

Australian/New Zealand Standard™

**Digital radio equipment operating in
land mobile and fixed services bands in
the frequency range 29.7 MHz to 1 GHz**

Part 1: Radiofrequency requirements



AS/NZS 4768.1:2010

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee RC-006, Radiocommunications Equipment—General. It was approved on behalf of the Council of Standards Australia on 28 September 2009 and on behalf of the Council of Standards New Zealand on 8 February 2010. This Standard was published on 23 February 2010.

The following are represented on Committee RC-006:

Airservices Australia
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Australian Industry Group
Australian Radio Communications Industry Association
Civil Aviation Safety Authority
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This Standard was issued in draft form for comment as DR 09028.

Australian/New Zealand Standard™

Digital radio equipment operating in land mobile and fixed services bands in the frequency range 29.7 MHz to 1 GHz

Part 1: Radiofrequency requirements

Originated as AS/NZS 4768.1:2003.
Previous edition 2006.
Third edition 2010.

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Jointly published by Standards Australia, GPO Box 476, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6140

ISBN 978 0 7337 9374 5

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee RC-006, Radiocommunications Equipment—General, to supersede AS/NZS 4768.1:2006.

The objective of this Standard is to provide the user, manufacturer or supplier of digital radio equipment operating in the frequency range 29.7 MHz to 1 GHz of the VHF and UHF Land Mobile and Fixed Services Bands with the minimum technical performance characteristics and requirements necessary to contribute to effective management of the radiofrequency spectrum in Australia and New Zealand.

In Australia and New Zealand, it is common to import equipment from other parts of the world where there may not be harmonized spectrum management and equipment specification regimes.

The requirements specified in this Standard take into account that, in Australia and New Zealand, digital radio equipment may operate in spectrum adjacent to analogue radio equipment. This arrangement requires that digital radio equipment operate without causing harmful interference to analogue radio equipment occupying adjacent channels and vice versa.

This Standard was originally developed from AS 4295, *Analogue speech (angle modulated) equipment operating in land mobile and fixed services bands in the frequency range 29.7 MHz to 1 GHz*, the ETSI publications EN 300 113-1 V1.3.1 and EN 300 113-1 V1.4.1, and IEC 60489-6, Ed.3 (1999), *Radio equipment used in mobile services—Methods of measurement*, Part 6: *Data equipment*.

Following a submission by manufacturers in an effort to reduce compliance testing costs, AS/NZS 4768.1:2006 introduced an alternative path to compliance based on testing to the ETSI EN 300 113-1 Standard with some additions where necessary. While the test methods and limits in the ETSI Standard in some areas are different to the IEC methods originally used in AS/NZS 4768.1:2003, the committee judged that product compliant with such tests, (including any additional requirements) would be suitable for use locally with some minor changes. The additions, which are set out in Appendix A, extend the maximum extreme temperature to 60°C and require transmitter spurious emission testing at extremes of voltage and temperature. Some limits contained in the main body of the Standard such as transmitter power, are retained to support the licensing arrangements in both countries.

The proposed changes in this new edition, made at the request of industry, incorporate relaxations to the performance requirements for certain remote multipoint stations in view of their remote location and low duty cycle operation, as well as to encourage reduced power consumption designs.

This Standard is Part 1 of AS/NZS 4768, *Digital radio equipment operating in land mobile and fixed services bands in the frequency range 29.7 MHz to 1 GHz*, which consists of the following parts:

Part 1: Radiofrequency requirements (this Standard)

Part 2: Methods of test

This Part 1 provides the minimum radiofrequency requirements for operation of the equipment in Australia and New Zealand. Part 2 provides the test methods to be used when compliance with these limits is to be assessed. Not all of the test methods in Part 2 are required.

Statements expressed in mandatory terms in notes and footnotes to tables are deemed to be requirements of this Standard.

The term ‘normative’ has been used in this Standard to define the application of the Appendix. A normative appendix is an integral part of a Standard.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Digital radio equipment operating in land mobile and fixed services bands in the frequency range 29.7 MHz to 1 GHz****Part 1: Radiofrequency requirements****1 SCOPE**

This Standard provides radiofrequency requirements for constant envelope emission digital radio equipment operating in land mobile and fixed services radiofrequency bands in the frequency range 29.7 MHz to 1 GHz with channel spacings of 12.5 kHz or 25 kHz. Equipment employing non-constant envelope emissions is not within the scope of this standard.

Categories of equipment within this range include—

- (a) base, mobile, personal mobile and RF control stations operating in designated land mobile bands; and
- (b) fixed point-to-point and point-to-multipoint equipment operating in designated single channel fixed service bands.

Equipment operating in the land mobile services bands from 806 to 825 MHz and 851 to 870 MHz is not within the scope of the Standard.

NOTE: For operation of land mobile equipment in these bands refer to the relevant authorities in Australia and New Zealand.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS/NZS

- 4295 Analogue speech (angle modulated) equipment operating in land mobile and fixed services bands in the frequency range 29.7 MHz to 1 GHz
- 4768 Digital radio equipment operating in land mobile and fixed services bands in the frequency range 29.7 MHz to 1 GHz
- 4768.2 Part 2: Methods of test

ETSI EN

- 300 113 Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Land mobile service; Radio equipment intended for the transmission of data (and/or speech) using constant or non-constant envelope modulation and having an antenna connector
- 300 113-1 Part 1: Technical characteristics and methods of measurement

IEC

- 60489 Radio equipment used in mobile services—Methods of measurement
- 60489-6 Part 6: Data equipment

ITU-T

- 0.152 Error performance measuring equipment for bit rates of 64 kbit/s and $N \times 64$ kbit/s
- 0.153 Basic parameters for the measurement of error performance at bit rates below the primary rate
- 0.163 Equipment to perform in-service monitoring on 1544 kbit/s signals

3 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

3.1 Adjacent channel power (transmitter)

That part of the total power output of a transmitter under defined conditions of modulation, which falls within a specified passband centred on the nominal frequency of either of the adjacent channels.

3.2 Adjacent channel selectivity (receiver)

A measure of the ability of the receiver to receive a wanted signal without exceeding a given degradation because of the presence of an unwanted adjacent channel signal.

3.3 Artificial load

A non-reactive, non-radiating load whose impedance as presented to the transmitter output corresponds to the terminal impedance of the antenna normally connected to the transmitter (this is usually 50 Ω).

3.4 Average radiofrequency output power

The average radiofrequency power supplied to a transmission line—

- (a) measured as a continuous power when the data modulation is continuous; or
- (b) measured during the time of the data modulation.

3.5 Base station

A radiocommunications transmitter and/or receiver fitted with an antenna connector, for use with an external antenna, and intended for use at a fixed location.

NOTE: Unless otherwise indicated (refer Clause 4.8) the specifications for base station equipment are applicable to point-to-point and point-to-multipoint systems..

3.6 Blocking immunity (receiver)

A measure of the ability of the receiver to receive a wanted signal without exceeding a specified degradation due to the presence of an unwanted signal within a specified bandwidth, offset from the nominal frequency of the receiver.

3.7 Communal site

A radiocommunications transmission/reception site at which a number of users have facilities that share common frequency bands of operation. Useful benchmarks for defining a communal site are—

- (a) a site that is described by a circle of radius of up to 200 m; and
- (b) a site at which three or more channels are assigned from within any 20 MHz band.

3.8 Comparator, data (bit stream or character string)

A device capable of—

- (a) storing a reference sequence of bits or characters;
- (b) counting the number of bits or characters that are transmitted;
- (c) comparing the bits or characters received with the reference sequence bits or characters; and
- (d) counting the number of correctly received messages or calls.

3.9 Comparator (message or selective calling)

A device capable of—

- (a) storing a reference message or call;
- (b) counting the number of times a message or call is transmitted;
- (c) comparing the message or call received with the reference message or call; and
- (d) counting the number of correctly received messages or calls.

3.10 Conducted spurious radiation (receiver)

Radiofrequency signals generated from components and wiring within the receiver and which are radiated by way of conduction from the RF input terminals of the receiver.

3.11 Digital radio equipment

Analogue modulated equipment designed to carry data and digitally modulated equipment carrying speech and/or data.

3.12 Error ratio

The number of erroneous bits, characters, messages or selective callings received, divided by the total number of bits, characters, messages or selective callings transmitted, respectively. For selective calling (1-error ratio), it is also called 'calling probability'.

3.13 Frequency error (transmitter)

The difference between the measured carrier frequency and its nominal value.

3.14 Integral antenna

An antenna either permanently attached to the equipment or intended for direct attachment, without the use of an external cable, to a fixed connector on the equipment. This definition includes lapel speaker/microphone adaptors incorporating an antenna.

3.15 Intermodulation immunity (receiver)

A measure of the ability of a receiver to receive a wanted signal without exceeding a specified degradation because of the presence of two unwanted signals with a specific amplitude and frequency relationship to the wanted signal frequency.

3.16 Matching and combining network

An impedance matching network intended to facilitate the connection of two or more test signal sources to the receiver input.

3.17 Measured useable sensitivity (MUS)

The radiofrequency level of the standard coded test signal, at a specified frequency, which will result in the reference error ratio.

3.18 Message format

Description of the elements and their arrangement in a message.

NOTE: The arrangements may include among other items, synchronization bits, address bits, text, flag bits and additional bits for error correction and/or detection.

3.18.1 Synchronization bits

Additional bits that are provided only for the purpose of synchronization.

3.18.2 Address

Information that identifies the address or identifies the sending unit.

3.18.3 *Function*

Information that identifies which of a plurality of responses is to be executed.

3.18.4 *Text*

Information (e.g. character string).

3.18.5 *Error control bits*

Bits that are provided solely for the purpose of error correction and/or deletion.

3.19 **Mobile station**

A radiocommunications transmitter, receiver or transceiver fitted with an antenna connector, for use with an external antenna, and intended for use from a vehicle while in motion or during stops at unspecified points.

3.20 **Multi-coupled base**

A base station intended to be used in conjunction with other similar base stations at a communal site and connected by filtering to a common antenna.

3.21 **Personal mobile station**

A radiocommunications transmitter, receiver or transceiver incorporating an integral antenna, and intended to be carried on the person or held in the hand.

3.22 **Point-to-point**

A fixed station intended to communicate with a similar station at another fixed location.

3.23 **Point-to-multipoint**

A fixed base station intended to communicate with more than one station at other fixed locations.

3.24 **Remote multipoint stations**

Fixed stations intended to communicate with a point-to-multipoint base station.

3.25 **Rated transmitter output power**

The maximum power declared by the manufacturer available at the transmitter output, under standard test conditions, when the equipment is operated into the artificial load.

3.26 **Reference error ratio**

The reference error ratios that apply for equipment measured with the standard test signal are—

- (a) reference error ratio (bit stream or character string) 0.01 or 1%; and
- (b) reference error ratio (message or selective calling) 0.2 or 20%.

Where the reference error ratio cannot be achieved, an alternative threshold point or indication becomes the subject of agreement between the manufacturer and the test house. The alternative threshold point or indication shall be recorded in the test report.

3.27 **RF control station**

A mobile station established at a fixed location for the remote control of a base station that is used for communicating with mobile stations (trigger link).