COMMUNICATIONS

ALLIANCE LTD

AUSTRALIAN STANDARD

AS/ACIF S006:2008

Requirements for Customer Equipment, operating in the voiceband, for connection to the non-switched Telecommunications Network

Adopted for regulatory purposes

STANDARDS Australia

Australian Standard – *Requirements for Customer Equipment, operating in the voiceband, for connection to the non-switched Telecommunications Network*

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FOREWORD

General

This Standard was prepared by Communications Alliance and most recently revised by the *WC07 : VDSL2* Working Committee. It is one of a series of Telecommunication Standards developed under the Memorandum of Understanding between the Australian Communications Authority (ACA) and the Australian Communications Industry Forum.

Note: On 1 July 2005 the ACA became the Australian Communications and Media Authority (ACMA) and the Memorandum of Understanding continues in effect as if the reference to the ACA were a reference to ACMA.

This Standard is a revision of AS/ACIF S006:2001 ***Requirements for Customer Equipment, operating in the voiceband, for connection to the non-switched Telecommunications Network*** Standard.

This Standard is the result of a consensus among representatives on the Communications Alliance Working Committee to produce it as an Australian Standard.

The requirements in this Standard are consistent with the aims of s376 of the *Telecommunications Act 1997*. Specifically these aims are—

(a) protecting the integrity of a telecommunications network or facility;

(b) protecting the health and safety of persons;

(c) ensuring access to emergency services; and

(d) ensuring interoperability with a standard telephone service.

It should be noted that some Customer Equipment (CE) may also need to comply with requirements in other Standards.

Applicable electrical safety Standards and EMC Standards may apply under Commonwealth or State laws, or both.

Intellectual property rights

Equipment which is manufactured to comply with this Standard may require the use of technology which is protected by patent rights in Australia. Questions about the availability of such technology, under licence or otherwise, should be directed to the patent holder or Australian licensee (if known) or through enquiry at IP Australia which incorporates the Patent, Designs and Trade Marks and Offices. Further information can be found at www.ipaustralia.gov.au.

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The Project Manager
Customer Equipment and Cable Reference Panel
Communications Alliance
PO Box 444
Milsons Point NSW 1565

Regulatory notice

This document has been made by ACMA as Telecommunications Technical Standard AS/ACIF S006–2008 under s376 of the *Telecommunications Act 1997*.

ACMA is a Commonwealth authority with statutory powers to impose requirements concerning telecommunications Customer Equipment and Customer Cabling.

ACMA requires Australian manufacturers and importers of specified items of Customer Equipment and Customer Cabling to establish compliance with Standards such as this. Items are required to be labelled to the applicable labelling notices.

Details on current compliance arrangements can be obtained from the ACMA website at http://www.acma.gov.au or by contacting ACMA below at:

Australian Communications and Media Authority
PO Box 13112
Law Courts PO
Melbourne VIC 8010
Australia

Telephone: +61 3 9963 6800
Facsimile: +61 3 9963 6899
TTY: +61 3 9963 6948

Introduction

This introduction for the AS/ACIF S006 ***Requirements for Customer Equipment, operating in the voiceband, for connection to the non-switched Telecommunications Network*** Standard is not an authoritative section of this Standard and is only provided as guidance for the user of the Standard to outline its objectives, and the factors that have been taken into account in its development and to list the principle differences between the new and the previous edition.

The reader is directed to the clauses of this Standard for the specific requirements and to the Australian Communications and Media Authority (ACMA) for the applicable telecommunications labelling and compliance arrangements.

Note: Further information on the telecommunications labelling and compliance arrangements can be found in *The Telecommunications Labelling (Customer Equipment and Customer Cabling) Notice* (the TLN). The TLN can be obtained from the Australian Communications and Media Authority (ACMA) website at www.acma.gov.au.

The objective of this Standard is to provide the requirements and test methods for customer equipment designed or intended for connection to a non-switched Telecommunications Network presented as a cable pair interface in order to meet the regulatory arrangements for such equipment in Australia.

The objective of this revision is to align the requirements with the introduction of VDSL2 technology, which has a power spectral density mask specified up to 30MHz, in contrast with the existing12 MHz limit.

The principle differences between this edition of AS/ACIF S006 and the previous edition are:

(i) the addition in Clause 5.2.3.1 that the power spectral density (PSD) of signals beyond 3.4 kHz shall not exceed the specified limits while the CE is in any idle or active operational state.

(ii) an update of Clause 5.2.3.2, Table 1 and Figure 1 to extend the upper limit of the PSD mask from 12 MHz to 30 MHz.

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1 INTERPRETATIVE GUIDELINES

1.1 Categories of requirements

This Standard contains mandatory requirements as well as provisions that are recommendatory only. Mandatory requirements are designated by the words '**shall**' or '**shall not'**. All other provisions are voluntary.

1.2 Compliance statements

Compliance statements, in italics, suggest methodologies for demonstrating CE's compliance with the requirements.

1.3 Definitions, expressions and terms

If there is any conflict between the definitions used in this Standard and the definitions used in the *Telecommunications Act 1997*, the definitions in the Act take precedence.

1.4 Notes

Text denoted as 'Note' is for guidance in interpretation and is shown in smaller size type.

1.5 References

(a) Applicable editions (or versions) of other documents referred to in this Standard are specified in Section 3: REFERENCES.

(b) If a document refers to another document, the other document is a sub-referenced document.

(c) Where the edition (or version) of the sub-referenced document is uniquely identified in the reference document, then that edition (or version) applies.

(d) Where the edition (or version) of the sub-referenced document is not uniquely identified in the reference document, then the applicable edition (or version) is that which is current at the date the reference document is legislated under the applicable regulatory framework, or for a non- legislated document, the date upon which the document is published by the relevant standards organisation.

(e) A number in square brackets '[ ]' refers to a document listed in Section 3: REFERENCES.

1.6 Units and symbols

In this Standard the International System (SI) of units and symbols is used in accordance with Australian Standard AS ISO 1000 [2].

2 SCOPE

2.1 This Standard applies to Customer Equipment (CE) that:

(a) is designed or intended for connection to a non-switched Telecommunications Network presented as a cable pair interface;

(b) is designed or intended for operation in the voice frequency band; and

(c) does not have a DC or out-of-band signalling capability or DC power feed.

2.2 CE is not excluded from the scope of this Standard by reason only that it is capable of performing functions additional to those described in this Standard.

3 REFERENCES

	Publication	Title
	ANSI Standards	
[1]	ANSI T1.601-1999 (R2004)	ISDN Basic Access Interface for Use on Metallic Loops for Application at the Network Side of NT, Layer 1 Specification
	Australian Standards	
[2]	AS ISO 1000-1998	The international System of Unit (SI) and its application.
	AS/ACIF Standards	
[3]	AS/ACIF S004:2006	Voice frequency performance requirements for Customer Equipment
[4]	AS/ACIF S008:2006	Requirements for customer cabling products
	Federal Communications Commission (FCC) – USA	
[5]	FCC 68.500:1993	Rules Part 68, Sub-part F Connectors

4 ABBREVIATIONS AND DEFINITIONS

For the purposes of this Standard, the following abbreviations and definitions and those of Part 1 apply:

4.1 Abbreviations

ACA	Australian Communications Authority
ACMA	Australian Communications and Media Authority
ACIF	Australian Communications Industry Forum
ANSI	American National Standards Institute
AS	Australian Standard
CE	Customer Equipment
DSL	Digital Subscriber Line
FCC	Federal Communications Commission (USA)
ISO	International Organization for Standardization
PSD	Power Spectral Density
RMS	Root Mean Square
TNV	Telecommunication Network Voltage
VF	Voice Frequency

4.2 Definitions

4.2.1 Carrier

The holder of a carrier licence under the *Telecommunications Act 1997*.

4.2.2 Customer Cabling

Refer to Section 20 of the *Telecommunications Act 1997*.

Note: This covers both internal and external cable of any type, e.g. metallic pair, screened metallic pair, coaxial or optic fibre.

4.2.3 Customer Equipment (CE)

Refer to Section 21 of the Telecommunications Act 1997. .

4.2.4 Facility

Refer to Section 7 and subsection 374(2) of the Telecommunications Act 1997.

4.2.5 Telecommunications Network

Refer to Section 7 and subsection 374(1) of the Telecommunications Act 1997.

4.2.6 Voice Frequency (VF)

Those frequencies in the range of 300 Hz to 3.4 kHz.

4.2.7 Voiceband

Refer to Clause 4.2.6 for voice frequency (VF) signals.

5 REQUIREMENTS

5.1 General

5.1.1 Fail-safe operation

5.1.1.1 CE **shall not** cause harm or damage to a Telecommunications Network or Facility if any of the following events occurs:

(a) Failure of any mechanical or electrical component in the CE.

(b) Failure of any power supplies, resulting in total or partial loss of power, to the CE.

(c) Discharge or partial discharge of any battery supply.

(d) Incorrect manual operation of the CE.

5.1.1.2 CE should not cause harm or damage to a Telecommunications Network or Facility when CE is operated outside the range of operating voltage and environmental conditions specified by the manufacturer.

A suggested method for demonstrating compliance with Clause 5.1.1 is described in Clause 6.3.

5.1.2 DC line potential

CE **shall not**—

(a) require provision of a DC potential from the Telecommunications Network; or

(b) apply a DC potential to the Telecommunications Network.

5.1.3 Line connection

CE should terminate on and be supplied with—

(a) an insulation displacement connection system;

(b) a cable complying with AS/ACIF S008 [4] and which is able to be terminated on an insulation displacement connection system;

(c) a socket on the CE complying with AS/ACIF S008 [4]; or

(d) a modular 8-way plug on the end of a line cord, where both the plug and cord comply with the requirements of AS/ACIF S008 [4] and the plug is Plug Type FCC 68 [5] (eight-position).

Note 1: The following pin assignments should be used where a Plug Type FCC 68 [5] (eight-position) is supplied for connection of CE.
For 2-wire: Pins 4 & 5 (Pair 1) should be used.
For 4-wire: Pins 4 & 5 (Pair 1) should be used.
Pins 1 & 2 (Pair 3) should be used.

Other line connections may also be appropriate.

5.2 Power level limits for transmitted signals

5.2.1 The peak-to-peak level of signals transmitted to line **shall not** exceed 5.0 V when measured across a 600 Ω resistive termination.

5.2.2 Voiceband transmissions

5.2.2.1 The one-minute mean power level of signals transmitted to line within the frequency range 300 Hz to 3.4 kHz, except for speech and music, **shall not** exceed –10 dBm.

Compliance with Clause 5.2.2 should be checked by using the methods described in Clauses 6.4.3.1, and 6.4.3.2 with R set to 600 Ω.

5.2.2.2 The normal operating level of speech and music **shall not** exceed –6 VU.

Compliance with Clause 5.2.2.2 should be checked by using the methods described in Clauses 6.4.3.5.

5.2.3 Signals beyond 3.4 kHz

5.2.3.1 The power spectral density (PSD) of signals beyond 3.4 kHz **shall not** exceed the limits shown in Figure 1 when measured using a noise power bandwidth of 10 kHz while the CE is in any idle or active operational state.

Compliance with Clause 5.2.3.1 should be checked by using the methods described in Clauses 6.4.3.1 and 6.4.3.3 (a) with R in 6.4.3.1 set to 135 Ω.

5.2.3.2 The PSD of signals between 300 kHz and 30.175 MHz **shall** be either—

(a) less than –120 dBm/Hz; or

(b) more than 10 dB below the PSD limit shown in Figure 1 (represented by the dashed line).

when measured as the total average power within a 1 MHz sliding window (1 MHz bandwidth) which is described in Table 1:

Table 1

PSD parameters

Parameter	Value
Bandwidth of sliding window	1 MHz
Reference frequency	Lower edge
Step Size	10 kHz
Start Frequency	300 kHz
Stop Frequency	29.175 MHz

Note 1: The Power Spectral Density requirements contained in Clause 5.2.3 are the same as in ANSI Standard T1.601 [1], and have been included to ensure spectral compatibility of CE with DSL CE.

Note 2: The purpose of the sliding window measurement is to ensure that CE does not generate noise up to the allowable limit across the entire band.

Compliance with Clause 5.2.3.2 should be checked by using the methods described in Clauses 6.4.3.1 and 6.4.3.3 (b) with R in 6.4.3.1 set to 135 Ω.

5.2.4 Longitudinal power

The power level of individual spectral components of any longitudinal component of the output signals **shall not** exceed the limits shown in Figure 2 when measured using a measurement bandwidth of 10 kHz while the CE is in any idle or active operational state.

Compliance with Clause 5.2.4 should be checked by using the methods described in Clauses 6.4.2.

6 TESTING

6.1 Verification of compliance with requirements

Compliance with all mandatory requirements in this AS/ACIF Standard is to be verified. This may be done by direct measurement, modelling and analysis, operation or inspection.

Methods for demonstrating compliance of CE with the requirement clauses specified in this Standard are described in Clauses 6.2 to 6.4.

Verification of compliance with the referenced standards may be confirmed by test reports to later versions of the referenced standards provided that all clauses of the referenced standards are shown to be met.

Alternative methods of demonstrating compliance to those described may be used if the risk of passing non-compliant CE is not increased because of increased measurement uncertainty.

6.2 Standard test conditions

6.2.1 Unless this Standard provides otherwise, testing for compliance with this Standard should be conducted at the nominal supply voltage of the CE and within the following ranges of atmospheric conditions:

(c) An ambient temperature in the range of 15°C to 25°C inclusive.

(d) A relative humidity in the range of 30% to 75% inclusive.

(e) An air pressure in the range of 86 kPa to 106 kPa inclusive.

6.2.2 Where elements in a test configuration are variable, the test should be carried out over the indicated range for that element.

6.2.3 Unless indicated elsewhere within this Standard:

(a) the accuracy level of all measurements should be better than ± 2% for voltage and current, ± 0.25% for frequency and ± 0.5% for time; and

(b) the tolerance of the nominal 48 V d.c. test source should be ± 0.5 V.

Unless indicated elsewhere within this Standard for an individual test, all component values in the test configuration should have a tolerance of—

(a) ± 1% for resistance;

(b) ± 1% for capacitance; and

(c) –0%, +25% for inductors.

6.3 Fail-safe operation

Compliance with the requirements of fail-safe operation specified in Clause 5.1.1 may be checked by operation and inspection.

6.4 Parameters to be tested

6.4.1 External Stimulus

6.4.1.1 The limits specified in Clause 5.2 are the requirements that have to be met in the normal operating modes of the CE, unless otherwise specified.

6.4.1.2 In some CE the power level presented to line is dependent on the excitation, either internal or external to the equipment. This excitation may be determined from the appropriate product specification or with some CE this will require the connection of the associated CE to provide the stimulus.

6.4.1.3 Compliance with Clauses 5.2 should be checked by performing this excitation then measuring the line signal as described by the appropriate tests.

6.4.1.4 Methods for external stimulus and excitation of the CE include the following:

(a) VF signals recorded by the user

If the equipment includes a voice frequency recording and reproducing element in which the signal recording is achieved by the user, the power levels of signals transmitted to the Telecommunications Network should be determined after making the recording in accordance with the manufacturer's operating instructions, user instructions or other appropriate product documentation for the CE under test.

Acoustic input other than from a handset should be measured for transmission level using an 'artificial voice' as the sound source. This is set to produce a continuous uniform pressure spectrum of 200 Hz to 5 kHz at a free field sound pressure level of 94 dB (reference pressure = 20 μPa) measured at the Mouth Reference Point (MRP) – a distance of 25 mm from the virtual source. The position of the virtual sound source relative to the CE under test should be in accordance with the manufacturer's operating instructions, user instructions or other appropriate product documentation for the CE under test.

(b) VF signals recorded from the Telecommunications Network

If the equipment includes a voice frequency recording and reproducing element in which the signal recording is achieved from signals injected into the recording element from the Telecommunications Network, the power levels of signals transmitted to the Telecommunications Network should be determined after making the recording in

accordance with the manufacturer's operating instructions, user instructions or other appropriate product documentation for the CE under test.

(c) Signal limiting

If the signal level control is achieved by means of limiters, this should be checked by injecting voice frequency signals, where indicated in the documentation, at any level necessary to test that the limiters are restricting the signals to the network to the specified limits.

(d) Complex signal power

If the equipment generates a modulated VF signal in response to an external stimulus initiated by the user, then the power levels of signals transmitted to the network should be determined after following the manufacturer's operating instructions, user instructions or other appropriate product documentation for the CE under test and any associated signal generating devices.

6.4.1.5 Internally generated signals should be measured for transmission level only for the duration of the message or over one minute periods, whichever is shorter.

6.4.1.6 For CE which requires speech or discontinuous signals and which cannot be tested using constant or continuous signals, testing may be performed after taking into account any special instructions from the manufacturer or other appropriate product documentation for the CE.

6.4.2 Longitudinal power measurement

The CE under test should be connected to the measuring instrument as shown in Figure 3. A selective measuring set or spectrum analyser having an effective bandwidth sufficiently narrow to measure individual spectral components should be used to explore the frequency band from 200 Hz to 30.175 MHz and to measure the RMS voltage (V) of any spectral component either using the internal calibration or from comparison with a sinusoidal signal of known RMS voltage and the same frequency.

6.4.3 VF signal level measurement

6.4.3.1 Signal levels and frequencies should be measured using a selective level meter or spectrum analyser with appropriate input dynamic range and frequency range. Power levels specified in Clause 5.2 should be determined as V^2/R, the voltage level being measured with a high impedance RMS voltmeter bridged across R, the termination resistor (nominally 600 Ω unless otherwise specified).

6.4.3.2 For the one-minute mean power level measurements, the voltmeter should have the following elements:

(a) An input band-selection filter with passband 300 Hz to 3.4 kHz.

(b) A square-law detector having a time constant of nominally 100 ms.

(c) An averaging circuit that performs a continuing averaging process over a period of one minute, i.e., computes the value of:

$$\frac{1}{60}\int_{Tn}^{Tn+60} V^2 \, dt$$

where: Tn is time in seconds
V is the RMS voltage indicated by the square-law detector, in volts.

The measurement should be carried out for a sufficient time for the averaging circuit to record a steady value.

Note: In practice, when measuring telephone speech or sustained signals from modems it may be convenient to observe the indication of the square-law detector and then to calculate the one-minute mean value.

6.4.3.3 Power Spectral Density should be measured using the following:

(a) A 10 kHz noise power bandwidth for frequencies between 3.4 kHz and 30.175 MHz.

(b) A 1 MHz noise power bandwidth for frequencies between 300 kHz and 30.175 MHz as described in Clause 5.2.3.2.

6.4.3.4 For determining the value required by Clause 5.2.3, the input filter centre frequency should be adjustable over the range 4.9 kHz to 30.175 MHz, with a passband of 10 kHz.

6.4.3.5 The level of speech or music as required by Clause 5.2.2.2 should be measured using a VU meter with characteristics in accordance with AS/ACIF S004 [3] Appendix A.

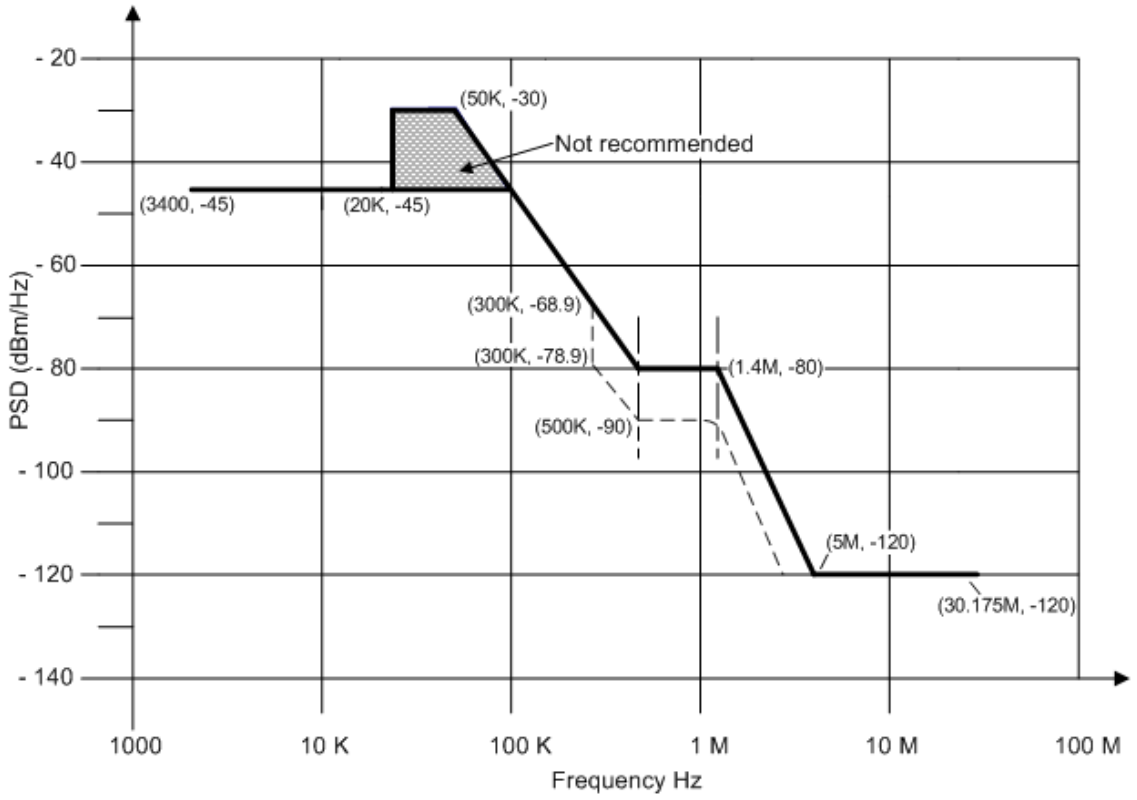

Figure 1
Power level limits above 3.4 kHz

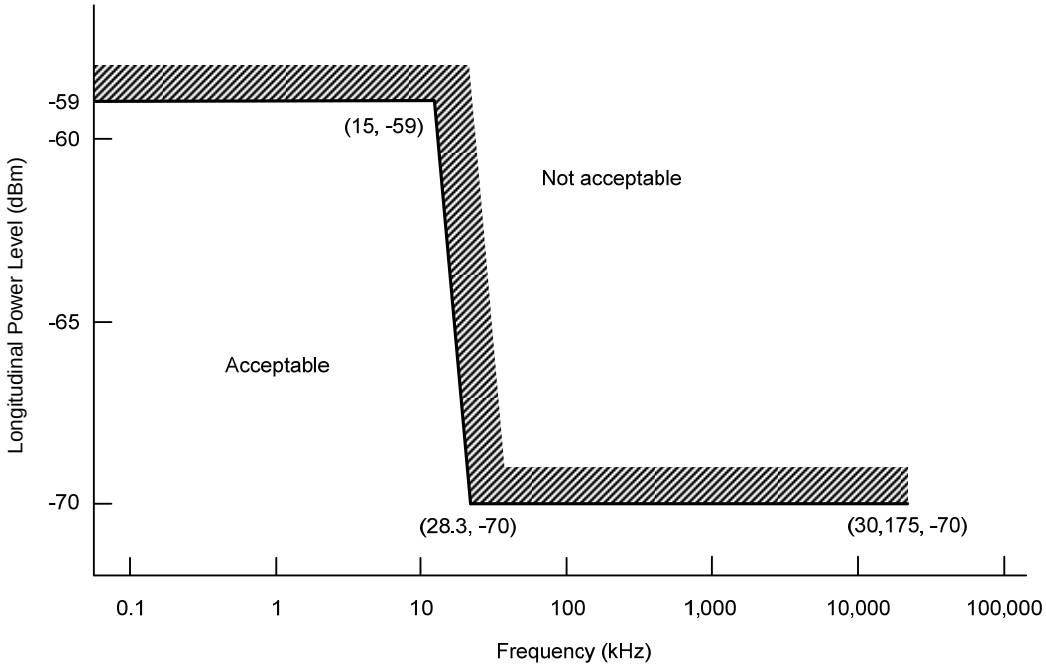

Figure 2
Longitudinal power level limits

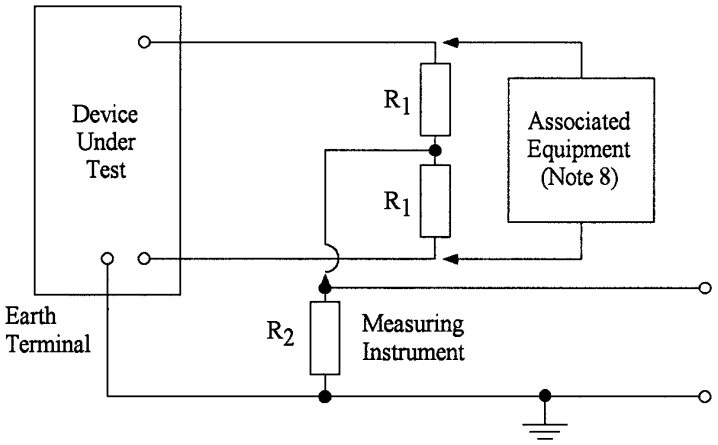

Figure 3

Test circuit for measurement of longitudinal power level

Note 1:If the equipment has separate protective and signal earth terminals they are connected together.

Note 2:The two resistors R_1 are to be matched to within 0.01%.

Note 3:The measuring instrument is of high impedance, and capable of measuring over the frequency range 200 Hz to 30175 kHz.

Note 4:The measuring instrument is calibrated in dBm as if it was measuring across a resistive load.

Note 5: The adequacy of the balance is checked by repeating measurements with appropriate connection reversal, or equipment disconnection.

Note 6:The value of the resistors R_1 and R_2 are to be 300 Ω for CE signals with fundamental frequency components in the 300 Hz to 3.4 kHz range.

PARTICIPANTS

The Working Committee responsible for the revisions made to this Standard consisted of the following organisations:

Organisation	Membership
ACCC	Non-Voting
ACMA	Non-Voting
Adtran Networks	Voting
Agile	Voting
Alcatel-Lucent	Voting
Austest	Voting
Cisco Systems	Voting
Ericsson	Voting
NEC Australia	Voting
Nokia Siemens Networks	Voting
Primus	Voting
SingTel Optus	Voting
Telecom NZ	Voting
Telstra	Voting

This Working Committee was chaired by Peter Cooke. James Duck of Communications Alliance Ltd provided project management support.

Communications Alliance was formed in 2006 to provide a unified voice for the Australian communications industry and to lead it into the next generation of converging networks, technologies and services.

In pursuing its goals, Communications Alliance offers a forum for the industry to make coherent and constructive contributions to policy development and debate.

Communications Alliance seeks to facilitate open, effective and ethical competition between service providers while ensuring efficient, safe operation of networks, the provision of innovative services and the enhancement of consumer outcomes.

It is committed to the achievement of the policy objective of the *Telecommunications Act 1997* - the greatest practicable use of industry self-regulation without imposing undue financial and administrative burdens on industry.

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