

# General information



## Emission Standards

For full details of broadcasting emission standards, please see

- A/ *Broadcasting Services (Technical Planning) Guidelines 2007 Appendix 1 Emission standard for the Australian Amplitude Modulation Sound Broadcasting Service.*
- B/ *Broadcasting Services (Technical Planning) Guidelines 2007 Appendix 2 Emission standard for the Australian Frequency Modulation Sound Broadcasting Service.*
- C/ *Australian Standard AS4943.1-2009 Digital Radio – Terrestrial broadcasting Part 1 : Characteristics of terrestrial digital audio broadcasting (T-DAB+) transmissions*
- D/ *Australian Standard AS4599.1-2015 Digital Television – Terrestrial Broadcasting – Characteristics of digital terrestrial television transmissions.*

The following sections are extracts from those standards.

## Australian MF AM Radio Stereo Standard

Australian MF AM radio stations may broadcast stereophonic sound. The Government approved a single standard based on the Motorola C-QAM system, after the then Department of Communications conducted a comprehensive test program in conjunction with representatives of the broadcasting and receiver industry.

### THE C-QAM SIGNAL

The AM stereo system adopted by Australia is fully compatible with existing monophonic receivers. The amplitude of the transmitted carrier frequency is modulated by the sum of the left and right channel signals. The stereo information is encoded in the instantaneous phase of the transmitted carrier frequency. At the transmitter, the carrier frequency is divided into two components which are separated by 90 degrees relative to each other, that is, they are in quadrature.

One component is modulated by the sum of the left and right channel signals, while the other is modulated by the difference between the left and right channel signals. Thus, two double sideband suppressed carrier signals in quadrature are generated. These signals are then added vectorially to the carrier. The modulated component due to the sum signal is in phase, and that due to the difference is in quadrature, with the carrier.

## Australian VHF FM Radio Standard

Australia uses the 'pilot-tone' system commonly used throughout the world. Principal characteristics of the system used in Australia are set out below:

Frequency Range:	88 – 108 MHz <sup>(i)</sup>
Channel Centre Frequencies:	88.1, 88.3, ... 107.7, 107.9 MHz
Deviation:	75 kHz
Pre-emphasis/de-emphasis:	50 $\mu$ s
Stereo Channel Subcarrier Frequency:	38 kHz
Pilot Frequency:	19 kHz

The stereo baseband signal occupies a frequency range of 53 kHz.

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(i) Note : low power open narrowcasting services are licensed to operate in the band 87.5 MHz to 88.0 MHz.

## ANCILLARY COMMUNICATIONS SERVICES

Ancillary communication services (ACS) may also be added to the main program channel. The emission standard for the Australian Frequency Modulation Sound Broadcasting Service permits use of specified sub-carrier frequencies on condition that:

- A/ the use of such sub-carriers does not cause interference to or degradation of the main channel or other channels
- B/ the deviation of the main carrier due to the entire baseband signal, including all ACS signals, does not exceed  $\pm 75$  kHz and
- C/ the deviation of the main carrier by any one ACS sub-carrier alone does not exceed  $\pm 7.5$  kHz.

## The Australian Digital Radio Standard

### Radiated signal characteristics

Planning for Digital Radio Broadcasting (DRB) is based on the Australian Standard AS4943.1-2009 Digital Radio – Terrestrial broadcasting Part 1 : Characteristics of terrestrial digital audio broadcasting (T-DAB+) transmissions. This standard is based on technical content of relevant European Telecommunications Standards Institute (ETSI) standards, but includes a number of variations specific to Australia.

#### *Digital Radio frequency blocks.*

The width of the digital radio frequency block is 1.536 MHz. Digital radio services are planned in the same band as television band III services, with 4 frequency blocks allocated to each television channel. The allocation scheme for digital radio frequency blocks is shown on page 410.

The centre frequency of the digital radio frequency block is shown in the service listings in this book. It should be noted that for implementation reasons, digital radio multiplex transmitter (DRMT) licensees may choose to operate with a maximum  $+/- 80$  kHz offset (in multiples of 16 kHz) from the nominal channel centre frequency.

#### *Modulation schemes*

The Australian digital radio service is planned to reference modulation parameters of Transmission Mode I and Protection Level 3 using differentially encoded Quadrature Phase Shift Keying (D-QPSK), as defined in the ETSI standard ETSI EN 300 401 V1.4.1. A DRMT licensee may elect to operate with other modulation parameters to improve coverage or capacity. However, the licensee will not be entitled to protection greater than that afforded by the reference modulation.

#### *Carriers and guard interval*

The digital radio transmission standard for Transmission Mode I allows for the use 1536 carriers with a guard interval of 246  $\mu$ S.

## The Australian Digital Terrestrial Television Standard

### Radiated signal characteristics

Planning for Digital Terrestrial Television Broadcasting (DTTB) is based on the Australian Standard AS4599–1999 *Digital television – Terrestrial broadcasting – Characteristics of digital terrestrial television transmissions*. This standard is based on the European standard for terrestrial digital video broadcasting (DVB-T), but includes a number of variations specific to Australia.

#### *Television channels*

The width of the digital television channel is 7 MHz. Digital television services are planned using the same channel allocation scheme as for the former analog television service. However, not all of these channels are used for digital television as the following table illustrates:

VHF Band I	Channels 0, 1 and 2	Not suitable for digital television broadcasting transmissions as these channels are prone to interference from electrical noise.
VHF Band II	Channels 3, 4 and 5	Used for FM radio and thus no new television services in Australia will be planned using these channels.
VHF Band III	Channels 5A – 12	Suitable for digital transmissions, although no new television services in Australia will be planned using channel 5A as it has been allocated internationally to other services.
UHF Band IV	Channels 28 – 35	Suitable for digital transmissions.
UHF Band V	Channels 36 – 51	Suitable for digital transmissions.
UHF Band V	Channels 52 – 69	“Digital Dividend” spectrum reallocated for other uses.

The channels allocated for Australian digital television services are shown on page 411.

#### *Modulation schemes*

DVB-T offers flexibility in the use of transmission mode by supporting a range of modulation schemes, code rates and guard intervals to accommodate different broadcasting requirements. For the purpose of digital television planning, the reference modulation listed in the table below will be employed. However broadcasters have the option of using other modulation schemes to improve DTTB coverage or data capacity.

Modulation	Code Rate	C/N	Guard Interval	Carrier Mode
64-QAM	2/3	20 dB	1/8	8k

#### *Carriers and guard interval*

The DVB-T transmission standard allows for the use of either 1705 carriers (known as ‘2k’ mode), or 6817 carriers (‘8k’ mode). Australian DVB-T receivers are expected to be capable of receiving both 2k and 8k modes.

The centre frequency of the digital television channel is shown in the service listings in this book. It should be noted that for implementation reasons, broadcasters may choose to operate with a  $\pm 125$  kHz offset from the nominal channel centre frequency.

## Digital Radio (DAB) Frequency Blocks

Digital Radio (DAB) Frequency Block Identifier	Australian Television Channel Number	Centre Frequency (MHz)	Frequency Range (MHz)
5A	6	174.928	174.160 - 175.696
5B	6	176.640	175.872 - 177.408
5C	6	178.352	177.584 - 179.120
5D	6	180.064	179.296 - 180.832
6A	7	181.936	181.168 - 182.704
6B	7	183.648	182.880 - 184.416
6C	7	185.360	184.592 - 186.128
6D	7	187.072	186.304 - 187.840
7A	8	188.928	188.160 - 189.696
7B	8	190.640	189.872 - 191.408
7C	8	192.352	191.584 - 193.120
7D	8	194.064	193.296 - 194.832
8A	9	195.936	195.168 - 196.704
8B	9	197.648	196.880 - 198.416
8C	9	199.360	198.592 - 200.128
8D	9	201.072	200.304 - 201.840
9A	9A	202.928	202.160 - 203.696
9B	9A	204.640	203.872 - 205.408
9C	9A	206.352	205.584 - 207.120
9D	9A	208.064	207.296 - 208.832
10A	10	209.936	209.168 - 210.704
10B	10	211.648	210.880 - 212.416
10C	10	213.360	212.592 - 214.128
10D	10	215.072	214.304 - 215.840
11A	11	216.928	216.160 - 217.696
11B	11	218.640	217.872 - 219.408
11C	11	220.352	219.584 - 221.120
11D	11	222.064	221.296 - 222.832
12A	12	223.936	223.168 - 224.704
12B	12	225.648	224.880 - 226.416
12C	12	227.360	226.592 - 228.128
12D	12	229.072	228.304 - 229.840

### Notes:

- 1/ This table is for information only. For more detail, refer to *ETSI TR 101 496-3 V1.1.2 (2001-05) Digital Audio Broadcasting (DAB); Guidelines and rules for implementation and operation; Part 3: Broadcast network.*
- 2/ This table excludes DAB frequency blocks 10N, 11N and 12N as these are not applicable to Australia.
- 3/ Under the ACMA's *Planning principles for the expansion of digital radio to regional Australia*, digital radio services will generally be allocated on a 6/2 frequency allotment scenario, with the national broadcaster frequency blocks being 9C and 8B, while frequency blocks 8A, 8C, 8D, 9A, 9B and 9D will be available for allotment in each licence area to multiplexes carrying commercial and community services.

## Television Channel Numbers and Frequency Limits

Australian Television Channel Number	Channel Planning Block	VHF/UHF Frequency Band	Centre Frequency (MHz)	Frequency Range (MHz)
6	A	3	177.5	174–181
7	A	3	184.5	181–188
8	A	3	191.5	188–195
9		3	198.5	195–202
9A		3	205.5	202–209
10	A	3	212.5	209–216
11	A	3	219.5	216–223
12	A	3	226.5	223–230
28	B	4	529.5	526–533
29	B	4	536.5	533–540
30	B	4	543.5	540–547
31	B	4	550.5	547–554
32	B	4	557.5	554–561
33	B	4	564.5	561–568
34	C	4	571.5	568–575
35	C	4	578.5	575–582
36	C	5	585.5	582–589
37	C	5	592.5	589–596
38	C	5	599.5	596–603
39	C	5	606.5	603–610
40	D	5	613.5	610–617
41	D	5	620.5	617–624
42	D	5	627.5	624–631
43	D	5	634.5	631–638
44	D	5	641.5	638–645
45	D	5	648.5	645–652
46	E	5	655.5	652–659
47	E	5	662.5	659–666
48	E	5	669.5	666–673
49	E	5	676.5	673–680
50	E	5	683.5	680–687
51	E	5	690.5	687–694

### Notes:

1/ In the *Clearing the digital dividend - Decisions on planning principles for restacking digital television channels – May 2011*, the decision was made to adopt the block planning approach, with 5 blocks of 6 channels, as shown in the table. Channels 9 and 9A may be used for digital TV in some remote areas.