Commission for
Communications Regulation

Technical Conditions

Digital Video Broadcasting Terrestrial (DVB-T) Network Technical Conditions attached to a Digital Terrestrial Television (DTT Licence)

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1 General

1.1 Purpose

This document specifies characteristics for the operation of a Digital Video Broadcasting Terrestrial (DVB-T) transmission network under a Digital Terrestrial Television (DTT) Licence.

1.2 Summary Information

These conditions detail the characteristics of the equipment that must be considered in order to ensure that services are provided to subscribers, in a safe manner. They do not include detailed equipment specifications.

These conditions also detail those characteristics relevant for ensuring compatibility with other authorised users of the radio frequency spectrum.

The parameters specified in this document are based on harmonised European Standards as revised: including those given in ETSI and CENELEC documents: ISO/IEC 13818-1, 2, 3, ISO/IEC 14496 for coding standards, EN 300 744 and TR 101 190 for the transmission standards.

For conditions not referred to by this document, the licensee shall comply with standards set out in any relevant ETSI (European Telecommunications Standards Institute), IEC (International Electrotechnical Committee) or CENELEC (Comité Européen de Normalisation ELECtrotechnique) standard relating to DVB-T.

The conditions specified in this document may be revised and/or added to from time to time.

1.3 Definitions

ComReg

Commission for Communications Regulation.

Conditional Access Service Provider

A provider of conditional access services or operator of conditional access systems.

Conditional Access System/Service

A system or service or any part thereof controlling access to digital television services, so that only authorised subscribers receive such services. This includes *Encryption Services*, that is to say, any encryption of signals for digital television services; and the conveyance by such a system of encryption information.

Digital Multiplex

A signal (which in its baseband form is a DVB transport stream, but is a signal with a bandwidth of 8 MHz in UHF and 7 MHz in VHF Band III, when modulated) containing one or more than one programme service, with associated and other data.

Digital Terrestrial Television System (DTT)

A Digital Terrestrial Television System (DTT) is a system used for the transmission of a modulated data stream containing Digital Multiplexes in the broadcasting bands III, IV and V intended for direct reception by the general public.

Effective Radiated Power (e.r.p.) (in a given direction)

The product of the power supplied to the antenna and its gain in a given direction relative to a half-wave dipole. This is usually expressed in decibels relative to one watt (dBW).

Electronic Programme Guide (EPG)

Electronic Programme Guide is the means by which a user can navigate around the supplied services.

Encryption

A method of encoding a Programme Service, such that it is only available to subscribers who are authorised to avail of such a service.

European Standards Body

A body such as ETSI, the IEC or CENELEC, which sets standards for equipment or services.

Licensee

Means the holder of a DTT licence or any party to whom the benefits and obligations of the Licence have been assigned to.

Multiplex Contractor

Provider of the programme service multiplex, under a Broadcasting Commission of Ireland Multiplex Contract.

Omni directional Antenna.

An antenna having a horizontal radiation pattern with variations of 2 dB, or less, over 360 degrees.

Programme Redistribution Operator

The operator of a system for the retransmission or relay of programme service multiplexes on a point-to-multipoint basis over-the-air or by cable.

Programme Service Multiplex (Multiplex)

A signal containing one or more than one Programme Service, with associated and other data.

Programme Service Provider

A compiler of programme content into a programme service.

Set Top Box

A device, which can receive and demodulate fully a scrambled Programme Service, which when a normal television is connected to it enables a subscriber to view such a service.

Station

One or more transmitters or receivers, or a combination of transmitters and receivers, including the associated equipment necessary, at one location for implementing a digital terrestrial television system.

Subscriber Authorisation Services

The means to actuate or control remotely or otherwise decoders or any other such device or the initial transmission of messages connected with the aforesaid.

Subscriber Management Services

The preparation and/or supply to subscribers of essential components, or the preparation from subscribers' orders of instructions for authorisation signals, for transmission to decoders, or both.

Technical Services

Those detailed in the definitions for Subscriber Management Services or Subscriber Authorisation Services or any part thereof which is of a technical nature, which prevents the digitally transmitted services of the Programme Service provider, or the Programme Service Multiplex provider, being accessed by subscribers.

Trans-control

The means whereby, upon payment of any relevant charges, a Programme Redistribution Operator may access Programme Services and retransmit them, using their own Technical Services.

Transport Stream

A data stream corresponding to the relevant ETSI (DVB) standards carrying MPEG encoded video and associated or other data.

1.4 System Engineering:-

1.4.1 General

The mechanical and electrical construction of the installation shall be in accordance with best practice.

The practice of good system engineering is a necessary requirement to ensure the provision of a high quality service and the minimising of the potential for interference to, or from, radiocommunication services operating in accordance with the Irish Table of Frequency Allocations.

1.4.2 Controls

Controls which, when wrongly adjusted, change the system parameters, increase the risk of interference or cause improper functioning of the transmitter and other appropriate equipment, shall be immediately accessible to qualified personnel only.

1.4.3 Manufacturer's Identification.

The equipment shall be labelled with the manufacturer's trademark, type designation and serial number.

1.4.4 Weather Protection.

All apparatus and cables exposed to weather, corrosive atmosphere, or other adverse conditions shall be so constructed, or protected, as may be necessary to prevent danger, or interference, arising from such exposure.

1.5 Installation Certification and Maintenance:-

1.5.1 Access and Personnel

The licensee shall, on a request made by an authorised officer of ComReg, facilitate that officer in the inspection[1] of any part of the multiplex or digital terrestrial television system installation.

Only authorised personnel shall have access to the multiplex or digital terrestrial television system for the purpose of adjustment and/or maintenance of that equipment.

The licensee shall ensure that all authorised personnel are adequately trained for the functions they are to undertake.

1.5.2 Examination and Testing

When the installation of equipment is complete, the licensee shall examine the station and indicate to ComReg whether the installation is ready to commence operation in accordance with these conditions. Permission for on-air testing prior to the examination and commencement of regular service can be obtained.

On commencement of operation, the licensee shall inform ComReg of the date of commencement and provide certification indicating that the station is operating in accordance with the specified conditions and characteristics.

[1] Inspection shall include the undertaking of measurements.

1.5.3 Maintenance

The digital multiplex and digital terrestrial television system installation shall be so maintained as to always comply with these conditions. The licensee shall ensure that a suitably qualified person has the necessary technical training, knowledge and practical experience so as to be able to certify that the installation and maintenance of the installation complies with these conditions. The licensee shall ensure that the installation is examined annually to ensure compliance and a log shall be kept indicating the dates and results of these examinations.

2 System Standards:-

2.1 Software Updates and Encryption:-

Changes to software and/or services, should be implemented 'over the air' with the data in the form dictated by EN 301 192 conforming to TS 102 006.

Encryption data may be included in the Transport Stream to enable only authorised subscribers to view certain programmes.

2.2 Additional Broadcasting Services:-

2.2.1 Permitted Additional Broadcasting Services

The transmission of; subtitling, EPG, Sound Broadcasting Services or teletext services are permitted[2].

Any data carried which is an integral part of the programme shall conform to the methods described in EN 301 192[3] and observe the guidelines referenced in TR101 202 and TR 101 211. The subtitling system used must conform to EN 300 743 or any future European standard describing the implementation of such services. 'Over the air' software updates to set top boxes conforming to TS 102 006 are also permitted.

2.2.2 Non-Programme Related Data

The provision of data services and internet on a Transport Stream should be secondary to the provision of programme services (both television and Sound Broadcasting). However, where there is residual capacity in a Transport Stream it may be used for non-broadcast related purposes subject to the following limit; Non Programme Related Data may comprise no more than 20 percent of the capacity of each Transport Stream at any one time, subject to a cumulative maximum of 15 percent in any 24 hour period.

[2] These services include and are not limited to, sound broadcasting services, closed caption signing, audio description, multi-channel or alternative language audio, interactive programme features and in general enhanced content related to the programme service.

[3] For Reasons of spectrum efficiency Time Slicing is not permitted.

2.3 DTT Transmission characteristics

2.3.1 Transmission Standard

The Transmission Standard used shall be the DVB-T standard as specified in EN 300 744.

2.3.2 Summary List of Parameters:-

MPEG 2 Encoding Standards

System	ISO/IEC 13818-1
Video *	MPEG 2 Main Profile, Main Level, ISO/IEC 13818-2
Audio	MPEG 2 layer I and II, ISO/IEC 13818-3
Audio (Sound Broadcasting Services)	ISO/IEC 13818-3[5] (MPEG-1 Layer 2)
Data (Additional services for general reception)	EN 301 192
Data (Additional services for closed user groups)	EN 301 192
Technical Services (CA Message sections)	TR 101 289

**Note: Higher levels and profiles may be used for the provision of HDTV.*

MPEG 4 Encoding Standards

System	ISO/IEC 13818-1
Video *	ISO/IEC 14496-10, MPEG4 High Profile, Level 4.0 or Main Profile, Level 3.0
Audio	ISO/IEC 14496-3, HEAAC
Audio (Sound Broadcasting Services)	ISO/IEC 13818-3[5] (MPEG-1 Layer 2)
Data (Additional services for general reception)	EN 301 192
Data (Additional services for closed user groups)	EN 301 192
Technical Services (CA Message sections)	TR 101 289

Other Video and Audio Parameters

SD Video Frame rate	25 or 50Hz
SD Aspect Ratio	4:3 or 16:9
SD Resolution	720 x 576
Audio Sampling Frequency	48kHz
Emphasis	None
HD Video Frame rate	25 or 50Hz
HD Aspect Ratio	4:3, 14.9or 16:9
HD Resolution	1920 x 1080
Audio Sampling Frequency	48kHz
Emphasis	None

2.3.3 Frequency Spacing and Bands of Operation

Nominal radio-frequency channel bandwidth occupied by a modulated Digital Multiplex for UHF:- Band IV and V	8MHz
Nominal radio-frequency channel bandwidth occupied by a modulated Digital Multiplex for VHF:- Band III[4]	7MHz

2.3.4 Modulation

Modulation (COFDM)	X7F
Number of carriers[5]	6817
Carrier Modulation	16QAM or 64QAM
Guard Interval (Single Frequency Network)* (Multi Frequency Network or SFN where the inter-station distance is less than 8.5km)	1/8 to 1/32
Forward Error Correction (FEC) [6]	All

**Note: Where a station that is a member of an SFN loses synchronisation, then the output of that station should be reduced by 6dB, or the station should cease transmission, to avoid interference with the remaining synchronised stations.*

[4] Band III may be considered post analogue switch off.
[5] For reasons of spectrum efficiency the use of the 2k and 4k DVB-T modes is not permitted.
[6] For Reasons of spectrum efficiency the use of Multi-Protocol Encapsulation Forward Error Correction (MPE-FEC) as specified in EN 301 192 is not permitted.

2.3.5 Emission Designation

UHF Band IV and V (470 to 862MHz)	8M00X7FXF
VHF Band III (174 – 230MHz)	7M00X7FXF

3 System Performance:-

3.1 Planning Criteria

The performance limits set out in this section apply in the presence of all signals for which the Digital Terrestrial Television System was designed.

There are three main forms of visible interference in a digital television signal. These are exhibited by artefacts; such as an absence of picture, freezing of frames and blocking (where the picture turns into course blocks).

The signal should be free from all such interference for 95% of the time at 50% of locations served for an ITU-R 601 Grade 4[7] service.

3.2 Frequency Stability

The equipment shall be designed to operate on the assigned frequency in the frequency Bands III, IV and V only.

The frequency tolerance shall be

Fs = Bw/100N

Fs	Frequency Stability
Bw	Bandwidth (8 MHz or 7 MHz)
N	No of carriers

Or

- ± 250 Hz, for transmitters for which the licence characteristics do not require the use of offset and are part of a Multi Frequency Network.

- ± 1 Hz, for transmitters for which the licence characteristics require the use of offset or are part of a single frequency network

The transmitter frequency adjustment control shall be accessible to qualified personnel only.

3.2.1 Power

As the total effective radiated power is the sum of the transmitter output power (in dBW) and the gain of the antenna (in dB), the output power of transmitter shall be adjustable so that the value of the effective radiated power permitted for each station is not exceeded.

If the equipment is designed to operate with different levels of power, the rated output power for each power level must be declared by the manufacturer.

[7] Impairments are perceptible but not annoying

3.3 Maximum Permitted Levels of Spurious Emissions

The maximum permitted level of spurious emission for a transmitting station shall be:-

- at least 40 dB below the transmitter e.r.p. and shall not in any case:-
  exceed -46 dBW for a transmitter e.r.p. less than, or equal to, 14dBW.

- at least 60dB below the transmitter e.r.p. and shall not in any case:-
  exceed -17 dBW for transmitter e.r.p. above 14 dBW.

3.4 Overview of National Band Plan:-

3.4.1 Frequency Channels and Standard Groups

The frequency bands for broadcasting are bands III, IV and V.

Due to the phased development of the Digital Terrestrial Television System, a station may initially have coverage in excess of the planned service area. With the introduction of additional stations, it is to be expected that this extended service area will be reduced.

3.4.2 Assignment List

A list of the Assignments, which constitute the national plan, will be maintained by ComReg.

3.4.3 Planning Parameters

The planning parameters used by ComReg correspond to those set out in the Final Acts of the Regional Radiocommunication Conference for planning of the digital terrestrial broadcasting service in parts of Region 1 and 3, in the frequency bands 174 – 230 MHz and 470 – 862 MHz, Geneva 2006 (GE06). This was a conference convened by the ITU. A summary of these parameters is given in Appendix A

3.4.4 Additional and Modified Assignments:-

3.4.4.1 Requisite information

The licensee shall provide ComReg with all the necessary details in support of an application for an additional assignment, or a modification of an existing assignment.

3.4.4.2 Examination

The licensee shall examine any proposal for an additional, or modified, assignment with regard to other persons having assignments in the same frequency segment.

3.4.4.3 Field Strength Measurements

It may be necessary to supply field strength measurements in support of an application or an interference complaint.

3.4.4.4 International Agreements

ComReg is bound by the provisions of the Radio Regulations and the Final Acts of the Regional Radiocommunication Conference for planning of the digital terrestrial broadcasting service in parts of Region 1 and 3, in the frequency bands 174 – 230 MHz and 470 – 862 MHz, Geneva 2006 (GE-06) in relation to aspects of UHF and VHF Band III broadcast television services. These agreements require ComReg to undertake certain co-ordination and registration procedures when considering additions / modifications of the assignment plan.

A minimum of three months is allowed for co-ordination. However, co-ordination of additional or modified assignments cannot be guaranteed. The licensee shall allow adequate time in planning, and provide ComReg with the relevant information, to ensure compliance with these agreements.

3.4.5 Information to be submitted to ComReg:-

3.4.5.1 Update of System Information

The licensee shall, upon request from ComReg, submit in a format specified by ComReg:

- an up to date frequency plan indicating the Digital Multiplex on any given frequency channel.
- An updated network diagram/map of their system, clearly indicating the most up to date geographical area of operation of their DVB-T transmission network and
- Any additional information required by ComReg within 21 days of the receipt of the request.

4 Conditions for the Operation of Conditional Access Systems:-

4.1 Condition 1; Conditional Access Standards:-

Licensees in the State, intending to use the above Conditional Access Systems as defined or part thereof, must use either of the systems referred to in subparagraph a) or b) below.

a) Multicrypt technology, as specified in CENELEC standards EN50221 and R 206001.
b) Simulcrypt technology, as specified in ETSI standards TS 101 197-1, 101 197-2.

Licensees must ensure that any Set Top Box offered for sale, lease or rent by them or their agents is fully labelled to indicate the equipment functionality and that all user manuals clearly document any limitations of the equipment.

4.2 Condition 2; Service Obligations for Conditional Access Service Providers:-

4.2.1 Non Discrimination

Any Technical Services, in respect of the licensee's Conditional Access System, offered by the licensee to a programme service provider or a Multiplex Contractor shall be offered on a fair, reasonable and non-discriminatory basis.

4.2.2 Co-operation

If any Technical Service is provided under subparagraph 4.3.1 the licensee shall co-operate with the programme service provider or Multiplex Contractor and do whatever is required, within reason, to ensure the interconnection and or interoperability of the relevant system and all associated apparatus for provision and maintenance of Technical Services.

4.2.3 Proportionality of Incremental Expenditure

The licensee shall not cause the programme service provider or Multiplex Contractor to incur costs or incremental expenditure in interfacing with the licensee's apparatus or systems greater than the initial charge for the Technical Service or disproportionate to the benefit to be gained from the use of the Technical Services.

4.3 Condition 3, Cost Effective Trans-control:-

4.3.1 Effecting Trans-control

Where the licensee provides to a programme service provider or Multiplex Contractor any Technical Service in relation to the provision of digital video services; and the programme service providers or Multiplex Contractor's digital video services are provided to a programme redistribution operator for the purpose of redistribution;

The licensee shall co-operate with and assist the programme redistribution operator, providing all information and assistance necessary to facilitate cost effective trans-control, whereby the programme redistribution operator can trans-control and redistribute the digital video service using its own Technical Services.

4.3.2 Licensees Responsibility for Third Party Services

The licensee shall be responsible for third party services where the licensee does not provide any Technical Services but contracts a Conditional Access Service Provider to provide Technical Services in relation to the provision of programme services, which programme services are then provided to a programme redistribution operator for the purpose of redistribution.

Furthermore the licensee shall make all reasonable efforts to ensure that the Conditional Access Service Provider co-operates with and assists the programme redistribution operator, providing all information and assistance necessary to facilitate cost-effective trans-control, such that , whereby :-the programme redistribution operator can trans-control and redistribute the digital video service using its own Technical Services.

4.4 Prohibition on Linked Sales:-

4.4.1 Attachment of Conditions

The licensee or Conditional Access Service Provider shall not attach any condition on the provision of Technical Services where such condition requires the purchase of:-

a) another service from the licensee, except where the service is essential for the operation of the Technical Service requested; or

b) any apparatus or system, unless the requested Technical Service cannot be provide without such apparatus or system.

Appendix A – Planning Parameters

Table 1.0

Parameter	Description	Value used
Propagation using terrain data	Wanted Signal: Unwanted Signal, Domestic: Unwanted Signal, DVB-T and RBL[8]:	50% location, 50% time 50% location, 5% time 50% location, 1% time
Quality of service	Continuous Interference: Tropospheric Interference:	Grade 4 [9] Grade 3 [10]
Polarisation Discrimination	Domestic: RBL:	15 dB 20 dB

Table 2.0

Parameter	Description	Value used
Maximum Receive antenna directivity	Domestic: RBL:	16 dB 20 dB

Analogue television (for information)

Table 3.0

Parameter	Description	Value used
Analogue Protection Ratios	Co-channel, continuous	52 dB, no offset
		40 dB, 3/12 line offset
	Co-channel, tropospheric	45 dB, no offset
		30 dB, 3/12 line offset
	Lower Adjacent Channel	-9 dB, tropospheric
	Upper Adjacent Channel	-12 dB, tropospheric
	Image channel	-10 dB, tropospheric
	Local oscillator channel	-10 dB, tropospheric
Analogue Protection Ratios, with precision offset	Continuous, no offset	36 dB
	Tropospheric, no offset	32 dB
	Continuous, 3/12 line offset	27 dB
	Tropospheric, 3/12 line offset	22 dB

Table 4.0

Parameter	Description	Value used
Analogue, PAL I interfered with by DVB-T 8 MHz.	Co-channel, continuous	40 dB
	Co-channel, tropospheric	34 dB
Analogue vision signal interfered with by a DVB-T 8 MHz channel.	Lower adjacent, continuous	-5 dB
	Lower adjacent, Tropospheric	-9 dB
	Upper adjacent, continuous	-5 dB
	Upper adjacent, tropospheric	-8 dB

[8] Radio Broadcasting Link
[9] Grade 4: Perceptible, but not annoying
[10] Grade 3: Slightly annoying

Table 5.0

Parameter	Description	Value used
Analogue, PAL I interfered with by DVB-T 7 MHz.	Co-channel, continuous	41 dB
	Co-channel, tropospheric	35 dB
Analogue vision signal interfered with by a DVB-T 7 MHz channel.	Lower adjacent, continuous	-5 dB
	Lower adjacent, tropospheric	-9 dB
	Upper adjacent, continuous	-5 dB
	Upper adjacent, tropospheric	-8 dB

Digital Video Broadcasting – Terrestrial (DVB-T)

Table 6.0

Parameter	Description	Value used
Protection rations for co-channel DVB-T interfered with by DVB-T, for fixed reception.	16-QAM 1/2	11.00 dB
	16-QAM 2/3	14.00 dB
	16-QAM 3/4	15.00 dB
	16-QAM 5/6	16.90 dB
	16-QAM 7/8	17.50 dB
	64-QAM 1/2	17.00 dB
	64-QAM 2/3	20.00 dB
	64-QAM 3/4	21.00 dB
	64-QAM 5/6	23.30 dB
	64-QAM 7/8	24.30 dB

Table 7.0

Parameter	Description	Value used
Protection rations for co-channel DVB-T interfered with by DVB-T, for portable indoor reception.	16-QAM 1/2	13.00 dB
	16-QAM 2/3	16.00 dB
	16-QAM 3/4	18.00 dB
	16-QAM 5/6	19.40 dB
	16-QAM 7/8	20.10 dB
	64-QAM 1/2	19.00 dB
	64-QAM 2/3	23.00 dB
	64-QAM 3/4	25.00 dB
	64-QAM 5/6	25.80 dB
	64-QAM 7/8	26.90 dB

Table 8.0

Parameter	Description	Value used
Protection ratios for DVB-T interfered with by DVB-T.	Lower adjacent	-30 dB
	Upper adjacent	-30 dB

Table 9.0

Parameter	Description	Gauss	Value used
Protection ratios for DVB-T, fixed reception, interfered with by co-channel analogue television.	16-QAM 1/2	-8.0 dB	-8.0 dB
	16-QAM 2/3	-3.0 dB	0.0 dB
	16-QAM 3/4	0.0 dB	2.5 dB
	16-QAM 5/6	9.0 dB	10.3 dB
	16-QAM 7/8	16.0 dB	17.40 dB
	64-QAM 1/2	-3.0 dB	0.0 dB
	64-QAM 2/3	3.0 dB	4.5 dB
	64-QAM 3/4	9.00 dB	12.0 dB
	64-QAM 5/6	15.0 dB	16.30 dB
	64-QAM 7/8	20.0 dB	21.4 dB

Table 10.0

Parameter	Description	Gauss	Value used
Protection ratios for DVB-T, portable indoor reception, interfered with by co-channel analogue television.	16-QAM 1/2	- 8.0 dB	-8.0 dB
	16-QAM 2/3	- 3.0 dB	3.0 dB
	16-QAM 3/4	0.0 dB	5.0 dB
	16-QAM 5/6	9.0 dB	12.8 dB
	16-QAM 7/8	16.0 dB	20.0 dB
	64-QAM 1/2	- 3.0 dB	3.0 dB
	64-QAM 2/3	3.0 dB	6.0 dB
	64-QAM 3/4	9.00 dB	15.0 dB
	64-QAM 5/6	15.0 dB	18.8 dB
	64-QAM 7/8	20.0 dB	24.0 dB

Table 11.0

Parameter	Description	Gauss	Value used
Protection ratios for DVB-T, fixed reception and portable indoor reception, interfered with by lower adjacent (N – 1) analogue television.	16-QAM 1/2	- 43.0 dB	- 43.0 dB
	16-QAM 2/3	- 42.0 dB	- 42.0 dB
	16-QAM 3/4	- 38.0 dB	- 38.0 dB
	16-QAM 5/6	- 39.4 dB	- 39.4 dB
	16-QAM 7/8	- 38.9 dB	- 38.9 dB
	64-QAM 1/2	- 40.0 dB	- 40.0 dB
	64-QAM 2/3	- 35.0 dB	- 35.0 dB
	64-QAM 3/4	- 32.0 dB	- 32.0 dB
	64-QAM 5/6	- 32.0 dB	- 32.0 dB
	64-QAM 7/8	- 31.1 dB	- 31.1 dB

Table 12.0

Parameter	Description	Gauss	Value used
Protection ratios for DVB-T, fixed reception and portable indoor reception, interfered with by upper adjacent (N + 1) analogue television.	16-QAM 1/2	- 45.4 dB	- 45.4 dB
	16-QAM 2/3	- 43.0 dB	- 43.0 dB
	16-QAM 3/4	- 41.5 dB	- 41.5 dB
	16-QAM 5/6	- 40.4 dB	- 40.4 dB
	16-QAM 7/8	- 39.9 dB	- 39.9 dB
	64-QAM 1/2	- 40.2 dB	- 40.2 dB
	64-QAM 2/3	- 38.0 dB	- 38.0 dB
	64-QAM 3/4	- 36.4 dB	- 36.4 dB
	64-QAM 5/6	- 35.0 dB	- 35.0 dB
	64-QAM 7/8	- 34.1 dB	- 34.1 dB

Table 13.0

Parameter	Description	Gauss	Value used
Protection ratios for DVB-T (7 MHz), fixed reception, interfered with by overlapping 8 MHz analogue television.	16-QAM 1/2	- 5.8 dB	- 4.8 dB
	16-QAM 2/3	- 3.4 dB	- 2.3 dB
	16-QAM 3/4	- 1.9 dB	- 0.7 dB
	16-QAM 5/6	- 0.8 dB	0.5 dB
	16-QAM 7/8	- 0.3 dB	1.1 dB
	64-QAM 1/2	- 0.2 dB	0.8 dB
	64-QAM 2/3	2 dB	3.1 dB
	64-QAM 3/4	3.6 dB	4.8 dB
	64-QAM 5/6	5.0 dB	6.3 dB
	64-QAM 7/8	5.9 dB	7.3 dB

Table 14.0

Parameter	Description	Gauss	Value used
Protection ratios for DVB-T (7 MHz), portable indoor reception, interfered with by overlapping 8 MHz analogue television.	16-QAM 1/2	- 5.8 dB	- 2.6 dB
	16-QAM 2/3	- 3.4 dB	0.0 dB
	16-QAM 3/4	- 1.9 dB	1.7 dB
	16-QAM 5/6	- 0.8 dB	3.0 dB
	16-QAM 7/8	- 0.3 dB	3.7 dB
	64-QAM 1/2	- 0.2 dB	3.0 dB
	64-QAM 2/3	2 dB	5.4 dB
	64-QAM 3/4	3.6 dB	7.2 dB
	64-QAM 5/6	5.0 dB	8.8 dB
	64-QAM 7/8	5.9 dB	9.9 dB

Table 15.0

Parameter	Description	Value used
Protection ratios for DVB-T, fixed reception, interfered with by co-channel T-DAB.	16-QAM 1/2	16.00 dB
	16-QAM 2/3	19.10 dB
	16-QAM 3/4	21.20 dB
	16-QAM 5/6	21.90 dB
	16-QAM 7/8	22.50 dB
	64-QAM 1/2	21.00 dB
	64-QAM 2/3	25.10 dB
	64-QAM 3/4	27.20 dB
	64-QAM 5/6	28.30 dB
	64-QAM 7/8	32.40 dB

Table 16.0

Parameter	Description	Value used
Protection ratios for DVB-T, portable reception, interfered with by co-channel T-DAB.	16-QAM 1/2	18.20 dB
	16-QAM 2/3	21.40 dB
	16-QAM 3/4	23.60 dB
	16-QAM 5/6	24.40 dB
	16-QAM 7/8	25.10 dB
	64-QAM 1/2	23.20 dB
	64-QAM 2/3	27.40 dB
	64-QAM 3/4	29.60 dB
	64-QAM 5/6	30.80 dB
	64-QAM 7/8	35.00 dB

Minimum Field Strength

The minimum field strengths used in planning are:-

DVB-T, Band III (174 – 230 MHz)

Table 17.0

Parameter	Description	Value used
Minimum median field-strength values (dB(μV/m)) for fixed reception at reference frequency 200 MHz.	16-QAM 1/2	40.60
	16-QAM 2/3	43.10
	16-QAM 3/4	44.70
	16-QAM 5/6	45.90
	16-QAM 7/8	46.50
	64-QAM 1/2	46.20
	64-QAM 2/3	48.50
	64-QAM 3/4	50.20
	64-QAM 5/6	51.70
	64-QAM 7/8	52.70

Table 18.0

Parameter	Description	Value used
Minimum median field-strength values (dB(μV/m)) for portable indoor reception at reference frequency 200 MHz.	16-QAM 1/2	71.80
	16-QAM 2/3	74.40
	16-QAM 3/4	76.10
	16-QAM 5/6	77.40
	16-QAM 7/8	78.10
	64-QAM 1/2	77.40
	64-QAM 2/3	79.80
	64-QAM 3/4	81.60
	64-QAM 5/6	83.20
	64-QAM 7/8	84.30

DVB-T, Band IV/V (470 - 862 MHz)

Table 19.0

Parameter	Description	Value used
Minimum median field-strength values (dB(μV/m)) for fixed reception at reference frequency 500 MHz.	16-QAM 1/2	44.60
	16-QAM 2/3	47.10
	16-QAM 3/4	48.70
	16-QAM 5/6	49.90
	16-QAM 7/8	50.50
	64-QAM 1/2	50.20
	64-QAM 2/3	52.50
	64-QAM 3/4	54.20
	64-QAM 5/6	55.70
	64-QAM 7/8	56.70

Table 20.0

Parameter	Description	Value used
Minimum median field-strength values (dB(μV/m)) for portable indoor reception at reference frequency 500 MHz.	16-QAM 1/2	81.80
	16-QAM 2/3	84.40
	16-QAM 3/4	86.10
	16-QAM 5/6	87.40
	16-QAM 7/8	88.10
	64-QAM 1/2	87.40
	64-QAM 2/3	89.80
	64-QAM 3/4	91.60
	64-QAM 5/6	93.20
	64-QAM 7/8	94.30

The minimum median field-strengths given in the above tables 17 – 20 (above) are for reference frequencies, *fr*, 200 MHz (Band III) and 500 MHz (Band IV/V). For other frequencies, the following interpolation rule shall be used:-

$$E_{med\ (f)} = E_{med\ (fr)} + Corr$$

where:

$E_{med\ (fr)}$ The minimum median field strength at the reference frequency in dBµV/m,
$E_{med\ (f)}$ The minimum median field strength at the actual frequency in dBµV/m,

Fixed reception:-

Corr $Corr = 20 \log_{10} (f/fr)$, *f* is the actual frequency, *fr* is the reference frequency.

Portable reception:-
Corr $Corr = 30 \log_{10} (f/fr)$, *f* is the actual frequency, *fr* is the reference frequency.

The above values are for 10 metres above ground level for fixed reception.
Protection cannot be sought for locations with a field-strength below the values mentioned above.