



Office of the Director of
**Telecommunications
Regulation**

Annex B

DRAFT

CONDITIONS

**for the Operation of Digital
Cable Television Systems**

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**TECHNICAL CONDITIONS RELATING TO THE ESTABLISHMENT AND
OPERATION OF A WIRED DIGITAL BROADCAST RELAY SYSTEM
IN THE
FREQUENCY BAND 30.0 - 862.0 MHz**

1 PURPOSE

This document specifies the general conditions attached to a licence for wired digital broadcast relay systems.

2 SUMMARY INFORMATION.

These conditions detail those characteristics of the system that need to be considered for the purposes of providing a satisfactory service to the subscriber.

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

The parameters specified in this document are mainly based on those given in ETSI and CENELEC documents: EN 300 429, TS 101 197-1 and EN 50221.

For issues not referred to by this document the licensee shall comply with standards set out in any relevant ETSI, IEC or CENELEC standard relating to DVB.

Evidence of type approval of digital cable relay equipment is not required by the Director of Telecommunications Regulation. Instead a procedure of system audits will apply.

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, authorizations or licences that may be necessary for the exercise entitlements under the licence.

3 DEFINITIONS AND GLOSSARY OF TERMS

- 3.1 Digital cable relay systems
A wired broadcast relay system conveying a modulated data stream.
- 3.2 Headend
Equipment which is connected to receiving antennas or other signal sources and also connected to the remainder of the digital cable relay system, to process the signal to be relayed.
- 3.3 Feeder
A transmission path forming part of a digital cable relay system. Such a path may consist of a metallic cable, optic fibre or any combination of them.
- 3.4 Trunk feeder
A feeder used for the transmission of signals between a head end and a distribution point or between distribution points.
- 3.5 Distribution point
A point where signals are taken from the trunk feeder to energize spur feeders
Note:- In some cases a distribution point may be directly connected to the head end.
- 3.6 Spur Feeder
A feeder to which subscriber taps are connected.
- 3.7 Subscriber's tap
A device for connecting a subscriber's feeder to a spur feeder.
- 3.8 Subscriber feeder
A feeder connecting a Subscriber's tap to a system outlet or, where the latter is not used, directly to the subscriber's equipment.
- 3.9 System Outlet
A device for connecting a subscriber's feeder to a receiver lead.
- 3.10 Receiver lead
A lead which connects the system outlet to the subscriber's equipment.
- 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 Transfer point
An interface between the digital cable relay system and the building's internal network, each of which may be separately owned.

- 3.13 Immunity (to a disturbance)
The ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance.
- 3.14 Screening effectiveness
The ability of equipment or a system to attenuate the influence of electromagnetic fields from outside the equipment or system or to suppress the leakage of electromagnetic fields from inside the equipment or system.
- 3.15 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).
- 3.16 Mutual Isolation
The attenuation between one system outlet and another at any frequency within the range of the system under investigation. It is always specified, for any particular installation, as the minimum value obtained within specified frequency limits.
- 3.17 Echo rating
The result of a system test with a 2 T sine-squared pulse (as determined in CCIR Recommendations 473 and 567) using the boundary line on a specified graticule within which all parts of the received pulse fall.
- 3.18 In-band channels
Channels used on a digital cable relay system whose frequencies are within one of the bands for broadcasting specified in the Irish Table of Frequency Allocations.¹
- 3.19 Out of band channels
Channels used on a digital cable relay system whose frequencies are not fully within one of the bands for broadcasting specified in the Irish Table of Frequency Allocations.
- 3.20 'Must carry' programme services
These are television programme services which the licensee is obliged by the terms of his license to distribute on the digital cable relay system.
- 3.21 'Basic service' programme services

¹ The bands -within the frequency range 30 MHz to 862 MHz- for broadcasting specified in the Irish table of Allocations are Band I (47 to 68 MHz), Band II (87.5 to 108 MHz), Band III (174 to 230 MHz) and Bands IV&V (470 to 862 MHz).

These are television programme services relayed by the licensee which a person is obliged to pay for in order to become a subscriber to digital cable relay service.

3.22 Programme Services Multiplex

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

3.23 Transport Stream

A data stream corresponding to the relevant ETSI (DVB) standards carrying MPEG2 encoded video and associated data.

3.24 European Standards Body

A Body such as ETSI IEC or CENELEC who specify standards for equipment or services.

Q3.1 Are these definitions appropriate and complete

4. System Transparency

4.1 Television

Unless specifically excluded by the licence the digital cable relay system shall be designed in such a manner that it is capable of relaying all components within a Programme Service, intended for general reception² ³.

Note:- This would include:-

Teletext and additional sound channels associated with the vision material. (see section 6.3.1)

5. System Engineering

5.1 General

The mechanical and electrical construction of the digital cable relay 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 minimizing of the potential for interference to, or from, radiocommunication services operating in accordance with the Irish Table of Frequency Allocations. This is particularly relevant when considering:

- leakage from the digital cable relay system which could interfere with radiocommunication services, especially aeronautical systems, private mobile radio networks used by the emergency services, stations of the amateur service and other radiocommunication stations operating in the same environment as the digital cable relay system.
- the ability of the digital cable relay system to perform without degradation in the same environment as 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 cable relay system, care must be taken in the installation and maintenance of this equipment. The headend and associated equipment shall be labeled with the manufacturer's trade mark, type

² While not intended for reception by the general public, the broadcast organisations include Test signals in the Transport Stream. The system must be transparent to these signal so as to facilitate performance measurements.

³ While the digital cable relay system shall be designed to relay all the components within a television signal the actual components relayed shall take account of the copyright arrangements between the licensee and the service provider.

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 labeled. 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.

5.2.1 Spurious Emissions and Receiver Filtering

Careful consideration should be given to the levels of unwanted emissions received at the headend and adequate filtering employed to ensure that the picture and sound quality as specified in Section 7 for each system outlet can be met.

5.2.2 Headend output

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

5.3 Standards for installation by non-licensee staff.

The licensee shall provide written guidelines on installation standards to individuals or organizations or their representatives, authorized by the licensee, for the installation of additional wiring after the system outlet or transfer point of the digital cable relay system within their premises so as to ensure that the leakage and immunity requirements in Section 9 are met.

5.4 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.

5.5 Use of Earth.

The use of an earth return circuit for programme transmission is prohibited. This does not preclude the earthing of the sheath of a cable.

Q5.1 Are these provisions sufficient to ensure a satisfactory standard of service?

6. System Standards

6.1. Transmission Standard

The Transmission Standard used shall be the DVB-C standard as specified in ETS 300 429

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	8 MHz
Frequency Band	30.0-862.0MHz

6.2.3 Modulation

Type of modulation (N Quadrature Amplitude Modulation)	D7W
Number of states	4, 16, 32, 64, 128, 256, 2 ^N

6.2.4 Emission designation

8M00D7WFT

6.2.5 Encoding standards

Video	MPEG 2 Main Profile, Main Level, ISO/IEC 13818-1
Audio	MPEG 2 layer I and II, ISO/IEC 13818-1
Data	EN 301 192

6.2.6 Minimum Programme Bit rates

Encoded Video	4.5MBps
Encoded Audio, Stereo Channel	256kBps
Encoded Audio, Mono Channel	96kBps

6.3 Additional Broadcasting Services

6.3.1 Permitted Additional Broadcasting Services.

The transmission of a subtitling or teletext service is permitted. The system used must conform to ETS 300 743 or any future European standard describing the implementation of such services.

6.3.2 Additional Broadcasting Services Requiring Approval from the Director of Telecommunications Regulation

Prior approval must be obtained from the Director of Telecommunications Regulation for any additional services other than those indicated in Section 6.3.1 that are included within a Programme Service Multiplex.

6.4 Leakage reference signals

Any digital cable relay system is likely to be spread over a wide geographical area and its quality as regards screening effectiveness may vary from part to part. To obtain a complete picture of leakage characteristics measurements have to be made over its entire area and on a regular basis. This also helps to locate all the strong leakage points caused by major faults in screening effectiveness.

In order that the measurements are not confused by off-air signals, a leakage reference signal, also referred to as a “tagged carrier”, which can positively identified as emanating from the digital cable relay system must be used.

The modulation, frequency and level at which the leakage reference signal shall be specified by the Director of Telecommunications Regulation following consultation with the licensee. As there will be ongoing developments in the use of the Radio spectrum, it may be necessary to change the frequency used from time to time.

- Q6.1 Is the use of the DVB-C standard appropriate?**
- Q6.2 Should a modulation type and emission designation other than that specified in 6.2.3/6.2.4?**
- Q6.3 Are the encoding standards in 6.2.5 appropriate?**
- Q6.4 Are the minimum bit rates proposed in 6.2.6 sufficient?**
- Q6.5 What TeleText delivery methods might operators provide other than those suggested in 6.3.1?**
- Q6.6 What additional broadcasting services other than those suggested in 6.3.1 would you envisage?**
- Q6.7 What future developments do you envisage that will require revision of these conditions?**

7 System Performance

7.1 General

7.1.1 Impairment quality

The performance limits set out in this section apply in the presence of all signals for which the digital cable system was designed.

There are two 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 coarse blocks).

The signal should be free from all such interference for 99.99% of the time at any subscriber's outlet.

7.1.2 Impedance

The nominal impedance of the 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 cable relay system.

7.1.3 Measurement point

The parameters specified in Section 7 relate to performance at the system outlet. However it is recognized that subscribers often install system outlets additional to those installed by the licensee. Where additional outlets occur after the system outlet installed by the licensee the values specified in Section 7 shall relate to the licensee's system outlet.

Where a licensee installs a transfer point then the licensee must install a system outlet and this will be the reference outlet for measurement purposes. The signal provided to the transfer point should be above the minimum specified so that measurements at the reference outlet will be in accordance with those specified in this section.

7.2 System performance for Television.

7.2.1 Minimum and maximum carrier levels

The minimum and maximum carrier levels are expressed as the r.m.s. voltage of each Programme Service Multiplex, measured at the system television outlet across an external 75 ohm termination or referred to 75 ohms. These values are given in table 1.

Table 1 Minimum and maximum carrier levels at system outlets.

Type of Service	Minimum carrier level (dBuV)	Maximum Carrier level (dBuV)
DVB-C	57	80
Note :- In order not to overload the receivers, the figures quoted above for the maximum level might have to be reduced.		

7.2.2 Mutual isolation between system outlets

The minimum isolation at any frequency between any two subscriber system outlets connected separately to a spur feeder of the cable relay system shall be as in table 3.

Table 3 Mutual isolation between system outlets.

Frequency Range in MHz.	Mutual Isolation (dB)	Condition
TV/TV 30.0 to 862.0	42 36*	* For systems having 8MHz spacing

7.2.3 Frequency stability

When a Programme Service Multiplex is not relayed at the received frequency or is locally generated, the variation in frequency from the declared nominal value shall not exceed $\pm 30\text{kHz}$

7.2.4 Random Noise

At any system outlet, the level of noise voltage generated in the system in any channel shall be such that the carrier to noise ratio shall not be less than the value given in table 4.

Table 4. Carrier to noise ratio at system outlet

Type of service	Minimum carrier to noise ratio (dB)
64 QAM	25

7.2.5 Interference to Television channels

7.2.6 Single frequency interference

This clause refers to single-frequency interference which may result from intermodulation or the presence of other interfering signals.

At any system outlet the level of any unwanted signal generated within the system shall be such that the lowest carrier to interference ratio within a wanted Programme Service Multiplex shall not be less than 57dB.

7.2.7 Single channel Intermodulation interference

In this special case of single frequency interference the ratio of the reference level relative to the interference signal shall be not less than 54 dB.

7.2.8 Echoes in television channels

The echo rating in any television channel at any system outlet shall not exceed 6%

Q7.1 Is 99.99% time interference free in 7.11 appropriate?

Q7.2 Are the carrier levels in table 1 too high?

Q7.3 Is a frequency Stability of +/- 30kHz too stringent (7.2.3)?

Q7.4 Is Carrier to noise ratio in table 4 appropriate?

Q7.5 Are the C/I values proposed in 7.2.6, 7.2.7 too high?

Q7.6 If your answer to any of the questions 7.2-7.5 is yes, what alternative values would you propose?

Q7.7 Should echo ratings be lower?

Q7.8 If a limit on the time displacement of echoes were to be specified, what should it be?

8. Leakage and immunity

8.1 General

In general a digital cable relay system can covers a wide geographic area. The quality as regards screening effectiveness can vary from location to location. The licensee shall ensure that the cable relay system or any apparatus connected to it shall not cause interference to:-

- (a) reception of licenced sound broadcast programme services
- (b) reception of any licenced television broadcast programme services
- (c) communication circuits of licensed telecommunication service providers
- (d) any wireless telegraphy stations authorized under the Wireless Telegraphy Acts (1926 - 1990).

The licensee shall be responsible for checking the level of signal leakage, on a regular basis, throughout the area served by the digital cable relay system and maintain them in accordance with the levels indicated in Table 11 (section 9.2).

Where signal leakage is detected and is deemed by the Director to be causing interference to any service contained in the categories listed in points 9.1 (a) to (d), the digital cable relay licensee shall take whatever steps are necessary to immediately eliminate the interference. If the licensee is unable to eliminate the interference the licensee shall remove the offending Programme Service Multiplex from the digital cable relay system until the matter is rectified to the satisfaction of the Director of Telecommunications Regulation. In certain cases it may be necessary for the Director to specify lower limits for signal leakage or amend the licence to resolve any interference problems that arise.

8.2 Signal Leakage

8.2.1 The limits for leakage from a cable distribution system using digital technology are given in table 11. The maximum⁸ field strength values are for a distance of 10 metres from the cable system.

Table 11 Signal Leakage Limits for Cable Distribution Networks

Frequency Range MHz	Maximum ⁸ Field Strength (dBμV/m) at 10 m distance from the Cable system
30 - 44	Use prohibited
44 - 68	-2
68 - 74.8	-2
74.8 - 75.2	Use prohibited
75.2 - 87.5	-2
87.5 - 108	8 (note 1)
108 - 138	use prohibited (note 2)
138 - 144	4
144 - 146	use prohibited
146 - 156.6	5
156.6 - 157.0	Use prohibited
157.0 -174	5
174 - 230	13 (note 4)
230 - 242.8	9
242.8 - 243.2	use prohibited
243.2 - 281	10
281 - 282	Use prohibited
282 - 318.5	10
318.5 - 319.5	Use prohibited
319.5 - 328.6	11
328.6 - 335.4	use prohibited
335.4 - 380	11
380 - 405.85	11
405.85 - 406.25	use prohibited
406.25 - 430	12
430 - 440	use prohibited
440 - 450	12
450 - 470	12
470 - 790	13 (note 3)
790 - 862	13 (note 3)

Note 1: This values assumes 100 kHz separation from off-air FM broadcasting.

⁸ Notwithstanding the signal leakage limits set out in table 11 the licensee may be required to adhere to stricter limits in the event of interference being caused by the digital cable relay system to other authorised radio users. This is particularly relevant if interference is being caused to an aeronautical or emergency service. Any costs incurred shall be borne by the licensee.

Note 2: Except for the leakage reference signal, provided it is specifically authorized in the licence by the Director for Telecommunications Regulations.

Note 3: The limit specified is based on the assumption that the digital cable system is not using a frequency channel that is co-channel with the frequency channels used for off-air reception of digital or analogue television signals within the cable area.

8.2.2 Correction factors that can be applied for various measurement distances are given in table 12.

Table 12. Distance correction factor

Distance (m)	Correction factor (dB)
3	+10
5	+6
10	0
15	-3.5
20	-6
25	-8
30	-9.5

Note: intermediate values of reduction factor should be obtained by interpolation.

8.3 Immunity

Interference can enter a digital cable relay system (sometimes referred to as ingress) by the following means:

- poor screening of passive equipment (plugs, etc.),
- poor screening of active equipment (amplifiers, converters etc.),
- poor screening of the cable against induced voltages,
- poor screening of the cable against induced currents,
- excessive impedance in the ground connection of the input terminals of active equipment
- insufficient rejection of power supply borne interference on mains powered equipment.

The licensee shall ensure that the immunity of the digital cable relay system shall be such that at any system outlet on any relayed channel the carrier to interference ratio (caused by an external field) shall be not less than the limit given for single frequency interference to television signals given in Section 7.2.6.1

Q8.1 Are the leakage and immunity conditions sufficient and appropriate?

9. Frequency Matters

9.1 Allocation of spectrum between 30.0 and 862.0 MHz.

The licensee shall only use the frequency channels authorized by this licence. for television programmes on a digital cable relay system. Within this frequency range cover by this document (30 to 862 MHz) certain frequencies are not allowed to be used or are restricted in how they may be used. These frequency ranges are given in table 11 in Section 9.2.1.

9.2 Digital Cable Relay Frequency plan

9.2.1 Television

In assigning frequency channels to television programme services the licensee shall ensure that all Programme Service Multiplexes which form part of the “basic service” shall be relayed on frequency channels which are within the standard broadcasting bands. Where the licensee has a difficulty with this provision, the procedures it is proposed to adopt, to overcome the problem encountered must be outline to the Director of Telecommunications Regulations for consideration.

In determining the “basic service” and assigning in-band channels to programmes, due consideration must be given to “must carry” programmes.

9.3 Priority between Radiocommunications Services and CATV Systems.

The licensee must, at their own expense, ensure that no interference is caused to licensed or otherwise authorized radio services as a result of the operation of the digital cable relay system and must act speedily and promptly to rectify such interference when it is brought to their attention. Where the Director of Telecommunications Regulation deems it necessary the licensee may be instructed to cease using the Programme Service Multiplex(es) on their system.

10. Access to equipment, System testing and maintenance

10.1 Access and Personnel

The licensee shall on request made by an authorized officer of the Director of Telecommunications Regulation, facilitate that officer in the inspection⁴ of any part of the digital cable relay system.

⁴ Inspection shall include the undertaking of measurements

10.2 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.

10.3 Test equipment (signal leakage)

Adequate test equipment shall be held by the licensee for measurements of the system signal leakage limits as specified in section 9.2 whilst the system is undergoing initial alignment, regular maintenance and performance audits.

10.4 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 authorized officer of the Director of Telecommunications Regulation on request.

Q10.1 Are the requirements appropriate? What alternative proposals do you have?

11. Measurement procedures.

11.1 Measurement of performance parameters

Unless otherwise specified by the Director of Telecommunications Regulation, the procedure for measuring performance parameters shall be in accordance with those specified in CENELEC document EN50083 part 7 or any new relevant ETSI, IEC or CENELEC standard.

Note:- As some of these procedure 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 Director so as to minimize disruption to the viewers. However where the Director is not satisfied with results obtained using alternative measurement procedures then the measurements shall be repeated using the procedures in the CENELEC document or any new relevant ETSI, IEC or CENELEC standard.

11.2 Measurement of signal leakage

Unless otherwise specified by the Director of Telecommunications Regulation, the measurement procedure for signal leakage reference signal shall be in accordance with the “mobile method” - section 4.2- in CENELEC document EN50083 part 8 or any new relevant ETSI, IEC or CENELEC standard.

12. Performance Audits and information to be submitted to the Director of Telecommunications Regulation.

12.1 Regular performance Audits

Licensees will be required to undertake regular performance audits on their digital cable relay system and submit the results to the Director of Telecommunications Regulation for consideration. These audits must be carried out in compliance with any methodology, time periods or requirements specified by the Director of Telecommunications Regulation.

12.2 Regular Signal Leakage audits

Licensees will be required to carry out regular signal leakage audits on their digital cable system and submit the results to the Director of Telecommunications Regulation for consideration. These audits must be carried out in compliance with any methodology, time periods or requirements specified by the Director of Telecommunications Regulation.

12.3 Updating of information on subscribers

The licensee shall submit to the Director of Telecommunications Regulation on a six monthly basis an up to date list of:

- the number of subscribers using the digital cable relay system
- the number of system outlets in the digital cable relay system

12.3 Update of system information

The licensee shall upon request from the Director of Telecommunications 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 Director immediately any change occurs.

an updated network diagram/map of their system clearly indicating the most up to date geographical area of operation of their digital cable distribution system and the location of the headend and feeder cables including amplifiers.

Q12.1 Are these arrangements appropriate?

13. Channel Allocations

- 13.1 The channels authorised for use in the Digital Wired Broadcast Relay system to which this licence relates are specified in the Schedule hereto.

14. Transitional arrangements.

- 14.1 Within 4 months of the introduction of these conditions, the licensee shall undertake a performance audit and a leakage audit of the digital cable relay system and shall submit the results to the Director for consideration together with a schedule for correcting any deficiencies identified in the audit. Any such schedule shall be subject to amendment and approval by the Director.

Q14.1 Are these arrangements appropriate?