HKTA 1004
ISSUE 4
FEBRUARY 2003

PERFORMANCE SPECIFICATION FOR

VHF TRANSMITTERS AND RECEIVERS

FOR USE IN THE PUBLIC PAGING SERVICE

TELECOMMUNICATIONS AUTHORITY
HONG KONG

FOREWORD

1. This specification is prescribed under section 32D of the Telecommunications Ordinance (Cap 106) ("the Ordinance") to set out the technical and evaluation requirements for transmitters and receivers for use in the Public Paging Service operating in VHF band. Radiocommunications apparatus falling into the scope of this specification shall meet the stipulated requirements.

2. Under the Ordinance, the possession or use of any radiocommunications apparatus or any apparatus emitting radio frequency energy must be covered by an appropriate licence issued by the Telecommunications Authority (TA) with the exception of those specifically exempted from licensing under the Ordinance, such as those covered by the Telecommunications (Telecommunications Apparatus)(Exemption from Licensing) Order.

3. At present, the Office of the Telecommunications Authority (OFTA) operates a **H**ong **K**ong **T**elecommunications Equipment **E**valuation and **C**ertification (HKTEC) Scheme. Details of the HKTEC Scheme can be found in the information note OFTA I 421. Under the Scheme, suppliers or manufacturers of the radiocommunications apparatus shall apply to OFTA for certification of their apparatus against this specification. The application procedures for certification of radiocommunications apparatus can be found in the information note OFTA I 401.

4. The TA reserves the right to give separate certification to models he considers to be technical variants and the performance of which may differ between models.

5. The TA may amend any part of this specification as and when he deems necessary.

6. In case of doubt about the interpretation of this specification, the methods of carrying out the test and the validity of statements made by the equipment manufacturers or suppliers about the equipment, the decision of the TA shall be final.

7. The HKTA specifications and information notes are issued by the TA. The documents can be obtained through one of the following methods —

- downloading direct through the OFTA's Internet Home Page. The Home Page address is http://www.ofta.gov.hk;

- making a request for hard copies to :-

  Radio Laboratory,
  Standards Section,
  Office of the Telecommunications Authority,
  29/F Wu Chung House,
  213 Queen's Road East,
  Wanchai,
  Hong Kong.

  Fax: +852 2343 5824

Email: radiolab@ofta.gov.hk

8. Enquiries about this specification may be directed to —

Radio Laboratory, Standards Section,
Office of the Telecommunications Authority,
29/F Wu Chung House,
213 Queen's Road East, Wanchai, Hong Kong.

Fax : +852 2343 5824
Email: radiolab@ofta.gov.hk

AMENDMENT TABLE

Item	Issue No.	Paragraph	Descriptions
1.	Issue 4 February 2003	Foreword	Add information of HKTEC Scheme and other editorial changes.

CONTENTS

1 GENERAL

1.1 SCOPE OF SPECIFICATION

This specification covers the minimum performance requirements for transmitters and receivers for use in the public paging service operating in VHF band. The transmitter part covers the paging base station whilst the receiver part covers the mobile and portable unit.

1.2 OPERATING FREQUENCY RANGES AND CHANNEL SPACING REQUIREMENTS

Unless otherwise approved by the Authority, paging transmitters and receivers shall be capable of operating on any one channel, separated by 25 kHz, in the frequency band of :

(i) 170 MHz to 174 MHz or
(ii) 275 MHz to 285 MHz

Paging transmitters and paging receivers with a channel spacing of 12.5 kHz or 25 kHz may be submitted for type approval test.

1.3 TRANSMITTER RF POWER

Whenever the RF power of a radio transmitter is referred to it shall be expressed as the carrier power which is the mean power supplied by a transmitter during one radio frequency cycle taken under the condition of no modulation.

The carrier power shall be that supplied from the transmitter output to a matched transmission line connected to the antenna terminals.

The rated carrier power shall be that declared by the manufacturer.

Unless otherwise approved by the Authority, the maximum rated carrier power shall be limited to :

(i) 25 Watts for paging transmitters operating in the frequency band of 170.0-174.0 MHz

(ii) 100 Watts for paging transmitters operating in the frequency band of 275.0-285.0 MHz

1.4 LABELLING

The equipment shall be provided with a clear indication of the type number and description under which it is submitted for type testing. Each type number shall be unique and in the event that the Authority finds two manufacturers have used a similar type number, the latecomer manufacturer will be asked to use another type number.

Technical variants of the same model shall be separately labelled.

1.5 CONTROLS

Those controls, which if maladjusted might increase the interfering potentialities of the equipment, shall not be easily accessible.

1.6 DECLARATIONS BY THE MANUFACTURER

When submitting an equipment for type-approval testing, the manufacturer shall supply a service manual complete with drawings of constructional details, circuit diagrams and printed circuit board layouts. The following information should be supplied if not recorded in the manual supplied :

(i) nominal frequency of transmitter and of receiver
(ii) crystal frequency and carrier generator formula
(iii) crystal type
(iv) rated carrier power of transmitter
(v) continuous or intermittent power rating
(vi) single or multi-channel
(vii) value of resistive load into which audio output power is delivered
(viii) nominal supply voltage
(ix) type of battery
(x) battery end point voltage where applicable

1.7 SIGNALLING INFORMATION

Complete details of all codes and formats shall be given. This information will be recorded by the Authority to assist in its monitoring activities.

2. TEST CONDITIONS : ATMOSPHERIC CONDITIONS AND POWER SUPPLIES

2.1 GENERAL

Type approval tests shall be conducted under normal test conditions and also, where stated, under extreme test conditions.

2.2 NORMAL TEST CONDITIONS

2.21 Normal temperature and humidity

The normal temperature and humidity conditions for test shall be any convenient combination of temperature and humidity within the following ranges :

Temperature	:	15 to 35 degrees Celsius
Relative humidity	:	10% to 80%

When it is impracticable to carry out the tests under the conditions stated above, a note to this effect, stating the actual temperature and relative humidity during the tests, shall be added to the test report.

2.2.2 Mains voltage

For equipment powered by AC mains, 220V ± 6% at a frequency of 50 Hz ±1 Hz shall be designated as the normal test voltage.

2.2.3 D.C. test source voltage

For equipment supplied from self-contained primary cells or batteries or any d.c. source, the normal test source voltage shall be the nominal supply voltage declared by the manufacturer.

2.3 EXTREME TEST CONDITIONS

2.3.1 Extreme temperatures

For tests at extreme temperatures, measurements shall be made in accordance with the procedures specified in Clause 2.4 at an upper value of + 55 degrees Celsius and at a lower value of - 10 degrees Celsius.

2.3.2 Extreme mains test source voltage

The extreme mains test source voltage shall be 220V ± 10% at a frequency of 50 Hz ± 1 Hz.

2.3.3 Extreme d.c. test source voltages

The extreme d.c. test source voltage shall be as follows :

(a) Regulated lead-acid battery power source

When the equipment is intended for operation from the regulated lead-acid power source, the extreme test source voltage shall be + 30% and -10% of the nominal voltage of the battery.

(b) Other power sources

When the equipment is intended for operation from power sources using primary batteries, the extreme test sources voltage shall be as follows :

(i) For Leclanche type of battery it shall be 15% below the nominal voltage.
(ii) For Mercury type of battery it shall be 10% below the nominal voltage.
(iii) For other type of battery it shall be the end point voltage declared by the equipment manufacturer.

For equipment using other power sources or capable of being operated from a variety of power sources, the extreme test voltages shall be those agreed between the equipment manufacturer and the Authority and shall be the test results recorded.

2.4 PROCEDURES FOR TESTS AT EXTREME TEMPERATURES

2.4.1 General

Before making measurements, the equipment, which is switched off, shall be placed in a temperature controlled chamber for a period of one hour for temperature stabilization. The humidity content in the test chamber shall be controlled so that all tests should be carried out in non-condensing condition.

2.4.2 Equipment designed for continuous operation

For test at the upper temperature, after thermal balance has been attained (Clause 2.4.1), the equipment shall be switched on in the 'transmit' condition for half an hour, after which the appropriate tests shall be carried out. For test at the lower temperature, after thermal balance has been attained (Clause 2.4.1), the equipment shall be switched on for 1 minute in the 'standby' condition, after which the appropriate tests shall be carried out. (Note : If the equipment contains temperature stabilization circuits designed to operate continuously, the equipment shall be switched on for 15 minutes before measurements are made.)

2.4.3 Equipment designed for intermittent operation only

The procedure shall be as described in Clause 2.4.2 except that at the upper temperature, the half hour 'transmit' condition shall be replaced by one minute in the 't ransmit' condition followed by four minutes in the 'standby' condition before appropriate tests are carried out.

3 TEST CONDITIONS : ELECTRICAL

3.1 RADIO FREQUENCY TEST SIGNALS

All signal sources shall be connected in such a way that the impedance presented to the relevant input is 50 ohms. This requirement shall be met irrespective of whether one or more signals are applied to the input simultaneously. The levels of the test signals shall be expressed in terms of the potential difference at the relevant input terminals.

3.2 NORMAL TEST MODULATION

The normal test modulation shall be defined as :

either a sequence of alternate 'ones' and 'zeros' (marks and spaces) at the clock rate employed with the normal paging modulation at the input level declared by the equipment manufacturer.

or in the case of a tone selective calling system, trains of correctly coded signals separated from each other by a time of not less than the reset time of the receiver.

An encoder for testing the submitted sample should accompany the model submitted, complete with details of the normal modulation process. If possible, the encoder should be capable of operating in a repetitive mode, with intervals between each code that are not less than the reset time of the receiver.

3.3 TEST FIXTURE

The manufacturer shall supply a test fixture permitting relative measurements to be made on the submitted sample.

This test fixture shall provide a 50-ohm connection at the working frequencies of the equipment and shall provide a means of connecting an external power supply.

The performance characteristics of this test fixture under normal and extreme conditions shall be subject to the approval of the Authority. In particular, the following characteristics shall apply :

(i) the coupling loss shall be as low as possible, and in any case not greater than 30 dB.
(ii) the variation of coupling loss with frequency shall not cause errors in measurement exceeding 2 dB.
(iii) the coupling device shall not incorporate any non-linear elements.
(iv) the VSWR shall not be greater than 1.2 for all frequencies at which measurements are made.

In conjunction with the manufacturer the Authority may provide its own test fixture.

3.4 ARTIFICIAL ANTENNA

Tests on the transmitter shall be carried out with a non-reactive, non-radiating load of 50 ohms connected to the antenna terminals.

3.5 GENERAL REQUIREMENTS FOR TESTS INVOLVING THE USE OF RADIATED FIELDS

3.5.1 Test site (Fig. 1)

The test site shall be flat and free of reflecting objects. No extraneous metallic objects having any dimension in excess of 50 mm shall be in the immediate vicinity of the test sample or the test antenna.

The test sample and the measuring equipment shall be located over a wire mesh ground screen of 9 m x 6 m width. The wire mesh shall be considered as the reference earth for the measuring system.

The distance between the vertical line through the centre of the vertical projection of the test sample in the horizontal plane and the vertical line through the centre of the test antenna shall be 3 m.

3.5.2 Test antenna (Fig. 2 to 5)

The test antenna is used to detect the radiation from both the test sample and the substitution antenna, when the site is used for radiation measurement; where necessary, it is used as a transmitting antenna, when the site is used for the measurement of receiver characteristics.

The antenna shall be mounted at the end of a horizontal boom supported by a vertical pole, both made of non-conducting material. The boom shall project at least 1 m from the vertical pole in the direction of the test sample and shall be arranged so that it can be raised and lowered through a range of heights from 1 m to 4 m. The fixings for the antenna shall permit it to be positioned for measuring the horizontal and vertical components of the electric field.

The cable from the antenna shall be mounted along the horizontal boom and vertical pole. The size of the test antenna along the measurement axis shall not exceed 20% of the measuring distance.

For radiation measurement, the test antenna is connected to a test receiver, capable of being turned to any frequency under the investigation and of measuring accurately the relative levels of signals at its input. When necessary. (for receiver measurements) the test receiver is replaced by a signal source.

3.5.3 Substitution antenna (Fig. 3 & 5)

The substitution antenna shall be connected to a signal generator when the site is used for radiation measurement and to a test receiver when the site is used for measurement of receiver characteristics. It shall be a half wave dipole resonant at the frequency under consideration. The centre of this antenna shall coincide with the reference point of the test sample it has replaced. This reference point shall be the volume centre of the sample when its antenna is mounted inside the cabinet, or the point where an external antenna is connected. For radiation test at frequency below about 100 MHz, this is impossible to achieve when the antenna is arranged for vertical polarization. In this case, the lower end of the dipole shall be 0.3 m above the ground.

3.5.4 Measuring equipment

The radio-frequency generator, if any, shall be placed at ground level. The selective measuring device may be placed on a suitable table or tripod near the bottom of the support for the test antenna.

The measuring instruments or the operator must not be so situated that they have an adverse influence on the measurements by causing reflection or affecting the antenna impedance, particularly when the antennae are at a low height.

If the measuring equipment is supplied from the mains, its housing shall be connected to the wire mesh ground screen by a copper braid of minimum length with a width of at least 2 cm.

The vertical part of the cable connecting the selective measuring device and the mains supply shall be screened. The rest of the cable, and also the cable connecting the generator and the mains supply, shall be either screened and set at ground level, or shall be buried approximately 300 mm.

4 TRANSMITTER TESTS

4.1 CARRIER POWER

4.1.1 Definition

The rated value of the transmitter carrier power is the value of the output power, when the transmitter is unmodulated for which all the relevant specification requirements are met. The rated carrier power shall be declared by the manufacturer.

4.1.2 Method of measurement

(a) The transmitter output terminals shall be connected to an artificial antenna (Clause 3.4) with means of measuring the power delivered to this antenna.

(b) In the absence of modulation, the transmitter shall be operated in accordance with the manufacturer's instructions.

(c) If it is not possible to obtain a carrier output in the absence of modulation, normal test modulation shall be applied to the transmitter and operated in accordance with the manufacturer's instruction.

(d) The carrier power shall be measured.

(e) The measurement shall be made under normal test conditions (Clause 2.2) and repeated under extreme test conditions (Clause 2.3).

4.1.3 Limit

The carrier power shall be within ± 1.5 dB of the rated carrier power under normal test conditions, and within + 2 dB and - 3 dB of the rated carrier power under extreme test conditions. These limits are applied to any paging transmitters operating in the frequency bands as stated in Clause 1.2.

4.2 FREQUENCY ERROR

4.2.1 Definition

The frequency error of the transmitter is the difference between the measured carrier frequency and its nominal value.

4.2.2 Method of measurement where an unmodulated carrier is available

(a) The carrier frequency shall be measured in the absence of modulation with the transmitter connected to an artificial antenna (Clause 3.4).

(b) The measurement shall be made under normal test conditions (Clause 2.2) and extreme test conditions (Clause 2.3).

4.2.3 Method of measurement where it is impossible to obtain an unmodulated carrier

(a) The transmitter output shall be connected to an artificial antenna.

(b) The emission shall be monitored by a frequency counter and the carrier frequency shall be measured with the transmitter set to produce continuously the carrier frequency representing the ‘space’ condition.

(c) The measurement shall be repeated with the transmitter set to produce continuously the carrier frequency representing the 'mark' condition.

(d) The unmodulated carrier frequency shall be obtained as the arithmetic mean of the two frequencies measured above.

(e) The measurement shall be made under normal test conditions (Clause 2.2) and extreme test conditions (Clause 2.3)

4.2.4 Limit

The frequency error, under both normal and extreme test conditions, or at any intermediate condition, shall not exceed the values of :

(i) ± 2.0 kHz for 25 kHz channel spacing *or*
(ii) ± 1.0 kHz for 12.5 kHz channel spacing

4.3 FREQUENCY DEVIATION

4.3.1 Definition

The frequency deviation is the difference between the instantaneous frequency of the modulated radio-frequency signal and the carrier frequency in the absence of modulation. For type approval purposes, only the maximum value of the frequency deviation (maximum permissible frequency deviation) available in the transmitter will be measured.

4.3.2 Method of measurement

(a) The equipment shall be operated in accordance with the manufacturer's instructions to obtain rated carrier power.

(b) The emission shall be monitored by a modulation meter capable of measuring the peak value of both positive and negative frequency deviation including that due to any harmonics and intermodulation products which may be produced in the transmitter.

(c) The equipment shall be operated with normal test modulation (Clause 3.2)

(d) The peak deviation shall be measured.

4.3.3 Limit

The maximum frequency deviation shall not exceed the values given below :

(i) ±5.0 kHz for 25 kHz channel spacing *or*
(ii) ±2.5 kHz for 12.5 kHz channel spacing

4.4 SPURIOUS EMISSIONS

4.4.1 Definition

Spurious emissions are emissions at frequencies other than those of the carrier and sidebands associated with normal modulation.

The level of spurious emissions shall be measured as :

(i) conducted power due to spurious signals generated or amplified in a transmitter and appearing at transmitter antenna terminals;

(ii) their effective radiated power when radiated by the cabinet and structure of the equipment. This is also known as 'cabinet radiation'.

4.4.2 Method of measurement : conducted power

(a) Spurious emission shall be measured as the power level of any discrete signal delivered into a 50-ohm load. This may be done by connecting the transmitter output through an attenuator to a spectrum analyzer or selective voltmeter.

(b) The transmitter shall be operated without any external source of modulation and the measurements shall be made over the frequency range from 100 kHz to 2000 MHz, except for the channel on which the transceiver is intended to operate and its adjacent channels.

(c) The measurements shall be repeated with the transmitter modulated with normal test modulation (Clause 3.2). The measurement shall be repeated with the transmitter in 'standby' condition.

4.4.3 Method of measurement : effective radiated power

(a) On a test site fulfilling the requirements of Clause 3.5.1, the sample shall be placed at the specified height on the non-conducting support.

(b) The transmitter shall be operated without modulation at the rated carrier power and connected to an artificial antenna (Clause 3.4).

(c) Radiation of any spurious components shall be detected by the test antenna (Clause 3.5.2) and receiver over the frequency range from 100 kHz to 2000 MHz except for the channel on which the transmitter is intended to operate and its adjacent channels.

(d) At each frequency at which an emission is detected, the sample shall be rotated and the test antenna shall be adjusted in height to obtain maximum response.

(e) The sample shall be replaced by a signal generator connected to a substitution antenna (Clause 3.5.3) and the effective radiated power of that equipment under test is determined by a substitution measurement.

(f) The measurements shall be repeated with the test antenna in the orthogonal polarization plane.

(g) The measurement shall be repeated with the transmitter modulated by the normal test modulation (Clause 3.2). The equipment shall be repeated with the transmitter in 'standby' condition.

4.4.4 Limit

The spurious emission power of any paging transmitters operating in the frequency bands as stated in Clause 1.2 shall not exceed 2.5 μW.

4.5 ADJACENT CHANNEL POWER

4.5.1 Definition

The adjacent channel power is that part of the total power output of a transmitter under defined conditions of modulation which falls within the bandwidth of a receiver of the type normally used in the system and operating on a channel of one channel spacing above or below the nominal frequency of the transmitter.

4.5.2 Method of measurement

(a) The equipment of the test fixture (Clause 3.3) shall be connected to the power measuring receiver via a 50-ohm attenuator, set to produce an appropriate level at the receiver input.

(b) The transmitter shall be operated at the carrier power measured under normal test conditions.

(c) The transmitter shall be modulated as appropriate by the normal test modulation (Clause 3.2) at the level declared by the manufacturer.

(d) The test receiver shall than be tuned to the nominal frequency of the transmitter and the receiver attenuator adjusted to a value 'x' such that a meter reading of order of 5 dB above the receiver noise level is obtained.

(e) The test receiver shall then be tuned to the nominal frequency of the higher adjacent channel and the receiver attenuator re-adjusted to a value 'y' such that the same meter reading is again obtained.

(f) The difference x-y in decibels in the attenuator settings gives the attenuation value of the adjacent channel power relative to the carrier power.

(g) The measurement shall be repeated for the lower adjacent channel.

4.5.3 Limit

The lower figure between the attenuation values in (f) obtained in the upper and lower adjacent channel measurements shall exceed 70 dB.

4.5.4 Power measuring receiver specification

The power measuring receiver shall comprise a mixer, a crystal filter, a variable attenuator, an intermediate frequency amplifier and a r.m.s. meter connected in cascade, using a low noise signal generator as a local oscillator. The bandwidth of the filter shall be as follows within a tolerance of ± 10%.

Channel spacing	Bandwidth between 6 dB attenuation points	Bandwidth between 70 dB attenuation points	Bandwidth between 90 dB attenuation points
25.0 kHz	16.0 kHz	35.0 kHz	50 kHz
12.5 kHz	8.5 kHz	17.5 kHz	25 kHz

The attenuator shall cover a range of at least 80 dB in 1 dB step. The noise factor of the amplifier shall not worse than 4 dB. Over the 6 dB bandwidth, the amplitude/frequency characteristics of the amplifier shall not vary by more than 1 dB. The combined response of the filter and amplifier outside the 90 dB bandwidth shall maintain an attenuation of at least 90 dB. The r.m.s. meter, if not a power meter shall have a crest factor of at least 10 for full scale readings. The measuring accuracy of the receiver over an input level range of 100 dB shall be better than 1.5 dB.

5 RECEIVER CHARACTERISTICS

5.1 REFERENCE SENSITIVITY

5.1.1 Definition

The reference sensitivity is 3 dB above the minimum field-strength surrounding the receiver antenna of a signal at the nominal operating frequency, modulated with normal test modulation (Clause 3.2) which will produce a successful calling rate of 80%.

5.1.2 Method of measurement

On a test site fulfilling the requirement of Clause 3.5.1 the paging receiver shall be mounted vertically as shown in fig. 4. The test antenna (Clause 3.5.2), oriented for vertical polarization, shall be connected to a signal generator tuned at nominal frequency of the receiver and modulated with normal test modulation (Clause 3.2).

The level of the signal generator shall be adjusted until the receiver successful calling rate is reduced to 80%.

The minimum of such level shall be obtained by rotating the receiver through 360 degrees and by adjusting the height of the test antenna above ground.

The actual field strength at the receiver corresponding to this minimum level shall be determined by replacing the receiver with the substitution antenna (Clause 3.5.3) connected to a field strength meter (fig. 5) and the field strength relative to 1 μV/m shall be determined.

This measured field strength plus 3 dB shall be recorded as the reference sensitivity.

5.1.3 Limit

The reference sensitivity shall not be greater than 26 dBμV/m.

5.2 SPURIOUS RESPONSE REJECTION

5.2.1 Definition

Spurious response rejection is a measure of the capability of a paging receiver to operate to a specified successful calling rate from a wanted signal at the reference sensitivity, in the presence of a signal at any other frequency.

5.2.2 Method of measurement

On a test site fulfilling the requirement of Clause 3.5.1 the paging receiver shall be positioned on a non-conducting support at a height of 1.0m above the ground plane of the test site in the same way as used in determining the reference sensitivity (Clause 5.1.2).

The test antenna (Clause 3.5.2), oriented for vertical polarization shall be supplied via one path of a combining unit, with a radio frequency signal at the nominal operating frequency, modulated with normal test modulation (Clause 3.2). The level of this signal shall be adjusted to produce a field strength at the paging receiver antenna corresponding to the reference sensitivity (Clause 5.1). This signal constitutes the wanted signal.

A second test signal shall be applied to the test antenna via the second path of the combining unit. This test signal shall be unmodulated and shall be adjusted to a frequency at which it is anticipated that a spurious response could occur. This constitutes the unwanted signal.

The level of the unwanted signal shall be increased, until the successful calling rate is reduced to 80%.

The unwanted signal shall be maintained at this level and the paging receiver replaced by the substitution antenna (Clause 3.5.3) connected to a field strength meter (fig. 5), and the field strength relative to 1 μ V/m determined.

The spurious response rejection is expressed as the difference in decibels between the unwanted signal field strength and the reference sensitivity.

The measurement shall be repeated for each frequency at which it is anticipated that a spurious response could occur.

5.2.3 Limit

At any frequency in the range 30 to 1000 MHz, the spurious response rejection shall not be less than 50 dB.

5.3 DESENSITISATION

5.3.1 Definition

Desensitisation is a reduction of successful calling rate of a paging receiver due to the presence of an unwanted signal at a frequency not less than one channel away from the nominal frequency.

5.3.2 Method of measurement

The receiver shall be placed in a test fixture (Clause 3.3). A test signal at the nominal operating frequency and modulated with normal test modulation (Clause 3.2) shall be applied to the input of the test fixture via one path of a combining unit. This constitutes the wanted signal.

A second test signal shall be applied via the second path of the combining unit. This test signal shall be unmodulated and shall be set to any frequency not less than one channel away from the nominal frequency. This constitutes the unwanted signal.

In the absence of the unwanted signal, the level of the wanted signal shall be adjusted to produce a successful calling rate of 80%. This level plus 3 dB shall be recorded as the reference sensitivity level in the test fixture.

With the wanted signal level adjusted to the reference sensitivity level in the test fixture, the unwanted signal shall then be switched on and adjusted in level until the successful calling rate is reduced to 80%. The difference in decibels between these two signal levels shall be recorded as the desensitisation level.

The above procedure shall be repeated with the unwanted signal frequency varied from one channel to 10 MHz away from the nominal frequency of the receiver.

5.3.3 Limit

At any unwanted signal frequency not less than one channel away from the nominal frequency of the receiver, the desensitisation level shall not be less than 65 dB.

5.4 INTERMODULATION RESPONSE REJECTION

5.4.1 Definition

Intermodulation response rejection is a measure of the capability of a paging receiver to inhibit the generation of a successful decoder response caused by two equal level unwanted signals, having specific frequency relationships to the nominal operating frequency, one of which is modulated with normal test modulation.

5.4.2 Method of measurement

The receiver shall be placed in a test fixture (Clause 3.3). A test signal at the nominal operating frequency and modulated with normal test modulation (Clause 3.2) shall be applied to the input of the test fixture via one path of a combining unit. This signal constitutes the wanted signal.

A second test signal shall be applied via the second path of the combining unit. This test signal shall be unmodulated and shall be set to the carrier frequency of the channel four channels above the nominal operating frequency. This signal constitutes one of the unwanted signals.

In the absence of the unwanted signal, the level of the wanted signal shall be adjusted to produce a successful calling rate of 80%. This level plus 3 dB shall be recorded as the reference sensitivity level in the test fixture.

The frequency of the wanted signal shall then be changed to a frequency eight channels above the nominal operating frequency. This signal now constitutes the second unwanted signal.

The levels of the two unwanted signals shall be kept equal and increased in level until a decoder response is obtained. If necessary, the frequency of either signal shall be varied slightly and the levels re-adjusted to establish the minimum level at which a decoder response is obtained.

The difference in decibels between the levels of the unwanted signals and the level of the wanted signal shall be recorded as the intermodulation response rejection.

5.4.3 Limit

The intermodulation response rejection ratio shall not be less than 50 dB.

5.5 RADIATED SPURIOUS EMISSIONS

5.5.1 Definition

Radiated spurious emissions from a receiver are any emissions radiated by the receiver either by way of the integral antenna or radiated directly by the chassis and case of the receiver.

5.5.2 Method of measurement

On a test site fulfilling the requirement of Clause 3.5.1, the paging receiver shall be placed on a non-conducting support as shown in fig. 2. The attitude of the receiver shall be vertical, with the vertical axis positioned as when in normal use. The radiation from the test sample shall be detected by a vertically polarized tests antenna (Clause 3.5.2) connected to a test receiver, over the frequency range 30 MHz to 1000 MHz.

At each frequency at which an emission is detected, the sample shall be rotated and the test antenna height above ground shall be adjusted to obtain maximum response.

The paging receiver shall then be replaced by a signal generator connected to a substitution antenna (Clause 3.5.3) and the effective radiated power of the emission from the paging receiver shall be determined by the substitution method (fig. 3).

The measurement shall be repeated with the test antenna (Clause 3.5.2) positioned to receive horizontally polarized radiation.

5.5.3 Limit

The effective radiated power of any spurious emissions in the frequency range 30 MHz to 1000 MHz, at either plane of polarization, shall not exceed 20 nW.

6 ACCURACY OF MEASUREMENT

The tolerance for the measurement of the following parameters shall be as follows :

(a) dc voltage	± 3%
(b) ac mains voltage	± 3%
(c) ac mains frequency	±0.5%
(d) audio frequency voltage, power etc.	±0.5 dB
(e) audio frequency	± 1%
(f) distortion and noise etc. of audio frequency generators	1%
(g) radio frequency	±50Hz
(h) radio frequency voltage	± 2 dB
(i) radio frequency field strength	± 3 dB
(j) radio frequency carrier power	± 2 dB
(k) impedance of artificial loads, combining units, cables, plugs, attenuators etc.	± 5%

(l) source impedance of generators and input impedance of measuring receivers	±10%
(m) attenuation of attenuators	±0.5 dB
(n) temperature	± 1°C
(o) relative humidity	± 5%

7. FIGURES

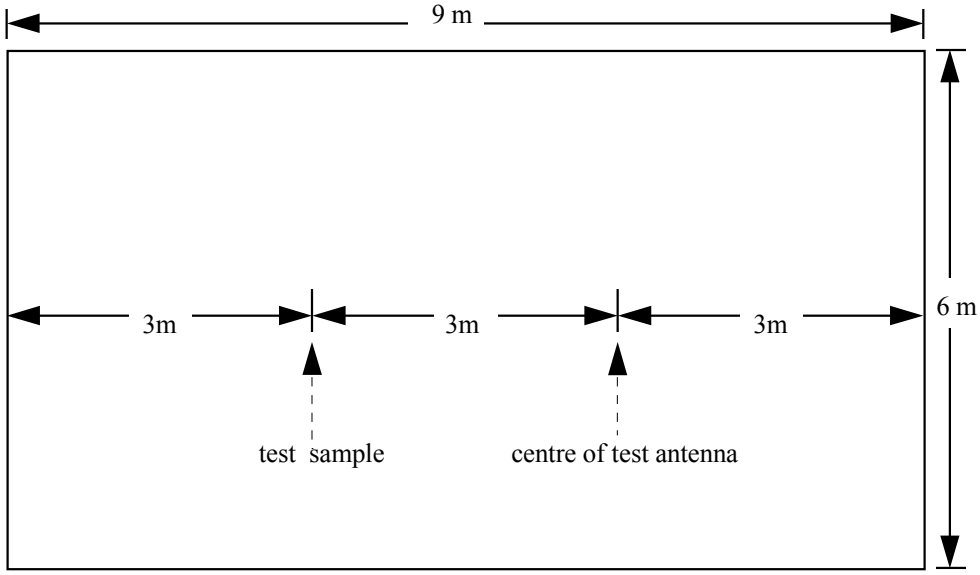

Figure 1 : 3-metre Test Site

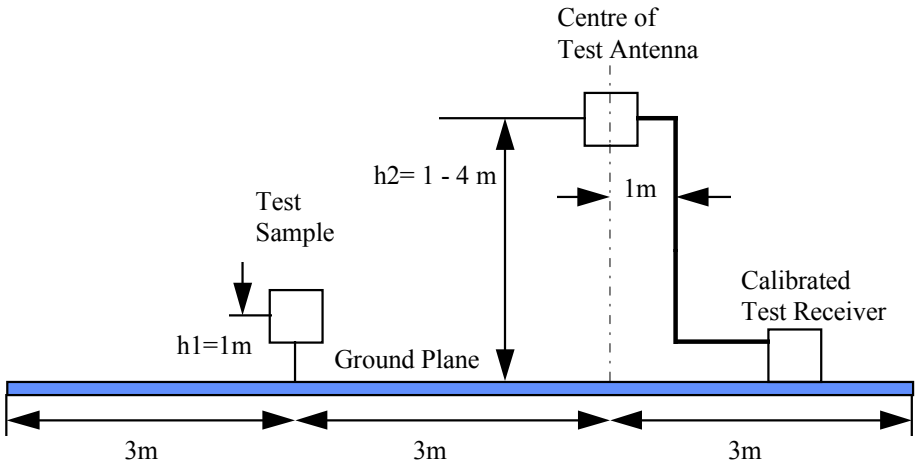

Figure 2 : Radiation Measurement
(Position of Radiating Test Sample)

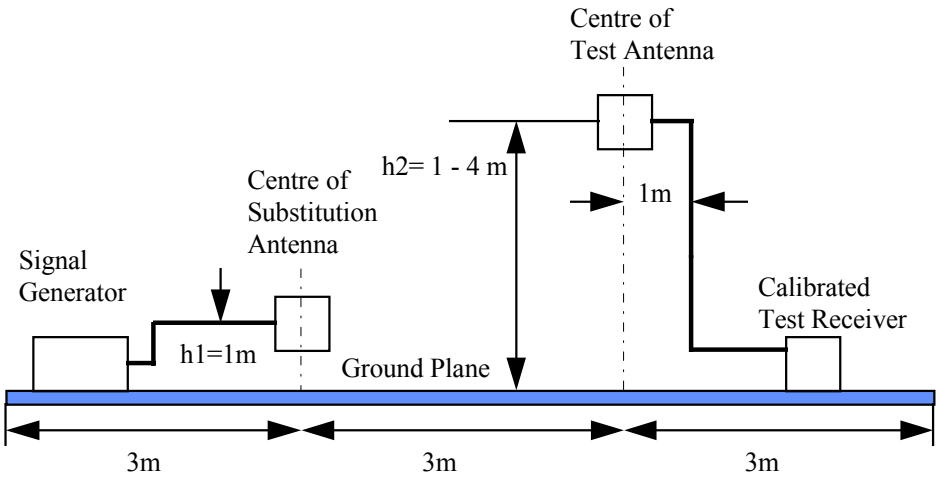

Figure 3 : Radiation Measurement
(Position of Substitution Antenna)

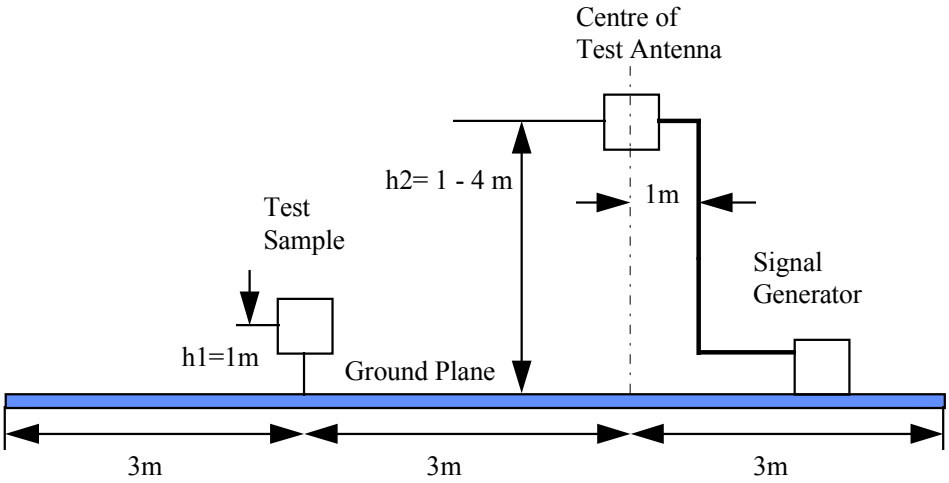

Figure 4 : Receiver Characteristics Measurement
(Position of Receiver Sample)

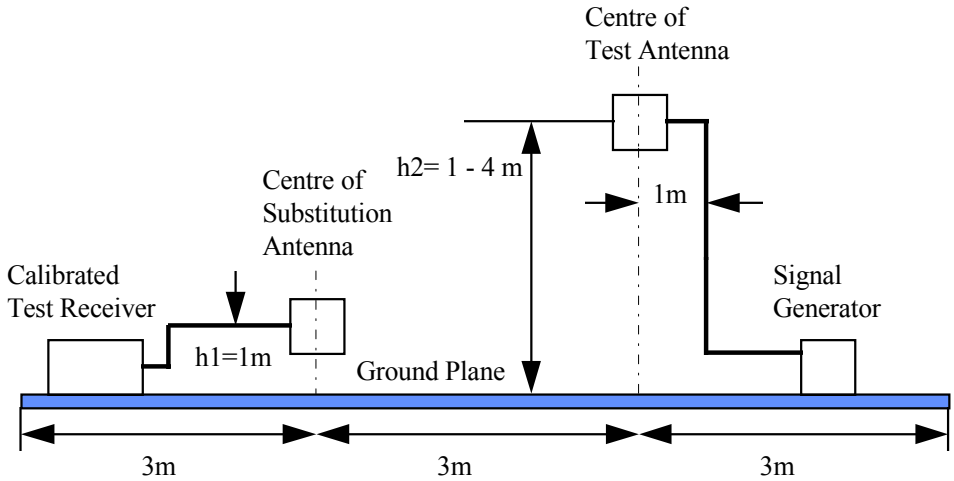

Figure 5 : Receiver Characteristics Measurement
(Position of Substitution Antenna)