DR 99047

DRAFT AUSTRALIAN STANDARD FOR COMMENT

LIABLE TO ALTERATION—DO NOT USE AS A STANDARD

DATE OF ISSUE: 1 FEBRUARY 1999

CLOSING DATE FOR COMMENT: 31 MARCH 1999

Digital television—Terrestrial broadcasting
Part 1: Characteristics of digital terrestrial television transmissions

PRICE: C

STANDARDS AUSTRALIA

DRAFT AUSTRALIAN STANDARD FOR COMMENT

The committee responsible for the issue of this draft comprised representatives of organizations interested in the subject matter of the proposed Standard. These organizations are listed on the inside back cover.

Would you please examine this proposal and draw attention to any changes which in your opinion are necessary or desirable. The coordination of the requirements of this draft with those of any related Standards is of particular importance and you are invited to point out any areas where this may be necessary.

Comment should be classified into two categories: general comment and specific comment. It will assist the committee if your comment is presented in the form of specific recommendations for improvements of the draft Standard (e.g. specific amendments to a particular Clause). Each recommendation should be accompanied with concise reasons in support of the changes.

It would be further appreciated if you could either type or neatly print your comments in black ink on the form attached.

Standards Australia will arrange for any comment received by the closing date to be considered by the drafting committee prior to the publication of the Standard in its final form. Comment received is not normally acknowledged because of the volume involved.

If you do not consider any alterations are necessary and find the draft generally acceptable, your advice to this effect would also be appreciated.

Your comments should be submitted by the date indicated on the front cover of this draft Standard to the Head Office of Standards Australia. They should be marked to the attention of the officer indicated on the top left corner of the form. **We ask that comments sent by fax be confirmed by mail.**

If you know of other persons or organizations who may wish to comment on this draft Standard, could you please advise them of its availability. Further copies of the draft are available from the Customer Service Centre listed below.

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RECOMMENDED CHANGES TO DRAFT AUSTRALIAN STANDARD

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DR 99047	**Committee:** CT/2	**Closing** 31 MARCH 1999	**Date of Comment**

Title:

Digital television - Terrestrial broadcasting
Part 1: Characteristics of digital terrestrial television transmissions

1 GENERAL COMMENT (Attach if space insufficient, please type)

2 SPECIFIC COMMENT (Please type)

Clause/ Figure/ Table	Page No	Para-graph	Line No	Recommended Changes and Reason (Exact wording of recommended changes should be given)

2 SPECIFIC COMMENT (Please type)

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PREFACE

This Standard was prepared by the Standards Australia Committee CT/2, Broadcasting and Related Services.

The objective of this Standard is to provide television receiver manufacturers and broadcasters with the technical specification for the Australian digital terrestrial television transmission system in order to achieve interoperability in DTTB transmission and reception.

This Standard, Digital television—Terrestrial broadcasting: Characteristics of digital terrestrial television transmission, is Part 1 of a series on the subject of digital broadcasting. **It is important to note that some sections of this Part are yet to be completed, as indicated in the text. Other parts still in development will address digital television planning, digital television receivers, digital sound transmissions and digital sound reception.**

The part was prepared in conjunction with the Australian Broadcasting Authority and the television broadcasting industry to ensure consistency of terrestrial broadcasting transmissions and to enable the design of receivers for that service.

The Australian Digital Terrestrial Television Broadcasting System will use the DVB-T Standards, adapted where necessary to meet the specific Australian requirements. This Standard lists those operative parts of the relevant DVB and ETSI standards and guidelines applicable to terrestrial broadcasting. Other Standards and parts of the referenced Standards addressing other digital television systems are not covered in this Standard.

Paper copies of referenced ETSI Standards can be purchased from Standards Australia or are available for download from the ETSI website www.etsi.fr.

At the time of preparing this preliminary draft standard several of the referenced ETSI standards are being reviewed by DVB. Those ETSI/ATSC Standards and clauses marked " * " are known to be under consideration for revision by DVB. Information on the revisions may be obtained on request. Clauses marked with " ** " have been written for the Australian DTTB system.

This document needs to be read in conjunction with the referenced standards. In brackets below each AS clause heading is the clause number in the referenced Standard.

Example

2.1.1 Interfacing ← AS clause number

(refer/replace Clause 4.2) ← Clause number referenced or to be replaced in ETSI/ATSC Standard

Please note that, for the purposes of this draft, a comma is frequently used when referring to a decimal marker, particularly in tables.

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STANDARDS AUSTRALIA

Australian Standard
Digital television—Terrestrial broadcasting

Part 1: Characteristics of digital terrestrial television transmissions

1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies the digital terrestrial television system to be used in Australia. It covers the video, audio and data coding, the characteristics of the transport stream, the channel coding and the modulation system to be used.

At the time of preparation of this standard many of the relevant international standards and guidelines defining the systems are still being revised. The applicable clause listed in this standard is from the version of the international documents dated as shown in the references.

1.2 APPLICATION

This Standard shall be read in conjunction with the Standards referenced in Sections 2, 3, 5, 6, and 7 of this Standard.

1.3 STRUCTURE

The Standard lists the specific operative parts of the relevant DVB, ETSI and ITU references that are applicable to digital terrestrial television transmissions. Where specific changes are identified the revised clause or section is given in full.

For convenience, this standard is prepared in sections addressing parts of the total system. Some parts concern more than one reference document, while some reference documents are relevant to more than one part. Where the latter situation arises, the reference document clauses are listed together with appropriate cross-referencing.

1.4 REFERENCES

The following documents are referred to in this Standard:

AS/NZS

13818 : 1997	Information Technology – Generic coding of moving pictures and associated audio information
4230	Information Technology – Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s

ETSI

EN 300 744 1.1.2 08/97	Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for digital terrestrial television
EN 300 468 1.3.1 02/98	Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems

EN 300 472 1.2.1 08/97	Digital Video Broadcasting (DVB); Specification for conveying ITU-R System B Teletext in DVB bitstreams
EN 301 192 1.1.1 12/97	Digital Video Broadcasting (DVB); Specification for data broadcasting
ETS 300 743 1 09/97	Digital Video Broadcasting (DVB); Subtitling systems
ETR 154 3 10/97	Digital Video Broadcasting (DVB); Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications
ETR 211 2 08/97	Digital Video Broadcasting (DVB); Guidelines on implementation and usage of Service Information (SI)
ETR 289 1 10/96	Digital Video Broadcasting (DVB); Support for use of scrambling and Conditional Access (CA) within digital broadcasting systems
ETR 290 1 05/97	Digital Video Broadcasting (DVB); Measurement guidelines for DVB systems
prTR101162 1.2.1 08/98	Digital Video Broadcasting (DVB); Allocation of Service Information (SI) codes for DVB systems
DVB	
TS 101191 1.1.1 04/97	Digital Video Broadcasting (DVB); Mega-frame for Single Frequency Network (SFN) synchronization
ISO/IEC	
13818: 1995	Information Technology – Generic coding of moving pictures and associated audio information
11172	Information Technology – Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s
639 –1: 1988	Codes for the representation of names of languages
639 – 2: 1998	Codes for the representation of names of languages
ITU	
BS.1196	Audio Coding for Digital Terrestrial Television Broadcasting
ATSC	References
A/52	Digital Audio Compression Standard (AC-3)
A/53	ATSC Digital Television Standard

2 CHANNEL CODING AND MODULATION

2.1 Framing structure, channel coding and modulation

(refer EN 300744 Digital Video Broadcasting; Framing structure, channel coding and modulation for digital terrestrial television)

2.1.1 *General considerations*

(replace Clause 4.1)

General considerations (EN 300 744 Clause 4.1) shall be replaced by the following:

The system is defined as the functional block of equipment performing the adaptation of the baseband TV signals from the output of the MPEG-2 transport multiplexer, to the terrestrial channel characteristics. The following processes shall be applied to the data stream (see figure 1 – EN 300 744):

- transport multiplex adaptation and randomization for energy dispersal;
- outer coding (i.e. Reed-Solomon code);
- outer interleaving (i.e. convolutional interleaving);
- inner coding (i.e. punctured convolutional code);
- inner interleaving;
- mapping and modulation;
- Orthogonal Frequency Division Multiplexing (OFDM) transmission.

The system is directly compatible with MPEG-2 coded TV signals ISO/IEC 13818 [1] (AS/NZS 13818: 1997).

Since the system is being designed for digital terrestrial television services to operate within the existing VHF and UHF (see note) spectrum allocation for analogue transmissions, it is required that the System provides sufficient protection against high levels of Co-Channel Interference (CCI) and Adjacent-Channel Interference (ACI) emanating from existing PAL services. It is also a requirement that the System allows the maximum spectrum efficiency when used within the VHF and UHF bands; this requirement can be achieved by utilising Single Frequency Network (SFN) operation.

NOTE: ie. 7 MHz channel spacing. An adaptation of the document for 6 or 8 MHz channels can be achieved by scaling all system parameters according to a change of the system clock rate. In case of 8 MHz channels the clock rate is 64/7 MHz. The corresponding clock rate for 7 MHz channels is 8,0 MHz and for 6 MHz channels 48/7 MHz. The frame structure and the rules for coding, mapping and interleaving are kept, only the data capacity of the system is multiplied by a factor 6/7 or 8/7 respectively due to the respective reduction of signal bandwidth, see Clause 2.1.39.

To achieve these requirements an OFDM system with concatenated error correcting coding is being specified.

To maximise commonality with the Satellite baseline specification (see EN 300 421 [2]) and Cable baseline specifications (see EN 300 429 [3]) the outer coding and outer interleaving are common, and the inner coding is common with the Satellite baseline specification. To allow optimal trade off between network topology and frequency efficiency, a flexible guard interval is specified. This will enable the system to support different network configurations, such as large area SFN and single transmitter, while keeping maximum frequency efficiency.

Two modes of operation are defined: a "2k mode" and an "8k mode". The "2k mode" is suitable for single transmitter operation and for small SFN networks with limited transmitter distances. The "8k mode" can be used both for single transmitter operation and for small and large SFN networks.

The system allows different levels of QAM modulation and different inner code rates to be used to trade bit rate versus ruggedness. The system also allows two level hierarchical channel coding and modulation, including uniform and multi-resolution constellation. In this case the functional block diagram of the system shall be expanded to include the modules shown dashed in figure 1 (EN 300 744). The splitter separates the incoming transport stream into two independent MPEG transport streams, referred to as the high-priority and the low-priority stream. These two bitstreams are mapped onto the signal constellation by the Mapper and Modulator which therefore has a corresponding number of inputs.

To guarantee that the signals emitted by such hierarchical systems may be received by a simple receiver the hierarchical nature is restricted to hierarchical channel coding and modulation without the use of hierarchical source coding.

A programme service can thus be "simulcast" as a low-bit-rate, rugged version and another version of higher bit rate and lesser ruggedness. Alternatively, entirely different programmes can be transmitted on the separate streams with different ruggedness. In either case, the receiver requires only one set of the inverse elements: inner de-interleaver, inner decoder, outer de-interleaver, outer decoder and multiplex adaptation. The only additional requirement thus placed on the receiver is the ability for the demodulator/de-mapper to produce one stream selected from those mapped at the sending end.

The price for this receiver economy is that reception can not switch from one layer to another (e.g. to select the more rugged layer in the event of reception becoming degraded) while continuously decoding and presenting pictures and sound. A pause is necessary (e.g. video freeze frame for approximately 0,5 seconds, audio interruption for approximately 0,2 seconds) while the inner decoder and the various source decoders are suitably reconfigured and reacquire lock.

(refer Figure 1 in EN 300 744 for *Functional block diagram of the System*)

2.1.2 *Interfacing*

(refer Clause 4.2)

Interfacing shall be in accordance with the requirements of EN 300 744 Clause 4.2.

2.1.3 *Transport multiplex adaption and randomization for energy dispersal*

(refer Clause 4.3.1)

TS adaption and energy dispersal shall be in accordance with the requirements of EN 300 744 Clause 4.3.1.

2.1.4 *Outer coding and outer interleaving*

(refer Clause 4.3.2)

Outer coding and interleaving shall be in accordance with the requirements of EN 300 744 Clause 4.3.2.

2.1.5 *Inner coding*

(refer Clause 4.3.3)

Inner coding shall be in accordance with the requirements of EN 300 744 Clause 4.3.3.

2.1.6 *Inner interleaving*

(refer Clause 4.3.4)

Inner interleaving shall be in accordance with the requirements of EN 300 744 Clause 4.3.4.

2.1.7 *Signal constellations and mapping*

(refer Clause 4.3.5)

Signal constellations and mapping shall be in accordance with the requirements of EN 300 744 Clause 4.3.5.

2.1.8 *OFDM frame structure*

(replace Clause 4.4)

OFDM frame structure (EN 300 744 Clause 4.4.) shall be replaced by the following:

The transmitted signal is organised in frames. Each frame has a duration of T_F, and consists of 68 OFDM symbols.

Four frames constitute one super-frame. Each symbol is constituted by a set of K = 6 817 carriers in the 8k mode and K = 1 705 carriers in the 2k mode and transmitted with a duration T_S. It is composed by parts: a useful part with duration T_U and a guard interval with a duration Δ. The guard interval consists in a cyclic continuation of the useful part, T_U, and is inserted before it. Four values of guard intervals may be used according to table 5 where the different values are given both in multiples of the elementary period T = 1/8 μs and in microseconds.

The symbols in an OFDM frame are numbered from 0 to 67. All symbols contain data and reference information.

Since the OFDM signal comprises many separately-modulated carriers, each symbol can in turn be considered to be divided into cells, each corresponding to the modulation carried on one carrier during one symbol.

In addition to the transmitted data an OFDM frame contains:

- Scattered pilot cells;
- Continual pilot carriers;
- TPS carriers.

The pilots can be used for frame synchronisation, frequency synchronisation, time synchronisation, channel estimation, transmission mode identification and can also be used to follow the phase noise.

The carriers are indexed by $k \in [K_{min}; K_{max}]$ and determined by K_{min} = 0 and K_{max} = 1 704 in 2k mode and 6 816 in 8k mode respectively. The spacing between adjacent carriers is $1/T_U$ while the spacing between carriers K_{min} and K_{max} are determined by $(K-1)/T_U$. The numerical values for the OFDM parameters for the 8k and 2k modes are given in table 2.1.

(replace Table 4 *Numerical values for the OFDM parameters for the 8k and 2k mode*)

Numerical values for the OFDM parameters for the 8k and 2k mode (EN 300 744 Table 4) shall be replaced by the following:

Table 2.1: Numerical values for the OFDM parameters for the 8k and 2k mode

Parameter	8k mode	2k mode
Number of carriers K	6 817	1 705
Value of carrier number K_{min}	0	0
Value of carrier number K_{max}	6 816	1 704
Duration T_U	1024 µs	256 µs
Carrier spacing $1/T_U$ (note 1) (note 2)	*0,976563 Hz*	3,90625 *Hz*
Spacing between carriers K_{min} and K_{max} $(K-1)/T_U$ (note 2)	6,65625 *MHz*	6,65625 *MHz*
NOTE 1: Values in italics are approximate values. NOTE 2: Values for 7 MHz channels. Values for 6 and 8 MHz channels are given in Clause 2.1.39		

The emitted signal is described by the following expression:

$$s(t) = \mathrm{Re}\left\{ e^{j2\pi f_c t} \sum_{m=0}^{\infty} \sum_{l=0}^{67} \sum_{k=K_{min}}^{K_{max}} c_{m,l,k} \times \psi_{m,l,k}(t) \right\}$$

where

$$\psi_{m,l,k}(t) = \begin{cases} e^{j\,2\pi\,\frac{k'}{T_U}\,(t-\Delta-l\times T_s-68\times m\times T_s)} \\ 0 \end{cases}$$

$$(l+68\times m)\times T_s \le t \le (l+68\times m+1)\times T_s$$

else

where:

k denotes the carrier number;

l denotes the OFDM symbol number;

m denotes the transmission frame number;

K is the number of transmitted carriers;

T_S is the symbol duration;

T_U is the inverse of the carrier spacing;

Δ is the duration of the guard interval;

f_c is the central frequency of the RF signal;

k' is the carrier index relative to the centre frequency, $k' = k - (K_{max} + K_{min}) / 2$;

$c_{m,0,k}$ complex symbol for carrier k of the Data symbol no. 1 in frame number m;

$c_{m,1,k}$ complex symbol for carrier k of the Data symbol no. 2 in frame number m;

...

$c_{m,67,k}$ complex symbol for carrier k of the Data symbol no. 68 in frame number m.

(replace Table 5 *Duration of symbol part for the allowed guard intervals*)

Duration of symbol part for the allowed guard intervals (EN 300 744 Table 5) shall be replaced by the following:

Table 2.2: Duration of symbol part for the allowed guard intervals

Mode	**8k mode**				**2k mode**			
Guard interval Δ / T_U	1/4	1/8	1/16	1/32	1/4	1/8	1/16	1/32
Duration of symbol part T_U	8 192 × T 1024 µs (note)				2 048 × T 256 µs (note)			
Duration of guard interval Δ	2 048 × T 256 µs	1 024 × T 128 µs	512 × T 64 µs	256 × T 32 µs	512 × T 64µs	256 × T 32 µs	128 × T 16 µs	64 × T 8 µs
Symbol duration $T_S = \Delta + T_U$	10 240 × T 1280 µs	9 216 × T 1152 µs	8 704 × T 1088 µs	8 448 × T 1056 µs	2 560 × T 320 µs	2 304 × T 288 µs	2 176 × T 272µs	2 112 × T 264 µs
NOTE: Values for 7 MHz channels. Values for 6 and 8 MHz channels are given in Clause 2.1.39								

The $c_{m,l,k}$ values are normalised modulation values of the constellation point z (see figure 9 – EN 300 744) according to the modulation alphabet used for the data. The normalisation factors yield $E[c \times c^*] = 1$ and are shown in table 2.3.

(replace Table 6 *Normalization factors for data symbols*)

Normalization factors for data symbols (EN 300 744 Table 6) shall be replaced by the following:

Table 2.3: Normalization factors for data symbols

Modulation scheme		**Normalization factor**
QPSK		$c = z/\sqrt{2}$
16-QAM	$\alpha = 1$	$c = z/\sqrt{10}$
	$\alpha = 2$	$c = z/\sqrt{20}$
	$\alpha = 4$	$c = z/\sqrt{52}$
64-QAM	$\alpha = 1$	$c = z/\sqrt{42}$
	$\alpha = 2$	$c = z/\sqrt{60}$
	$\alpha = 4$	$c = z/\sqrt{108}$

2.1.9 *Reference signals*

(refer Clause 4.5)

Reference signals shall be in accordance with the requirements of EN 300 744 Clause 4.5.

2.1.10 *Functions and derivation*

(replace Clause 4.5.1)

Functions and derivation (EN 300 744 Clause 4.5.1.) shall be replaced by the following:

Various cells within the OFDM frame are modulated with reference information whose transmitted value is known to the receiver. Cells containing reference information are transmitted at "boosted" power level (see subclause 2.1.14).

The information transmitted in these cells are scattered or continual pilot cells.

Each continual pilot coincides with a scattered pilot every fourth symbol; the number of useful data carriers is constant from symbol to symbol: 1 512 useful carriers in 2k mode and 6 048 useful carriers in 8k mode. The number of continual pilots per symbol remains constant whereas the number of scattered pilots varies between symbols in the pattern shown in Figure 11. The number of occasions continual pilots coincide with the scattered pilots varies between symbols and has a pattern of 12, 11, 11, 11, 12 (45, 44, 44, 44, 45) for 2K (8K).

The value of the scattered or continual pilot information is derived from a PRBS (Pseudo Random Binary Sequence) which is a series of values, one for each of the transmitted carriers (see subclause 2.1.11).

2.1.11 *Definition of reference sequence*

(refer Clause 4.5.2)

Definition of reference sequences shall be in accordance with the requirements of EN 300 744 Clause 4.5.2.

2.1.12 *Location of Scattered Pilot Cells*

(replace Clause 4.5.3)

Location of Scattered Pilot Cells (EN 300 744 Clause 4.5.3.) shall be replaced by the following:

Reference information, taken from the reference sequence, is transmitted in scattered pilot cells in every symbol. Scattered pilot cells are always transmitted at the "boosted" power level (see subclause 2.1.14). Thus the corresponding modulation is given by:

$$\mathrm{Re}\{c_{m,l,k}\} = 4 / 3 \times 2 (½ - w_k)$$
$$\mathrm{Im}\{c_{m,l,k,}\} = 0$$

Where m is the frame index, k is the frequency index of the carriers and l is the time index of the symbols.

For the symbol of index l (ranging from 0 to 67), carriers for which index k belongs to the subset
$\{k = K_{min} + 3 \times (l \bmod 4) + 12p \mid p \text{ integer}, p \geq 0, k \in [K_{min}; K_{max}] \}$ are scattered pilots.

Where p is an integer that takes all possible values greater than or equal to zero, provided that the resulting value
for k does not exceed the valid range $[K_{min};K_{max}]$.

The pilot insertion pattern is shown in figure 2.1.

(replace Figure 11 *Frame structure*)

Frame structure (EN 300 744 Figure 11) shall be replaced by the following:

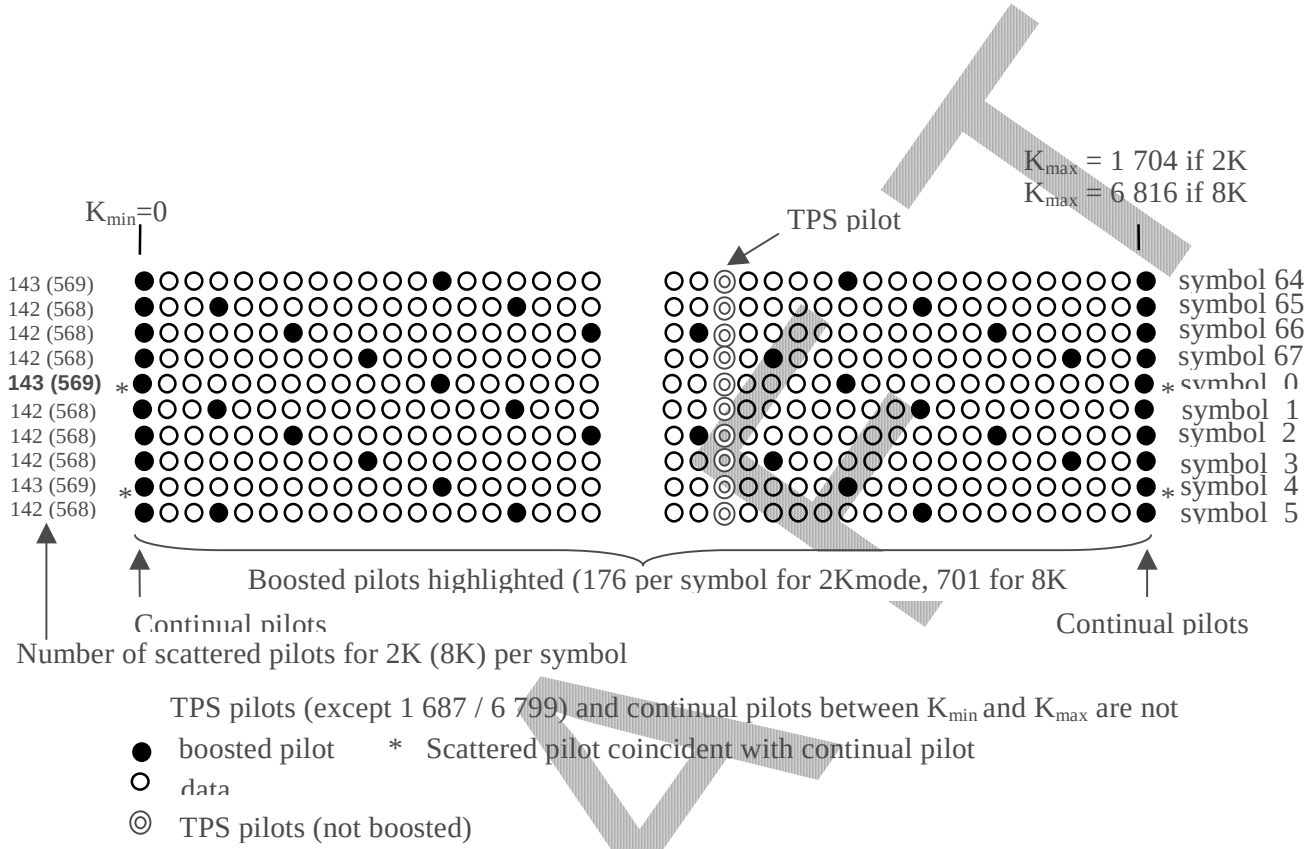


Figure 2.1: Frame Structure

2.1.13 *Location of continual pilot carriers*

(refer Clause 4.5.4)

Location of continual pilot carriers shall be in accordance with the requirements of EN 300 744 Clause 4.5.4.

2.1.14 *Amplitudes of all reference information*

(replace Clause 4.5.5)

Amplitudes of reference information (EN 300 744 Clause 4.5.5.) shall be replaced by the following:

As explained in subclause 2.1.8 the modulation of all data cells is normalised so that $E[c \times c*] = 1$.

All cells which are continual or scattered pilots, i.e. they are members of the sets defined in subclauses 2.1.12 or 2.1.13, are transmitted at boosted power so that for these $E[c \times c*] = 16/9$ (2,5 dB higher)

2.1.15 *Transmission Parameter Signalling (TPS)*

(refer Clause 4.6)

Transmission parameter signalling shall be in accordance with the requirements of EN 300 744 Clause 4.6.

2.1.16 *Scope of the TPS*

(refer Clause 4.6.1)

Scope of TPS shall be in accordance with the requirements of EN 300 744 Clause 4.6.1.

2.1.17 *TPS transmission format*

(replace Clause 4.6.2)

TPS transmission format (EN 300 744 Clause 4.6.2.) shall be replaced by the following:

The transmission parameter information shall be transmitted as shown in table 2.4.

The mapping of each of the transmission parameters: constellation characteristics, α value, code rate(s), super-frame indicator, guard interval, transmission mode, and bandwidth onto the bit combinations is performed according to subclauses 2.1.18 to 2.1.27.

The left most bit is sent first.

(replace Table 9 *TPS signalling information and format*)

TPS signalling information and format (EN 300 744 Table 9) shall be replaced by the following:

Table 2.4: TPS signalling information and format

Bit number	Format	Purpose/Content
s_0	see subclause 2.1.18	Initialisation
s_1- s_{16}	0011010111101110 or 1100101000010001	Synchronisation word
s_{17} - s_{22}	010 111	Length indicator
s_{23}, s_{24}	see table 10*	Frame number
s_{25}, s_{26}	see table 11*	Constellation
s_{27}, s_{28}, s_{29}	see table 12*	Hierarchy information
s_{30}, s_{31}, s_{32}	see table 13*	Code rate, HP stream
s_{33}, s_{34}, s_{35}	see table 13*	Code rate, LP stream
s_{36}, s_{37}	see table 14*	Guard interval
s_{38}, s_{39}	see table 15*	Transmission mode
s_{40} – s_{41}	see table 2.5	Bandwidth
S_{42} - s_{53}	All set to "0"	Reserved for future use
s_{54} - s_{67}	BCH code	Error protection

* refer EN 300 744

The TPS information transmitted in super-frame m' bits s_{25} - s_{39} always apply to super-frame m' + 1, whereas all other bits refer to super-frame m'.

2.1.18 *Initialization*

(refer Clause 4.6.2.1)

Initialization shall be in accordance with the requirements of EN 300 744 Clause 4.6.2.1.

2.1.19 *Synchronization*

(refer Clause 4.6.2.2)

Synchronization shall be in accordance with the requirements of EN 300 744 Clause 4.6.2.2.

2.1.20 *TPS length indicator*

(refer Clause 4.6.2.3)

TPS length indicator shall be in accordance with the requirements of EN 300 744 Clause 4.6.2.3.

2.1.21 *Frame number*

(refer Clause 4.6.2.4)

Frame number shall be in accordance with the requirements of EN 300 744 Clause 4.6.2.4.

2.1.22 *Constellation*

(refer Clause 4.6.2.5)

Constellation shall be in accordance with the requirements of EN 300 744 Clause 4.6.2.5.

2.1.23 *Hierarchy information*

(refer Clause 4.6.2.6)

Hierarchy information shall be in accordance with the requirements of EN 300 744 Clause 4.6.2.6.

2.1.24 *Code rates*

(refer Clause 4.6.2.7)

Code rates shall be in accordance with the requirements of EN 300 744 Clause 4.6.2.7.

2.1.25 *Guard intervals*

(refer Clause 4.6.2.8)

Guard intervals shall be in accordance with the requirements of EN 300 744 Clause 4.6.2.8.

2.1.26 *Transmission mode*

(refer Clause 4.6.2.9)

Transmission mode shall be in accordance with the requirements of EN 300 744 Clause 4.6.2.9.

2.1.27 *Error protection of TPS*

(refer Clause 4.6.2.10)

Error protection of TPS shall be in accordance with the requirements of EN 300 744 Clause 4.6.2.10.

2.1.28 *Bandwidth***

Two bits are used to signal the bandwidth of the channel.

Table 2.5 : Signalling formats for channel bandwidth

Bits s_{40}, s_{41}	Bandwidth
00	7MHz
01	8MHz
10	6MHz
11	reserved

2.1.29 *TPS modulation*

(refer Clause 4.6.3)

TPS modulation shall be in accordance with the requirements of EN 300 744 Clause 4.6.3.

2.1.30 *Number of RS-packets per OFDM super-frame*

(replace Clause 4.7)

Number of RS-packets per OFDM super-frame (EN 300 744 Clause 4.7.) shall be replaced by the following:

The OFDM frame structure allows for an integer number of Reed-Solomon 204 byte packets to be transmitted in an OFDM super-frame, and therefore avoids the need for any stuffing, whatever the constellation, the guard interval length, the coding rate or the channel bandwidth may be. See table 2.6.

The first data byte transmitted in an OFDM super-frame shall be one of the SYNC/ $\overline{\text{SYNC}}$ bytes.

(replace Table 16 *Number of Reed-Solomon packets per OFDM super-frame for all combinations of guard interval, code rates and modulation forms*)

Number of Reed-Solomon packets per OFDM super-frame for all combinations of guard interval, code rates and modulation forms (EN 300 744 Table 16) shall be replaced by the following:

Table 2.6: Number of Reed-Solomon packets per OFDM super-frame for all combinations of guard interval, code rates and modulation forms

Code rate	QPSK		16-QAM		64-QAM	
	2k mode	8k mode	2k mode	8k mode	2k mode	8k mode
1/2	252	1008	504	2016	756	3024
2/3	336	1344	672	2688	1008	4032
3/4	378	1512	756	3024	1134	4536
5/6	420	1680	840	3360	1260	5040
7/8	441	1764	882	3528	1323	5292

(replace Table 17 *Useful bitrate (Mbit/s) for all combinations of guard interval, constellation and code rate for non-hierarchical systems*)

Useful bitrate (Mbit/s) for all combinations of guard interval, constellation and code rate for non-hierarchical systems (EN 300 744 Table 17) shall be replaced by the following:

Table 2.7: Useful bitrate (Mbit/s) for all combinations of guard interval, constellation and code rate for non-hierarchical systems

Modulation	Code rate	Guard interval			
		1/4	1/8	1/16	1/32
QPSK	1/2	*4,354*	*4,838*	*5,123*	*5,278*
	2/3	*5,806*	*6,451*	*6,830*	*7,037*
	3/4	*6,532*	*7,257*	*7,684*	*7,917*
	5/6	*7,257*	*8,064*	*8,538*	*8,797*
	7/8	*7,620*	*8,457*	*8,965*	*9,237*
16-QAM	1/2	*8,709*	*9,676*	*10,246*	*10,556*
	2/3	*11,612*	*12,902*	*13,661*	*14,075*
	3/4	*13,063*	*14,515*	*15,369*	*15,834*
	5/6	*14,515*	*16,127*	*17,076*	*17,594*
	7/8	*15,240*	*16,934*	*17,930*	*18,473*
64-QAM	1/2	*13,063*	*14,515*	*15,369*	*15,834*
	2/3	*17,418*	*19,353*	*20,491*	*21,112*
	3/4	*19,595*	*21,772*	*23,053*	*23,751*
	5/6	*21,772*	*24,191*	*25,614*	*26,390*
	7/8	*22,861*	*25,401*	*26,895*	*27,710*

NOTE: Figures in italics are approximate values. Values for 7 MHz channels. Values for 6 and 8 MHz channels are given in Clause 2.1.39.

For the hierarchical schemes the useful bit rates can be obtained from table 2.7 as follows:
HP stream: figures from QPSK columns;
LP stream, 16 QAM: figures from QPSK columns;
LP stream, 64 QAM: figures from 16 QAM columns.

2.1.31 *Spectrum characteristics and spectrum mask*

(refer Clause 4.8)

Spectrum characteristics and spectrum mask shall be in accordance with the requirements of EN 300 744 Clause 4.8.

2.1.32 *Spectrum characteristics for 7MHz*

(replace Clause 4.8.1)

Spectrum characteristics (EN 300 744 Clause 4.8.1.) shall be replaced by the following:

The OFDM symbols constitute a juxtaposition of equally-spaced orthogonal carriers. The amplitudes and phases of the data cell carriers are varying symbol by symbol according to the mapping process described in subclause 2.1.7.

The power spectral density $P_k(f)$ of each carrier at frequency:

$$f_k = f_c + \frac{k'}{T_U}$$

$$k' = k - (K_{max} + K_{min})/2; \quad (K_{min} \le k \le K_{max})$$

is defined by the following expression:

$$P_k(f) = \left[\frac{\sin \pi \times (f - f_k) \times T_s}{\pi \times (f - f_k) \times T_s}\right]^2$$

The overall power spectral density of the modulated data cell carriers is the sum of the power spectral densities of all these carriers, plus the modification due to the boosted level of the reference carriers. A theoretical DVB transmission signal spectrum is illustrated in figure 2.2 (for *7* MHz channels). Because the OFDM symbol duration is larger than the inverse of the carrier spacing, the main lobe of the power spectral density of each carrier is narrower than twice the carrier spacing. Therefore the spectral density is not constant within the nominal bandwidth of *6,657 227* MHz for the 8k mode *or 6,660 156* MHz for the 2k mode (see note).

NOTE: Values in italics are approximate values.

(replace Figure 12 *Theoretical DVB transmission signal spectrum for guard interval $\Delta = T_u$ /32 (for 7 MHz channels)*)

Theoretical DVB transmission signal spectrum for guard interval $\Delta = T_u$ /32 (for 7 MHz channels) (EN 300 744 Figure 12) shall be replaced by the following:

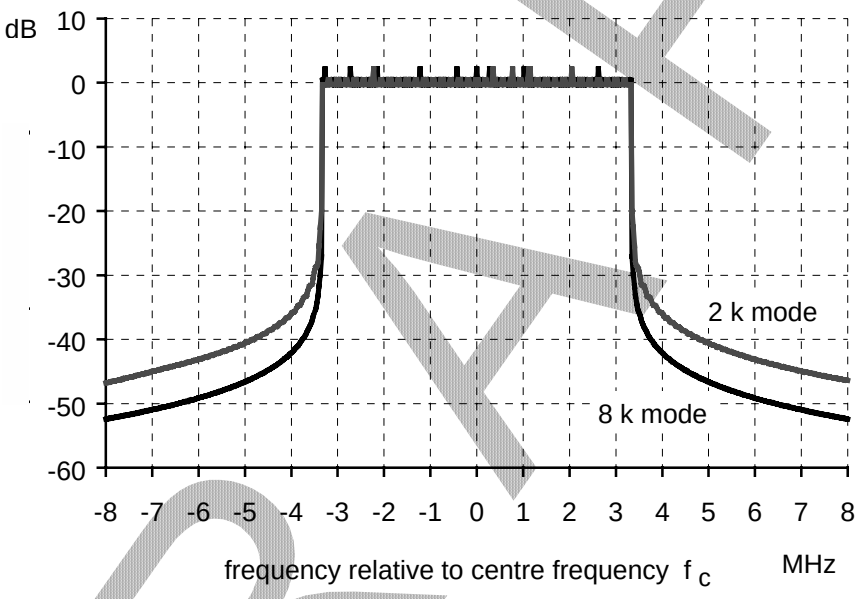


Figure 2.2: Theoretical DVB transmission signal spectrum for guard interval $\Delta = T_u$ /32 (for *7* MHz channels)

2.1.33 *Spectrum mask (for 7 MHz channels)*

(replace Clause 4.8.2)

Out-of-band spectrum mask (EN 300 744 Clause 4.8.2.) shall be replaced by the following:

To control the interference into Analogue or Digital services from a Digital service, the level of the spectrum at frequencies outside the nominal bandwidth of the interfering Digital service, can be reduced by applying the appropriate filtering or by reducing the interfering Digital service power.

Spectrum masks for cases where a transmitter for digital terrestrial television is co-located with, and operating on a channel adjacent to :

(A) A transmitter for analogue television are given in figure 2.3 and table 2.8 for analogue television system B / PAL / A2.

(B) A transmitter for digital television are given in figure 2.4 and table 2.9 for COFDM digital television with a modulation mode of 64QAM with an FEC of 2/3.

The masks shown in figure 2.3 and 2.4 cover the minimum protection needed for analogue and digital television where the analogue and the digital television transmitters are co-located and are applicable for cases where:

- no polarisation discrimination between digital and analogue television is used.

The masks are to be used for the comparison of ERP's of the wanted and unwanted services. Such comparison may be provided from calculation from the actual transmitter spectrum output and antenna system gains.

The masks provide the limit to the power and the out of band products of the unwanted Digital service. The mask levels are fixed in relationship to the wanted service, hence the actual mask of the interfering service must be derived from the actual operating power of the interfering service and its relationship to the wanted analogue or digital service.

(replace Figure 13 *Spectrum mask for a digital terrestrial television transmitter operating with a co-located lower or upper adjacent channel analogue television transmitter*)

Spectrum mask for a digital terrestrial television transmitter operating with a co-located lower or upper adjacent channel analogue television transmitter (EN 300 744 Figure 13) shall be replaced by the following:

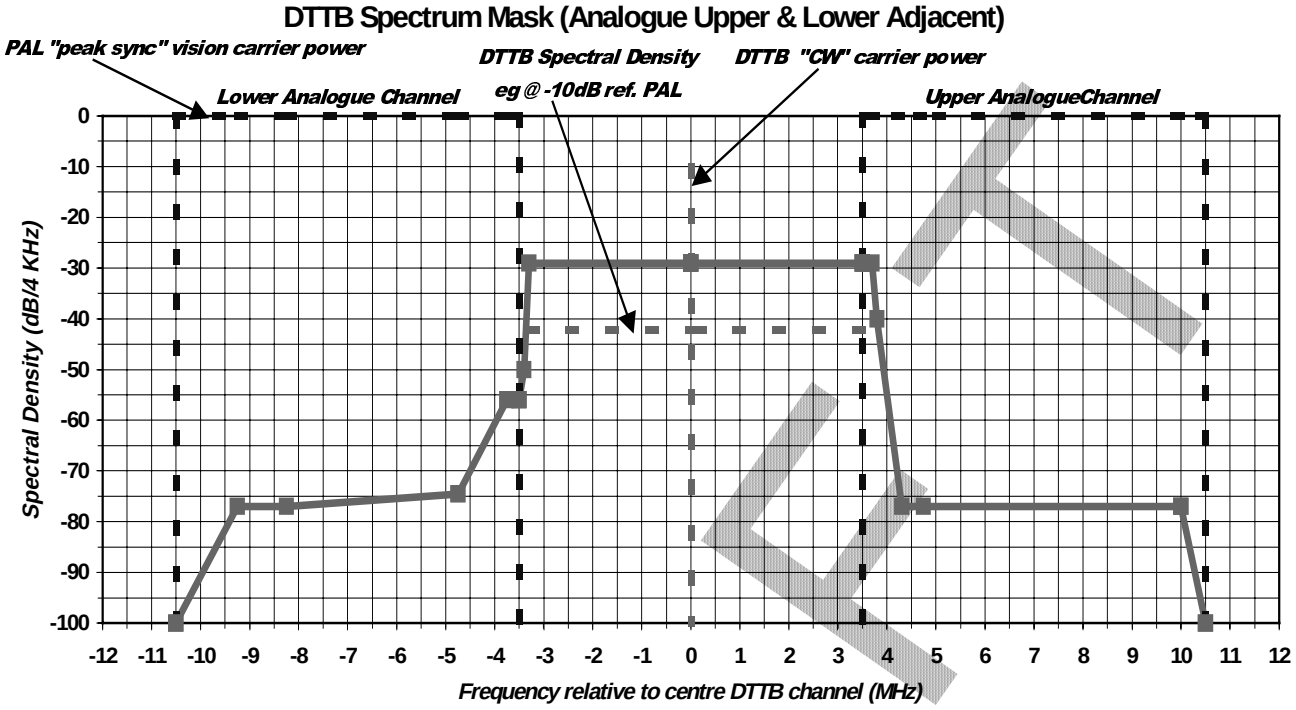


Figure 2.3 : Spectrum mask for a digital terrestrial television transmitter operating with a co-located lower or upper adjacent channel analogue television transmitter

(replace Table 18 *Breakpoints for spectrum mask*)

Breakpoints for spectrum mask (EN 300 744 Table 18) shall be replaced by the following:

Table 2.8: Breakpoints for spectrum mask

.1.a.i.A.1 Lower Breakpoints

Relative frequency (- MHz)	**0**	**3,3**	**3,4**	**3,5**	**3,51**	**3,75**	**4,75**	**8,25**	**9,25**	**10,25**
Relative level (dB / 4 kHz)	**-29**	**-29**	**-50**	**-56**	**-56**	**-56**	**-74.5**	**-77**	**-77**	**-77**

.1.a.i.A.2 Upper Breakpoints

Relative frequency (MHz)	**0**	**3,5**	**3,7**	**3,8**	**4,7**	**4,75**	**10**	**10,5**
Relative level (dB / 4 kHz)	**-29**	**-29**	**-29**	**-40**	**-77**	**-77**	**-77**	**-100**

(replace Figure 14 *Spectrum mask for a digital terrestrial television transmitter operating with a co-located lower or upper adjacent channel digital terrestrial television transmitter*)

Spectrum mask for a digital terrestrial television transmitter operating with a co-located lower or upper adjacent channel digital terrestrial television transmitter (EN 300 744 Figure 14) shall be replaced by the following:

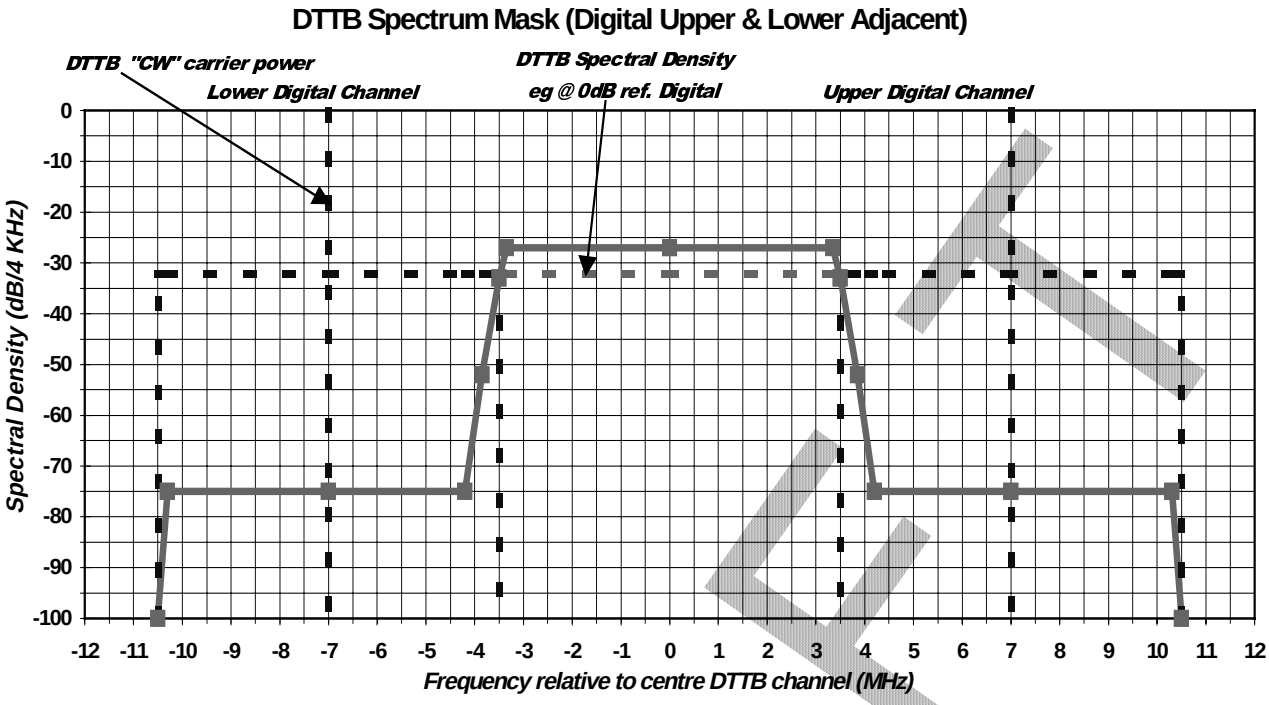


Figure 2.4 : Spectrum mask for a digital terrestrial television transmitter operating with a co-located lower or upper adjacent channel digital terrestrial television transmitter

(replace Table 19 *Breakpoints for spectrum mask*)

Breakpoints for spectrum mask (EN 300 744 Table 19) shall be replaced by the following:

Table 2.9 : Breakpoints for spectrum mask

BREAKPOINTS								
Relative frequency (+/- MHz)	**0**	**3,35**	**3,5**	**3,85**	**4,2**	**7**	**10,3**	**10,5**
Relative level (dB / 4 kHz)	**-27**	**-27**	**-33**	**-52**	**-75**	**-75**	**-75**	**-100**

2.1.34 *Centre frequency of RF signal*

(replace Clause 4.8.3)

Centre frequency of RF signal (EN 300 744 Clause 4.8.3.) shall be replaced by the following:

In Australia DTTB transmissions will be based upon a 7 MHz channel spectrum plan for both VHF Band III (CH6-12) and UHF Band IV / V (CH27 – 69). The transmissions will be nominally centred in the channel with the exact location determined by both analogue PAL and DTTB offset requirements. The centre frequency can be calculated form the channel frequency limits in the particular location.

For nominal channel limits and for possible variations to the nominal 7 MHz bandwidth refer to the Australian Broadcasting Planning Handbook for Digital Terrestrial Television Broadcasting (The DTTB Handbook) available from the Australian Broadcasting Authority .

2.1.35 *Simulated system performance for 7MHz channels*

(refer Annex A)

Simulated system performance (EN 300 744 Annex A.) shall be replaced by the following:

Tables 2.10, 2.11 and 2.12 give simulated performance anticipating "perfect channel estimation and without phase noise" of channel coding and modulation combinations, and are subject to confirmation by testing.

These results are given for the Gaussian channel, Ricean channel (F_1) and Rayleigh channel (P_1). F_1 and P_1 are described in Clause 2.1.36.

Associated useful bit rates available are also indicated as a function of the guard interval to active symbol duration for the four different values of guard interval.

(replace Table A1 *Required C/N for non-hierarchical transmission to achieve a BER = 2×10^{-4} after the Viterbi decoder for all combinations of coding rates and modulation types. The net bit rates after the Reed-Solomon decoder are also listed*)

Required C/N for non-hierarchical transmission to achieve a BER = 2×10^{-4} after the Viterbi decoder for all combinations of coding rates and modulation types. The net bit rates after the Reed-Solomon decoder are also listed (EN 300 744 Table A1) shall be replaced by the following:

Table 2.10: Required C/N for non-hierarchical transmission to achieve a BER = 2×10^{-4} after the Viterbi decoder for all combinations of coding rates and modulation types. The net bit rates after the Reed-Solomon decoder are also listed

		Required C/N for BER = 2×10^{-4} after Viterbi QEF after Reed-Solomon			Bitrate (Mbit/s)			
Modu-lation	**Code rate**	**Gaussian Channel**	**Ricean channel (F_1)**	**Rayleigh channel (P_1)**	**Δ/T_U = 1/4**	**Δ/T_U = 1/8**	**Δ/T_U = 1/16**	**Δ/T_U = 1/32**
QPSK	**1/2**	***3,1***	***3,6***	***5,4***	*4,354*	*4,838*	*5,123*	*5,278*
QPSK	**2/3**	***4,9***	***5,7***	***8,4***	*5,806*	*6,451*	*6,830*	*7,037*
QPSK	**3/4**	***5,9***	***6,8***	***10,7***	*6,532*	*7,257*	*7,684*	*7,917*
QPSK	**5/6**	***6,9***	***8,0***	***13,1***	*7,257*	*8,064*	*8,538*	*8,797*
QPSK	**7/8**	***7,7***	***8,7***	***16,3***	*7,620*	*8,467*	*8,965*	*9,237*
16-QAM	**1/2**	***8,8***	***9,6***	***11,2***	*8,709*	*9,676*	*10,246*	*10,556*
16-QAM	**2/3**	***11,1***	***11,6***	***14,2***	*11,612*	*12,902*	*13,661*	*14,075*
16-QAM	**3/4**	***12,5***	***13,0***	***16,7***	*13,063*	*14,515*	*15,369*	*15,834*
16-QAM	**5/6**	***13,5***	***14,4***	***19,3***	*14,515*	*16,127*	*17,076*	*17,594*
16-QAM	**7/8**	***13,9***	***15,0***	***22,8***	*15,240*	*16,934*	*17,930*	*18,473*
64-QAM	**1/2**	***14,4***	***14,7***	***16,0***	*13,063*	*14,515*	*15,369*	*15,834*
64-QAM	**2/3**	***16,5***	***17,1***	***19,3***	*17,418*	*19,353*	*20,491*	*21,112*
64-QAM	**3/4**	***18,0***	***18,6***	***21,7***	*19,595*	*21,772*	*23,053*	*23,751*
64-QAM	**5/6**	***19,3***	***20,0***	***25,3***	*21,772*	*24,191*	*25,614*	*26,390*
64-QAM	**7/8**	***20,1***	***21,0***	***27,9***	*22,861*	*25,401*	*26,895*	*27,710*

NOTE: Figures in italics are approximate values.

Quasi Error Free (QEF) means less than one uncorrected error event per hour, corresponding to BER = 10^{-11} at the input of the MPEG-2 demultiplexer.

(replace Table A2 *Required C/N for hierarchical transmission to achieve a BER = 2×10^{-4} after Viterbi decoder*)

Required C/N for hierarchical transmission to achieve a BER = 2×10^{-4} after Viterbi decoder (EN 300 744 Table A2) shall be replaced by the following:

Table 2.11: Required C/N for hierarchical transmission to achieve a BER = 2×10^{-4} after Viterbi decoder

			Required C/N for BER = 2×10^{-4} after Viterbi QEF after Reed-Solomon			Bitrate (Mbit/s)			
Modulation	**Code Rate**	α	**Gaussian Channel**	**Ricean Channel (F_1)**	**Rayleigh Channel (P_1)**	Δ/T_U = 1/4	Δ/T_U = 1/8	Δ/T_U = 1/16	Δ/T_U = 1/32
	1/2		*4,8*	*5,4*	*6,9*	*4,354*	*4,838*	*5,123*	*5,278*
QPSK	2/3		*7,1*	*7,7*	*9,8*	*5,806*	*6,451*	*6,830*	*7,037*
	3/4		*8,4*	*9,0*	*11,8*	*6,532*	*7,257*	*7,684*	*7,917*
in		2				+			
	1/2		*13,0*	*13,3*	*14,9*	*4,354*	*4,838*	*5,123*	*5,278*
non-	2/3		*15,1*	*15,3*	*17,9*	*5,806*	*6,451*	*6,830*	*7,037*
uniform	3/4		*16,3*	*16,9*	*20,0*	*6,532*	*7,257*	*7,684*	*7,917*
16-QAM	5/6		*16,9*	*17,8*	*22,4*	*7,257*	*8,064*	*8,538*	*8,797*
	7/8		*17,9*	*18,7*	*24,1*	*7,620*	*8,467*	*8,965*	*9,237*
	1/2		*3,8*	*4,4*	*6,0*	*4,354*	*4,838*	*5,123*	*5,278*
QPSK	2/3		*5,9*	*6,6*	*8,6*	*5,806*	*6,451*	*6,830*	*7,037*
	3/4		*7,1*	*7,9*	*10,7*	*6,532*	*7,257*	*7,684*	*7,917*
in		4				+			
	1/2		*17,3*	*17,8*	*19,6*	*4,354*	*4,838*	*5,123*	*5,278*
non-	2/3		*19,1*	*19,6*	*22,3*	*5,806*	*6,451*	*6,830*	*7,037*
uniform	3/4		*20,1*	*20,8*	*24,2*	*6,532*	*7,257*	*7,684*	*7,917*
16-QAM	5/6		*21,1*	*22,0*	*26,0*	*7,257*	*8,064*	*8,538*	*8,797*
	7/8		*21,9*	*22,8*	*28,5*	*7,620*	*8,467*	*8,965*	*9,237*

NOTE: Figures in italics are approximate values.

Results for QPSK in non-uniform 64-QAM with α = 4 are not included due to the poor performance of the 64-QAM signal.

(replace Table A3 *Required C/N for hierarchical transmission to achieve a BER = 2 x 10^{-4} after Viterbi decoder*)

Required C/N for hierarchical transmission to achieve a BER = 2 x 10^{-4} after Viterbi decoder (EN 300 744 Table A3) shall be replaced by the following:

Table 2.12: Required C/N for hierarchical transmission to achieve a BER = 2 x 10^{-4} after Viterbi decoder

Modu-lation	Code Rate	α	Required C/N for BER = 2 x 10^{-4} after Viterbi QEF after Reed-Solomon			Bitrate (Mbit/s)			
			Gaussian Channel	Ricean Channel (F_1)	Rayleigh Channel (P_1)	Δ/T_U = 1/4	Δ/T_U = 1/8	Δ/T_U = 1/16	Δ/T_U = 1/32
QPSK	1/2	1	*8,9*	*9,5*	*11,4*	*4,354*	*4,838*	*5,123*	*5,278*
	2/3		*12,1*	*12,7*	*14,8*	*5,806*	*6,451*	*6,830*	*7,037*
	3/4		*13,7*	*14,3*	*17,5*	*6,532*	*7,257*	*7,684*	*7,917*
in						+			
	1/2		*14,6*	*14,9*	*16,4*	*8,709*	*9,676*	*10,246*	*10,556*
uniform	2/3		*16,9*	*17,6*	*19,4*	*11,612*	*12,902*	*13,661*	*14,075*
64-QAM	3/4		*18,6*	*19,1*	*22,2*	*13,063*	*14,515*	*15,369*	*15,834*
	5/6		*20,1*	*20,8*	*25,8*	*14,515*	*16,127*	*17,076*	*17,594*
	7/8		*21,1*	*22,2*	*27,6*	*15,240*	*16,934*	*17,930*	*18,473*
QPSK	1/2	2	*6,5*	*7,1*	*8,7*	*4,354*	*4,838*	*5,123*	*5,278*
	2/3		*9,0*	*9,9*	*11,7*	*5,806*	*6,451*	*6,830*	*7,037*
	3/4		*10,8*	*11,5*	*14,5*	*6,532*	*7,257*	*7,684*	*7,917*
in						+			
	1/2		*16,3*	*16,7*	*18,2*	*8,709*	*9,676*	*10,246*	*10,556*
non-	2/3		*18,9*	*19,5*	*21,7*	*11,612*	*12,902*	*13,661*	*14,075*
uniform	3/4		*21,0*	*21,6*	*24,5*	*13,063*	*14,515*	*15,369*	*15,834*
64-QAM	5/6		*21,9*	*22,7*	*27,3*	*14,515*	*16,127*	*17,076*	*17,594*
	7/8		*22,9*	*23,8*	*29,6*	*15,240*	*16,934*	*17,930*	*18,473*

NOTE: Figures in italics are approximate values.

Results for QPSK in non-uniform 64-QAM with α = 4 are not included due to the poor performance of the 64-QAM signal.

2.1.36 *Definition of P_1 and F_1*

(refer Annex B)

Definition of P1 and F1 shall be in accordance with the requirements of EN 300 744 Annex B.

2.1.37 *Interleaving example*

(refer Annex C)

Interleaving example shall be in accordance with the requirements of EN 300 744 Annex C.

2.1.38 *Guidelines for implementation of the emitted signal*

(refer Annex D)

Guidelines for implementation shall be in accordance with the requirements of EN 300 744 Annex D.

2.1.39 *Values for 6 and 7 MHz channels***

Values for 6 and 7 MHz channels is to be proposed as an Annex E to EN 300 744.

Values for 6, 7 and 8 MHz channels (Normative).

The system can be scaled to 6 or 7 MHz channels by changing the clock frequency from 64/7 MHz for 8 MHz channels to 48/7 MHz for 6 MHz channels and 8,0 MHz for 7 MHz channels. i.e. the elementary period is changed from T = 7/64 uS for 8 MHz to T = 7/48 µs for 6 MHz channels and T = 1/8 µs for 7 MHz channels.

The frame structure and the rules for coding, mapping and interleaving are kept. The change of sampling frequency results in change of the carrier spacing, the symbol length, the guard interval length and the useful bit rate as given in tables below.

Australia will be implementing a 7 MHz bandwidth system. There may be a requirement for a 6 MHz system. The 8 MHz parameters have been included for comparison.

Table 2.13: Numerical values for the OFDM parameters for the 8k and 2k modes for 6 MHz channels

Parameter	8k mode	2k mode
Number of carriers K	6 817	1 705
Value of carrier number K_{min}	0	0
Value of carrier number K_{max}	6 816	1 704
Duration T_U	*1194,667 µs*	*298,667 µs*
Carrier spacing $1/T_U$	*8 371 Hz*	*3 348 Hz*
Spacing between carriers K_{min} and K_{max}, $(K-1)/T_U$	*5,71 MHz*	*5,71 MHz*
NOTE : Values in italics are approximate values.		

Table 2.14: Numerical values for the OFDM parameters for the 8k and 2k modes for 7 MHz channels

Parameter	8k mode	2k mode
Number of carriers K	6 817	1 705
Value of carrier number K_{min}	0	0
Value of carrier number K_{max}	6 816	1 704
Duration T_U	1024 µs	256 µs
Carrier spacing $1/T_U$	*9 766 Hz*	*3 906 Hz*
Spacing between carriers K_{min} and K_{max}, $(K-1)/T_U$	*6,66 MHz*	*6,66 MHz*
NOTE : Values in italics are approximate values.		

Table 2.15: Numerical values for the OFDM parameters for the 8k and 2k mode for 8 MHz channels

Parameter	8k mode	2k mode
Number of carriers K	6 817	1 705
Value of carrier number K_{min}	0	0
Value of carrier number K_{max}	6 816	1 704
Duration T_U	896 µs	224 µs
Carrier spacing $1/T_U$ (note 1) (note 2)	*1 116 Hz*	*4 464 Hz*
Spacing between carriers K_{min} and K_{max} $(K-1)/T_U$ (note 2)	*7,61 MHz*	*7,61 MHz*
NOTE : Values in italics are approximate values.		

Table 2.16: Duration of symbol part for the allowed guard intervals for 6 MHz channels

Mode	8k mode				2k mode			
Guard interval Δ / T_U	1/4	1/8	1/16	1/32	1/4	1/8	1/16	1/32
Duration of symbol part T_U	$8192 \times T$ *1194,667 µs*				$2048 \times T$ *298,667 µs*			
Duration of guard Interval Δ	$2\,048 \times T$ *298,667µs*	$1\,024 \times T$ *149,333 µs*	$512 \times T$ *74,667 µs*	$256 \times T$ *37,333 µs*	$512 \times T$ *74,667 µs*	$256 \times T$ *37,333 µs*	$128 \times T$ *18,667 µs*	$64 \times T$ *9,333 µs*
Symbol duration $T_S = \Delta + T_U$	$10\,240 \times T$ *1493,3 µs*	$9\,216 \times T$ *1344 µs*	$8\,704 \times T$ *1269,3 µs*	$8\,448 \times T$ *1232 µs*	$2\,560 \times T$ *373,3 µs*	$2\,304 \times T$ *336 µs*	$2\,176 \times T$ *317,3 µs*	$2\,112 \times T$ *308 µs*
NOTE: Values in italics are approximate values.								

Table 2.17: Duration of symbol part for the allowed guard intervals for 7 MHz channels

Mode	8k mode				2k mode			
Guard interval Δ / T_U	1/4	1/8	1/16	1/32	1/4	1/8	1/16	1/32
Duration of symbol part T_U	$8\,192 \times T$ 1024 µs				$2\,048 \times T$ 256 µs			
Duration of guard Interval Δ	$2\,048 \times T$ 256 µs	$1\,024 \times T$ 128 µs	$512 \times T$ 64 µs	$256 \times T$ 32 µs	$512 \times T$ 64 µs	$256 \times T$ 32 µs	$128 \times T$ 16 µs	$64 \times T$ 8 µs
Symbol duration $T_S = \Delta + T_U$	$10\,240 \times T$ 1280 µs	$9\,216 \times T$ 1152 µs	$8\,704 \times T$ 1088 µs	$8\,448 \times T$ 1056 µs	$2\,560 \times T$ 320 µs	$2\,304 \times T$ 288 µs	$2\,176 \times T$ 272 µs	$2\,112 \times T$ 264 µs

Table 2.18: Duration of symbol part for the allowed guard intervals for 8 MHz channels

Mode	8k mode				2k mode			
Guard interval Δ / T_U	1/4	1/8	1/16	1/32	1/4	1/8	1/16	1/32
Duration of symbol part T_U	$8\,192 \times T$ 896 µs				$2\,048 \times T$ 224 µs			
Duration of guard interval Δ	$2\,048 \times T$ 224 µs	$1\,024 \times T$ 112 µs	$512 \times T$ 56 µs	$256 \times T$ 28 µs	$512 \times T$ 56 µs	$256 \times T$ 28 µs	$128 \times T$ 14 µs	$64 \times T$ 7 µs
Symbol duration $T_S = \Delta + T_U$	$10\,240 \times T$ 1 120 µs	$9\,216 \times T$ 1 008 µs	$8\,704 \times T$ 952 µs	$8\,448 \times T$ 924 µs	$2\,560 \times T$ 280 µs	$2\,304 \times T$ 252 µs	$2\,176 \times T$ 238 µs	$2\,112 \times T$ 231 µs

Table 2.19: Useful bitrate (Mbit/s) for all combinations of guard interval, constellation and code rate for non-hierarchical systems for 6 MHz channels

Modulation 5,0625 Ms/s	Code Rate	Guard Interval			
		1/4	1/8	1/16	1/32
QPSK	1/2	*3,732*	*4,147*	*4,391*	*4,524*
	2/3	*4,976*	*5,529*	*5,855*	*6,032*
	3/4	*5,599*	*6,221*	*6,587*	*6,786*
	5/6	*6,221*	*6,912*	*7,318*	*7,540*
	7/8	*6,532*	*7,257*	*7,684*	*7,917*
16-QAM	1/2	*7,465*	*8,294*	*8,782*	*9,048*
	2/3	*9,953*	*11,059*	*11,709*	*12,064*
	3/4	*11,197*	*12,441*	*13,173*	*13,572*
	5/6	*12,441*	*13,824*	*14,637*	*15,080*
	7/8	*13,063*	*14,515*	*15,369*	*15,834*
64-QAM	1/2	*11,197*	*12,441*	*13,173*	*13,572*
	2/3	*14,929*	*16,588*	*17,564*	*18,096*
	3/4	*16,796*	*18,662*	*19,760*	*20,358*
	5/6	*18,662*	*20,735*	*21,955*	*22,620*
	7/8	*19,595*	*21,772*	*23,053*	*23,751*
Guard Time: (μsec)	"2K"	*74,7*	*37,3*	*18,7*	*9,3*
	"8K"	*298,7*	*149,3*	*74,7*	*37,3*

Table 2.20: Useful bitrate (Mbit/s) for all combinations of guard interval, constellation and code rate for non-hierarchical systems for 7 MHz channels

Modulation	Code Rate	Guard Interval			
5,90625 Ms/s		1/4	1/8	1/16	1/32
QPSK	1/2	4,354	4,838	5,123	5,278
	2/3	5,806	6,451	6,830	7,037
	3/4	6,532	7,257	7,684	7,917
	5/6	7,257	8,064	8,538	8,797
	7/8	7,620	8,467	8,965	9,237
16-QAM	1/2	8,709	9,676	10,246	10,556
	2/3	11,612	12,902	13,661	14,075
	3/4	13,063	14,515	15,369	15,834
	5/6	14,515	16,127	17,076	17,594
	7/8	15,240	16,934	17,930	18,473
64-QAM	1/2	13,063	14,515	15,369	15,834
	2/3	17,418	19,353	20,491	21,112
	3/4	19,595	21,772	23,053	23,751
	5/6	21,772	24,191	25,614	26,390
	7/8	22,861	25,401	26,895	27,710

Guard Time: (μsec)	"2K"	64	32	16	8
	"8K"	256	128	64	32

Table 2.21: Useful bitrate (Mbit/s) for all combinations of guard interval, constellation and code rate for non-hierarchical systems for 8 MHz channels

Modulation	Code Rate	Guard Interval			
6,75 Ms/s		1/4	1/8	1/16	1/32
QPSK	1/2	4,976	5,529	5,855	6,032
	2/3	6,635	7,373	7,806	8,043
	3/4	7,465	8,294	8,782	9,048
	5/6	8,294	9,216	9,758	10,053
	7/8	8,709	9,676	10,246	10,556
16-QAM	1/2	9,953	11,059	11,709	12,064
	2/3	13,271	14,745	15,612	16,086
	3/4	14,929	16,588	17,564	18,096
	5/6	16,588	18,431	19,516	20,107
	7/8	17,418	19,353	20,491	21,112
64-QAM	1/2	14,929	16,588	17,564	18,096
	2/3	19,906	22,118	23,419	24,128
	3/4	22,394	24,882	26,346	27,144
	5/6	24,882	27,647	29,273	30,160
	7/8	26,126	29,029	30,737	31,668

Guard Time: (μsec)	"2K"	56	28	14	7
	"8K"	224	112	56	28

2.2 Transmission aspects

(refer TS 101 191 Digital Video Broadcasting (DVB); Implementation guidelines for DVB terrestrial services; Transmission aspects)

2.2.1 *General Description*

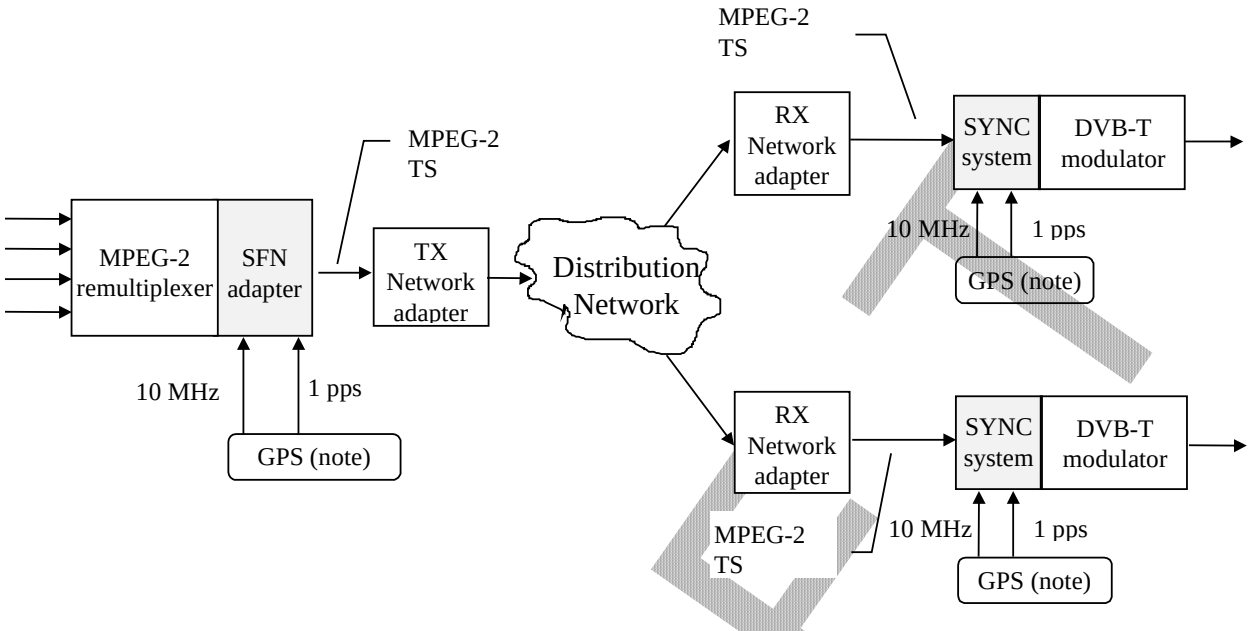
(replace Clause 4)

General Description (TS 101 191 Clause 4.) shall be replaced by the following:

Figure 2.5 shows a block diagram of a complete SFN system.

(replace Figure 1 *DVB-T primary distribution with SFN adaptation*)

DVB-T primary distribution with SFN adaptation (TS 101 191 Figure 1) shall be replaced by the following:



NOTE: Could be any common available frequency reference.

Figure 2.5: DVB-T primary distribution with SFN adaptation

The SFN functionality is an extension to the DVB system. The blocks associated with SFN functionality are the grey boxes in figure 2.5. These blocks could be implemented either as separate equipment or integrated in the multiplexer and/or the DVB-T modulator.

SFN system blocks

MPEG-2 re-multiplexer

The MPEG-2 re-multiplexer re-multiplexes the programmes from various input channels, updates the Service Information (SI) and provides an MPEG-2 Transport Stream (TS) which, after SFN adaptation, is transmitted via the DVB-T modulators in the SFN.

SFN adapter

The SFN adapter forms a mega-frame, consisting of n TS-packets corresponding to 8 DVB-T frames in the 8k mode or 32 frames in the 2k mode, and inserts a MIP with a dedicated Packet IDentifier (PID) value. Inserted anywhere within a mega-frame of index M, the MIP of that mega-frame, MIP_M, allows to uniquely identify the starting point (i.e. the first packet) of the mega-frame M+1. This is accomplished by using a pointer carried by the MIP_M itself to indicate its position with regards to the start of the mega-frame M+1.

The time difference between the latest pulse of the "one-pulse-per-second" reference, derived e.g. from Global Positioning System (GPS), that precedes the start of the mega-frame M+1 and the actual start (i.e. first bit of first packet) of this mega-frame M+1 is copied into the MIP_M. This parameter is called Synchronization Time Stamp (STS).

The time duration of a mega-frame is independent of the duration T_u, constellation and code rate of the DVB-T signal but does depend on the system bandwidth. Four different time durations exist depending on the chosen guard interval proportion. In Table 2.22 a set of time durations are presented for each system bandwidth and guard interval:

Table 2.22: Mega-frame Duration (Seconds)

Guard Interval	8 MHz	7 MHz	6 MHz
(Δ/T_u =1/32)	0,502656 s	0,574464 s	0,670208 s
(Δ/T_u =1/16)	0,517888 s	0,591872 s	0,690517 s
(Δ/T_u =1/8)	0,548352 s	0,626688 s	0,731136 s
(Δ/T_u =1/4)	0,609280 s	0,696320 s	0,812373 s

The output of the SFN adapter shall be fully DVB/MPEG-2 TS compliant.

Transmitter/Receiver network adapter

The network adapters shall provide a transparent link for the MPEG-2 TS from the central to the local units. The maximum network delay - caused by the different paths of the transmission network - the synchronization (SYNC) system can handle is 1 second.

SYNC system

The SYNC system will provide a propagation time compensation by comparing the inserted STS with the local time reference and calculate the extra delay needed for SFN synchronization. See Clause 2.1.50 for an example of the synchronization process.

DVB-T modulator

The modulator should provide a fixed delay from the input to the air interface. The information inserted in the MIP could be used for the direct control of the modulator modes or control of other transmitter parameters. The modulator clocks at the different sites have to be synchronized. Since it is a requirement of an SFN that all transmitted signals be identical, the MPEG-2 TS inputs to the various DVB-T modulators have to be bit identical.

Global Positioning System (GPS)

GPS is one among many possible time references but it is the only one available globally. GPS receivers are available which provide both a 10 MHz frequency reference and a 1 pulse per second (1 pps) time reference. The 1 pps time reference, used in SFN synchronization, is divided into 100 ns steps of the 10 MHz clock. The 10 MHz system clock is assumed to be available at all nodes in the network.

The functional blocks "SFN adapter" and "SYNC system" are additional elements for SFN use, and not necessary in Multi Frequency Network (MFN) applications.

2.2.2 *Mega-frame definition*

(refer Clause 5)

Mega-frame definition shall be in accordance with the requirements of TS 101 191 Clause 5.

2.2.3 *Mega-frame Initialization Packet (MIP)*

(replace Clause 6)

Mega-frame Initialization Packet (MIP) (TS 101 191 Clause 6.) shall be replaced by the following:

The MIP is an MPEG-2 compliant TS packet, made up of a 4-byte header and a 184-byte data field. The organization of the MIP is shown in table 2.23.

(replace Table 1 *Mega-frame Initialization Packet (MIP)*)

Mega-frame Initialization Packet (MIP) (TS 101 191 Table 1) shall be replaced by the following:

Table 2.23: Mega-frame Initialization Packet (MIP)

Syntax	Number of bits	Identifier
mega-frame_initialization_packet(){		
transport_packet_header	32	bslbf
Synchronization_id	8	uimsbf
section_length	8	uimsbf
Pointer	16	uimsbf
Periodic_flag	1	bslbf
future_use	15	bslbf
Synchronization_time_stamp	24	uimsbf
Maximum_delay	24	uimsbf
tps_mip	32	bsblf
Individual_addressing_length	8	uimsbf
for (i=0;i<N;i++){		
tx_identifier	16	uimsbf
function_loop_length	8	uimsbf
for(i=0;i<N;i++){	8	uimsbf
function()		
}		
}		
crc_32	32	rpchof
for (i=0, i<N,i++){		
stuffing_byte	8	uimsbf
}		
}		

NOTE 1: Optional parameters are shown in italic.

NOTE 2: All parameter values in the MIP_M apply to mega-frame M+1, i.e. to the mega-frame pointed out by the pointer, except for the tps_mip which describes the parameters of mega-frame M+2. See Clause 2.1.51 for details.

NOTE 3: For the definition of the CRC decoder model, see Clause 2.1.49.

NOTE 4: The length of a MIP shall always be 188 bytes.

transport_packet_header: The transport_packet_header shall comply with ISO/IEC 13818-1 [1] (AS/NZS 13818.1:1997) subclause 2.4.3.2, table 2 and 3.

The PID value for the MIP shall be 0×15.

The payload_unit_start_indicator is not used by the SFN synchronization function and shall be set to 1.

The transport_priority value is not used by the SFN synchronization function and shall be set to 1.

The transport_scrambling_control value shall be set to 00 (not scrambled).

The adaptation_field_control value shall be set to 01 (payload only).

All other parameters are according to ISO/IEC 13818-1 [1] (AS/NZS 13818.1:1997) subclause 2.4.3.2.

The Transport Packet Header (TPH) is mandatory.

Mandatory SFN parameters

synchronization_id: The synchronization_id is used to identify the synchronization scheme used (See table 2.24).

(replace Table 2 *Signalling format for the synchronization_id*)

Signalling format for the synchronization_id (TS 101 191 Table 2) shall be replaced by the following:

Table 2.24: Signalling format for the synchronization_id

synchronization_id	Function
0x00	SFN synchronization
0x01-0xFF	Future use

section_length: The section_length specifies the number of bytes following immediately after the section_length field until, and including, the last byte of the crc_32 but not including any stuffing_byte. The section_length shall not exceed 182 bytes.

pointer: The pointer is a 2-byte binary integer indicating the number of transport packets between the MIP and the first packet of the succeeding mega-frame.
The range of the pointer depends on the DVB-T mode used for emission.

periodic_flag: Indicates if a periodic or an aperiodic insertion of the MIP is performed. Periodic insertion means that the value of the pointer is not time varying. A "0" indicates aperiodic mode and a "1" indicates periodic mode. All SFN "SYNC systems" shall be able to handle both aperiodic and periodic mode.

future_use: Reserved for future use.

synchronization_time_stamp: The synchronization_time_stamp of MIP_M contains the time difference, expressed as a number of 100 ns steps, between the latest pulse of the "one-pulse-per-second" reference (derived e.g. from GPS) that precedes the start of the mega-frame M+1 and the actual start (i.e. beginning of first bit of first packet) of this mega-frame M+1.

maximum_delay: The maximum_delay contains the time difference between the time of emission of the start of mega-frame M+1 of the DVB-T signal from the transmitting antenna and the start of mega-frame M+1 at the SFN adapter, as expressed by the value of its synchronization_time_stamp in the MIP_M. The value of maximum_delay shall be larger than the sum of the longest delay in the primary distribution network and the delays in modulators, power transmitters and antenna feeders. The unit is 100 ns and the range of maximum_delay is 0x000000-0x98967F, this equals a maximum delay of 1 second.

tps_mip: The tps_mip consists of 32 bits, P_0-P_{31}. The relationship between the Transport Parameter Signalling (TPS) as defined in EN 300 744 [2] and tps_mip as defined in the present document is described in table 2.25.

(replace Table 3 *Relationship between TPS (as defined in EN 300 744 [2]) and tps_mip (as defined in the present document)*)

Relationship between TPS (as defined in EN 300 744 [2]) and tps_mip (as defined in the present document) (TS 101 191 Table 3) shall be replaced by the following:

Table 2.25: Relationship between TPS (as defined in EN 300 744 [2]) and tps_mip (as defined in the present document)

Bit number (TPS)	Format	Purpose/Content	Bit number (tps_mip)
s_0	see subclause 4.6.2.1, EN 300 744 [2]	Initialization	Not used
s_1- s_{16}	0011010111101110 or 1100101000010001	Synchronization word	Not used
s_{17} - s_{22}	010111	Length indicator	Not used
s_{23}, s_{24}	see table 10, EN 300 744 [2]	Frame number	Not used
s_{25}, s_{26}	see table 11, EN 300 744 [2]	Constellation	P_0,P_1
s_{27}, s_{28}, s_{29}	see table 12, EN 300 744 [2]	Hierarchy information	P_2,P_3,P_4
s_{30}, s_{31}, s_{32}	see table 13, EN 300 744 [2]	Code rate, HP stream	P_5,P_6,P_7
s_{33}, s_{34}, s_{35}	see table 13, EN 300 744 [2]	Code rate, LP stream	P_5,P_6,P_7
s_{36}, s_{37}	see table 14, EN 300 744 [2]	Guard interval	P_8,P_9
s_{38}, s_{39}	see table 15, EN 300 744 [2]	Transmission mode	P_{10},P_{11}
s_{40} - s_{53}	all set to "0"	Reserved for future use	P_{15} - P_{31}
s_{54} - s_{67}	BCH code	Error protection	Not used
-	see table 4: "Signalling format for the bandwidth"	Bandwidth of the RF channel	P_{12},P_{13}
-	see table 5: "Signalling format for the bit stream priority"	The priority of the transport stream	P_{14}
NOTE: There are 17 bits allocated for future use in tps_mip, whereas there are 14 bits allocated in the TPS of EN 300 744 [2].			

(replace Table 4 *Signalling format for the bandwidth*)

Signalling format for the bandwidth (TS 101 191 Table 4) shall be replaced by the following:

Table 2.26: Signalling format for the bandwidth

Bits P_{12}, P_{13}	Bandwidth
00	7 MHz
01	8 MHz
10	6 MHz
11	reserved for future use

(replace Table 5 *Signalling format for the bit stream priority*)

Signalling format for the bit stream priority (TS 101 191 Table 5) shall be replaced by the following:

Table 2.27: Signalling format for the bit stream priority

Bit P_{14}	Transmission mode
0	Low Priority TS
1	High Priority TS

P_0-P_{13}: In case of inconsistent values of P_0-P_{13} for the HP and LP TSs, the HP value is valid. In case of change of DVB-T mode, see annex C for the time relationship between P_0-P_{13} and the TPS data of the DVB-T signal.

individual_addressing_length: The individual_addressing_length field gives the total length of the individual addressing field in bytes. If individual addressing of transmitters is not

performed the field value is 0x00, indicating that the crc_32 immediately follows the individual_addressing_length.

crc_32: This 32 bit crc_32 field contains the CRC value that gives a zero output of the registers in the decoder defined in Clause 2.1.49 of the present document, after processing all of the bytes in the MIP, excluding the stuffing bytes.

stuffing_byte: Every stuffing_byte has the value 0xFF.

Optional MIP section parameters

tx_identifier: The tx_identifier is a 16 bit word used to address an individual transmitter. The tx_identifier value 0x0000 is used as a broadcast address to address all transmitters in the network.

function_loop_length: The function_loop_length field gives the total length of the function loop field in bytes.

function: The functions are described in subclause 2.2.4.

2.2.4 *Functions*

(refer Clause 6.1)

Functions shall be in accordance with the requirements of TS 101 191 Clause 6.1.

2.2.5 *Transmitter time offset functions*

(refer Clause 6.1.1)

Transmitter time offset functions shall be in accordance with the requirements TS 101 191 Clause 6.1.1.

2.2.6 *Transmitter frequency offset functions*

(refer Clause 6.1.2)

Transmitter frequency offset functions shall be in accordance with the requirements of TS 101 191 Clause 6.1.2.

2.2.7 *Transmitter power function*

(refer Clause 6.1.3)

Transmitter power function shall be in accordance with the requirements of TS 101 191 Clause 6.1.3.

2.2.8 *Private data function*

(refer Clause 6.1.4)

Private data function shall be in accordance with the requirements of TS 101 191 Clause 6.1.4.

2.2.9 *CRC decoder model*

(refer Annex A)

CRC decoder model shall be in accordance with the requirements of TS 101 191 Annex A.

2.2.10 *Functional description of SFN synchronization*

(refer Annex B)

Functional description of SFN synchronization shall be in accordance with the requirements of TS 101 191 Annex B.

2.2.11 *Reconfiguration of DVB-T modulator parameters by using the MIP*

(refer Annex C)

Reconfiguration of DVB-T modulator parameters by using the MIP shall be in accordance with the requirements of TS 101 191 Annex C.

3 MULTIPLEX AND TRANSPORT STREAM

3.1 Use of MPEG-2 Systems, Video and Audio

(refer ETR 154 Digital Video Broadcasting (DVB); Implementation Guidelines for the Use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications)

3.1.1 *Systems layer*

(refer Clause 4)

Systems Layer shall be in accordance with the requirements of ETR 154 Clause 4.

3.1.2 *Broadcast bitstreams and Baseline IRDs*

(refer Clause 4.1)

Broadcast bitstreams and baseline IRDs shall be in accordance with the requirements of ETR 154 Clause 4.1.

3.1.3 *Introduction (ISO/IEC 13818-1 section 0)*

(refer Clause 4.1.1)

Introduction (ISO/IEC 13818-1 (AS/NZS 13818.1:1997) section 0) shall be in accordance with the requirements of ETR 154 Clause 4.1.1.

3.1.4 *Packetized Elementary Stream (PES)(ISO/IEC 13818-1, section 0.4)*

(refer Clause 4.1.2)

Packetized Elementary Stream (PES) (ISO/IEC 13818-1 (AS/NZS 13818.1:1997), section 0.4) shall be in accordance with the requirements of ETR 154 Clause 4.1.2.

3.1.5 *TS system target decoder (ISO/IEC 13818-1, section 2.4.2)*

(refer Clause 4.1.3)

TS system target decoder (ISO/IEC 13818-1 (AS/NZS 13818.1:1997), section 2.4.2) shall be in accordance with the requirements of ETR 154 Clause 4.1.3.

3.1.6 *Transport packet layer (ISO/IEC 13818-1, section 2.4.3.2)*

(refer Clause 4.1.4)

Transport packet layer (ISO/IEC 13818-1 (AS/NZS 13818.1:1997), section 2.4.3.2) shall be in accordance with the requirements of ETR 154 Clause 4.1.4.

3.1.7 *Null packets*

(refer Clause 4.1.4.1)

Null packets shall be in accordance with the requirements of ETR 154 Clause 4.1.4.1.

3.1.8 *Transport packet header*

(refer Clause 4.1.4.2)

Transport packet header shall be in accordance with the requirements of ETR 154 Clause 4.1.4.2.

3.1.9 *transport_error_indicator*

(refer Clause 4.1.4.2.1)

transport_error_indicator shall be in accordance with the requirements of ETR 154 Clause 4.1.4.2.1.

3.1.10 *transport _priority*

(refer Clause 4.1.4.2.2)

transport_priority shall be in accordance with the requirements of ETR 154 Clause 4.1.4.2.2.

3.1.11 *transport _scrambling_control*

(refer Clause 4.1.4.2.3)

transport_scrambling_control shall be in accordance with the requirements of ETR 154 Clause 4.1.4.2.3.

3.1.12 *Packet IDentifier (PID) values for Service Information (SI) Tables**

(refer Clause 4.1.4.2.4*****)

Packet IDentifier (PID) values for Service Information (SI) Tables shall be in accordance with the requirements of ETR 154 Clause 4.1.4.2.4.

3.1.13 *Adaptation field (ISO/IEC13818-1, section 2.4.3.4)*

(refer Clause 4.1.5)

Adaptation field (ISO/IEC 13818-1 (AS/NZS 13818.1:1997), section 2.4.3.4) shall be in accordance with the requirements of ETR 154 Clause 4.1.5.

3.1.14 *Random_access_indicator*

(refer Clause 4.1.5.1)

Random_access_indicator shall be in accordance with the requirements of ETR 154 Clause 4.1.5.1.

3.1.15 *elementary_stream_priority_indicator*

(refer Clause 4.1.5.2)

elementary_stream_priority_indicator shall be in accordance with the requirements of ETR 154 Clause 4.1.5.2.

3.1.16 *Program Clock Reference (PCR)*

(refer Clause 4.1.5.3)

Program Clock Reference (PCR) shall be in accordance with the requirements of ETR 154 Clause 4.1.5.3.

3.1.17 *Other fields*

(refer Clause 4.1.5.4)

Other fields shall be in accordance with the requirements of ETR 154 Clause 4.1.5.4.

3.1.18 *Packetized Elementary Stream (PES) Packet (ISO/IEC13818-1, section 2.4.3.6)*

(refer Clause 4.1.6)

Packetized Elementary Stream (PES) Packet (ISO/IEC 13818-1 (AS/NZS 13818.1:1997), section 2.4.3.6) shall be in accordance with the requirements of ETR 154 Clause 4.1.6.

3.1.19 *stream_id and stream_type* *

(replace Clause 4.1.6.1*)

stream_id and stream_type (ETR 154 Clause 4.1.6.1.) shall be replaced by the following:

Encoding: Elementary streams shall be uniquely identified by **stream_id** and **stream_type** in accordance with ISO/IEC 13818-1 (AS/NZS 13818.1:1997) Table 2-18 and Table 2-29.

3.1.20 *PES_scrambling_control*

(refer Clause 4.1.6.2)

PES_scrambling_control shall be in accordance with the requirements of ETR 154 Clause 4.1.6.2.

3.1.21 *PES_priority*

(refer Clause 4.1.6.3)

PES_priority shall be in accordance with the requirements of ETR 154 Clause 4.1.6.3.

3.1.22 *copyright and original_or_copy**

(refer Clause 4.1.6.4*)

copyright and original_or_copy shall be in accordance with the requirements of ETR 154 Clause 4.1.6.4.

3.1.23 *Trick mode fields*

(refer Clause 4.1.6.5)

Trick mode fields shall be in accordance with the requirements of ETR 154 Clause 4.1.6.5.

3.1.24 *additional_copy_info**

(refer Clause 4.1.6.6*)

Additional_copy_info shall be in accordance with the requirements of ETR 154 Clause 4.1.6.6.

3.1.25 *Optional fields*

(refer Clause 4.1.6.7)

Optional fields shall be in accordance with the requirements of ETR 154 Clause 4.1.6.7.

3.1.26 *PES_extension_field*

(refer Clause 4.1.6.8)

PES_extension_field shall be in accordance with the requirements of ETR 154 Clause 4.1.6.8.

3.1.27 *Program Specific Information (PSI) (ISO/IEC13818-1, section 2.4.4)*

(refer Clause 4.1.7)

Program Specific Information (PSI) (ISO/IEC 13818-1 (AS/NZS 13818.1:1997), section 2.4.4) shall be in accordance with the requirements of ETR 154 Clause 4.1.7.

3.1.28 *Program and elementary stream descriptors (ISO/IEC13818-1, section 2.6)*

(refer Clause 4.1.8)

Program and elementary stream descriptors (ISO/IEC 13818-1 (AS/NZS 13818.1:1997), section 2.6) shall be in accordance with the requirements of ETR 154 Clause 4.1.8.

3.1.29 *video_stream_descriptor and audio_stream_descriptor* *

(replace Clause 4.1.8.1*)

video_stream_descriptor and audio_stream_descriptor (ETR 154 Clause 4.1.8.1.) shall be replaced by the following:

Encoding: The **video_stream_descriptor** shall be used to indicate video streams containing still picture data, otherwise these descriptors may be used when appropriate. If **profile_and_level_indication** is not present, then the video bit-stream shall comply with the constraints of Main Profile at Main Level. The appropriate **profile_and_level_indication field** shall always be transmitted for Profiles and Levels other than Main Profile at Main Level.

If the **audio_stream_descriptor** is not present, then the audio bit-stream shall not use sampling frequencies of 16 kHz, 22,05 kHz or 24 kHz, and all audio frames in the stream shall have the same bit rate.

Decoding: The IRD may use these descriptors when present to determine if it is able to decode the streams

3.1.30 *hierarchy_descriptor*

(replace Clause 4.1.8.2)

hierarchy_descriptor (ETR 154 Clause 4.1.8.2.) shall be replaced by the following:

Encoding: **The** hierarchy_descriptor **shall be used if, and only if, audio is coded as more than one hierarchical layer.**

3.1.31 *registration_descriptor*

(refer Clause 4.1.8.3)

registration_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.3.

3.1.32 *data_stream_alignment_descriptor*

(refer Clause 4.1.8.4)

data_stream_alignment_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.4.

3.1.33 *target_background_grid_descriptor*

(replace Clause 4.1.8.5)

target_background_grid_descriptor (ETR 154 Clause 4.1.8.5.) shall be replaced by the following:

Encoding: The **target_background_grid_descriptor** shall be used when the horizontal or vertical resolution exceeds the bounds of Main Profile at Main Level, otherwise its use is optional

Decoding: If this descriptor is absent, a default grid of 720 x 576 pixels shall be assumed by a 25Hz IRD, a default grid of 720 x 480 pixels shall be assumed by a 30Hz IRD. The IRD shall read this descriptor, when present, to override this default. The display of correctly windowed video on background grids other than 720 x 576 pixels is optional for a 25Hz SDTV IRD, the display of correctly windowed video on background grids other than 720 x 480 pixels is optional for a 30Hz SDTV IRD.

3.1.34 *video_window_descriptor*

(refer Clause 4.1.8.6)

video_window_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.6.

3.1.35 *Conditional Access CA_descriptor**

(refer Clause 4.1.8.7*)

Conditional Access CA_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.7.

3.1.36 *ISO_639_Language_descriptor*

(refer Clause 4.1.8.8)

ISO_639_Language_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.8.

3.1.37 *system_clock_descriptor*

(refer Clause 4.1.8.9)

system_clock_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.9.

3.1.38 *multiplex_buffer_utilization_descriptor*

(refer Clause 4.1.8.10)

multiplex_buffer_utilization_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.10.

3.1.39 *copyright_descriptor**

(refer Clause 4.1.8.11*)

copyright_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.11.

3.1.40 *maximum_bitrate_descriptor*

(refer Clause 4.1.8.12)

maximum_bitrate_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.12.

3.1.41 *private_data_indicator_descriptor*

(refer Clause 4.1.8.13)

private_data_indicator_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.13.

3.1.42 *STD_descriptor*

(refer Clause 4.1.8.14)

STD_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.14.

3.1.43 *IBP_descriptor*

(refer Clause 4.1.8.15)

IBP_descriptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.15.

3.1.44 *smoothing_buffer_descriptor*

(refer Clause 4.1.8.16)

smoothing_buffer_descirptor shall be in accordance with the requirements of ETR 154 Clause 4.1.8.16.

3.1.45 *Compatibility with ISO/IEC11172-1 (ISO/IEC13818-1, section 2.8)*

(refer Clause 4.1.9)

Compatibility with ISO/IEC 11172-1 (AS/NZS 4230) (ISO/IEC 13818-1 (AS/NZS 13818.1:1997), section 2.8) shall be in accordance with the requirements of ETR 154 Clause 4.1.9.

3.1.46 *Storage Media Interoperability **

(replace Clause 4.1.10*)

Storage Media Interoperability (ETR 154 Clause 4.1.10.) shall be replaced by the following:

It is recommended that the total bitrate of the set of components, associated PMT and PCR packets for an SDTV service anticipated to be recorded by a consumer, should not exceed 9 000 000 bit/s. It is recommended that the total bitrate of the set of components, associated PMT and PCR packets for an HDTV service anticipated to be recorded by a consumer, should not exceed 28 000 000 bit/s.

It is recommended that the parameters sb_size and sb_leak_rate in the smoothing_buffer_descriptor remain constant for the duration of an event. The value of the sb_leak_rate should be the peak attained during the event.

The short_smoothing_buffer_descriptor is defined in ETS 300 468 [6] and guidelines for its use are provided in ETR 211 [7].

3.1.47 *Bitstreams from storage applications and IRDs with digital interfaces*

(refer Clause 4.2)

Bitstreams from storage applications and IRDs with digital interfaces shall be in accordance with the requirements of ETR 154 Clause 4.2.

3.1.48 *Partial TSs*

(refer Clause 4.2.1)

Partial TSs shall be in accordance with the requirements of ETR 154 Clause 4.2.1.

3.1.49 *Decoding of Trick Play data (ISO/IEC13818-1, section 2.4.3.7)*

(refer Clause 4.2.2)

Decoding of Trick Play data (ISO/IEC 13818-1 (AS/NZS 13818.1:1997), section 2.4.3.7) shall be in accordance with the requirements of ETR 154 Clause 4.2.2.

3.1.50 *Video*

(replace Clause 5)

Video (ETR 154 Clause 5.) shall be replaced by the following:

This clause describes the guidelines for encoding MPEG-2 video in DVB broadcast bit-streams, and for decoding this bit-stream in the IRD.

Subclause 3.1.51 applies to 25 Hz SDTV IRDs and broadcasts intended for reception by such IRDs;
Subclause 3.1.59 applies to 25 Hz HDTV IRDs and broadcasts intended for reception by such IRDs;

The video encoding shall conform to ISO/IEC 13818-2 [2] (AS/NZS 13818.2:1997). Some of the parameters and fields are not used in the DVB System and these restrictions are described below. The IRD design should be made under the assumption that any legal structure as permitted by ISO/IEC 13818-2 [2] (AS/NZS 13818.2:1997) may occur in the broadcast stream even if presently reserved or unused.

To allow full compliance to the MPEG-2 standard and upward compatibility with future enhanced versions, a DVB IRD shall be able to skip over data structures which are currently "reserved", or which correspond to functions not implemented by the IRD.

This clause is based on ISO/IEC 13818-2 [2] (AS/NZS 13818.2:1997).

3.1.51 *25 Hz SDTV IRDs and Bitstreams*

(refer Clause 5.1)

25 Hz SDTV IRDs and Bitstreams shall be in accordance with the requirements of ETR 154 Clause 5.1.

3.1.52 *Profile and level*

(refer Clause 5.1.1)

Profile and level shall be in accordance with the requirements of ETR 154 Clause 5.1.1.

3.1.53 *Frame rate*

(refer Clause 5.1.2)

Frame rate shall be in accordance with the requirements of ETR 154 Clause 5.1.2.

3.1.54 *Aspect ratio*

(refer Clause 5.1.3)

Aspect ratio shall be in accordance with the requirements of ETR 154 Clause 5.1.3.

3.1.55 *Luminance resolution*

(refer Clause 5.1.4)

Luminance resolution shall be in accordance with the requirements of ETR 154 Clause 5.1.4.

3.1.56 *Chromaticity Parameters*

(refer Clause 5.1.5)

Chromaticity Parameters shall be in accordance with the requirements of ETR 154 Clause 5.1.5.

3.1.57 *Chrominance*

(refer Clause 5.1.6)

Chrominance shall be in accordance with the requirements of ETR 154 Clause 5.1.6.

3.1.58 *Video sequence header*

(refer Clause 5.1.7)

Video sequence header shall be in accordance with the requirements of ETR 154 Clause 5.1.7.

3.1.59 *25Hz HDTV IRDs and Bitstreams*

(refer Clause 5.2)

25Hz HDTV IRDs and Bitstreams shall be in accordance with the requirements of ETR 154 Clause 5.2.

3.1.60 *Profile and level*

(refer Clause 5.2.1)

Profile and level shall be in accordance with the requirements of ETR 154 Clause 5.2.1.

3.1.61 *Frame rate*

(refer Clause 5.2.2)

Frame rate shall be in accordance with the requirements of ETR 154 Clause 5.2.2.

3.1.62 *Aspect ratio**

(refer Clause 5.2.3*)

Aspect ratio shall be in accordance with the requirements of ETR 154 Clause 5.2.3.

3.1.63 *Luminance resolution**

(replace Clause 5.2.4*)

Luminance resolution (ETR 154 Clause 5.2.4) shall be replaced by the following:

Encoding: The encoded picture shall have a full-screen luminance resolution within the constraints set by Main Profile at High Level, i.e. it shall not have more than:

- 1152 lines per frame,
- 1920 luminance samples per line,
- 62 668 800 luminance samples per second.

It is recommended that the source video for 25Hz HDTV Bitstreams has a luminance resolution of:

- 1080 lines per frame and
- 1920 luminance samples per line,
- with an associated frame rate of 25 Hz, with two interlaced fields per frame. The source video may or may not be down-sampled prior to encoding.

The use of other encoded video resolutions within the constraints of Main Profile at High Level is also permitted. Annex A of ETR 154 provides examples of supported full screen luminance resolutions. In addition, non full-screen pictures may be encoded for display at less than full-size.

Note (1): The limit of 62 668 800 luminance samples per second of Main Profile at High Level excludes the use of the maximum allowed picture resolution at 50Hz frame rate.

Note (2): If the recommended source video format is encoded without down-sampling it gives 51 840 000 luminance samples per second and therefore falls within the allowed range for Main Profile at High Level.

Decoding: The 25 Hz HDTV IRD shall be capable of decoding and displaying pictures with luminance resolutions within the constraints set by Main Profile at High Level.

3.1.64 *Chromaticity Parameters* *

(refer Clause 5.2.5*)

Chromaticity Parameters shall be in accordance with the requirements of ETR 154 Clause 5.2.5.

3.1.65 *Chrominance*

(refer Clause 5.2.6)

Chrominance shall be in accordance with the requirements of ETR 154 Clause 5.2.6.

3.1.66 *Video sequence header*

(refer Clause 5.2.7)

Video sequence header shall be in accordance with the requirements of ETR 154 Clause 5.2.7.

3.1.67 *Backwards Compatibility*

(refer Clause 5.2.8)

Backwards Compatibility shall be in accordance with the requirements of ETR 154 Clause 5.2.8.

3.1.68 *Audio*

(replace Clause 6)

Audio (ETR 154 Clause 6.) shall be replaced by the following:

This clause is based on ISO/IEC 11172-3 (AS/NZS 4230) , ISO/IEC 13818-3 (AS/NZS 13818.3:1997) and ATSC A/52 (Rec. ITU-R BS. 1196).

This clause describes the guidelines for encoding MPEG-2 and Dolby AC-3 audio in DVB broadcast bit-streams, and for decoding this bit-stream in the IRD.

The recommended level for reference tones for transmission is 20 dB below clipping level, in accordance with SMPTE recommended practice RP 155-1997.

The audio encoding shall conform to one of the above, except where otherwise specified. Some of the parameters and fields are not used in the DVB System and these restrictions are described below. The IRD design should be made under the assumption that any legal structure as permitted by the above standards may occur in the broadcast stream even if presently reserved or unused. To allow full compliance to the above standards and upward compatibility with future enhanced versions, a DVB IRD shall be able to skip over data structures which are currently "reserved", or which correspond to functions not implemented by the IRD. For example, an IRD which is not designed to make use of the ancillary data field shall skip over that portion of the bit-stream.

3.1.69 *Audio Mode*

(replace Clause 6.1)

Audio Mode (ETR 154 Clause 6.1) shall be replaced by the following:

Encoding: The audio shall be encoded in one or more of the following modes:

- MPEG-1 single channel;
- MPEG-1 dual channel;
- MPEG-1 joint stereo;
- MPEG-1 stereo;
- MPEG-2 multi-channel audio, backwards compatible to MPEG-1 (dematrix procedure = 0 or 1);*
- Dolby AC-3 multi-channel audio, stereo and mono.

Decoding: The IRD shall be capable of decoding the following audio modes:

- MPEG-1 single channel;
- MPEG-1 dual channel;
- MPEG-1 joint stereo;
- MPEG-1 stereo;
- Dolby AC-3 multi-channel audio, stereo and mono.

Note: An MPEG-1 Layer II audio decoder will decode MPEG-2 Layer II audio as single channel, joint stereo or stereo.

3.1.70 *Compression layer*

(replace Clause 6.2)

Compression layer (ETR 154 Clause 6.2) shall be replaced by the following:

Encoding: The encoded bit-stream shall use either Layer I or Layer II coding (layer = "11" or "10" respectively). Use of Layer II is recommended.

Decoding: IRDs shall be capable of decoding at least Layer I and Layer II. Support for Layer III decoding (layer = "01") is optional.

3.1.71 *Bit rate*

(replace Clause 6.3)

Bit rate (ETR 154 Clause 6.3) shall be replaced by the following:

Encoding: The value of bitrate_index in the encoded bit-stream shall be one of the 14 values from "0001" to "1110" (inclusive).

For MPEG-1 Layer I, these correspond to bit rates of: 32, 64, 96, 128, 160, 192, 224, 256, 288, 320, 352, 384, 416 or 448 kbit/s.

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* Full decoding of a MPEG-2 multi-channel audio bit-stream is optional.

For MPEG-1 Layer II, these correspond to bitrates of: 32, 48, 56, 64, 80, 96, 112, 128, 160, 192, 224, 256, 320, 384 kbit/s.

For MPEG-2 encoded bit-streams with total bitrates greater than 448 kbit/s for Layer I or 384 kbit/s for Layer II, an extension bit-stream shall be used. The bit rate of that extension may be in the range of 0 to 682 kbit/s.

For Dolby AC-3 a maximum bitrate of up to 640 kbit/s shall be used.

Decoding: IRDs shall be capable of decoding bit-streams with a value of bitrate_index from "0001" to "1110" (inclusive). Support for the free format bit rate (bitrate_index = "0000") is optional.

For Dolby AC-3 a maximum bitrate of up to 640 kbit/s shall be used.

3.1.72 *Sampling frequency*

(replace Clause 6.4)

Sampling frequency (ETR 154 Clause 6.2) shall be replaced by the following:

Encoding: For MPEG the audio sampling rate of primary sound services shall be 32 kHz, 44.1 kHz or 48 kHz. Sampling rates of 16 kHz, 22.05 kHz, 24 kHz, 32 kHz, 44.1 kHz or 48 kHz may be used for secondary sound services.

For Dolby AC-3 the audio sampling rate of sound services shall be 32 kHz, 44.1 kHz or 48 kHz.

Decoding: For MPEG the IRD shall be capable of decoding audio with sampling rates of 32 kHz, 44.1 kHz and 48 kHz. Support for sampling rates of 16 kHz, 22.05 kHz and 24 kHz is optional.

For Dolby AC-3 the IRD shall be capable of decoding audio with sampling rates of 32 kHz, 44.1 kHz and 48 kHz.

3.1.73 *Emphasis*

(refer Clause 6.5)

Emphasis shall be in accordance with the requirements of ETR 154 6.5.

3.1.74 *Cyclic redundancy code*

(refer Clause 6.6)

Cyclic redundance code shall be in accordance with the requirements of ETR 154 6.6.

3.2 Service Information

(refer EN 300 468 Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems)

3.2.1 *References*

(replace Clause 2)

References (EN 300 468 Clause 2) shall be modified to include the following:

[14] Recommendation ITU-R BS.1196-E (1995) “Audio Coding For Digital Terrestrial Television Broadcasting”.

3.2.2 *Definitions*

Definitions (EN 300 468 Clause 3.1) shall be modified to include the following:

(replace Figure 1 *Digital broadcasting, service delivery model*)

Digital broadcasting, service delivery model (EN 300 468 Figure 1) shall be replaced by the following:

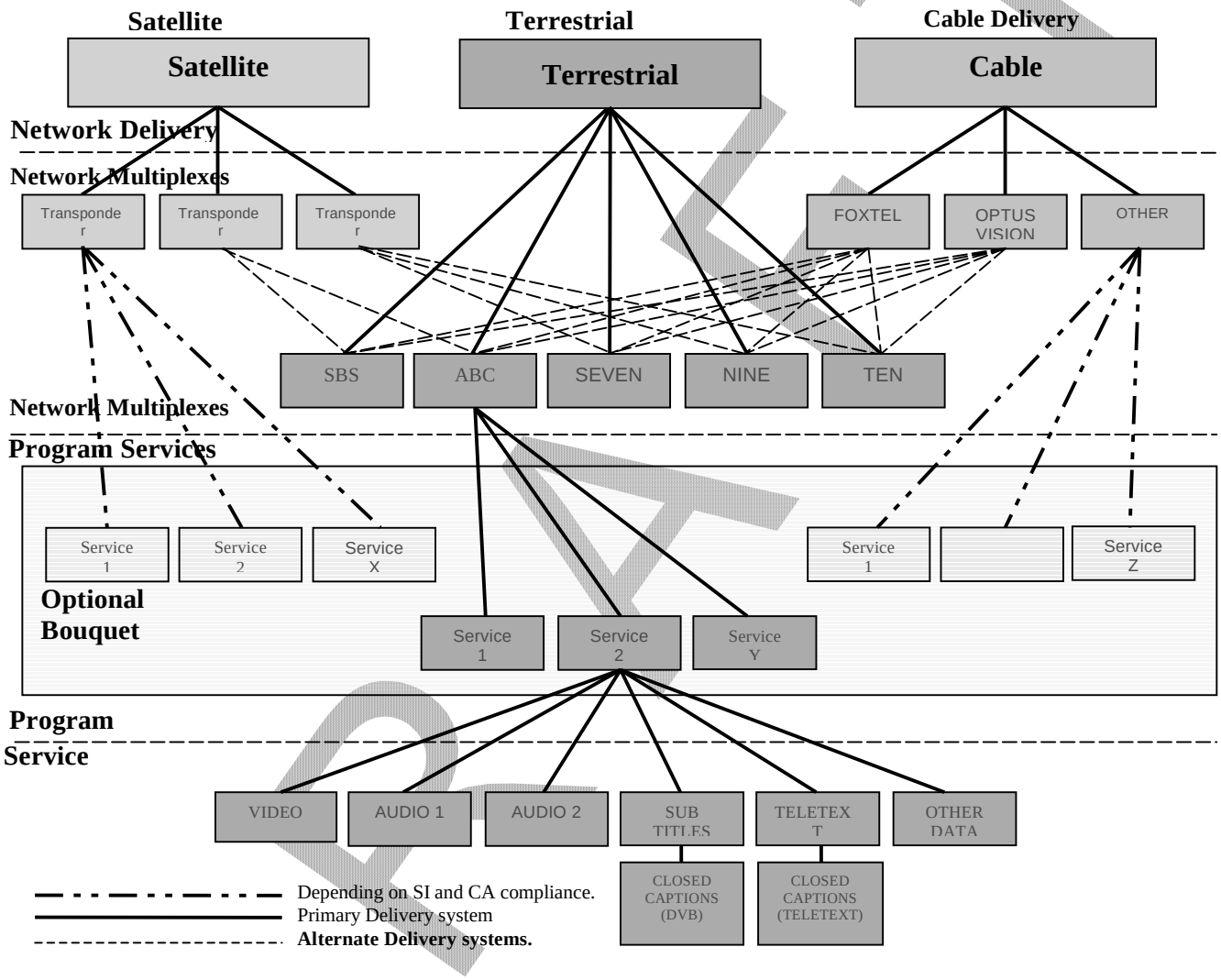

Figure 3.1: Digital broadcasting, service delivery model

3.2.3 *Abbreviations*

(replace Clause 3.2)

Abbreviations (EN 300 468 Clause 3.2) shall be modified to include the following:

AC-3 Dolby encoded audio

3.2.4 *Service Information (SI) description*

(refer Clause 4)

Service Information (SI) description shall be in accordance with the requirements of EN 300 468 Clause 4.

3.2.5 *Service Information (SI) tables*

(refer Clause 5)

Service Information (SI) tables shall be in accordance with the requirements of EN 300 468 Clause 5.

3.2.6 *SI table mechanism*

(refer Clause 5.1)

SI table mechanism shall be in accordance with the requirements of EN 300 468 Clause 5.1.

3.2.7 *Explanation*

(refer Clause 5.1.1)

Explanation shall be in accordance with the requirements of EN 300 468 Clause 5.1.1.

3.2.8 *Mapping of sections into Transport Stream (TS) packets*

(refer Clause 5.1.2)

Mapping of sections into Transport Stream (TS) packets shall be in accordance with the requirements of EN 300 468 Clause 5.1.2.

3.2.9 *Coding of PID and table_id fields**

(refer Clause 5.1.3*)

Coding of PID and table_id fields shall be in accordance with the requirements of EN 300 468 Clause 5.1.3

3.2.10 *Repetition rates and random access*

(refer Clause 5.1.4)

Repetition rates and random access shall be in accordance with the requirements of EN 300 468 Clause 5.1.4

3.2.11 *Scrambling*

(refer Clause 5.1.5)

Scrambling shall be in accordance with the requirements of EN 300 468 Clause 5.1.5.

3.2.12 *Table definitions*

(refer Clause 5.2)

Table definitions shall be in accordance with the requirements of EN 300 468 Clause 5.2.

3.2.13 *Network Information Table (NIT)***

(replace Clause 5.2.1)

Network Information Table (NIT) shall be modified as follows:

Editor's Note: The syntax of a transmitter-id descriptor should be included in the network descriptors loop of the Network Information Table.

The NIT (see table 3.1) conveys information relating to the physical organization of the multiplexes/TSs carried via a given network, and the characteristics of the network itself. The combination of original_network_id and transport_stream_id allow each TS to be uniquely identified throughout the ETS application area. Networks are assigned individual network_id values, which serve as unique identification codes for networks. The allocation of these codes may be found in ETR 162 [6]. In the case that the NIT is transmitted on the network on which the TS was originated, the network_id and the original_network_id shall take the same value.

Guidelines for the processing of SI at transitions between delivery media boundaries, e.g. from satellite to cable or SMATV systems, can be found in ETR 211 [7].

IRDs may be able to store the NIT information in non-volatile memory in order to minimize the access time when switching between channels ("channel hopping"). It is also possible to transmit a NIT for other networks in addition to the actual network. Differentiation between the NIT for the actual network and the NIT for other networks is achieved using different table_id values (see table 2 – EN 300 468).

The NIT shall be segmented into network_information_sections using the syntax of table 1. Any sections forming part of an NIT shall be transmitted in TS packets with a PID value of 0x0010. Any sections of the NIT which describe the actual network (that is, the network of which the TS containing the NIT is a part) shall have the table_id 0x40 with ***the same table_id_extension (network_id).*** *The network_id field takes the value assigned to the actual network in ETR 162 [6]. Contrary to the NIT other delivery system sub_tables, the NIT actual delivery system sub_table shall be unique in a given TS.*

Table 3.1: Network information section

Syntax	No. of bits	Identifier
network_information_section(){		
table_id	8	uimsbf
section_syntax_indicator	1	bslbf
reserved_future_use	1	bslbf
reserved	2	bslbf
section_length	12	uimsbf
network_id	16	uimsbf
reserved	2	bslbf
version_number	5	uimsbf
current_next_indicator	1	bslbf
section_number	8	uimsbf
last_section_number	8	uimsbf
reserved_future_use	4	bslbf
network_descriptors_length	12	uimsbf
for(i=0;i<N;i++){		
descriptor()		
}		
reserved_future_use	4	bslbf
transport_stream_loop_length	12	uimsbf
for(i=0;i<N;i++){		
transport_stream_id	16	uimsbf
original_network_id	16	uimsbf
reserved_future_use	4	bslbf
transport_descriptors_length	12	uimsbf
for(j=0;j<N;j++){		
descriptor()		
}		
}		
CRC_32	32	rpchof
}		

Semantics for the network information section:
table_id: See table 2 (EN 300 468).
section_syntax_indicator: The section_syntax_indicator is a 1-bit field which shall be set to "1".
section_length: This is a 12-bit field, the first two bits of which shall be "00". It specifies the number of bytes of the section, starting immediately following the section_length field and including the CRC. The section_length shall not exceed 1 021 so that the entire section has a maximum length of 1 024 bytes.
network_id: This is a 16-bit field which serves as a label to identify the delivery system, about which the NIT informs, from any other delivery system. Allocations of the value of this field are found in ETR 162 [6].
version_number: This 5-bit field is the version number of the sub_table. The version_number shall be incremented by 1 when a change in the information carried within the sub_table occurs. When it reaches value 31, it wraps around to 0. When the current_next_indicator is set to "1", then the version_number shall be that of the currently applicable sub_table defined by the table_id and network_id. When the current_next_indicator is set to "0", then the version_number shall be that of the next applicable sub_table defined by the table_id and network_id.
current_next_indicator: This 1-bit indicator, when set to "1" indicates that the sub_table is the currently applicable sub_table. When the bit is set to "0", it indicates that the sub_table sent is not yet applicable and shall be the next sub_table to be valid.
section_number: This 8-bit field gives the number of the section. The section_number of the first section in the sub_table shall be "0x00". The section_number shall be incremented by 1 with each additional section with the same table_id and network_id.
last_section_number: This 8-bit field specifies the number of the last section (that is, the section with the highest section_number) of the sub_table of which this section is part.
network_descriptors_length: This 12-bit field gives the total length in bytes of the following network descriptors.
transport_stream_loop_length: This is a 12-bit field specifying the total length in bytes of the TS loops that follow, ending immediately before the first CRC-32 byte.
transport_stream_id: This is a 16-bit field which serves as a label for identification of this TS from any other multiplex within the delivery system.
original_network_id: This 16-bit field gives the label identifying the network_id of the originating delivery system.
transport_descriptors_length: This is a 12-bit field specifying the total length in bytes of TS descriptors that follow.

CRC_32: This is a 32-bit field that contains the CRC value that gives a zero output of the registers in the decoder defined in Clause 3.2.69 after processing the entire section.

3.2.14 *Bouquet Association Table (BAT)*

(replace Clause 5.2.2)

Bouquet Association Table (BAT) (EN 300 468 Clause 5.2.2) may require modification to meet Australian requirements.

3.2.15 *Logical channel descriptor*

The logical channel descriptor permits each service to be given a logical number for the ordering of services in a receiver's service list(s).

A descriptor for use in the second loop of the BAT. It binds a "logical channel number" to each service in a bouquet. Applications presenting lists of services *within bouquets* should use this information to order the lists. Service with lower channel numbers should be presented before those with higher channel numbers.

The rules for use of the logical channel number descriptor are:

1. The channel numbers are assigned by the owner of the bouquet.
2. There is no requirement to coordinate the numbers with other organisations.
3. Inclusion of a “logical channel number” is optional. However, it should be provided for either ALL or NONE of the services in a bouquet.
4. The logical channel numbers assigned to services should be substantially constant.
5. There is no requirement for the series of numbers to start at any particular value.
6. There is no requirement for the series of numbers to be complete or contiguous.

Table 3.2: Logical Channel Descriptor

Syntax	No. of bits	Mnemonic
logical_channel_decriptor{		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
for (i=0; i<N;++){		
service_id	16	uimbsf
logical_channel_number	10	uimsbf
reserved	7	bslbf
irregular_service_flag	1	bslbf
}		
}		

descriptor_tag: This shall be assigned to be **0x81**. (Note: conflicts with the AC-3 descriptor_tag value)

service_id: This is a 16-bit field which serves as a label to identify this service from any other service within the Transport Stream. The service_id is the same as the program_number in the corresponding program_map_section. Services shall be included irrespective of their running status.

logical_channel_number: this is a 10-bit field which indicates the broadcaster preference for ordering services. Its use is defined in Table 6-10.

Table 3.3: Logical Channel Number

logical_channel_number	Description
0	undefined
1 - 999	logical_channel_number
1000 - 1023	reserved for future use

reserved: All "reserved" bits shall be set to '1'.

irregular_service_flag: this 1-bit field when set to ‘1’ indicates that a service may not be in regular use. For example, it may be a side-channel for another service. Such a service has a low priority for inclusion in favourite channel lists or **Remote Control Unit** button configurations. However, the service should not be concealed. When set to ‘0’ this is a “normal” service.

The logical channel descriptor may be inserted in the second descriptor loop of the BAT. It shall be allowed only once in each loop.

It is not necessary that all service_ids referenced in the in the service_list_descriptor be allocated a logical channel number. The numbers used may start at any value, and need not be contiguous. The allocation of logical channel number to service within a sub-table should be quasi-static.

The logical_channel_number shall be unique across the bouquet if carried in the BAT for all services which the broadcaster wishes to be displayed separately. Where more than one service is assigned to the same logical_channel_number, only one service shall have the running status of "running" at a time. The receiver may use the logical channel number for default service ordering, and assigning a number to the **remote control** for selection of that service.

3.2.16 *Service Description Table (SDT)**

(replace Clause 5.2.3*)

Service Description Table (SDT) shall be modified as follows:

Each sub_table of the SDT (see table 3.4) shall describe services that are contained within a particular TS. The services may be part of the actual TS or part of other TSs, these being identified by means of the table_id (see table 2 – EN 300 468).

The SDT shall be segmented into service_description_sections using the syntax of table 5. Any sections forming part of an SDT shall be transmitted in TS packets with a PID value of 0x0011. Any sections of the SDT which describe the actual TS (that is, the TS containing the SDT) shall have the table_id 0x42, ***with the same table_id_extension (transport_stream_id) and with the same original_network_id (cf definition of an SDT sub_table).*** *Any sections of an SDT which refer to a TS other than the actual TS shall take a table-id value of 0x46. Contrary to the SDT other transport stream sub_tables, the SDT actual transport stream sub_table shall be unique in a given TS.*

Table 3.4: Service description section

Syntax	No. of bits	Identifier
service_description_section(){		
table_id	8	uimsbf
section_syntax_indicator	1	bslbf
reserved_future_use	1	bslbf
reserved	2	bslbf
section_length	12	uimsbf
transport_stream_id	16	uimsbf
reserved	2	bslbf
version_number	5	uimsbf
current_next_indicator	1	bslbf
section_number	8	uimsbf
last_section_number	8	uimsbf
original_network_id	16	uimsbf
reserved_future_use	8	bslbf
for (i=0;i<N;i++){		
service_id	16	uimsbf
reserved_future_use	6	bslbf
EIT_schedule_flag	1	bslbf
EIT_present_following_flag	1	bslbf
running_status	3	uimsbf
free_CA_mode	1	bslbf
descriptors_loop_length	12	uimsbf
for (j=0;j<N;j++){		
descriptor()		
}		
}		
CRC_32	32	rpchof
}		

Semantics for the service description section:
table_id: See table 2 (EN 300 468).
section_syntax_indicator: The section_syntax_indicator is a 1-bit field which shall be set to "1".
section_length: This is a 12-bit field, the first two bits of which shall be "00". It specifies the number of bytes of the section, starting immediately following the section_length field and including the CRC. The section_length shall not exceed 1 021 so that the entire section has a maximum length of 1 024 bytes.
transport_stream_id: This is a 16-bit field which serves as a label for identification of the TS, about which the SDT informs, from any other multiplex within the delivery system.
version_number: This 5-bit field is the version number of the sub_table. The version_number shall be incremented by 1 when a change in the information carried within the sub_table occurs. When it reaches value "31", it wraps around to "0". When the current_next_indicator is set to "1", then the version_number shall be that of the currently applicable sub_table. When the current_next_indicator is set to "0", then the version_number shall be that of the next applicable sub_table.
current_next_indicator: This 1-bit indicator, when set to "1" indicates that the sub_table is the currently applicable sub_table. When the bit is set to "0", it indicates that the sub_table sent is not yet applicable and shall be the next sub_table to be valid.
section_number: This 8-bit field gives the number of the section. The section_number of the first section in the sub_table shall be "0x00". The section_number shall be incremented by 1 with each additional section with the same table_id, transport_stream_id, and original_network_id.
last_section_number: This 8-bit field specifies the number of the last section (that is, the section with the highest section_number) of the sub_table of which this section is part.
original_network_id: This 16-bit field gives the label identifying the network_id of the originating delivery system.

service_id: This is a 16-bit field which serves as a label to identify this service from any other service within the TS. The service_id is the same as the program_number in the corresponding program_map_section.
EIT_schedule_flag: This is a 1-bit field which when set to "1" indicates that EIT schedule information for the service is present in the current TS, see ETR 211 [7] for information on maximum time interval between occurrences of an EIT schedule sub_table). If the flag is set to 0 then the EIT schedule information for the service should not be present in the TS.
EIT_present_following_flag: This is a 1-bit field which when set to "1" indicates that EIT_present_following information for the service is present in the current TS, see ETR 211 [7] for information on maximum time interval between occurrences of an EIT present/following sub_table). If the flag is set to 0 then the EIT present/following information for the service should not be present in the TS.
running_status: This is a 3-bit field indicating the status of the service as defined in table 3.5.

Table 3.5: running_status

Value	Meaning
0	undefined
1	not running
2	starts in a few seconds (e.g. for video recording)
3	pausing
4	running
5 to 7	reserved for future use

For an NVOD reference service the value of the running_status shall be set to "0".
free_CA_mode: This 1-bit field, when set to "0" indicates that all the component streams of the service are not scrambled. When set to "1" it indicates that access to one or more streams may be controlled by a CA system.
descriptors_loop_length: This 12-bit field gives the total length in bytes of the following descriptors.

CRC_32: This is a 32-bit field that contains the CRC value that gives a zero output of the registers in the decoder defined in Clause 3.2.69 after processing the entire section.

3.2.17 *Event Information Table (EIT)**

(refer Clause 5.2.4*)

Event Information Table (EIT) shall be in accordance with the requirements of EN 300 468 Clause 5.2.4.

3.2.18 *Time and Date Table (TDT)*

(refer Clause 5.2.5)

Time and Date Table (TDT) shall be in accordance with the requirements of EN 300 468 Clause 5.2.5.

3.2.19 *Time Offset Table (TOT)**

(refer Clause 5.2.6*)

Time Offset Table (TOT) shall be in accordance with the requirements of EN 300 468 Clause 5.2.6.

3.2.20 *Running Status Table (RST)*

(refer Clause 5.2.7)

Running Status Table (RST) shall be in accordance with the requirements of EN 300 468 Clause 5.2.7.

3.2.21 *Stuffing Table (ST)*

(refer Clause 5.2.8)

Stuffing Table (ST) shall be in accordance with the requirements of EN 300 468 Clause 5.2.8.

3.2.22 *Discontinuity Information Table (DIT)*

(refer Clause 5.2.9)

Discontinuity Information Table (DIT) shall be in accordance with the requirements of EN 300 468 Clause 5.2.9.

3.2.23 *Selection Information Table (SIT)*

(refer Clause 5.2.10)

Selection Information Table (SIT) shall be in accordance with the requirements of EN 300 468 Clause 5.2.10.

3.2.24 *Descriptors*

(refer Clause 6)

Descriptors shall be in accordance with the requirements of EN 300 468 Clause 6.

3.2.25 *Descriptor identification and location**

(replace Clause 6.1*)

Descriptor identification and location (EN 300 468 Clause 6.1) may require modification to meet Australian requirements.

3.2.26 *Descriptor coding **

(refer Clause 6.2*)

Descriptor coding shall be in accordance with the requirements of EN 300 468 Clause 6.2

3.2.27 *Bouquet name descriptor*

(refer Clause 6.2.1)

Bouquet name descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.1.

3.2.28 *CA identifier descriptor*

(refer Clause 6.2.2)

CA identifier descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.2.

3.2.29 *Component descriptor**

(replace Clause 6.2.3*)

Component descriptor (EN 300 468 Clause 6.2.3) shall require modification to meet Australian requirements. This modification will amend "Table 16: stream_content and component_type", by adding values for the component_type field for AC-3 audio modes using values from the DVB reserved values in the range 0x42 to 0xAF.

3.2.30 *Content descriptor**

(replace Clause 6.2.4*)

Content descriptor (EN 300 468 Clause 6.2.4 shall require modification to meet Australian requirements. This modification will amend "Table 18: Content_nibble level 1 and 2 assignments", by modifying the description of level 1 (categories) and modifying the description of level 2 (content description) to suit Australian programming requirements.

3.2.31 *Country availability descriptor*

(refer Clause 6.2.5)

Country availability descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.5

3.2.32 *Data broadcast descriptor**

(refer Clause 6.2.6*)

Data broadcast descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.6.

3.2.33 *3.2.33 Data broadcast id descriptor**

(refer Clause 6.2.7*)

Data broadcast id descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.7.

3.2.34 *Delivery system descriptors**

(refer Clause 6.2.8*)

Delivery system descriptors shall be in accordance with the requirements of EN 300 468 Clause 6.2.8.

[Editor's Note: 6.2.8.1 (Cable) and 6.2.8.2 (Satellite) not applicable.]

3.2.35 *Terrestrial delivery system descriptor*

(replace Clause 6.2.8.3)

Terrestrial delivery system descriptor (EN 300 468 Clause 6.2.8.3) may require modification to meet Australian requirements. This modification will assign a value to Table 30 for the 6 MHz bandwidth field of the terrestrial_system_delivery_descriptor which describe the value assignments for the terrestrial television bandwidths applicable to Australia.

Table 3.6: Signalling format for the bandwidth

bandwidth	bandwidth value
000	8 MHz
001	7 MHz
010	6 MHz
011 to 111	reserved for future use

3.2.36 *Extended event descriptor*

(refer Clause 6.2.9)

Extended event descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.9.

3.2.37 *Frequency list descriptor**

(refer Clause 6.2.10*)

Frequency list descriptor (EN 300 468 Clause 6.2.10) shall be in accordance with the requirements of EN 300 468 Clause 6.2.10

Editor's Note: This clause does not require modification unless offset values are required for Australian Band IV and Band V operation. No offset is required for Band III operation.

3.2.38 *Linkage descriptor**

(refer Clause 6.2.11*)

Linkage descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.11

3.2.39 *Local time offset descriptor**

(refer Clause 6.2.12*)

Local time offset descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.12

Editor's Note: The local time offset descriptor may be used in the TOT to describe country specific dynamic changes of the local time offset relative to UTC. Table 42 identifies the coding of country_region_id. This may require modification to meet Australian requirements.

3.2.40 *Mosaic descriptor**

(refer Clause 6.2.13*)

Mosaic descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.13.

3.2.41 *Multilingual bouquet name descriptor*

(refer Clause 6.2.14)

Multilingual bouquet name descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.14.

3.2.42 *Multilingual component descriptor*

(refer Clause 6.2.15)

Multilingual component descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.15.

3.2.43 *Multilingual network name descriptor*

(refer Clause 6.2.16)

Multilingual network name descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.16.

3.2.44 *Multilingual service name descriptor*

(refer Clause 6.2.17)

Multilingual service name descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.17.

3.2.45 *Near Video On Demand (NVOD) reference descriptor*

(refer Clause 6.2.18)

Near Video On Demand (NVOD) reference descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.18.

3.2.46 *Network name descriptor*

(refer Clause 6.2.19)

Network name descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.19.

3.2.47 *Parental rating descriptor*

(replace Clause 6.2.20)

Parental rating descriptor (EN 300 468 Clause 6.2.20) may require modification to meet Australian requirements.

3.2.48 *Partial Transport Stream (TS) descriptor*

(refer Clause 6.2.21)

Partial Transport Stream (TS) descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.21

3.2.49 *Private data specifier descriptor*

(replace Clause 6.2.22)

Private data specifier descriptor (EN 300 468 Clause 6.2.20) may require modification to meet Australian requirements.

3.2.50 *Short smoothing buffer descriptor*

(refer Clause 6.2.23)

Short smoothing buffer descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.23.

3.2.51 *Service descriptor**

(refer Clause 6.2.24*)

Service descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.24.

3.2.52 *Service list descriptor**

(refer Clause 6.2.25*)

Service list descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.25.

3.2.53 *Service move descriptor*

(refer Clause 6.2.26)

Service move descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.26.

3.2.54 *Short event descriptor*

(refer Clause 6.2.27)

Short event descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.27.

3.2.55 *Stream identifier descriptor*

(refer Clause 6.2.28)

Stream identifier descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.28.

3.2.56 *Stuffing descriptor*

(refer Clause 6.2.29)

Stuffing descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.29.

3.2.57 *Subtitling descriptor*

(refer Clause 6.2.30)

Subtitling descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.30.

3.2.58 *Telephone descriptor**

(refer Clause 6.2.31*)

Telephone descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.31.

3.2.59 *Teletext descriptor**

(refer Clause 6.2.32*)

Teletext descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.32.

3.2.60 *Time shifted event descriptor*

(refer Clause 6.2.33)

Time shifted event descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.33.

3.2.61 *Time shifted service descriptor*

(refer Clause 6.2.34)

Time shifted service descriptor shall be in accordance with the requirements of EN 300 468 Clause 6.2.34.

3.2.62 *Storage Media Interoperability (SMI) measures*

(refer Clause 7)

Storage Media Interoperability (SMI) measures shall be in accordance with the requirements of EN 300 468 Clause 7

3.2.63 *SMI tables*

(refer Clause 7.1)

SMI tables shall be in accordance with the requirements of EN 300 468 Clause 7.1

3.2.64 *Discontinuity Information Table (DIT)*

(refer Clause 7.1.1)

Discontinuity Information Table (DIT) shall be in accordance with the requirements of EN 300 468 Clause 7.1.1

3.2.65 *Selection Information Table (SIT)*

(refer Clause 7.1.2)

Selection Information Table (SIT) shall be in accordance with the requirements of EN 300 468 Clause 7.1.2

3.2.66 *SMI descriptors*

(refer Clause 7.2)

SMI descriptors shall be in accordance with the requirements of EN 300 468 Clause 7.2

3.2.67 *Partial Transport Stream (TS) descriptor*

(refer Clause 7.2.1)

Partial Transport Stream (TS) descriptor shall be in accordance with the requirements of EN 300 468 Clause 7.2.1

3.2.68 *Annex A (normative): Coding of text characters*

(refer Annex A)

Annex A (normative): Coding of text characters shall be in accordance with the requirements of EN 300 468.

3.2.69 *Annex B (normative): CRC decoder model*

(refer Annex B)

Annex B (normative): CRC decoder model shall be in accordance with the requirements of EN 300 468.

3.2.70 *Annex C (informative): Conversion between time and date conventions*

(refer Annex C)

Annex C (informative): conversion between time and date conventions shall be in accordance with the requirements of EN 300 468.

3.3 Implementation and usage of Service Information (Reference ETR 211 Digital Video Broadcasting (DVB);Guidelines on implementation and usage of Service Information (SI))

3.3.1 *Service Information (SI) table information*

(replace Clause 4.1)

Service Information (SI) table information (ETR 211 Clause 4.1) may require modification to meet Australian requirements.

3.3.2 *Network Information Table (NIT) information*

(replace Clause 4.1.1)

Network Information Table (NIT) information (ETR 211 Clause 4.1) may require modification to meet Australian requirements.

3.3.3 *Bouquet Association Table (BAT) information*

(replace Clause 4.1.2)

Bouquet Association Table (BAT) (ETR 211 Clause 4.1.2) may require modification to meet Australian requirements.

3.3.4 *Service Description Table (SDT) information*

(replace Clause 4.1.3)

Service Description Table (SDT) information (ETR 211 Clause 4.1.3) may require modification to meet Australian requirements.

3.3.5 *Event Information Table (EIT) information*

(refer Clause 4.1.4)

Event Information Table (EIT) information shall be in accordance with the requirements of ETR 211 Clause 4.1.4

3.3.6 *EIT Present/Following information*

(refer Clause 4.1.4.1)

EIT Present/Following information shall be in accordance with the requirements of ETR 211 Clause 4.1.4.1.

3.3.7 *EIT Schedule information*

(refer Clause 4.1.4.2)

EIT Schedule information shall be in accordance with the requirements of ETR 211 Clause 4.1.4.2

3.3.8 *EIT Schedule structure*

(refer Clause 4.1.4.2)

Schedule structure shall be in accordance with the requirements of ETR 211 Clause 4.1.4.2.1

3.3.9 *EIT scrambling*

(refer Clause 4.1.4.2.2)

EIT scrambling shall be in accordance with the requirements of ETR 211 Clause 4.1.4.2.2.

3.3.10 *Time and Date Table (TDT)*

(refer Clause 4.1.5)

Time and Date Table (TDT) shall be in accordance with the requirements of ETR 211 Clause 4.1.5.

3.3.11 *Time Offset Table (TOT)*

(refer Clause 4.1.6)

Time Offset Table (TOT) shall be in accordance with the requirements of ETR 211 Clause 4.1.6

3.3.12 *Running Status Table (RST)*

(refer Clause 4.1.7)

Running Status Table (RST) shall be in accordance with the requirements of ETR 211 Clause 4.1.7

3.3.13 *Stuffing Table (ST)*

(refer Clause 4.1.8)

Stuffing Table (ST) shall be in accordance with the requirements of ETR 211 Clause 4.1.8.

3.3.14 *Table update mechanism*

(refer Clause 4.1.9)

Table update mechanism shall be in accordance with the requirements of ETR 211 Clause 4.1.9.

3.3.15 *SI descriptor allocation and usage*

(refer Clause 4.2)

SI descriptor allocation and usage shall be in accordance with the requirements of ETR 211 Clause 4.2.

3.3.16 *Descriptors of the Network Information Table (NIT)*

(replace Clause 4.2.1)

Descriptors of the Network Information Table (NIT) (ETR 211 Clause 4.2.1) may require modification to meet Australian requirements.

3.3.17 *First descriptor loop*

(refer Clause 4.2.1.1)

First descriptor loop shall be in accordance with the requirements of ETR 211 Clause 4.2.1.1.

3.3.18 *Linkage descriptor*

(refer Clause 4.2.1.1.1)

Linkage descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.1.1.1

3.3.19 *Multilingual network name descriptor*

(refer Clause 4.2.1.1.2)

Multilingual network name descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.1.1.2.

3.3.20 *Network name descriptor*

(refer Clause 4.2.1.1.3)

Network name descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.1.1.3.

3.3.21 *Second descriptor loop*

(refer Clause 4.2.1.2)

Second descriptor loop shall be in accordance with the requirements of ETR 211 Clause 4.2.1.2.

3.3.22 *Delivery system descriptors**

(refer Clause 4.2.1.2.1*)

Delivery system descriptors shall be in accordance with the requirements of ETR 211 Clause 4.2.1.2.1

3.3.23 *Service list descriptor**

(refer Clause 4.2.1.2.2*)

Service list descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.1.2.2.

3.3.24 *Frequency list descriptor*

(replace Clause 4.2.1.2.3)

Frequency list descriptor (ETR 211 Clause 4.2.1.2.3) may require modification to meet Australian requirements.

3.3.25 *Descriptors of the Bouquet Association Table (BAT)*

(replace Clause 4.2.2)

Descriptors of the Bouquet Association Table (BAT) (ETR 211 Clause 4.2.2) may require modification to meet Australian requirements.

3.3.26 *First descriptor loop*

(refer Clause 4.2.2.1)

First descriptor loop shall be in accordance with the requirements of ETR 211 Clause 4.2.2.1

3.3.27 *Bouquet name descriptor*

(refer Clause 4.2.2.1.1)

Bouquet name descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.2.1.1

3.3.28 *CA identifier descriptor*

(refer Clause 4.2.2.1.2)

CA identifier descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.2.1.2

3.3.29 *Country availability descriptor*

(refer Clause 4.2.2.1.3)

Country availability descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.2.1.3

3.3.30 *Linkage descriptor*

(refer Clause 4.2.2.1.4)

Linkage descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.2.1.4

3.3.31 *Multilingual bouquet name descriptor*

(refer Clause 4.2.2.1.5)

Multilingual bouquet name descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.2.1.5

3.3.32 *Second descriptor loop*

(refer Clause 4.2.2.2)

Second descriptor loop shall be in accordance with the requirements of ETR 211 Clause 4.2.2.2

3.3.33 *Service list descriptor*

(refer Clause 4.2.2.2.1)

Service list descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.2.2.1.

3.3.34 *Descriptors of the Service Description Table (SDT)*

(replace Clause 4.2.3)

Descriptors of the Service Description Table (SDT) (ETR 211 Clause 4.2.3) may require modification to meet Australian requirements.

3.3.35 *Bouquet name descriptor*

(refer Clause 4.2.3.1)

Bouquet name descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.1

3.3.36 *CA identifier descriptor*

(refer Clause 4.2.3.2)

CA identifier descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.2

3.3.37 *Country availability descriptor*

(refer Clause 4.2.3.3)

Country availability descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.3

3.3.38 *Data_broadcast_descriptor*

(refer Clause 4.2.3.4)

Data_broadcast_descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.4.

3.3.39 *Linkage descriptor*

(refer Clause 4.2.3.5)

Linkage descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.5

3.3.40 *Mosaic descriptor*

(refer Clause 4.2.3.6)

Mosaic descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.6.

3.3.41 *Multilingual service descriptor*

(refer Clause 4.2.3.7)

Multilingual service descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.7.

3.3.42 *NVOD reference descriptor*

(refer Clause 4.2.3.8)

NVOD reference descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.8

3.3.43 *Service descriptor*

(refer Clause 4.2.3.9)

Service descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.9.

3.3.44 *Telephone descriptor*

(refer Clause 4.2.3.10)

Telephone descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.10.

3.3.45 *Time shifted service descriptor*

(refer Clause 4.2.3.11)

Time shifted service descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.3.11

3.3.46 *Descriptors of the Event Information Table (EIT)*

(refer Clause 4.2.4)

Descriptors of the Event Information Table (EIT) shall be in accordance with the requirements of ETR 211 Clause 4.2.4

3.3.47 *Component descriptor*

(refer Clause 4.2.4.1)

Component descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.4.1

3.3.48 *Content descriptor**

(refer Clause 4.2.4.2*)

Content descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.4.2.

3.3.49 *Data_broadcast_descriptor*

(refer Clause 4.2.4.3)

Data_broadcast_descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.4.3

3.3.50 *Extended event descriptor*

(refer Clause 4.2.4.4)

Extended event descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.4.4

3.3.51 *Linkage descriptor*

(refer Clause 4.2.4.5)

Linkage descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.4.5

3.3.52 *Multilingual component descriptor*

(refer Clause 4.2.4.6)

Multilingual component descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.4.6

3.3.53 *Parental rating descriptor*

(replace Clause 4.2.4.7)

Parental rating descriptor (ETR 211 Clause 4.2.7.7) may require modification to meet Australian requirements.

3.3.54 *Short event descriptor*

(refer Clause 4.2.4.8)

Short event descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.4.8.

3.3.55 *Telephone descriptor*

(refer Clause 4.2.4.9)

Telephone descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.4.9.

3.3.56 *Time shifted event descriptor*

(refer Clause 4.2.4.10)

Time shifted event descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.4.10

3.3.57 *Descriptors of the Time Offset Table (TOT)*

(refer Clause 4.2.5)

Descriptors of the Time Offset Table (TOT) shall be in accordance with the requirements of ETR 211 Clause 4.2.5

3.3.58 *Local time offset descriptor*

(refer Clause 4.2.5.1)

Local time offset shall be in accordance with the requirements of ETR 211 Clause 4.2.5.1

3.3.59 *Descriptors of the Program Map Table (PMT)*

(refer Clause 4.2.6)

Descriptors of the Program Map Table (PMT) shall be in accordance with the requirements of ETR 211 Clause 4.2.6

3.3.60 *Mosaic descriptor*

(refer Clause 4.2.6.1)

Mosaic descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.6.1.

3.3.61 *Service move descriptor*

(refer Clause 4.2.6.2)

Service move descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.6.2.

3.3.62 *Stream identifier descriptor*

(refer Clause 4.2.6.3)

Stream identifier descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.6.3.

3.3.63 *Teletext descriptor*

(refer Clause 4.2.6.4)

Teletext descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.6.4.

3.3.64 *Other descriptors*

(refer Clause 4.2.7)

Other descriptors shall be in accordance with the requirements of ETR 211 Clause 4.2.7

3.3.65 *Private data specifier descriptor*

(refer Clause 4.2.7.1)

Private data specifier descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.7.1

3.3.66 *Stuffing descriptor*

(refer Clause 4.2.7.2)

Stuffing descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.7.2.

3.3.67 *Data_broadcast_descriptor**

(refer Clause 4.2.7.3*)

Data_broadcast_descriptor shall be in accordance with the requirements of ETR 211 Clause 4.2.7.3

3.3.68 *ISO13818-1 descriptors**

(refer Clause 4.2.8*)

ISO 13818-1 (AS/NZS 13818.1:1997) descriptors shall be in accordance with the requirements of ETR 211 Clause 4.2.8.

3.3.69 *Unknown descriptors*

(refer Clause 4.2.9)

Unknown descriptors shall be in accordance with the requirements of ETR 211 Clause 4.2.9

3.3.70 *Program Specific Information (PSI) and DVB SI operational interaction states*

(refer Clause 4.3)

Program Specific Information (PSI) and DVB SI operational interaction states shall be in accordance with the requirements of ETR 211 Clause 4.3

3.3.71 *Minimum repetition rates*

(refer Clause 4.4)

Minimum repetition rates shall be in accordance with the requirements of ETR 211 Clause 4.4

3.3.72 *Satellite and cable delivery systems*

(refer Clause 4.4.1)

Satellite and cable delivery systems shall be in accordance with the requirements of ETR 211 Clause 4.4.1

3.3.73 *Terrestrial delivery systems*

(refer Clause 4.4.2)

Terrestrial delivery systems shall be in accordance with the requirements of ETR 211 Clause 4.4.2

3.3.74 *Terrestrial systems*

(refer Clause 4.5)

Terrestrial systems shall be in accordance with the requirements of ETR 211 Clause 4.5

3.3.75 *Terms used within terrestrial systems*

(refer Clause 4.5.1)

Terms used within terrestrial systems shall be in accordance with the requirements of ETR 211 Clause 4.5.1

3.3.76 *The use of alternative frequencies for multiplexes*

(refer Clause 4.5.2)

The use of alternative frequencies for multiplexes shall be in accordance with the requirements of ETR 211 Clause 4.5.2

3.3.77 *Regional or local services*

(refer Clause 4.5.3)

Regional or local services shall be in accordance with the requirements of ETR 211 Clause 4.5.3

3.3.78 *Text string formatting*

(refer Clause 4.6)

Test string formatting shall be in accordance with the requirements of ETR 211 Clause 4.6.

3.3.79 *Use of control codes in names*

(refer Clause 4.6.1)

Use of control codes in names shall be in accordance with the requirements of ETR 211 Clause 4.6.1.

3.3.80 *Use of control codes in text*

(refer Clause 4.6.2)

Use of control codes in text shall be in accordance with the requirements of ETR 211 Clause 4.6.2.

3.3.81 *Applications*

(refer Clause 5)

Applications shall be in accordance with the requirements of ETR 211 Clause 5

3.3.82 *NVOD services*

(refer Clause 5.1)

NVOD services shall be in accordance with the requirements of ETR 211 Clause 5.1

3.3.83 *Mosaic services*

(refer Clause 5.2)

Mosaic services shall be in accordance with the requirements of ETR 211 Clause 5.2

3.3.84 *General considerations*

(refer Clause 5.2.1)

General considerations shall be in accordance with the requirements of ETR 211 Clause 5.2.1

3.3.85 *Relationship between mosaic service and SI/PSI Tables*

(refer Clause 5.2.2)

Relationship between mosaic service and SI/PSI Tables shall be in accordance with the requirements of ETR 211 Clause 5.2.2

3.3.86 *Transitions at broadcast delivery media boundaries*

(refer Clause 5.3)

Transitions at broadcast delivery media boundaries shall be in accordance with the requirements of ETR 211 Clause 5.3

3.3.87 *Seamless transitions*

(refer Clause 5.3.1)

Seamless transitions shall be in accordance with the requirements of ETR 211 Clause 5.3.1

3.3.88 *Non-seamless transitions without re-multiplexing*

(refer Clause 5.3.2)

Non–seamless transitions without re–multiplexing shall be in accordance with the requirements of ETR 211 Clause 5.3.2

3.3.89 *Transitions with re-multiplexing*

(refer Clause 5.3.3)

Transitions with re–multiplexing shall be in accordance with the requirements of ETR 211 Clause 5.3.3

3.3.90 *Storage media*

(refer Clause 6)

Storage media shall be in accordance with the requirements of ETR 211 Clause 6

3.3.91 *Program Association Table (PAT)*

(refer Clause 6.1)

Program Association Table (PAT) shall be in accordance with the requirements of ETR 211 Clause 6.1

3.3.92 *Program Map Table (PMT)*

(refer Clause 6.2)

Program Map Table (PMT) shall be in accordance with the requirements of ETR 211 Clause 6.2

3.3.93 *SI tables (NIT, SDT, EIT, BAT, RST, TDT, TOT)*

(refer Clause 6.3)

SI tables (NIT, SDT, EIT, BAT, RST, TDT, TOT) shall be in accordance with the requirements of ETR 211 Clause 6.3

3.3.94 *Selection Information Table (SIT)*

(refer Clause 6.4)

Selection Information Table (SIT) shall be in accordance with the requirements of ETR 211 Clause 6.4

3.3.95 *Discontinuity Information Table (DIT)*

(refer Clause 6.5)

Discontinuity Information Table (DIT) shall be in accordance with the requirements of ETR 211 Clause 6.5

3.3.96 *Annex A (informative): Inter-operation with ATSC Systems*

(refer Annex A)

Annex A (informative): Inter-operation with ATSC Systems shall be in accordance with the requirements of ETR 211

3.4 Allocation of Service Information (SI) codes (refer ETR 162 Digital broadcasting systems for television, sound and data services; Allocation of Service Information (SI) codes for Digital Video Broadcasting (DVB) systems)*

3.4.1 *Allocation of Service Information (SI) codes.*

Editor's Note: Future versions of this Australian standard will address the modifications required to ETSI Technical Report ETR 162 to meet Australian requirements.

ETSI Technical Report ETR 162 supplements ETSI standard ETS 300 468. ETR 162 identifies the SI codes allocated for DVB systems. The following codes are identified;

the Original_network_id and the network_id used to identify a network;.

the Bouquet_id used to identify a bouquet;

the CA_system_id used to identify the kind of encryption used;

the Country code used to identify a country or region;

the Private_data_specifier values used to identify private service information.

These tables of DVB registered values of Service Information Codes will be referenced by the Australian Standard to maintain national and international co-ordination of these values.

Australia will apply for registration of it's Original_network_id's, Network_id's, Bouquet_id's (where applicable) and CA_system_id's.

4 ELEMENTARY STREAM VIDEO

4.1 Elementary stream video

(refer AS/NZS 13818-2 Information technology – Generic coding of moving pictures and associated audio information Part 2: Video)

4.2 Scope

(refer Clause 1)

Scope shall be in accordance with the requirements of AS/NZS 13818-2 Clause 1

4.3 Normative References

(refer Clause 2)

Normative References shall be in accordance with the requirements of AS/NZS 13818-2 Clause 2

4.4 Definitions

(refer Clause 3)

Definitions shall be in accordance with the requirements of AS/NZS 13818-2 Clause 3

4.5 Abbreviations and Symbols

(refer Clause 4)

Abbreviations and Symbols shall be in accordance with the requirements of AS/NZS 13818-2 Clause 4

4.6 Arithmetic operators

(refer Clause 4.1)

Arithmetic operators shall be in accordance with the requirements of AS/NZS 13818-2 Clause 4.1

4.7 Logical Operators

(refer Clause 4.2)

Logical Operators shall be in accordance with the requirements of AS/NZS 13818-2 Clause 4.2

4.8 Relational operators

(refer Clause 4.3)

Relational operators shall be in accordance with the requirements of AS/NZS 13818-2 Clause 4.3

4.9 Bitwise operators

(refer Clause 4.4)

Bitwise operators shall be in accordance with the requirements of AS/NZS 13818-2 Clause 4.4

4.10 Assignment

(refer Clause 4.5)

Assignment shall be in accordance with the requirements of AS/NZS 13818-2 Clause 4.5

4.11 Mnemonics

(refer Clause 4.6)

Mnemonics shall be in accordance with the requirements of AS/NZS 13818-2 Clause 4.6

4.12 Constants

(refer Clause 4.7)

Constants shall be in accordance with the requirements of AS/NZS 13818-2 Clause 4.7

4.13 Conventions

(refer Clause 5)

Conventions shall be in accordance with the requirements of AS/NZS 13818-2 Clause 5

4.14 Method of describing bitstream syntax

(refer Clause 5.1)

Method of describing bitstream syntax shall be in accordance with the requirements of AS/NZS 13818-2 Clause 5.1

4.15 Definition of functions

(refer Clause 5.2)

Definition of functions shall be in accordance with the requirements of AS/NZS 13818-2 Clause 5.2

4.16 Reserved, forbidden and marker bit

(refer Clause 5.3)

Reserved, forbidden and marker bit shall be in accordance with the requirements of AS/NZS 13818-2 Clause 5.3

4.17 Arithmetic precision

(refer Clause 5.4)

Arithmetic precision shall be in accordance with the requirements of AS/NZS 13818-2 Clause 5.4

4.18 Video Bitstream syntax and semantics

(refer Clause 6)

Video Bitstream syntax and semantics shall be in accordance with the requirements of AS/NZS 13818-2 Clause 6

4.19 Structure of coded video data

(refer Clause 6.1)

Structure of coded video data shall be in accordance with the requirements of AS/NZS 13818-2 Clause 6.1

4.20 Video bitstream syntax

(refer Clause 6.2)

Video bitstream syntax shall be in accordance with the requirements of AS/NZS 13818-2 Clause 6.2

4.21 Video bitstream semantics

(refer Clause 6.3)

Video bitstream semantics shall be in accordance with the requirements of AS/NZS 13818-2 Clause 6.3

4.22 The Video Decoding process

(refer Clause 7)

The Video Decoding process shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7

4.23 Higher syntactic structures

(refer Clause 7.1)

Higher syntactic structures shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.1

4.24 Variable length coding

(refer Clause 7.2)

Variable length coding shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.2

4.25 Inverse scan

(refer Clause 7.3)

Inverse scan shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.3

4.26 Inverse quantisation

(refer Clause 7.4)

Inverse quantisation shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.4

4.27 Inverse DCT

(refer Clause 7.5)

Inverse DCT shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.5

4.28 Motion compensation

(refer Clause 7.6)

Motion compensation shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.6

4.29 Spatial scalability

(refer Clause 7.7)

Spatial scalability shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.7

4.30 SNR scalability

(refer Clause 7.8)

SNR scalability shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.8

4.31 Temporal scalability

(refer Clause 7.9)

Temporal scalability shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.9

4.32 Data partitioning

(refer Clause 7.10)

Data partitioning shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.10

4.33 Hybrid scalability

(refer Clause 7.11)

Hybrid scalability shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.11

4.34 Output of the decoding process

(refer Clause 7.12)

Output of the decoding process shall be in accordance with the requirements of AS/NZS 13818-2 Clause 7.12

4.35 Profiles and Levels

(refer Clause 8)

Profiles and Levels shall be in accordance with the requirements of AS/NZS 13818-2 Clause 8

4.36 ISO/IEC 11172-2 compatibility

(refer Clause 8.1)

ISO/IEC 11172-2 compatibility shall be in accordance with the requirements of AS/NZS 13818-2 Clause 8.1

4.37 Relationship between the defined profiles

(refer Clause 8.2)

Relationship between the defined profiles shall be in accordance with the requirements of AS/NZS 13818-2 Clause 8.2

4.38 Relationship between the defined levels

(refer Clause 8.3)

Relationship between the defined levels shall be in accordance with the requirements of AS/NZS 13818-2 Clause 8.3

4.39 Scalable layers

(refer Clause 8.4)

Scalable layers shall be in accordance with the requirements of AS/NZS 13818-2 Clause 8.4

4.40 Parameter values for defined profiles, levels and layers

(refer Clause 8.5)

Parameter values for defined profiles, levels and layers shall be in accordance with the requirements of AS/NZS 13818-2 Clause 8.5

4.41 Discrete cosine transform

(refer Annex A)

Discrete cosine transform shall be in accordance with the requirements of AS/NZS 13818-2 Annex A

4.42 Variable length code tables

(refer Annex B)

Variable length code tables shall be in accordance with the requirements of AS/NZS 13818-2 Annex B

4.43 Macroblock addressing

(refer Annex B.1)

Macroblock addressing shall be in accordance with the requirements of AS/NZS 13818-2 Annex B.1

4.44 Macroblock type

(refer Annex B.2)

Macroblock type shall be in accordance with the requirements of AS/NZS 13818-2 Annex B.2

4.45 Macroblock pattern

(refer Annex B.3)

Macroblock pattern shall be in accordance with the requirements of AS/NZS 13818-2 Annex B.3

4.46 Motion vectors

(refer Annex B.4)

Motion vectors shall be in accordance with the requirements of AS/NZS 13818-2 Annex B.4

4.47 DCT coefficients

(refer Annex B.5)

DCT coefficients shall be in accordance with the requirements of AS/NZS 13818-2 Annex B.5

4.48 Video buffering verifier

(refer Annex C)

Video buffering verifier shall be in accordance with the requirements of AS/NZS 13818-2 Annex C

4.49 Features supported by the algorithm

(refer Annex D)

Features supported by the algorithm shall be in accordance with the requirements of AS/NZS 13818-2 Annex D

4.50 Overview

(refer Annex D.1)

Overview shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.1

4.51 Video formats

(refer Annex D.2)

Video formats shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.2

4.52 Picture quality

(refer Annex D.3)

Picture quality shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.3

4.53 Data rate control

(refer Annex D.4)

Data rate control shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.4

4.54 Low delay mode

(refer Annex D.5)

Low delay mode shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.5

4.55 Random access/channel hopping

(refer Annex D.6)

Random access/channel hopping shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.6

4.56 Scalability

(refer Annex D.7)

Scalability shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.7

4.57 Compatibility

(refer Annex D.8)

Compatibility shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.8

4.58 Differences between this specification and ISO/IEC 111172-2

(refer Annex D.9)

Differences between this specification and ISO/IEC 111172-2 shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.9

4.59 Complexity

(refer Annex D.10)

Complexity shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.10

4.60 Editing encoded bitstreams

(refer Annex D.11)

Editing encoded bitstreams shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.11

4.61 Trick modes

(refer Annex D.12)

Trick modes shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.12

4.62 Error resilience

(refer Annex D.13)

Error resilience shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.13

4.63 Concatenated sequences

(refer Annex D.14)

Concatenated sequences shall be in accordance with the requirements of AS/NZS 13818-2 Annex D.14

4.64 Profile and Level restrictions

(refer Annex E)

Profile and Level restrictions shall be in accordance with the requirements of AS/NZS 13818-2 Annex E

4.65 Syntax element restrictions in profiles

(refer Annex E.1)

Syntax element restrictions in profiles shall be in accordance with the requirements of AS/NZS 13818-2 Annex E.1

4.66 Permissible layer combinations

(refer Annex E.2)

Permissible layer combinations shall be in accordance with the requirements of AS/NZS 13818-2 Annex E.2

4.67 Bibliography

(refer Annex F)

Bibliography shall be in accordance with the requirements of AS/NZS 13818-2 Annex F

5 ELEMENTARY STREAM AUDIO

5.1 Elementary stream audio (refer A/53 ATSC Digital Television Standard)

5.2 Specification

(replace A/53 Annex B Clause 5)

Specification (A/53 Annex B Clause 5) shall be replaced by the following:

The Australian Standard is to adopt ATSC Standard A/53 with the exception of amendments to Sections 5.1, 5.2 and 5.3 of Annex B in A/53, as documented in this standard.

5.3 Constraints with respect to ATSC Standard A/52

(replace A/53 Annex B Clause 5.1)

Constraints with respect to ATSC Standard A/52 (A/53 Annex B Clause 5.1) shall be replaced by the following:

The digital television audio coding system is based on the Digital Audio Compression (Dolby AC-3) Standard specified in the body of ATSC Doc. A/52. Constraints on the system are shown in Table 5.1 which shows permitted values of certain syntactical elements. These constraints are described below.

Table 5.1 Audio Constraints

AC-3 syntactical element	Comment	Allowed value
fscod	Indicates sampling rate	'00' (indicates 48 kHz) '01' (indicates 44.1 kHz) '10' (indicates 32 kHz) '11' (reserved)

frmsizecod	Main audio service or associated audio service containing all necessary program elements	≤ '100100' (indicates ≤ 640 kbps)
frmsizecod	Single channel associated service containing a single program element	≤ '010000' (indicates ≤ 128 kbps)
frmsizecod	Two channel dialogue associated service	≤ '011000' (indicates ≤ 256 kbps)
(frmsizecod)	Combined bit rate of a main and an associated service intended to be simultaneously decoded	(total ≤ 768 kbps)
acmod	Indicates number of channels	≥ '001' (dual channel mode is not included)

5.4 Sampling frequency

(replace A/53 Annex B Clause 5.2)

*Sampling frequency (*A/53 Annex B Clause 5.2) shall be replaced by the following:

The system conveys digital audio sampled at a frequency of 32 kHz, 44.1 kHz or 48 kHz, locked to the 27 MHz system clock. The 48 kHz audio sampling clock is defined as:

- 48 kHz audio sample rate = (2 ÷1125) × (27 MHz system clock)

If analog signal inputs are employed, the A/D converters should sample at 32 kHz, 44.1 kHz or 48 kHz. If digital inputs are employed, the input sampling rate shall be 32 kHz, 44.1 kHz or 48 kHz

5.5 Bit rate

(replace A/53 Annex B Clause 5.3)

*Bit rate (*A/53 Annex B Clause 5.3) shall be replaced by the following:

A main audio service, or an associated audio service which is a complete service (containing all necessary program elements) shall be encoded at a bit rate less than or equal to 640 kbps. A single channel associated service containing a single program element shall be encoded at a bit rate less than or equal to 128 kbps. A two channel associated service containing only dialogue shall be encoded at a bit rate less than or equal to 256 kbps. The combined bit rate of a main service and an associated service which are intended to be decoded simultaneously shall be less than or equal to 768 kbps.

5.6 Audio encoding modes

(refer A/53 Annex B Clause 5.4)

Audio encoding modes shall be in accordance with the requirements of A/53 Annex B Clause 5.4.

5.7 Dialogue level

(refer A/53 Annex B Clause 5.5)

Dialogue level shall be in accordance with the requirements of A/53 Annex B Clause 5.5.

5.8 Dynamic range compression

(refer A/53 Annex B Clause 5.6)

Dynamic range compression shall be in accordance with the requirements of A/53 Annex B Clause 5.6.

5.9 Main and associated services

(refer A/53 Annex B Clause 6)

Main and associated services shall be in accordance with the requirements of A/53 Annex B Clause 5.5

5.10 Audio Encoder Interfaces

(refer A/53 Annex B Clause 7)

Audio Encoder Interfaces shall be in accordance with the requirements of ATSC A/53 Clause 7.

6 DATA BROADCASTING

6.1 Data broadcasting (refer EN 301 192 Digital Video Broadcasting (DVB); DVB specification for data broadcasting*)

6.1.1 *Data piping*

(refer Clause 4)

Data piping shall be in accordance with the requirements of EN 301 192 Clause 4.

6.1.2 *Data transport specification*

(refer Clause 4.1)

Data transport specification shall be in accordance with the requirements of EN 301 192 Clause 4.1.

6.1.3 *PSI and SI specifications*

(refer Clause 4.2)

PSI and SI specifications shall be in accordance with the requirements of EN 301 192 Clause 4.2.

6.1.4 *Data_broadcast_descriptor*

(refer Clause 4.2.1)

Data_broadcast_descriptor shall be in accordance with the requirements of EN 301 192 Clause 4.2.1.

6.1.5 *Stream type*

(refer Clause 4.2.2)

Stream type shall be in accordance with the requirements of EN 301 192 Clause 4.2.2.

6.1.6 *Asynchronous data streaming*

(refer Clause 5)

Asynchronous data streaming shall be in accordance with the requirements of EN 301 192 Clause 5.

6.1.7 *Data transport specification*

(refer Clause 5.1)

Data transport specification shall be in accordance with the requirements of EN 301 192 Clause 5.1.

6.1.8 *PSI and SI specifications*

(refer Clause 5.2)

PSI and SI specifications shall be in accordance with the requirements of EN 301 192 Clause 5.2.

6.1.9 *Data_broadcast_descriptor*

(refer Clause 5.2.1)

Data_broadcast_descriptor shall be in accordance with the requirements of EN 301 192 Clause 5.2.1.

6.1.10 *Stream type*

(refer Clause 5.2.2)

Stream type shall be in accordance with the requirements of EN 301 192 Clause 5.2.2.

6.1.11 *Synchronous and synchronized data streaming*

(refer Clause 6)

Synchronous and synchronized data streaming shall be in accordance with the requirements of EN 301 192 Clause 6.

6.1.12 *Data transport specification*

(refer Clause 6.1)

Data transport specification shall be in accordance with the requirements of EN 301 192 Clause 6.1.

6.1.13 *PSI and SI specifications*

(refer Clause 6.2)

PSI and SI specification shall be in accordance with the requirements of EN 301 192 Clause 6.2.

6.1.14 *Data_broadcast_descriptor*

(refer Clause 6.2.1)

Data_broadcast_descriptor shall be in accordance with the requirements of EN 301 192 Clause 6.2.1.

6.1.15 *Stream type*

(refer Clause 6.2.2)

Stream type shall be in accordance with the requirements of EN 301 192 Clause 6.2.2.

6.1.16 *Multiprotocol encapsulation*

(refer Clause 7)

Multiprotocol encapsulation shall be in accordance with the requirements of EN 301 192 Clause 7.

6.1.17 *Data transport specification*

(refer Clause 7.1)

Data transport specification shall be in accordance with the requirements of EN 301 192 Clause 7.1.

6.1.18 *PSI and SI specifications*

(refer Clause 7.2)

PSI and SI specification shall be in accordance with the requirements of EN 301 192 Clause 7.2.

6.1.19 *Data_broadcast_descriptor*

(refer Clause 7.2.1)

Data_broadcast_descriptor shall be in accordance with the requirements of EN 301 192 Clause 7.2.1.

6.1.20 *Stream type*

(refer Clause 7.2.2)

Stream type shall be in accordance with the requirements of EN 301 192 Clause 7.2.2.

6.1.21 *Data carousels*

(refer Clause 8)

Data carousels shall be in accordance with the requirements of EN 301 192 Clause 8.

6.1.22 *Data transport specification*

(refer Clause 8.1)

Data transport specification shall be in accordance with the requirements of EN 301 192 Clause 8.1.

6.1.23 *Structure of DVB data carousel*

(refer Clause 8.1.1)

Structure of DVB data carousel shall be in accordance with the requirements of EN 301 192 Clause 8.1.1.

6.1.24 *DownloadServerInitiate message*

(refer Clause 8.1.2)

DownloadServerInitiate message shall be in accordance with the requirements of EN 301 192 Clause 8.1.2.

6.1.25 *DownloadInfoIndication message*

(refer Clause 8.1.3)

DownloadInfoIndication message shall be in accordance with the requirements of EN 301 192 Clause 8.1.3.

6.1.26 *DownloadDataBlock message*

(refer Clause 8.1.4)

DownloadDataBlock message shall be in accordance with the requirements of EN 301 192 Clause 8.1.4.

6.1.27 *DownloadCancel*

(refer Clause 8.1.5)

DownloadCancel shall be in accordance with the requirements of EN 301 192 Clause 8.1.5.

6.1.28 *Descriptors*

(refer Clause 8.2)

Descriptors shall be in accordance with the requirements of EN 301 192 Clause 8.2.

6.1.29 *Descriptor identification and location*

(refer Clause 8.2.1)

Descriptor identification and location shall be in accordance with the requirements of EN 301 192 Clause 8.2.1.

6.1.30 *Type descriptor*

(refer Clause 8.2.2)

Type descriptor shall be in accordance with the requirements of EN 301 192 Clause 8.2.2.

6.1.31 *Name descriptor*

(refer Clause 8.2.3)

Name descriptor shall be in accordance with the requirements of EN 301 192 Clause 8.2.3.

6.1.32 *Info descriptor*

(refer Clause 8.2.4)

Info descriptor shall be in accordance with the requirements of EN 301 192 Clause 8.2.4.

6.1.33 *Module link descriptor*

(refer Clause 8.2.5)

Module link descriptor shall be in accordance with the requirements of EN 301 192 Clause 8.2.5.

6.1.34 *CRC32 descriptor*

(refer Clause 8.2.6)

CRC32 descriptor shall be in accordance with the requirements of EN 301 192 Clause 8.2.6.

6.1.35 *Location descriptor*

(refer Clause 8.2.7)

Location descriptor shall be in accordance with the requirements of EN 301 192 Clause 8.2.7.

6.1.36 *Estimated download time descriptor*

(refer Clause 8.2.8)

Estimated download time descriptor shall be in accordance with the requirements of EN 301 192 Clause 8.2.8.

6.1.37 *Group link descriptor*

(refer Clause 8.2.9)

Group link descriptor shall be in accordance with the requirements of EN 301 192 Clause 8.2.9.

6.1.38 *Private descriptor*

(refer Clause 8.2.10)

Private descriptor shall be in accordance with the requirements of EN 301 192 Clause 8.2.10.

6.1.39 *PSI and SI specifications*

(refer Clause 8.3)

PSI and SI specifications shall be in accordance with the requirements of EN 301 192 Clause 8.3.

6.1.40 *Data_broadcast_descriptor*

(refer Clause 8.3.1)

Data_broadcast_descriptor shall be in accordance with the requirements of EN 301 192 Clause 8.3.1.

6.1.41 *Stream type*

(refer Clause 8.3.2)

Stream type shall be in accordance with the requirements of EN 301 192 Clause 8.3.2.

6.1.42 *Object carousels*

(refer Clause 9)

Object carousels shall be in accordance with the requirements of EN 301 192 Clause 9.

6.1.43 *Scope of the object carousels*

(refer Clause 9.1)

Scope of the object carousels shall be in accordance with the requirements of EN 301 192 Clause 9.1.

6.1.44 *Data transport specification*

(refer Clause 9.2)

Data transport specifications shall be in accordance with the requirements of EN 301 192 Clause 9.2.

6.1.45 *Carousel NSAP address*

(refer Clause 9.2.1)

Carousel NSAP address shall be in accordance with the requirements of EN 301 192 Clause 9.2.1.

6.1.46 *PSI and SI specifications*

(refer Clause 9.3)

PSI and SI specifications shall be in accordance with the requirements of EN 301 192 Clause 9.3.

6.1.47 *Data_broadcast_descriptor*

(refer Clause 9.3.1)

Data_broadcast_descriptor shall be in accordance with the requirements of EN 301 192 Clause 9.3.1.

6.1.48 *Deferred_association_tags_descriptor*

(refer Clause 9.3.2)

Deferred_association_tags_descriptor shall be in accordance with the requirements of EN 301 192 Clause 9.3.2.

6.1.49 *Stream type*

(refer Clause 9.3.3)

Stream type shall be in accordance with the requirements of EN 301 192 Clause 9.3.3.

6.1.50 *Decoder models*

(refer Clause 10)

Decoder models shall be in accordance with the requirements of EN 301 192 Clause 10.

6.1.51 *Annex A (informative): Registration of private data broadcast systems*

(refer Annex A)

Annex A (informative): Registration of private data broadcast systems shall be in accordance with the requirements of EN 301 192.

6.2 Subtitling (Reference ETS 300 743 Digital Video Broadcasting (DVB); Subtitling systems)

6.2.1 *Subtitle decoder model*

(refer Clause 5)

Subtitle decoder model shall be in accordance with the requirements of ETS 300 743 Clause 5.

6.2.2 *Decoder temporal model*

(refer Clause 5.1)

Decoder temporal model shall be in accordance with the requirements of ETS 300 743 Clause 5.1.

6.2.3 *Service acquisition*

(refer Clause 5.1.1)

Service acquisition shall be in accordance with the requirements of ETS 300 743 Clause 5.1.1.

6.2.4 *Presentation Time Stamps (PTS)*

(refer Clause 5.1.2)

Presentation Time Stamps (PTS) shall be in accordance with the requirements of ETS 300 743 Clause 5.1.2.

6.2.5 *Page composition*

(refer Clause 5.1.3)

Page composition shall be in accordance with the requirements of ETS 300 743 Clause 5.1.3.

6.2.6 *Region composition*

(refer Clause 5.1.4)

Region composition shall be in accordance with the requirements of ETS 300 743 Clause 5.1.4.

6.2.7 *Points to note*

(refer Clause 5.1.5)

Points to note shall be in accordance with the requirements of ETS 300 743 Clause 5.1.5.

6.2.8 *Buffer memory model*

(refer Clause 5.2)

Buffer memory model shall be in accordance with the requirements of ETS 300 743 Clause 5.2.

6.2.9 *Pixel display buffer memory*

(refer Clause 5.2.1)

Pixel display buffer memory shall be in accordance with the requirements of ETS 300 743 Clause 5.2.1.

6.2.10 *Region memory*

(refer Clause 5.2.2)

Region memory shall be in accordance with the requirements of ETS 300 743 Clause 5.2.2.

6.2.11 *Composition buffer memory*

(refer Clause 5.2.3)

Composition buffer memory shall be in accordance with the requirements of ETS 300 743 Clause 5.2.3.

6.2.12 *Cumulative display construction*

(refer Clause 5.3)

Cumulative display construction shall be in accordance with the requirements of ETS 300 743 Clause 5.3.

6.2.13 *Decoder rendering bandwidth model*

(refer Clause 5.4)

Decoder rendering bandwidth model shall be in accordance with the requirements of ETS 300 743 Clause 5.4.

6.2.14 *Page erasure*

(refer Clause 5.4.1)

Page erasure shall be in accordance with the requirements of ETS 300 743 Clause 5.4.1.

6.2.15 *Region move or change in visibility*

(refer Clause 5.4.2)

Region move or change in visibility shall be in accordance with the requirements of ETS 300 743 Clause 5.4.2.

6.2.16 *Region fill*

(refer Clause 5.4.3)

Region fill shall be in accordance with the requirements of ETS 300 743 Clause 5.4.3.

6.2.17 *CLUT modification*

(refer Clause 5.4.4)

CLUT modification shall be in accordance with the requirements of ETS 300 743 Clause 5.4.4.

6.2.18 *Graphic object decoding*

(refer Clause 5.4.5)

Graphic object decoding shall be in accordance with the requirements of ETS 300 743 Clause 5.4.5.

6.2.19 *Character object decoding*

(refer Clause 5.4.6)

Character object decoding shall be in accordance with the requirements of ETS 300 743 Clause 5.4.6.

6.2.20 *PES packet format*

(refer Clause 6)

PES packet format shall be in accordance with the requirements of ETS 300 743 Clause 6.

6.2.21 *The PES packet data for subtitling*

(refer Clause 7)

The PES packet data for subtitling shall be in accordance with the requirements of ETS 300 743 Clause 7.

6.2.22 *Syntax and semantics of the PES data field for subtitling*

(refer Clause 7.1)

Syntax and semantics of the PES data field for subtitling shall be in accordance with the requirements of ETS 300 743 Clause 7.1.

6.2.23 *Syntax and semantics of the subtitling segment*

(refer Clause 7.2)

Syntax and semantics of the subtitling segment shall be in accordance with the requirements of ETS 300 743 Clause 7.2.

6.2.24 *Page composition segment*

(refer Clause 7.2.1)

Page composition segment shall be in accordance with the requirements of ETS 300 743 Clause 7.2.1.

6.2.25 *Region composition segment*

(refer Clause 7.2.2)

Region composition segment shall be in accordance with the requirements of ETS 300 743 Clause 7.2.2.

6.2.26 *CLUT definition segment*

(refer Clause 7.2.3)

CLUT definition segment shall be in accordance with the requirements of ETS 300 743 Clause 7.2.3.

6.2.27 *Object data segment*

(refer Clause 7.2.4)

Object data segment shall be in accordance with the requirements of ETS 300 743 Clause 7.2.4.

6.2.28 *Pixel-data sub-block*

(refer Clause 7.2.4.1)

Pixel-data sub-block shall be in accordance with the requirements of ETS 300 743 Clause 7.2.4.1.

6.2.29 *Syntax and semantics of the pixel code strings*

(refer Clause 7.2.4.2)

Syntax and semantics of the pixel code strings shall be in accordance with the requirements of ETS 300 743 Clause 7.2.4.2.

6.2.30 *Requirements for the subtitling data*

(refer Clause 8)

Requirements for the subtitling data shall be in accordance with the requirements of ETS 300 743 Clause 8.

6.2.31 *Scope of Identifiers*

(refer Clause 8.1)

Scope of Identifiers shall be in accordance with the requirements of ETS 300 743 Clause 8.1.

6.2.32 *Scope of dependencies*

(refer Clause 8.2)

Scope of dependencies shall be in accordance with the requirements of ETS 300 743 Clause 8.2.

6.2.33 *Composition page*

(refer Clause 8.2.1)

Composition page shall be in accordance with the requirements of ETS 300 743 Clause 8.2.1.

6.2.34 *Ancillary page*

(refer Clause 8.2.2)

Ancillary page shall be in accordance with the requirements of ETS 300 743 Clause 8.2.2.

6.2.35 *Order of delivery*

(refer Clause 8.3)

Order of delivery shall be in accordance with the requirements of ETS 300 743 Clause 8.3.

6.2.36 *PTS field*

(refer Clause 8.3.1)

PTS field shall be in accordance with the requirements of ETS 300 743 Clause 8.3.1.

6.2.37 *Positioning of regions and objects*

(refer Clause 8.4)

Positioning of regions and objects shall be in accordance with the requirements of ETS 300 743 Clause 8.4.

6.2.38 *Regions*

(refer Clause 8.4.1)

Regions shall be in accordance with the requirements of ETS 300 743 Clause 8.4.1.

6.2.39 *Objects sharing a PTS*

(refer Clause 8.4.2)

Objects sharing a PTS shall be in accordance with the requirements of ETS 300 743 Clause 8.4.2.

6.2.40 *Objects added to a region*

(refer Clause 8.4.3)

Objects added to a region shall be in accordance with the requirements of ETS 300 743 Clause 8.4.3.

6.2.41 *Avoiding excess pixel-data capacity*

(refer Clause 8.5)

Avoiding excess pixel-data capacity shall be in accordance with the requirements of ETS 300 743 Clause 8.5.

6.2.42 *Translation to colour components*

(refer Clause 9)

Translation to colour components shall be in accordance with the requirements of ETS 300 743 Clause 9.

6.2.43 *4- to 2-bit reduction*

(refer Clause 9.1)

4- to 2-bit reduction shall be in accordance with the requirements of ETS 300 743 Clause 9.1.

6.2.44 *8- to 2-bit reduction*

(refer Clause 9.2)

8- to 2-bit reduction shall be in accordance with the requirements of ETS 300 743 Clause 9.2.

6.2.45 *8- to 4-bit reduction*

(refer Clause 9.3)

8- to 4-bit reduction shall be in accordance with the requirements of ETS 300 743 Clause 9.3.

6.2.46 *Default CLUTs and map-tables contents*

(refer Clause 10)

Defult CLUTs and map-tables contents shall be in accordance with the requirements of ETS 300 743 Clause 10.

6.2.47 *256-entry CLUT default contents*

(refer Clause 10.1)

256-entry CLUT default contents shall be in accordance with the requirements of ETS 300 743 Clause 10.1.

6.2.48 *16-entry CLUT default contents*

(refer Clause 10.2)

16-entry CLUT default contents shall be in accordance with the requirements of ETS 300 743 Clause 10.2.

6.2.49 *4-entry CLUT default contents*

(refer Clause 10.3)

4-entry CLUT default contents shall be in accordance with the requirements of ETS 300 743 Clause 10.3.

6.2.50 *2_to_4-bit_map-table default contents*

(refer Clause 10.4)

2_to_4-bit_map-table default contents shall be in accordance with the requirements of ETS 300 743 Clause 10.4.

6.2.51 *2_to_8-bit_map-table default contents*

(refer Clause 10.5)

2_to_8-bit_map-table default contents shall be in accordance with the requirements of ETS 300 743 Clause 10.5.

6.2.52 *4_to_8-bit_map-table default contents*

(refer Clause 10.6)

4_to_8-bit_map-table default contents shall be in accordance with the requirements of ETS 300 743 Clause 10.6.

6.2.53 *Structure of the pixel code strings (informative)*

(refer Clause 11)

Structure of the pixel code strings (informative) shall be in accordance with the requirements of ETS 300 743 Clause 11.

6.2.54 *Annex A (informative):How the DVB subtitling system works*

(refer Annex A)

Annex A (informative) : How the DVCB subtitling systems works shall be in accordance with the requirements of ETS 300 743.

6.3 Conveying ITU-R System B Teletext (refer EN 300 472 Digital Video Broadcasting (DVB); Specification for conveying ITU-R System B Teletext in DVB bitstreams

6.3.1 *Insertion of Teletext into the MPEG-2 transport multiplex*

(refer Clause 4)

Insertion of Teletext into the MPEG-2 transport multiplex shall be in accordance with the requirements of EN 300 472 Clause 4.

6.3.2 *Transport Stream (TS) packet format*

(refer Clause 4.1)

Transport Stream (TS) packet format shall be in accordance with the requirements of EN 300 472 Clause 4.1.

6.3.3 *PES packet format*

(refer Clause 4.2)

PES packet format shall be in accordance with the requirements of EN 300 472 Clause 4.2.

6.3.4 *Syntax for PES data field*

(refer Clause 4.3)

Syntax for PES data field shall be in accordance with the requirements of EN 300 472 Clause 4.3.

6.3.5 *Semantics for PES data field*

(refer Clause 4.4)

Semantics for PES data field shall be in accordance with the requirements of EN 300 472 Clause 4.4.

6.3.6 *Teletext decoder model*

(refer Clause 5)

Teletext decoder model shall be in accordance with the requirements of EN 300 472 Clause 5.

7 CONDITIONAL ACCESS

7.1 Conditional Access (refer ETR 289 Digital Video Broadcasting (DVB); Support for use of scrambling and Conditional Access (CA) within digital broadcasting systems)

7.1.1 *The DVB Scrambling Algorithm*

(refer Clause 4)

The DVB Scrambling Algorithm shall be in accordance with the requirements of ETR 289 Clause 4.

7.1.2 *The DVB Scrambling Algorithm custodian*

(refer Clause 4.1)

The DVB Scrambling Algorithm custodian shall be in accordance with the requirements of ETR 289 Clause 4.1.

7.1.3 *Use of the scrambling algorithm in an MPEG-2 environment*

(refer Clause 5)

Use of the scrambling algorithm in an MPEG-2 environment shall be in accordance with the requirements of ETR 289 Clause 5.

7.1.4 *Scrambling control field*

(refer Clause 5.1)

Scrambling control field shall be in accordance with the requirements of ETR 289 Clause 5.1.

7.1.5 *Registration of CA System ID*

(refer Clause 5.2)

Registration of CA System ID shall be in accordance with the requirements of ETR 289 Clause 5.2.

7.1.6 *PES level scrambling issues*

(refer Clause 5.3)

PES level scrambling issues shall be in accordance with the requirements of ETR 289 Clause 5.3.

7.1.7 *Trans-control issues when crossing distribution media boundaries*

(refer Clause 6)

Trans-control issues when crossing distribution media boundaries shall be in accordance with the requirements of ETR 289 Clause 6.

7.1.8 *Conditional Access (CA) data*

(refer Clause 7)

Conditional Access (CA) data shall be in accordance with the requirements of ETR 289 Clause 7.

*** END OF DRAFT ***