



Commission for
Communications Regulation

Guidelines

Conditions for the operation of a Digital Cable Relay Network, Issued under an Authorisation

Document No:	ComReg 98/66R2
Date:	3rd September 2003

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Contents

1	Introduction	3
1.1	PURPOSE.....	3
1.2	SUMMARY INFORMATION	3
2	Definitions And Glossary Of Terms	4
3	System Transparency and Engineering	6
3.1	TELEVISION	6
3.2	GENERAL.....	6
3.2.1	<i>Headend output</i>	6
3.3	WEATHER PROTECTION	6
3.4	USE OF EARTH	7
4	System Standards	8
4.1	DVB-C	8
4.1.1	<i>Transmission Standard</i>	8
4.1.2	<i>Summary list of parameters</i>	8
4.2	DVB-T (COFDM)	9
4.2.1	<i>Transmission Standard</i>	9
4.2.2	<i>Summary List of Parameters</i>	9
4.3	ENCODING STANDARDS.....	10
4.4	SOFTWARE UPDATES	10
4.5	OTHER VIDEO AND AUDIO PARAMETERS	10
4.6	ADDITIONAL BROADCASTING SERVICES.....	10
4.6.1	<i>Permitted Additional Broadcasting Services</i>	10
4.6.2	<i>Leakage reference signals</i>	11
5	System Performance.....	12
5.1	GENERAL.....	12
5.1.1	<i>Impairment quality</i>	12
5.1.2	<i>Impedance</i>	12
5.1.3	<i>Measurement point</i>	12
5.2	SYSTEM PERFORMANCE FOR TELEVISION.....	13
5.2.1	<i>Minimum and maximum carrier levels</i>	13
5.2.2	<i>Mutual isolation between system outlets</i>	13
5.2.3	<i>Frequency stability</i>	13
5.2.4	<i>Random Noise</i>	14
5.2.5	<i>Echoes in television channels</i>	14
6	Leakage and Immunity.....	15
6.1	GENERAL.....	15
6.1.1	<i>Network Information to be Provided</i>	15
6.2	SIGNAL LEAKAGE	16
6.2.1	<i>Correction factors that can be applied for various measurement distances</i> <i>17</i>	
6.3	GENERAL IMMUNITY	17
7	Access to Equipment, System Testing and Maintenance	18
7.1	ACCESS AND PERSONNEL	18
7.2	TEST EQUIPMENT.....	18
7.3	MEASUREMENT OF PERFORMANCE PARAMETERS	18
7.4	MEASUREMENT OF SIGNAL LEAKAGE	18

Conditions for the operation of a Digital Cable Relay Network, Issued under an
Authorisation

7.5	SIGNAL LEAKAGE AUDITS.....	19
7.6	MAINTENANCE.....	19

1 Introduction

1.1 Purpose

This document specifies the conditions attached to an authorisation pursuant to Regulation 3 of the Authorisation Regulations for digital cable relay networks. It details the basic characteristics of the network that need to be considered to allow the conditions of an authorisation to be met. They also detail the characteristics relevant for ensuring compatibility with authorised users of the radio frequency spectrum.

1.2 Summary Information

The parameters specified in this document are based on those given in CENELEC document EN 50083 parts 1 to 8 entitled “Cable Distribution Systems for Television and Sound Signals” ETS 300 429, TS 101 197-1 and EN 50221.

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

Evidence of type approval of digital cable relay equipment is not required by the Commission for Communications Regulation. Instead a procedure of system audits will apply to assess compliance with the relevant European Standards.

Nothing contained in these conditions shall absolve the authorised person 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.

2 Definitions And Glossary Of Terms

“Authorisation”: means an authorisation pursuant to Regulation 3 of the Authorisation Regulations to provide Authorised Services;

“Authorisation Regulations”: means the European Communities (Electronic Communications) (Authorisation) Regulations, 2003 (S.I. No. – of 2003);

“Authorised Person”: means the person who is deemed to be authorised to provide Authorised Services under Regulation 3 of the Authorisation Regulations;

“Digital Cable Relay Systems”: means a wired broadcast relay system conveying a modulated data stream.

“Headend”: means 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.

“Feeder”: means 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.

“Trunk Feeder”: means a feeder used for the transmission of signals between a head end and a distribution point or between distribution points.

“Distribution Point”: means a point where signals are taken from the trunk feeder to energise spur feeders

Note: - In some cases a distribution point may be directly connected to the headend.

“Spur Feeder”: means a feeder to which subscriber taps are connected.

“Subscriber's Tap”: means a device for connecting a subscriber's feeder to a spur feeder.

“Subscriber Feeder”: means a feeder connecting a Subscriber's tap to a system outlet or, where the latter is not used, directly to the subscriber's equipment.

“System Outlet”: means a device for connecting a subscriber's feeder to a receiver lead.

“Transfer Point”: means an interface between the digital cable relay system and the building's internal network, each of which may be separately owned.

“Immunity (to a disturbance)”: means the ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance.

“Screening Effectiveness”: means 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.

Conditions for the operation of a Digital Cable Relay Network, Issued under an
Authorisation

“Carrier to Noise Ratio”: means 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).

“Mutual Isolation”: means 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.

“Echo Rating”: means 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.

“Programme Services Multiplex”: means a signal (which in its baseband form is a DVB transport stream, but is a signal with a bandwidth of 8MHz when modulated) containing more than one programme service, with associated and other data.

“Transport Stream”: means a data stream corresponding to the relevant ETSI (DVB) standards carrying MPEG2 encoded video and associated or other data.

“European Standards Body”: means a body such as ETSI, the IEC or CENELEC, which sets standards for equipment or services.

“ComReg”: means the Commission for Communications Regulation.

“Commission”: means the Commission for Communications Regulation.

3 System Transparency and Engineering

3.1 Television

The digital cable relay system shall be designed in such a manner that it is capable of relaying all components^{1 2} within a Programme Service intended for general reception

Note: - This would include Teletext and additional sound channels associated with the vision material. (See section 6.6. 1)

3.2 General

The mechanical and electrical construction of the digital cable relay network shall accord with best practice in order to minimise the potential for harmful interference to radiocommunication services operating in accordance with the Irish Table of Frequency Allocations. This is particularly relevant when considering:

- leakage from the digital cable relay network 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 network.

3.2.1 Headend output

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

3.3 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 harmful interference to radiocommunication services operating in accordance with the Irish Table of Frequency Allocations arising from such exposure.

¹ 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 signals so as to facilitate performance measurements.

² 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.

3.4 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.

4 System Standards

4.1 DVB-C

4.1.1 Transmission Standard

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

4.1.2 Summary list of parameters

4.1.2.1 Frequency spacing and bands of operation

Nominal radio-frequency channel bandwidth of a Programme Services Multiplex	8 MHz
Frequency Band (Programme Services)	47-862.0 MHz

4.1.2.2 Modulation

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

4.1.2.3 Emission designation

8MOOD7WFT

4.2 DVB-T (COFDM)

4.2.1 Transmission Standard

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

4.2.2 Summary List of Parameters

4.2.2.1 Frequency Spacing and Bands of Operation

Nominal radio-frequency channel bandwidth of a Programme Services Multiplex	8 MHz
Frequency Band (Programme services)	47-862.0 MHz

4.2.2.2 Modulation

Modulation (COFDM)	X7F
Number of carriers	6817
Carrier Modulation	QPSK, 16QAM or 64QAM
Guard band	1/4, 1/8, 1/16, 1/32

4.2.2.3 Emission Designation

8M00X7FXF

4.3 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
Data (Additional services for General reception)	EN 301 192
Data (Additional services for closed user groups)	EN 301 192
Technical Services (CA Message ETR 289 sections)	ETR 289

4.4 Software Updates

Changes to software services, should be implemented 'over the air' with the data in the form dictated by EN 301 192.

4.5 Other Video and Audio Parameters

Video Frame rate	25Hz
Aspect Ratio	4:3 or 16:9
Resolution	Full Screen
Audio Sampling Frequency	48 kHz
Emphasis	None

4.6 Additional broadcasting Services

4.6.1 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.

Conditions for the operation of a Digital Cable Relay Network, Issued under an
Authorisation

4.6.2 Leakage reference signals

Any cable relay network is likely to be spread over a wide 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 cable relay system must be used.

For spectrum management reasons the modulation, frequency and level of the leakage reference signal shall be specified by the Commission for Communications Regulation following consultation with the authorised person. 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.

5 System Performance

5.1 General

5.1.1 Impairment quality

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

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

The signal should be free from all such degradation for 99.9% of the time at any system outlet.

5.1.2 Impedance

The nominal impedance of the network 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 network.

5.1.3 Measurement point

The parameters specified in Section 5 relate to performance only at the system outlet installed by the authorised person.

Where an authorised person installs a transfer point then they must install a system outlet specifically to be the reference outlet for all network measurements. 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 Section 5.

5.2 System performance for Television.

5.2.1 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 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 (dB μ V)	Maximum carrier level (dB μ V)
DVB-C, T	47	77

5.2.2 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 digital cable relay network shall be as in table 2.

Table 2 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 8 MHz spacing

5.2.3 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 ± 30 kHz. Where the DVB-T standard is used the frequency stability shall be

$$F_s = B_w/100N$$

F_s Frequency Stability
 B_w Bandwidth (8 MHz)
 N No. of carriers

Conditions for the operation of a Digital Cable Relay Network, Issued under an
Authorisation

5.2.4 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 3.

Table 3. Carrier to noise ratio at system outlets.

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

5.2.5 Echoes in television channels

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

6 Leakage and Immunity

6.1 General

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

- reception of programme services
- communication circuits of authorised telecommunication service providers
- radiocommunication services operating in accordance with the Irish Table of Frequency Allocations.

The authorised person shall be responsible for checking the level of signal leakage, on a regular basis, throughout the area served by the cable relay network and maintain it in accordance with the levels indicated in Table 4 (section 6.2).

Where signal leakage is detected and is deemed by the Commission to be causing interference to any service contained in the categories listed in points 9.1 (a) to (d), the authorised person shall take whatever steps are necessary at their own expense to immediately eliminate the interference. If they are unable to eliminate the interference the offending channel, including all carriers, shall be removed from the cable relay network, until the matter is resolved to the satisfaction of the Commission for Communications Regulation.

In certain cases it may be necessary for the Commission to specify lower limits for signal leakage or amend the licence to resolve any interference problems that arise.

6.1.1 Network Information to be Provided

Upon request from the Commission, the authorised person shall submit:

- an up to date frequency plan indicating the programme name of each television channel and its vision carrier frequency. The authorised person shall notify the Commission immediately any change occurs.
- an up to date list of all the programme names of the FM sound radio channels and their respective carrier frequencies. The authorised person shall notify the Commission immediately any change occurs. For a digital network the frequency plan should indicate the programme name

Conditions for the operation of a Digital Cable Relay Network, Issued under an
Authorisation

of each television channel and its position and ID in the Programme Service Multiplex

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

6.2 Signal Leakage

The limits for leakage from a cable distribution network using analogue technology are given in table 4. The maximum³ field strength values are for a distance of 3 metres from the cable system.

Table 4 Signal Leakage Limits for Cable Distribution Networks

Frequency f (MHz) in the Range	Interfering Field Strength Limit dB μ V/m	Measurement distance	Measurement Bandwidth
1 – 30 MHz	20 – 7.7·log ₁₀ (f/MHz)	3m	9kHz
30 – 1000 MHz	27dB μ V/m	3m	9kHz

Table 5 Use Restrictions/Prohibitions

Frequency Range MHz	Restrictions/Prohibitions
74.8 - 75.2	Use restricted (Note 2)
108 – 138	Use prohibited (Note 3)
144 – 146	Use prohibited
156.6 - 157.0	Use restricted (Note 2)
242.8 - 243.2	Use prohibited
281 – 282	Use restricted (Note 2)
318.5 - 319.5	Use restricted (Note 2)
328.6 - 335.4	Use prohibited
405.85 - 406.25	Use prohibited
430 – 440	Use prohibited

³ Notwithstanding the signal leakage limits set out in table 4 the authorised person may be required to adhere to stricter limits in the event of interference being caused by the cable relay network 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 authorised person.

Conditions for the operation of a Digital Cable Relay Network, Issued under an
Authorisation

Note 2: The use of vision/sound/pilot carriers and colour sub-carriers is prohibited in this range.

Note 3: Except for the leakage reference signal, provided it is specifically authorised in the licence by the Commission.

6.2.1 Correction factors that can be applied for various measurement distances

Table 6 Distance correction factor

Distance (m)	Correction factor (dB)
3	0
5	-6
10	-10
15	-13.5
20	-16
25	-18
30	-19.5

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

6.3 General Immunity

Interference can enter a 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.

7 Access to Equipment, System Testing and Maintenance

7.1 Access and Personnel

The licensee shall on request made by an authorised officer of the Commission for Communications Regulation, facilitate that officer in the inspection⁴ of any part of the cable relay network.

7.2 Test equipment

Adequate test equipment shall be held by the authorised person for the accurate measurement of the system performance parameters specified in Section 7 and to ensure that the system signal leakage limits as specified in section 9 are complied with.

7.3 Measurement of performance parameters

Unless otherwise specified by the Commission, the procedure for measuring performance parameters shall be in accordance with those specified in CENELEC document EN50083 part 7.

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 so as to minimise disruption to the viewers. However where the Commission is not satisfied with results obtained using alternative measurement procedures then the measurements shall be repeated using the procedures in the CENELEC document.

7.4 Measurement of signal leakage

Unless otherwise specified by the Commission, 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.

⁴ Inspection shall include the undertaking of measurements.

7.5 Signal Leakage Audits

For the prevention of harmful interference an authorised person may be required to carry out signal leakage audits on their cable network and submit the results to the Commission for consideration. These audits must be carried out in compliance with any methodology, time periods or requirements specified by the Commission

7.6 Maintenance

The licensee shall ensure that the network is audited and maintained on a regular basis so as to ensure compliance with these conditions and in particular with all of the relevant European Standards.