Commission for
Communications Regulation

Technical Conditions

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For the Operation of Digital Television Delivery Systems between 11.7 GHz and 12.5 GHz

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1 Purpose

This document specifies the general conditions attached to a licence for the operation of a Digital Television Delivery System at 11.7 GHz and Above issued by the Commission for Communications Regulation under the Wireless Telegraphy (Multipoint Microwave Distribution System) Regulations, 2003.

2 Summary Information.

These conditions detail the characteristics of the equipment that need to be considered for the purposes of frequency spectrum management, safety and the provision of a satisfactory service to the subscriber, and 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 mainly based on those given in ETSI and CENELEC documents: EN 300 748, TS 101 197-1 and EN 50221.

For issues not referred to by this document the licensee should comply with the essential requirements of the relevant ETSI, IEC or CENELEC standard relating to DVB.

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

Nothing contained in these conditions shall absolve the licensee from any requirement in law to obtain whatever additional consents, permissions, authorisations or licences that may be necessary for the exercise entitlements under the licence.

3 Definitions and Glossary of Terms

3.1 Digital Television Delivery System

A Digital Television Delivery System in the 12 GHz band is a broadcasting service system used for the distribution of a modulated data stream containing Programme Service Multiplexes on a point to multipoint basis.

3.2 Headend Station

Equipment which is connected to receiving antennas or other signal sources and also connected to the remainder of the Digital Television Delivery System to process the signal to be distributed.

3.3 Effective Antenna Height (Eff. Ht.)

The height in metres above the average level of the ground between distances of 3 and 15 km from the transmitter. This is calculated for each of 36 evenly spaced radials (10 degree separation) starting from true North[1].

Note: This takes into account both the height of the site (a.s.l) and the height of the mast (a.g.l).

3.4 Omnidirectional Antenna.

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

3.5 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).

3.6 Equivalent Isotropic Radiated Power (E.I.R.P.)

The Equivalent Isotropic Radiated Power is equal to the power supplied to the antenna multiplied by the isotropic gain of the antenna in a given direction.

3.7 ComReg

The Commission for Communications Regulation.

3.8 Commission

The Commission for Communications Regulation.

3.9 LNB

Low Noise Block. The LNB amplifies the received satellite signal and converts the received signal to a lower frequency.

3.10 System Outlet

[1]This can be calculated by ComReg using the national grid reference, consisting of one letter and six digits, for the transmitting station, provided the site height above sea level and the antenna height above ground level are supplied.

In relation to a license, a device for connecting a subscriber's feeder to a receiver lead.

3.11 Subscriber's Equipment
Equipment at the subscriber's premises such as compatible Set Top Boxes, Integrated Receiving Devices, or any device that is, or contains a compatible decoder.

3.12 Carrier to Noise ratio
The difference in decibels between the carrier level at a given point in the system and the noise level at that point (measured within a bandwidth appropriate to the television or radio system in use).

3.13 Programme Services Multiplex
A signal (which in its baseband form is a DVB transport stream, but is a signal with a bandwidth of 33MHz when modulated) containing more than one programme service, with associated and other data.

3.14 Transport Stream
A data stream corresponding to the relevant ETSI (DVB) standards carrying MPEG2 encoded video and associated or other data.

3.15 European Standards Body
A Body such as ETSI, the IEC or CENELEC who set standards for equipment or services.

4 System Transparency

4.1 Television

Unless specifically excluded by the licence, the Digital Television Delivery System shall be designed in such a manner that it is capable of distributing all components within a Programme Service intended for general reception.

Note:- This would include:-

TeleText and additional sound channels associated with the vision material where provided with the original source material. (see Section 6.7.1)

5 System Engineering

5.1 General

The mechanical and electrical construction of the Digital Television Delivery System 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.

5.2 Headend Installation

As the performance of the headend installation is critical to the overall performance of a Digital Television Delivery System, care must be taken in the installation and maintenance of this equipment. The headend and associated equipment shall be labelled with the manufacturer's trademark, type designation and function. The label shall be fitted on the outside of the equipment, and shall be clearly readable.

All controls, displays, meters, indicators and terminals shall be clearly labelled. Controls which, when wrongly adjusted, increase the risk of causing interference or of improper functioning of the system shall only be immediately accessible to qualified personnel only. Particular attention should be paid to the separation and routing of signal, data and mains cables.

5.2.1 Spurious Emissions and Receiver Filtering

Careful consideration should be given to the levels of unwanted emissions at the headend and adequate filtering as specified in Section 7.8.2 employed to ensure that the picture quality as specified in Section 7.1 for each system outlet can be met.

5.2.2 Headend Station Output

The signal parameters at the headend output should be such as to permit the Digital Television Delivery System to operate in accordance with the system standard and performance set out in Sections 6 and 7 respectively.

5.3 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.

6 System Standards

6.1 Transmission Standard

The relevant transmission standard is specified in EN 300 748

6.2 Summary List of Parameters

6.2.1 Frequency Spacing and Bands of Operation

Nominal radio-frequency channel bandwidth of a Programme Services Multiplex	33 MHz
Frequency Band	11.7GHz - 12.5GHz

6.2.2 Emission Designation (nominal)

33M0G7WFT

6.3 Encoding Standards

System	ISO/IEC 13818-1
Video	MPEG 2 Main Profile at Main Level ISO/IEC 13818-2
Audio	MPEG 2 Layer I & II ISO/IEC 13818-3
Data - Additional Services for General Reception	EN 301 192
Data - Additional Services for Closed User Groups	EN 301 192
Technical Services - CA Message Sections	ETR 289

6.4 Minimum Programme Bit rates

Encoded Video	4.5 Mbps
Encoded Audio – Stereo Channel	256 kbps
Encoded Audio – Mono Channel	96 kbps

If the original Programme Service has an Encoded Video bit rate of less than 4.5 Mbps, then that Programme Service must be distributed at the supplied rate.

1: The Encoded Video bit rate may be reduced if the operator can objectively show that their system can provide a video signal with the equivalent resolution as an ITU-R Grade 4.5 PAL I Signal

and/or

2: The programme falls into one of the following categories for exemption:

a) Archival Footage
b) Footage originated on a non-broadcast format
c) News bulletins
d) Parliamentary Broadcasts
e) Educational Programmes

No other programmes may be broadcast at a lower bit rate.

The Commission for Communications Regulation reserves the right to assess and monitor the licensee's picture quality. Any abuse of the exemption will lead to withdrawal.

6.5 Software Updates

Changes to software services should be implemented "over-the-air" with the data in the form as dictated by EN 301 192

6.6 Other Video and Audio Parameters

Video Frame Rate	25Hz or 50 Hz
Aspect Ratio	4:3 or 16:9*
Resolution	Full
Audio Sampling Frequency	48 kHz
Emphasis	NONE

* Note – Where a service is originally broadcasted/distributed in widescreen mode, then that service must be re-distributed in the same manner.

6.7 Additional Broadcasting Services

6.7.1 Permitted Additional Broadcasting Services.

The transmission of a subtitling or TeleText service is permitted. The subtitling system used must conform to ETS 300 743 or any future European standard describing the implementation of such services. 'Over the air' software updates to Set Top Boxes are also permitted.

6.7.2 Additional Broadcasting Services Requiring Approval from the Commission for Communciaitons Regulation

The relevant Licences must be obtained from the Commission for Communications Regulation for any additional services, other than those indicated in Section 6.7.1 that are included within a Programme Service Multiplex. Any Telecommunications services, whether voice, data or otherwise will require approval from the Commission for Communications Regulation.

7 System Performance

7.1 Impairment Quality

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

There are three main forms of visible degradation 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 coarse blocks).

The signal should be free from all such degradation for 99% of the time at all locations served.

7.2 Impedance

The nominal impedance of the receive system shall be 75 ohms. It should be noted that this value applies to all coaxial feeder cable and system outlets and shall be used as the reference impedance in level measurements on the Digital Television Delivery System.

7.3 Measurement Point

The parameters specified in Section 7 relate to performance at the system outlet

7.4 Limit on Effective Antenna Height

The transmitting antenna shall be limited to that height necessary to provide a line of sight path to the required coverage area. Antenna heights above ground level greater than 50 metres will not normally be allowed, except as special cases.

7.5 Limit on Equivalent Isotropic Radiated Power

The maximum EIRP must not exceed 12dBW in any direction.

7.6 Relaxation of EIRP and Effective Antenna Height Limits

The Commission for Communications Regulation may consider a request for an increased maximum EIRP where the station has an Effective Antenna Height greater than 500m. However, in such cases the maximum EIRP must not exceed the limit set in 7.5 above if the antenna height above ground level is greater than 10m.

7.7 Transmitting Antenna

The permitted polar pattern of the transmitting antenna will be dependent on its location and potential for interference to other services. The antenna shall employ linear polarisation, using vertical and horizontal components in accordance with the table in section 10.1.

7.8 Transmitter Characteristics

7.8.1 Frequency Range of Operation

The transmitter will operate within the following frequency band 11.7 GHz – 12.7 GHz as specified in section 6.

7.8.1 Frequency Stability

For Digital Television Delivery Systems, the variation in frequency from the declared nominal value shall not exceed ±500 Hz.

It is recommended that if a number of channels are combined into a single antenna for transmission, a common reference frequency source is used for obtaining each channel.

7.8.2 Transmitter Spurious Emissions

Emissions within the channel shall be as set in the appropriate standard ETS 300 748. Emissions appearing on frequencies outside of the allocated channel bandwidth shall be attenuated by at least 40 dB at 1 MHz outside the channel edge.

If the transmitter site is shared with or is adjacent to that of another radio service, the Digital Television Delivery System operator may be required to take whatever measures necessary to reduce the level of spurious emissions to below the stated level.

8. Receiver Characteristics

8.1 Receiver Antenna Characteristics

The receiving antenna shall normally have the following minimum characteristics

Antenna gain	31dBi
Antenna front to back ratio	>30dB
Orthogonal polarisation discrimination	19 dB Main Beam 3 dB All other Azimuths

8.2 LNB Characteristics

Noise Figure	0.7 dB
Output Impedance	75 Ω
Output level	50 dBμV (+12 dB, -6 dB)

The receiving equipment interconnections shall use high quality double-screened co-axial cable of the tape and braid format.

8.3 Spurious Emissions

In any Digital Television Delivery System receiving device the output power of any spurious emissions shall not exceed 2 nW in the frequency range 100 kHz to 1 GHz and 20 nW on all frequencies above 1 GHz.

9. SAFETY

9.1 General Safety.

The headend station and its premises must comply with all relevant statutory safety regulations.

9.2 Safety Controls

There shall be a single control to isolate power for the entire installation. If a form of auxiliary power (such as diesel generators or an Uninterruptable Power Supply) is provided, then the same control should isolate these. The 'on' position of such a device must be clearly indicated. Guards may be fitted to the device to prevent accidental operation.

9.3 Safety Standards

The system must comply with the following requirements:

I.S./EN 60215: 1990
Safety Requirements for Radio Transmitting Equipment.

ENV50166-2
Human exposure to electromagnetic fields
High frequency (10 kHz to 300 GHz)

These standards are available from the National Standards Authority of Ireland[2].

Non-ionising radiation emissions from the system operated by the Licensee and the aggregate emissions from all systems at a given site shall be within limits specified in the guidelines published by the International Commission for Non-Ionising Radiation Protection ("ICNIRP"). The systems at the site should also comply with any radiation emission standards adopted and published by ICNORP or its successors from time to time, any radiation emissions standards of the European Committee for Electrotechnical Standards and any other radiation emission standards by law.

[2]Please note that the standard ENV 50166-2 is a European Pre standard and shall be replaced by the respective European Standard when it becomes available.

10 Protection and Co-ordination

10.1 Frequency Plan

The channels used shall be in accordance with those indicated in Table 1. In this table the frequencies are listed with orthogonal polarisation to the Astra satellite at 28.2° East. Use of frequencies co-polar with the Astra satellite 28.2° East is also permitted. The field strength limits beneath apply as appropriate.

Table 1:

Vertical Polarisation Frequencies (GHz)	Horizontal Polarisation Frequencies (GHz)
11720	11739
11758	11778
11798	11817
11836	11856
11876	11895
11914	11934
11954	11973
11992	12012
12032	12051
12070	12090
12110	12129
12148	12168
12188	12207
12226	12246
12266	12285
12304	12324
12344	12363
12382	12402
12422	12441
12460	12480

10.2 Co-ordination

Channel assignments in Ireland that are within approximately 80 km of the territorial boundary with Northern Ireland or within approximately 30 km of the South and East coast of Ireland may require co-ordination with the United Kingdom administration. Such co-ordination will be undertaken by the Commission for Communications Regulation in order to minimise the potential for interference between radio services in Ireland and those in the United Kingdom. Where changes arising from international co-ordination are required to be made, the licensee will be advised of the necessary changes. In this event, all expenses must be borne by the licensee.

In considering sharing between the Digital Television Delivery System and other services in the same or adjacent bands, reference will be made to the standard ITU-R sharing criteria as specified in the Radio Regulations or any relevant ETSI standard.

10.3 Frequency Sharing with Direct to Home (DTH) Satellite Receivers*

The section of the frequency spectrum from 11.7GHz to 12.5GHz is allocated to ENG Fixed Links, Satellite Broadcasting and Terrestrial Broadcasting. In order to prevent interference to the established direct to home satellite broadcasting service at 28° East, the station characteristics (Antenna Height, EIRP and Antenna radiation pattern) used for Digital Television Delivery Systems shall be such as not to give rise to a Field Strength exceeding -98dBW/m^2/27MHz [48dBμV/m]* at any conurbation. Furthermore the Field Strength must not exceed;

1) -138dBW/m^2/27MHz [8dBμV/m]* at any conurbation lying in the arc 305° - 330° with respect to a station within 6 times the height of the antenna above sea level from the station
2) -113dBW/m^2/27MHz [33dBμV/m]* at any conurbation lying in the arc 305° - 330° with respect to a station within 14 times the height of the antenna above sea level from the station
3) -113dBW/m^2/27MHz [33dBμV/m]* at any conurbation lying in the arcs 290° - 305° and 330° - 345° with respect to a station within 14 times the height of the antenna above sea level from the station
4) -108dBW/m^2/27MHz [38dBμV/m]* at any conurbation lying in the arc 290° - 345° with respect to a station greater than 14 times the height of the antenna above sea level from the station
5) -118dBW/m^2/27MHz [28dBμV/m]* at any conurbation lying in the arc 70° - 205° with respect to a station where the conurbation is within 4 times the height of the antenna above sea level.

* In preparing technical characteristics, proposals should be submitted in relation to the quoted Field Strength limits and values 4dB higher, that is corresponding to -94dBW/m^2/27MHz [52dBμV/m].

In computer assessments of the above limits, ComReg shall assume a receiving height of 10m above ground level.

Irrespective of the orbital location of a satellite, the licensee must endeavour to ensure that interference is not caused to satellite reception at individual receiving earth stations within a distance of six times the station antenna height above sea level.

The field strength restrictions may be relaxed where the transmission antenna height above sea level is significantly greater than the transmission antenna height above the local ground height of a conurbation. In such instances the height of the transmission antenna above sea level would be replaced by the height of the transmission antenna above local ground when calculating the area where the field strength restriction would apply.

10.4 Frequency Sharing with other terrestrial digital television delivery systems

The inter system protection ratio used in cases involving two similar terrestrial digital television delivery systems in the band 11.7-12.5 GHz will be 15dB.

11 Access to Equipment, System Testing and Maintenance

11.1 Access and Personnel

The licensee shall on request made by an authorised officer of the Commission for Communications Regulation, facilitate that officer in the inspection[3] of any part of the Digital Television Delivery System.

11.2 Test Equipment (system performance)

Adequate test equipment shall be held by the licensee for measurements of the system performance parameters specified in Section 7 whilst the system is undergoing initial alignment, regular maintenance and performance audits.

11.4 Maintenance

The licensee shall ensure that the system is audited and maintained on a regular basis so as to ensure compliance with these conditions. The licensee shall keep a log indicating the dates and results of these audits and maintenance work undertaken. A copy of the maintenance programme and the log shall be made available to an authorised officer of the Commission for Communications Regulation on request.

[3] Inspection shall include the undertaking of measurements

12. Measurement Procedures.

12.1 Measurement of Performance Parameters

Unless otherwise specified by the Commission for Communications Regulation, the procedure for measuring performance parameters shall be in accordance with those specified in any relevant ETSI, IEC or CENELEC standard.

Note: - As some of these procedures involve the removal of the programme signal and replacing it by a test signal, for the duration of the measurement period, alternative measurement procedures may be considered by the Commission for Communications Regulation so as to minimise disruption to the viewers. However where the Commission for Communications Regulation is not satisfied with results obtained using alternative measurement procedures then the measurements shall be repeated using the procedures any relevant ETSI, IEC or CENELEC standard.

13. Performance Audits and Information to be Submitted to the Commission for Communications Regulation.

13.1 Regular Performance Audits

Licensees will be required to undertake regular performance audits on their Digital Television Delivery System and submit the results to the Commission for Communications Regulation for consideration. These audits must be carried out in compliance with any methodology, time periods or requirements specified by the Commission for Communications Regulation.

13.2 Update of System Information

The licensee shall, upon request from the Commission for Communications Regulation, submit:-

An up to date frequency plan indicating the programme name of each television channel and its position and ID in the Programme Service Multiplex. The licensee shall notify the Commission for Communications Regulation immediately any change occurs.