be tested. This may be a spectrum analyzer.

2.3.2.2 Signal generators, of appropriate number, covering the frequencies at which the tests are to be carried out.

2.3.2.3 Variable attenuator, with a range greater than the signal to intermodulation ratio expected, if not incorporated in the voltmeter (**2.3.2.1**).

2.3.2.4 Combiner, for tests on equipment and systems with a single input (see Figure 4 and Figure 5).

2.3.2.5 Filters, where necessary, to ensure that measurements are not affected by spurious signals generated in the test equipment itself (see **2.3.4**).

2.3.3 General

2.3.3.1 The equipment shall be connected as shown in Figure 4 and shall be correctly terminated and well-matched.

2.3.3.2 Unless otherwise required, the reference levels used in measurements shall be the normal operating signal levels specified for the equipment or system.

2.3.3.3 Measurements of both second and third order products shall be carried out with the test signals widely and closely spaced over each band of interest at frequencies capable of producing significant products within the overall frequency range. An exception to this is dealt with in **C.2.2**.

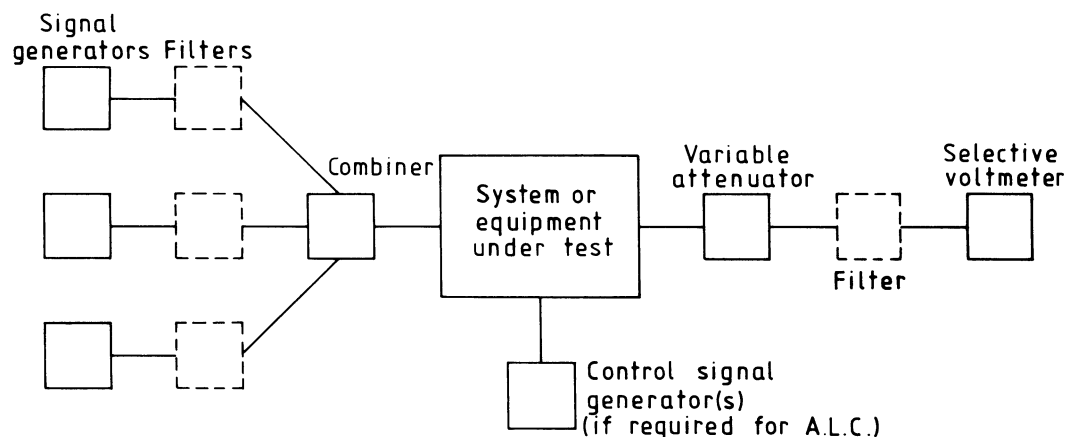
NOTE 1 Examples of second and third order intermodulation products are given in Appendix C.

NOTE 2 Second order products are encountered only in wideband equipment and systems covering more than one octave, and can be measured using two signals (see **C.1**).

NOTE 3 Third order products are encountered in both wideband and narrow-band equipment and systems and, depending on the type, can be measured using two signals or three signals (see **C.1** and **C.2**).

2.3.3.4 Where the system to be measured includes:

- a) automatic gain control (A.G.C.), tests shall be carried out at minimum and maximum levels of signal input;
- b) automatic level control (A.L.C.), pilot signals of the correct type, frequency and level shall be maintained throughout the tests.



NOTE 1 Whether the items of test equipment indicated by dotted lines are required depends on the results of the checks given in 2.3.4. The filters at the signal generator outputs may be needed to suppress spurious signals. The selective voltmeter input filter may be required to prevent intermodulation in the meter. If a filter is used, then possible mismatch should be avoided by not reducing the attenuator value below 10 dB.

NOTE 2 To avoid intermodulation between the signal generators, it may be necessary for the combiner to be in the form of one or more directional couplers.

Figure 4 — Basic arrangement of test equipment for evaluation of the ratio of signal to intermodulation product

2.3.4 Calibration and checks

2.3.4.1 Carry out a check to determine if harmonics and other spurious signals at the outputs of the signal generators are likely to affect significantly the results of the measurements by connecting the selective voltmeter to each of the signal generators in turn and determining the level of any spurious signals when the fundamental output is set to the level required for the test. If the ratio of fundamental to spurious signals is less than 30 dB, insert a filter to reject the unwanted signals such that this ratio is achieved.

2.3.4.2 Check the accuracy of the amplitude scale of the selective voltmeter using one of the signal generators and the variable attenuator.

2.3.4.3 Connect the equipment as for measurement of intermodulation and tune the voltmeter to an appropriate product, adjusting the attenuator as necessary to obtain a convenient reading. Check that a small change, e.g. 3 dB, in the attenuator setting produces an equivalent change in the meter reading. If the changes do not correspond, insert a filter at the input to the meter to reduce the level of one or more of the test signals.

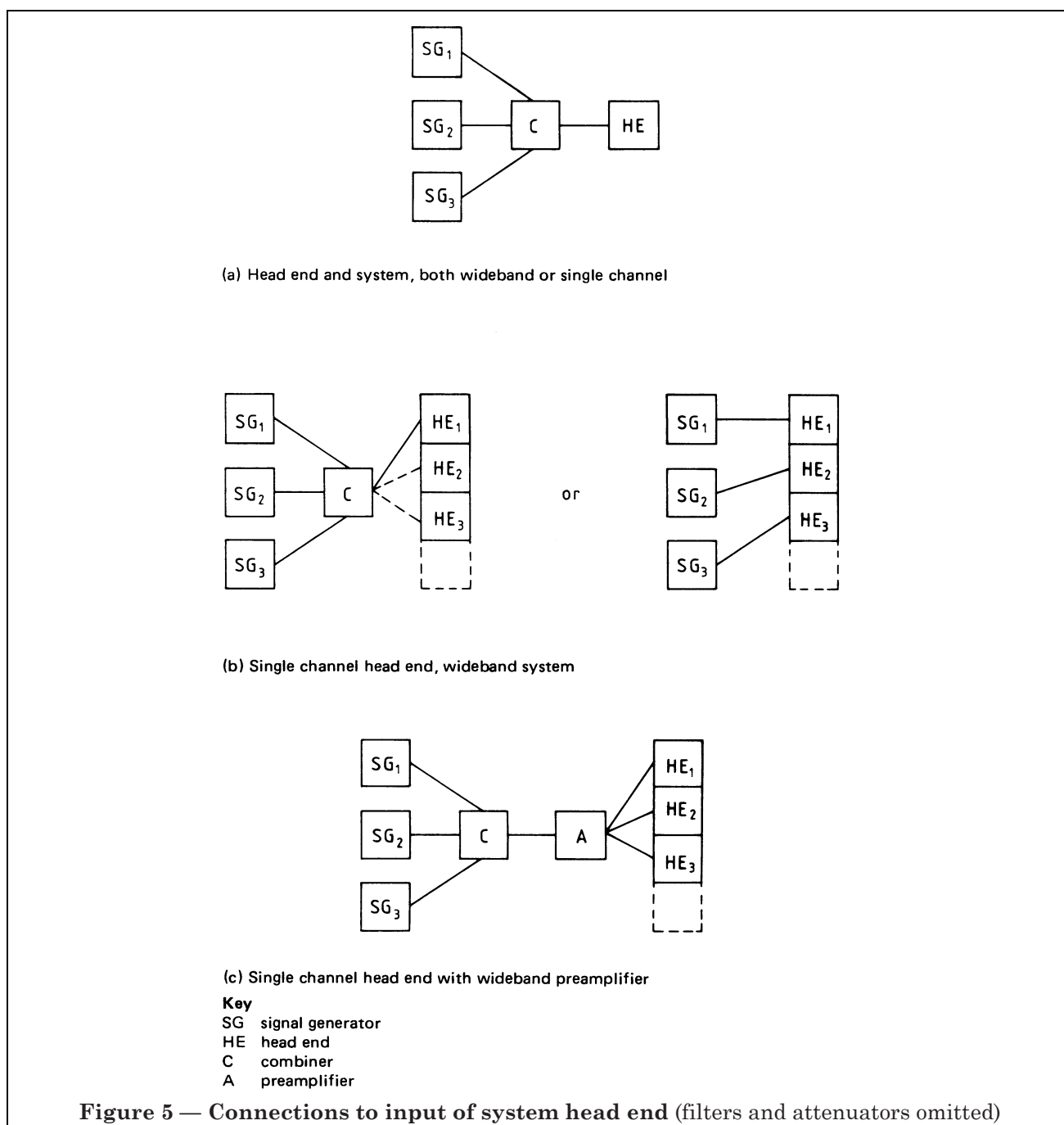
2.3.4.4 Carry out a check for possible intermodulation between the signal generators at the output levels to be used for the tests by inserting a 6 dB attenuator between the combiner output and the equipment or system under test and adjusting each generator output by the same amount to restore the original input test levels. If this gives rise to a change in the levels of the measured intermodulation products, then increase the isolation between the generator outputs.

2.3.5 Procedure

2.3.5.1 Set the signal generators to the frequencies of the test signals (see 2.3.3.3 and Appendix C), and adjust their outputs and the levels at the different points of the system as far as the point of measurement to obtain the required system operating levels throughout.

2.3.5.2 Connect the variable attenuator and selective voltmeter and filters if required to the point of measurement. Tune the meter to each test signal and note the attenuator value a_1 required to obtain a convenient meter reading R for the reference signal.

NOTE The attenuator value a_1 should be slightly greater than the signal to intermodulation product ratio expected at the point of measurement.



2.3.5.3 Tune the meter to the intermodulation product to be measured and reduce the attenuator setting to the value a_2 required to obtain the same meter reading R .

If a filter has been inserted at the input to the meter, add the insertion loss (in decibels) of the filter at the frequency of the product to the attenuator value a_2 .

2.3.6 Expression of results. The signal (S) to intermodulation product (I_p) ratio in decibels is given by:

$$S/I_p = a_1 - a_2$$

where

a_1 is the attenuator value for the test signal used as a reference (in dB);

a_2 is the attenuator value for the intermodulation product (in dB).

2.3.7 Test report. The test report shall include the following details:

- a) the particular effect that is measured;
- b) the list of input signals that produce this effect;
- c) the frequency at which the effect is measured;
- d) the levels of the signals producing the effect which, by convention, are stated for the output port of the device or system under test;
- e) the levels of all the test signals if the normal operating signal levels specified for the equipment or system are not constant over the frequency range.

2.4 Signal levels

2.4.1 Principle. The method describes the measurement of the amplitude of a vision or sound carrier of a television signal or of the carrier of an f.m. sound signal at any system outlet or at any other point in a cabled distribution system.

The vision carrier signal level is the r.m.s. value of the vision carrier at the peak of the modulation envelope, expressed in dB(μ V) and measured across a $75\ \Omega$ termination or referred to $75\ \Omega$.

This will correspond, in negative modulation systems, to the carrier amplitude during synchronizing pulses.

The level of an f.m. sound signal is the r.m.s. value of the carrier expressed in dB(μ V) and measured across a $75\ \Omega$ termination or referred to $75\ \Omega$.

2.4.2 Equipment

2.4.2.1 Well-matched radio frequency selective voltmeter having:

- a) a nominal input impedance of $75\ \Omega$ or transformed to $75\ \Omega$ and calibrated in dB(μ V);
- b) a detection system capable of attaining the peak of the modulation envelope of the particular vision signal to be measured;
- c) facilities to adjust the detector characteristics for the measurement of f.m. sound signals;
- d) a passband of at least 120 kHz, with sufficient selectivity that carriers other than those measured do not influence the measured result.

NOTE The accuracy of the radio frequency selective voltmeter is not specified, since this will depend on the purpose of the measurement.

Laboratory instrumentation can achieve better than 0.5 dB, but most level measurements of an operating cabled distribution system are concerned with levels at system outlets.

For this application, portable less expensive equipment, the overall accuracy of which is unlikely to be better than ± 1.5 dB, is usually found to be acceptable.

2.4.3 Procedure

2.4.3.1 Connect the selective voltmeter to the point of measurement by means of a suitable coaxial cable, taking care to maintain correct impedance matching.

2.4.3.2 Read the signal level in accordance with the instructions provided by the instrument manufacturer.

2.4.3.3 If the input impedance of the selective voltmeter is other than $75\ \Omega$, and a matching device is required, or if any other interface equipment is employed, then make an allowance for the resultant change in voltage level. Also take into account losses in the interconnecting cables, where these are significant.

2.4.4 Test report. The test report shall include the accuracy of the radio frequency selective voltmeter.

2.5 Radiation from components

2.5.1 Principle

2.5.1.1 The methods describe the measurement of radiation from active and passive components at the signal frequencies, at the local oscillator frequency and its harmonics and at other relevant frequencies.

2.5.1.2 To avoid the direct measurement of radiation, substitution methods are used.

The absorbing clamp method is used for the frequency range 30 MHz to 300 MHz where most of the radiation is from the input and output cables.

NOTE The absorbing clamp method is equivalent to that described in BS 727:1983. It should be appreciated that this method does not measure radiation from the equipment itself.

The radiation method with and without a connected output cable is used for the frequency range 300 MHz to 1 GHz where the equipment itself may radiate.

Both methods can be carried out indoors, provided that certain precautions are taken, although outdoor methods are preferred.

2.5.2 Equipment

2.5.2.1 *Signal generator*, covering the frequency range of interest and of sufficient output power.

2.5.2.2 *Absorbing clamp*, as described in Appendix D (for absorbing clamp method only).

2.5.2.3 *Stop filter*, as described in Appendix E (for radiation method only).

2.5.2.4 *Transmitting dipole antenna*, of known radiation characteristics and suitable for the frequency range of interest (for radiation method only).

2.5.2.5 *Receiving antenna*, of known characteristics and suitable for the frequency range of interest (for radiation method only).

2.5.2.6 *Measuring set*, of appropriate impedance covering the frequency range of interest.

2.5.2.7 *Measurement cable*, of length at least $\frac{1}{2}\lambda$ (at the lowest frequency of interest) plus 2 m, and of appropriate impedance.

2.5.2.8 *Adequately shielded terminating loads*, of appropriate impedance.

2.5.2.9 *Coupling devices*, as necessary, of an appropriate design.

2.5.2.10 *Power supply filter*, able to remove extraneous noise from the supply in the frequency range of interest.

2.5.2.11 *Absorbing devices*, such as ferrite rings, sufficient to suppress signals from the equipment under test on its input and power supply leads.

2.5.2.12 *Suitable calibrated attenuator*, of appropriate impedance.

2.5.2.13 *Suitable four-pole coaxial changeover switch*.

2.5.3 Measurements

2.5.3.1 Measurements shall be made with the following ports connected to the absorbing clamp or stop filter in turn.

- a) Passive components:
 - all output ports.
- b) Active components:
 - all output ports;
 - the power supply lead (if any);
 - the input ports (selected frequencies only).

2.5.3.2 Measurement shall be at the following frequencies.

- a) Single channel equipment:
 - at the vision and sound carrier frequencies;
 - at any other frequency considered necessary.
- b) Wideband equipment:
 - at the highest and lowest vision carrier frequency used in each band and at a selection of intervening frequencies chosen to give a realistic representation of the variation in radiation throughout the operating frequency range.
- c) Frequency converters, *output port and power supply lead (if any)*:
 - at the input and output vision and sound carrier frequencies;
 - at the local oscillator fundamental frequency;
 - at any local oscillator harmonic or other frequencies at which interference from the component under test might be troublesome.
- d) Frequency converters, *input port*:
 - at the local oscillator fundamental frequency;
 - at selected local oscillator harmonic, or other, frequencies [as in a), b) and c)].

2.5.4 General

2.5.4.1 The test cables, coupling devices and terminations shall all be well matched and well screened. Test equipment should normally be $75\ \Omega$ impedance.

2.5.4.2 An indoor, or outdoor, site may be used. When indoors, a room of sufficient size in relation to the wave-lengths of the test signals shall be chosen.

2.5.4.3 Any reflecting and absorbing objects should be so positioned or sufficiently removed away from the measuring set-up that they do not influence the results.

2.5.4.4 The component under test shall be placed at a height of approximately 1 m above the ground on a non-metallic support on which the absorbing clamp or stop filter can be accommodated and moved.

2.5.4.5 The output of the component under test shall be connected to a measurement cable of the same characteristic impedance and the cable shall be terminated with the nominal impedance of the output via the attenuator and coaxial switch.

2.5.4.6 Well-screened cables shall be connected to the terminals of the component under test as stated by the manufacturer. When a direct connection cannot be made due to the dimension of the well-screened cable, an adaptor as described in Appendix F shall be used.

2.5.4.7 The unused outputs, if any, of the component under test shall be terminated with their nominal impedance by means of non-radiating loads directly connected without any cabling (see Figure 7).

2.5.4.8 The power supply lead, if any, shall be placed vertically, as indicated in Figure 6, and connected to the power supply outlet through a suitable power supply filter. Any excess length of the power supply lead shall be made into a neat bundle at the filter end.

2.5.4.9 The power supply lead and the signal generator coaxial cable shall be provided with suitable absorbing devices (e.g. ferrite rings) placed close to the component under test, to avoid measurement errors.

2.5.4.10 The component under test shall be operated in accordance with the manufacturer's recommendations.

2.5.4.11 The component under test shall be tested under conditions which maximize the radiation as follows.

- a) The supply voltage shall be set to a value within the declared rating of the supply.
- b) Adjusting devices accessible to the users or installers shall be set so as to maximize radiation.
- c) The signal generator at the input shall be adjusted so that the maximum rated output level within the operating range of the component under test is used.

2.5.5 Precautions

2.5.5.1 Absorbing clamp method. The disposition of the signal generator cable preceding the absorbing device, the power supply lead, the measurement cable beyond the absorbing clamp and their proximity to other items shall not influence the readings on the measuring set by more than ± 1 dB. This can be checked before measurement by moving the cables and by running the hand along their length after setting up the equipment as shown in Figure 6 and Figure 8 and either Figure 9 or Figure 10, and as described in 2.5.4.

2.5.5.2 Radiation method. The residual radiation and pick-up of the test set at all test frequencies shall be at least 20 dB lower than the expected measurement value.

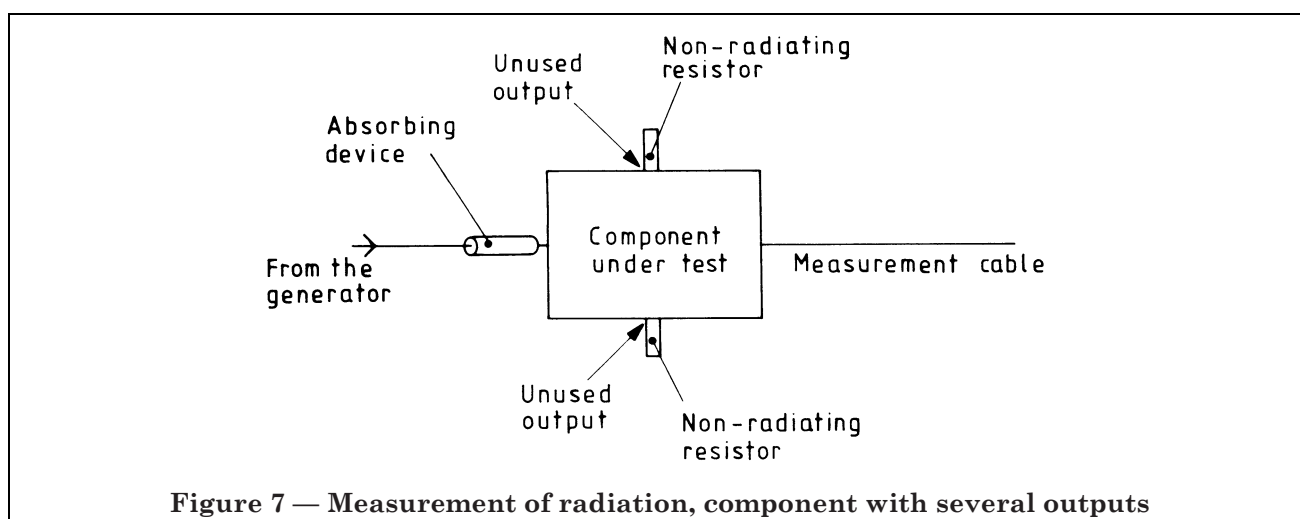
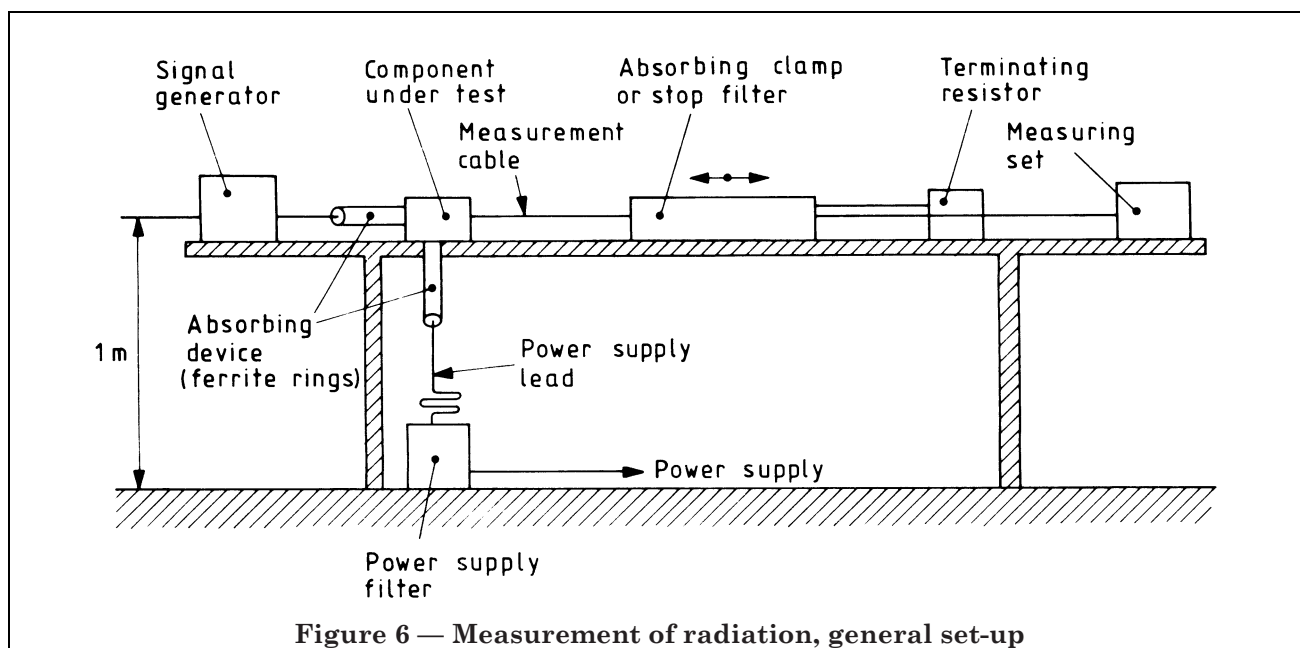
This shall be checked following the first component radiation measurement and before the result is recorded.

The component under test shall be removed. With the input and output leads correctly terminated, and the position of these connecting leads and other test equipment otherwise unchanged, the residual radiation measured shall be at least 20 dB lower than that measured or expected to be measured, with the component connected. If this cannot be achieved, repositioning of the test equipment may be helpful.

The positioning of the transmitting and receiving antennas shall be carefully adjusted to ensure sensibly consistent results over the frequency range of interest.

This shall be checked with a transmitting antenna connected horizontally in place of, and in the same position as, the component under test, and parallel with the receiving antenna not less than 1.3 m away. A test shall then be carried out to ensure that when the transmitting antenna is moved vertically, or laterally by ± 100 mm, the measuring set readings do not vary more than ± 1.5 dB. This shall be repeated at each test frequency and the distance d and height h adjusted until this requirement is met.

See Figure 13.



The antennas' positions, supports, etc., shall all then be moved round in the horizontal plane by 90° keeping the same precise spacing distance between the antennas. The new reading obtained shall be noted.

If the readings vary by more than 3 dB it will be necessary to carry out one or more of the following:

- use a larger room;
- add metallic layers or plates to improve reflection properties;
- use a corner reflector antenna;
- add absorbing material to the wall.

2.5.6 Procedure for absorbing clamp method

2.5.6.1 With the equipment set up as shown in Figure 8 and Figure 9 and the measurement cable coupled to an output port of the component under test, position the absorbing clamp at the component end of the measurement cable and place the coaxial switch in the check level mode.

Adjust the signal generator to the test frequency and to an input level that will give the maximum rated output level from the component under test (see 2.5.6.3). Record this input level v_i from the signal generator.

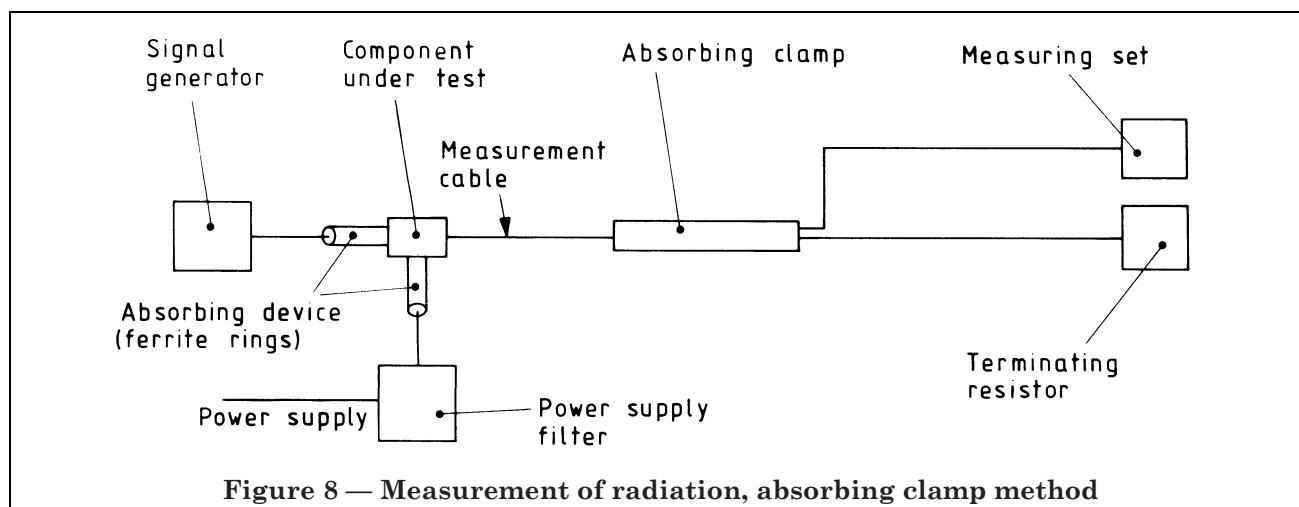


Figure 8 — Measurement of radiation, absorbing clamp method

2.5.6.2 Tune the measuring set to the test frequency. Turn the coaxial switch to the measure radiation mode. Set the calibrated attenuator to 0 dB. Move the absorbing clamp along the cable away from the component until a maximum reading is obtained on the measuring set (at a spacing of about $\frac{1}{2}\lambda$). Record the level of the reading v_m obtained.

2.5.6.3 When an active component is under test, confirm that the maximum rated output level is being used for the measurements.

With the equipment set-up as described in 2.5.6.1 and the measuring set control settings as described in 2.5.6.2 adjust the calibrated attenuator to give the same v_m reading. Calculate the output level, making due allowance for the calibrated attenuator setting and the attenuation of the measurement cable. It should be similar to that calculated from the known input level and the gain of the component. Record the output level v_o obtained.

2.5.6.4 Repeat the procedure described in 2.5.6.1 to 2.5.6.3 for each of the test frequencies specified in 2.5.3.2.

2.5.6.5 Repeat the procedure described in 2.5.6.1 to 2.5.6.4 for each of the measurement ports specified in 2.5.3.1.

2.5.6.6 For radiation measurements on a frequency converter output port, carry out the measurements as described in 2.5.6.1 to 2.5.6.3 but set the input signal generator in turn to the input frequencies used and tune the measuring set to each of the particular frequencies specified in 2.5.3.2 c).

2.5.6.7 For radiation measurements on an active component input port, connect the equipment as shown in Figure 10. Set the signal generator to each input frequency in turn at the level v_i used when measuring the output port. Carry out measurements as described in 2.5.6.1 and 2.5.6.2 at each of the frequencies specified in 2.5.3.2.

NOTE The check level mode of the coaxial switch is not used as only the input conditions can be checked with these connections.

2.5.6.8 For radiation measurements on the power supply lead of active components, feed the power supply lead without absorbing devices, extended if necessary, through the absorbing clamp in place of the measurement cable. Carry out measurements as described in 2.5.6.1 and 2.5.6.2. Set the signal generator output level v_i to that used when measuring the output port.

NOTE The check level mode of the coaxial switch is inoperative with this arrangement.

2.5.6.9 Convert the highest reading v_m obtained for each frequency to the substituted radiated power, p_m , using the calibration chart of the absorbing clamp described in Appendix D.

This value of p_m and the equivalent recorded values of v_o and v_i , converted into power form p_o for the output power from active components or p_i for the input power to passive components, are used to express the resultant component radiation characteristics as described in 2.5.9.