



Office of the Director of  
**Telecommunications  
Regulation**

**Consultative Document  
concerning  
DRAFT TECHNICAL CONDITIONS  
for the Operation of  
Cable Television Systems.**

**Document No. ODTR 98/ 01**

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**Draft Technical Conditions for Cable Relay Systems**

**Consultative Document**

**Introduction**

The Director of Telecommunications Regulation is responsible for the regulation of cable relay systems licensed under the Wireless Telegraphy (Wired Broadcast Relay Licence) Regulations, 1974. It is now proposed to revise the technical conditions of these licences to take account of changes in frequency management requirements and technology since they were first issued. The attached document sets out a first draft set of new technical conditions for comment by interested parties.

**Main Changes**

The main changes in the draft technical conditions:

1. Revised performance requirements for the relay of television and sound broadcasting programmes
2. Additional components within a television signal, such as NICAM sound and Teletext are now being taken into account
3. The addition of a section on signal encryption
4. The addition of a section concerning signal leakage from cable systems and the immunity of cable systems to external systems
5. The addition of a section concerning frequencies which may be used on a cable system and the rules for determining priority in the assignment of frequency channels to the programme services being relayed
6. The addition of a section concerning performance audits and information to be supplied to the Director

**Submission of Comments**

The Director invites you to submit your comments on this document before 31 March 1998 to Ms. Kate Considine, Office of the Director of Telecommunications Regulation, Abbey Court, Irish Life Centre, Lower Abbey Street, Dublin 1.

All comments will be taken into consideration before a final decision is made on the conditions

This is not a legal document and does not constitute legal advice, and the Director is not bound by it. Its purpose is to provide information on what the Director is proposing to do in exercise of her statutory functions. The contents of this document are without prejudice to the legal position of the Director or her rights and duties under the relevant legislation

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**TECHNICAL CONDITIONS RELATING TO THE ESTABLISHMENT AND  
OPERATION OF AN WIRED 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 broadcast relay systems in accordance with section 6(2) of S.I. 67 of 1974, Wireless Telegraphy (Wired Broadcast Relay Licence) Regulations, 1974.

**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 detail those characteristics relevant for ensuring compatibility with authorised users of the radio frequency spectrum.

The parameters specified in this document are mainly based on those given in IEC document EN 50083 parts 1, 2, 3, 5, 7 and 8 entitled "Cable Distribution Systems for Television and Sound Signals". The parameters only relate to analogue transmissions.

For issues not referred to by this document the licensee shall comply with standards set out in the IEC document EN 50083 parts 1 to 9.

Evidence of type approval of 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 in accordance with section 6 (2) of S.I. 67 of 1974

**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 of his entitlements under the licence.**

### **3 DEFINITIONS AND GLOSSARY OF TERMS**

- 3.1 Cable relay systems  
Those systems licensed under S.I. No. 67 of 1974 - Wireless Telegraphy (Wired Broadcast Relay Licence ) Regulations, 1974.
- 3.2 Headend  
Equipment which is connected to receiving antennas or other signal sources and also connected to the remainder of the cable relay system, to process the signal to be relayed.
- 3.3 Feeder  
A transmission path forming part of a 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 energise 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.

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- 3.10 Service point  
The expression used in S.I. 67 of 1974 to refer to a system outlet.
- 3.11 Receiver lead  
A lead which connects the system outlet to the subscriber's equipment.
- 3.12 Subscriber's Equipment  
Equipment at the subscriber's premises such as receivers, tuners, decoders, video recorders.
- 3.13 Transfer point  
An interface between the cable relay system and the building's internal network, each of which may be separately owned.
- 3.14 Immunity (to a disturbance)  
The ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance.
- 3.15 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.
- 3.16 Intermodulation  
The process whereby non-linearity in equipment in a system produces spurious output signal (called Intermodulation products) at frequencies which are a linear combination of those of the input signals.
- 3.17 Carrier to Intermodulation ratio  
The difference in decibels between the carrier level at a specified point in a system and the level of a specified Intermodulation product or combination of products.
- 3.18 Carrier to Noise ratio  
The difference in decibels between the vision or sound 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).
- 3.19 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.

- 3.20 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.
- 3.21 In-band channels  
Channels used on a cable system whose frequencies are within one of the internationally recognised broadcasting bands.<sup>1</sup>
- 3.22 Out of band channels  
Channels used on a cable relay system whose frequencies are not fully within one of the internationally recognised broadcasting bands.
- 3.23 'Must carry' programme channels  
These are television and FM sound radio programme channels which the licensee is obliged by the terms of his licence to distribute on the cable relay system.
- 3.24 'Basic service' programme channels  
These are television programmes and FM sound radio programme channels relayed by the licensee which a person is obliged to pay for in order to become a subscriber to a relay service.
- 3.25 'Discretionary service' channels  
These are television programmes or FM sound radio programmes relayed by the licensee which a subscriber may accept or refuse, at his discretion, without affecting the relay of basic services to that subscriber.

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<sup>1</sup> The internationally recognised broadcasting bands 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).

**4. System Transparency**

**4.1 Television**

The cable relay system shall be designed in such a manner that it is capable of relaying all components within a television signal, intended for general reception<sup>2</sup>.

Note:- This would include Teletext and additional sound channels associated with the vision material. (see section 6.1.3) This provision does not relate to additional sound channels associated with satellite Television transmissions carrying material not associated with the vision material.

**4.2 FM Sound Radio**

The cable relay system shall be designed in such a manner that it is capable of relaying all components transmitted within a sound broadcast signal and intended for general reception.

Note:- This would include radio data systems ( RDS ) and other permitted sub carriers for the transmission of supplementary information. (see Section 6.2.2).

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<sup>2</sup>While not intended for reception by the general public, broadcast organisation include Test insertion signal in the vertical blanking interval ( VBI ). The system must be transparent to these signal so as to facilitate performance measurements.



## 5. **System Engineering**

### 5.1 General

The mechanical and electrical construction of the cable television system shall accord with best practice.

The practice of good system engineering is a necessary requirement to ensure the provision of a high quality service and minimum interference to other services. This is particularly relevant when considering leakage from the cable relay system which could affect other radio services, especially aeronautical systems and private mobile radio networks used by the emergency services, when operating "out of band channels".

### 5.2 Headend installation

As the performance of the headend installation is critical to the overall performance of a cable relay system care must be taken in the installation and maintenance of this equipment.

#### 5.2.1 Equipment Identification.

The headend and associated equipment shall be labelled with the manufacturer's trade mark, type designation and serial number. The label shall be fitted on the outside of the equipment, and shall be clearly readable, non-removable and indelible. The licensee shall ensure that each item of equipment is clearly labelled indicating its function.

#### 5.2.2 Equipment Controls

Equipment Controls which, when wrongly adjusted, increase the risk of causing interference or of improper functioning of the system shall be immediately accessible to qualified personnel only. All controls, meters, indicators and terminals shall be clearly labelled. Details of the power supply from which the equipment is intended to operate shall be clearly indicated.

#### 5.2.3 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.

5.2.4 Headend output

The signal parameters at the headend output should be such as to permit the 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.

5.3.1 Residential type environment

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

5.3.2 Non-Residential type environment.

The licensee shall provide written guidelines on installation standards to individuals or organisations or their representatives for the installation of additional wiring after the system outlet or transfer point of the cable 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 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.

**6. System Standards**

**6.1. Television Standard**

The television standard used shall be PAL system I.

6.1.1 Summary list of parameters:-

6.1.1.1 Frequency spacing

Nominal radio-frequency channel bandwidth	8 MHz
Vision/Sound Carrier separation	5.9996 MHz (±0.0005 MHz)
Nearest edge of channel relative to vision carrier	-1.25 MHz
Nominal width of vestigial sideband	1.25 MHz
Nominal width of main sideband	5.5 MHz

6.1.1.2 Modulation

Type and polarity of vision modulation	C9F neg.
Type of sound modulation	F3E
- Maximum frequency deviation	±50 kHz
- Pre-Emphasis for modulation	50 µS

6.1.1.3 Levels in the radiated signal ( % of peak vision carrier)

Synchronising level	100
Blanking level	76 ±2
Difference between black level and blanking level	0 (nominal)
Peak white level	20 ±2
Ratio of vision to sound effective radiated powers <sup>3</sup>	10/1

6.1.2. Permitted second sound carrier for the transmission of stereo or bilingual sound.

An additional carrier at 6.552 MHz above the vision carrier for the NICAM 728 multi channel sound system as specified in ITU-R Rec. 707 is permitted.

<sup>3</sup> In certain cases an alternative vision to sound carrier ratio may be specified by the Director of Telecommunications Regulation.

### 6.1.3 Additional Broadcasting Services

#### 6.1.3.1 Permitted Additional Broadcasting Services.

The transmission of a teletext service during the field blanking interval is permitted. The system used must conform to Teletext System B parameters described in ITU-R Rec. 653-1. Insertion reference signals may be transmitted on lines 17 and 330 as outlined in ITU-R Rep. 628-4. Insertion test signals for automatic monitoring of the television system may also be transmitted on other blank lines.

Note for cable operators:

There is a need for a discussion between CATV operators and the ODTR on the use of insertion test signals by CATV operators.

#### 6.1.3.2 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 broadcasting services other than those indicated in Section 6.1.3.1

## 6.2 FM Sound Radio

### 6.2.1 Modulation Standards

The transmission system used shall be either Monophonic or Stereophonic pilot tone system as specified in ITU-R Rec. 450-1. The main parameters for these systems are:-

#### 6.2.1.1 Monophonic Transmission

The radio-frequency signal consists of a carrier, frequency modulated by the sound signal, after pre-emphasis, with a maximum frequency deviation of  $\pm 75$  kHz.

### 6.2.1.2 Stereophonic Transmission

The radio-frequency signal consists of a carrier, frequency modulated by a baseband signal according to the specifications of the pilot-tone system. The maximum frequency deviation is  $\pm 75\text{kHz}$ .

### 6.2.1.3 Pre emphasis and low pass filter

The headend must be provided with a pre-emphasis filter with a time-constant of 50 microseconds, combined with a low-pass filter with an attenuation of at least 30 dB at an input modulation frequency of 20 kHz, relative to the level at 1 kHz.

### 6.2.2 Permitted sub carriers for the transmission of supplementary information.

The addition of a sub-carrier on 57 kHz for the transmission of supplementary information using the Radio Data System (RDS), as specified in Irish Standard/EN 50067 : 1993 <sup>4</sup>, is permitted. Only certain features of this system are licensed<sup>5</sup> to Irish broadcast stations.

## 6.3 Signal Leakage reference signals

### 6.3.1 Type of Signal Leakage Reference Signal

Any cable relay system is likely to be spread over a wide area and if sources of signal leakage are to be kept in check it is necessary to achieve continuous monitoring of the whole system.

For this purpose a signal leakage reference signal shall be fed into the cable relay system in accordance with the IEC test method in prEN50083 part 8. This reference signal shall consist of a carrier that is modulated in amplitude and frequency as follows:

- Amplitude modulation  
In a period of approximately 2 seconds the level of the carrier is sequentially stepped down in four equally timed steps as follows:
  - first step: full amplitude
  - second step: -5 dB
  - third step: -10 dB
  - fourth step: -20 dB

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<sup>4</sup>Available from the National Standards Authority of Ireland

<sup>5</sup>An updated list of approved features shall be provided to the licensee by the Director of Telecommunications Regulation on request.

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- Frequency modulation  
Each of the amplitude steps is frequency modulated using, on alternate steps, one of two audio tones at for example 1 kHz and 800 Hz with the full amplitude step modulated with the higher frequency tone.

### 6.3.2 Frequency of Signal Leakage Reference Signal

The frequency reference signal shall be in Band II (87.5 to 108 MHz) and between 107.5 and 107.9 MHz unless otherwise specified by the Director of Telecommunications Regulation. As there will be ongoing developments in the use of Band II for National, local and community Radio it may be necessary to change the frequency used from time to time.

**7 System Performance**

**7.1 General**

**7.1.1 Impairment quality**

This section defines the system performance limits which will, with an unimpaired input, produce picture and sound signal where the impairment to any single parameter will be no worse in normal operating conditions for any channel than grade four on the five grade impairment scale contained in CCIR recommendation 500-5 (1992 - CCIR recommendations RBT series broadcasting service ( television ) ) as given below:

<b>Five-grade-scale</b>			
<b>Quality (of picture)</b>		<b>Impairment (due to interference)</b>	
5	Excellent	=	Imperceptible
4	Good	=	Perceptible but not annoying
3	Fair	=	Slightly annoying
2	Poor	=	Annoying
1	Bad	=	Very annoying

The performance limits set out in this section apply in the presence of all signals in the environment in which the cable system is operating.

**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 cable relay system.

7.1.3 Measurement point

The parameters specified in Section 7 relate to performance at the system outlet. However it is recognised 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 Section 7.

7.1.4 Markings on system outlet

Where both television and FM sound radio services are provided a separate outlet connection shall be provided for each service. Outlet connections should be clearly labelled indicating whether they are for FM Sound radio or for television.



**7.2 System performance for Television.**

7.2.1 Carrier levels at system outlets.

7.2.1.1 Minimum and maximum carrier levels

The minimum and maximum carrier levels are expressed as the r.m.s. voltage of each vision carrier at the peak of the modulation envelope 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)	Conditions
AM VSB Television (PAL System I)	57	80 77**	** for systems over 20 channels
Note :- In order not to overload the receivers, the figures quoted above for the maximum level might have to be reduced.			

7.2.1.2 Maximum Carrier level differences between relayed television channels

The difference in carrier levels shall not exceed the values given in table 2. It should be noted that the differences given in table 2 apply to signals having the same type of modulation.

**Table 2 Maximum Carrier level differences at system outlets between distributed television channels.**

Frequency Range	Maximum level difference (dB)
30.0 MHz to 862 .0 MHz	12
Any 60.0 MHz range	6
Adjacent channel	3

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 8 and 12 MHz spacing

7.2.3 Amplitude response within a television channel at any system outlet.

The Amplitude response as a function of frequency for the entire system shall be such that the variation in gain over any A.M. television channel of 8 MHz bandwidth is not more than  $\pm 2$  dB relative to that at the vision carrier frequency and the gain shall not vary by more than  $\pm 0.5$  dB within any frequency range of 0.5 MHz.

7.2.4 Frequency stability of relayed carrier signals at any system outlet.

When a signal is not relayed at the received frequency or is locally generated, the variation in frequency from the declared nominal value shall not exceed  $\pm 30$  kHz for a television signal and the difference between vision and sound carriers for any one channel shall be maintained within  $\pm 15$  kHz.

7.2.5 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)	Equivalent noise bandwidth (MHz)
AM VSB Television (PAL System I)	44	5.08

7.2.6 Interference to Television channels

7.2.6.1 Single frequency interference

This clause refers to single-frequency interference which may result from intermodulation or the presence of other interfering signals ( local oscillators, ingress signals etc.)

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 television channel shall not be less than 57dB.

7.2.6.2 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.

7.2.6.3 Multiple frequency Intermodulation interference

At any system outlet the level of multiple frequency Intermodulation interference in any wanted television channel shall be such that the carrier to interference ratio shall not be less than

- 57dB for each cluster of composite beats in negative modulation;
- 52 dB for each cluster of composite beats in positive modulation;
- 52 dB for the summation of the clusters falling into that channel.

7.2.7 Differential gain and phase in a television channel

The differential gain and phase in any television channel at any system outlet shall not exceed the figures given in table 5.

**Table 5 Differential gain and phase in a television channel.**

Type of service	Maximum differential gain (%)	Maximum differential phase (degrees)
AM VSB Television (PAL System I)	14	12

7.2.8 Echoes in television channels

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

7.2.9 Hum modulation of carriers in television channels

At any system outlet the spurious modulation of any vision carrier at the frequency of the supply mains and harmonics thereof shall be such that the reference modulation to the hum modulation ratio is not less than 46 dB.

**7.3 System performance for FM Sound Radio**

7.3.1 Carrier levels at system outlets.

7.3.1.1 Minimum and maximum carrier levels

The minimum and maximum carrier levels are expressed as the r.m.s voltage of each carrier measured at the system outlet connection for FM sound radio across an external 75 ohm termination or referred to 75 ohms. Values are given in table 6.

**Table 6 Minimum and maximum carrier levels at system outlets.**

Type of Service	Minimum carrier level (dBuV)	Maximum Carrier level (dBuV)
FM sound mono	40	70
Stereo	50	70
NOTE:- In order not to overload certain receivers, the figures quoted above for the maximum levels may have to be reduced.		

7.3.1.2 Carrier level differences

FM sound radio signals shall be at the same level at the headend before transmission through the cable relay system. The difference in FM sound radio carrier levels at the system outlet shall not exceed the values given in table 7.

**Table 7. Maximum level difference at any system outlet.**

Frequency Range	Maximum level difference (dB)
87.5 to 107.9 MHz	6
NOTE:- If FM. sound signals are present at the system outlet intended for AM-VSB television signals, the level of any FM. carrier shall be at least 3 dB lower than the lowest television signal at the outlet.	

7.3.2 Mutual isolation between system outlets

The minimum isolation at any frequency between any two subscribers' system outlets connected separately to a spur feeder of the relay system shall be as in table 8.

**Table 8 Mutual isolation.**

Frequency Range in MHz.	Minimum Mutual Isolation (dB)
FM sound radio / FM sound radio	42

7.3.3 Amplitude Response within an FM sound radio channel

The Amplitude response as a function of frequency for the entire system shall be such that the maximum amplitude variation over any FM channel of 270 kHz is not more than 3dB with the slope not exceeding 0.3 dB per 10 kHz within 75kHz of the carrier

7.3.4 Frequency stability of relayed carrier signals at any system outlet.

When a signal is not relayed at the received frequency or is locally generated, the variation in frequency from the declared nominal value shall not exceed  $\pm 12$ kHz for an FM sound radio signal.

7.3.5 Adjacent channel spacing.

When individual channel processing is applied the minimum spacing between unmodulated carriers shall be not less than 300kHz. The increment of channel spacing shall be an integer multiple of 100kHz.

7.3.6 Interference

At any system outlet the level of any unwanted signal within the system shall be such that the lowest carrier to interference ratio between a wanted and unwanted FM sound radio signal is as shown in table 9.

**Table 9. Minimum Carrier to Interference Ratio between wanted and unwanted FM sound signals**

Type of Service	Minimum Carrier to interference Ratio ( dB )
FM Sound Radio ( mono )	36
FM Sound Radio ( stereo )	51

7.3.7 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 be no less than the value given in table 10.

**Table 10. Carrier to noise ratio at system outlet**

<b>Type of service</b>	<b>Minimum carrier to noise ratio (dB)</b>	<b>Equivalent noise bandwidth (MHz)</b>
FM sound mono	38	0.2
FM sound stereo	48	0.2

7.3.8 Hum modulation

Hum modulation sidebands must be at least 46 dB below the carrier level.

**8. Encryption**

8.1 General

Encryption, when used, shall be used in such a way as to facilitate the simultaneous viewing/recording of two or more 'must carry' or 'basic service' programme channels on the cable relay system.

8.2 Coding Methods

The licensee shall be free to choose the type of encoding/decoding process to be used. However the encoding/decoding process shall not perceptibly degrade the quality of the signal provided at the output of the decoding device.

8.3 Output of the decoder

The output of the decoder must be within the normal VHF or UHF broadcasting bands and must be a standard PAL system I signal (see Section 6.1).

8.4 Transparency of the encoding / decoding equipment to multichannel sound system and permitted additional broadcast services.

Where an encoding/decoding process is used the signal at the output of the decoder shall, if it was present in the received signal at the head-end, contain:

- a NICAM 728 multichannel sound system (see section 6.1.2)
- any additional broadcast services (see section 6.1.3.1) that were present in the received signal at the head-end.

( See also section 4 of this document )

8.5 Spectral Energy

The use of an encoding and decoding process shall not increase the spectral energy of the transmitted signal above that relevant to a standard 8 MHz PAL system I signal.

System outlet

8.6 Where encryption is used the output of the decoder is deemed to be the system outlet.



**9. Leakage and immunity**

**9.1 General**

In general a 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 licensed sound broadcast programme services
- ( b ) reception of licensed television broadcast programme services
- ( c ) communication circuits of licensed telecommunication service providers
- ( d ) any wireless telegraphy stations authorised 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 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 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 channel from the 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 license to resolve any interference problems that arise.

9.2 Signal Leakage

9.2.1 The limits for leakage from a cable distribution system using analogue technology are given in table 11. The maximum<sup>6</sup> 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 <sup>6</sup> Field Strength (dB $\mu$ V/m) at 10 m distance from the Cable system
30 - 44	Use prohibited
44 - 68	-2
68 - 74	-2
74 - 76	use restricted (note 2)
76 - 87.5	-2
87.5 - 107.8	21 (note 1)
107.8 - 138	use prohibited (note 3 )
138 - 144	4
144 - 146	use restricted (note 2)
146 - 156	4
156 - 158	use restricted (note 2)
158 -174	4
174 - 230	13 (note 4)
230 - 240	4
240 - 248	use prohibited
248 - 281	4
281 - 282	use restricted (note 2)
282 - 318.5	4
318.5 - 319.5	use restricted (note 2)
319.5 - 328	4
328 - 336	use prohibited
336 - 380	4
380 - 400	4
400 - 408	use prohibited
408 - 430	4
430 - 440	use prohibited
440 - 450	4
450 - 470	4
470 - 790	13 (note 4)
790 - 862	13 (note 4)

<sup>6</sup> 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 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 1: This values assumes 100 kHz separation from off-air FM broadcasting.  
 Note 2: The use of vision/sound/pilot carriers and colour subcarriers is prohibited in this range.  
 Note 3: Except for narrow band low level leakage reference signal at or below 107.9 MHz ( See section 6.3.2 ).  
 Note 4: The limit specified is based on the assumption that the cable system is not using a frequency channel that is co-channel with the frequency channels used for off-air reception within the cable area.

9.2.2 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)
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.

9.3 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.

The licensee shall ensure that the immunity of the 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 and the values of carrier to interference ratios for FM sound radio signals given in Section 7.3.6.

## **10. Frequency Matters**

### **10.1 Allocation of radio spectrum between 30.0 and 862.0 MHz.**

A licensee shall only use frequency channels from the frequency range ( 30 to 862 MHz ) for television and FM sound radio programmes on a cable relay system. Within this frequency range 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.

### **10.2 Cable relay Frequency plan**

#### **10.2.1 Television**

The licensee shall only relay the frequency channels authorised in his licence. A licensee shall not use any frequency channel for test purposes without the prior approval of the Director of Telecommunications Regulation and such approval may be subject to specific conditions.

In assigning television programme channels to frequency channels the licensee shall comply with the following procedures:-

- The national television programmes ( i.e. RTE 1, Network 2, Telefís na Gaeilge, and Independent Radio and Television Commission contractor) must be on frequency channels which are within the standard broadcasting bands<sup>1</sup> (i.e. inband channels)
- The national television programmes ( i.e. RTE 1, Network 2, Telefís na Gaeilge, and Independent Radio and Television Commission contractor) must be carried on the inband frequency channels on which these programmes are least susceptible to suffer interference from other signal sources and are least susceptible to suffer degradation as a result of their relay on the cable system.
- Any UK terrestrial television programmes that are part of the basic service offered must be on frequency channels which are within the standard broadcasting bands<sup>1</sup> (i.e. inband channels).
- Other television programme channels that form part of the basic service may be relayed on any remaining inband channels.
- Discretionary service programme channels -which are encrypted- may not be relayed on inband channels.

### 10.2.2 FM Sound Radio

The licensee shall only relay the frequency channels authorised in their licence. A licensee shall not use any frequency channel for test purposes without the prior approval of the Director of Telecommunications Regulation and such approval may be subject to specific conditions.

In assigning FM sound radio programme channels to frequency channels the licensee shall comply with the following procedures:-

- All frequency channels used for the relay of FM sound radio programme channels shall be in the frequency range (87.5 to 108 MHz).
- The FM sound radio programme channels of Radio Telefís Éireann and of FM sound radio contractors of the Independent Radio and Television Commission shall not be relayed on the same frequency channels which are used to provide off-air service to the area served by the cable relay system.

### 10.3 **Priority between Radiocommunications Services and CATV Systems.**

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

**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 Director of Telecommunications Regulation, facilitate that officer in the inspection of any part of the cable relay 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 and regular maintenance.

11.3 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 and regular maintenance.

11.4 Maintenance

The licensee shall ensure that the system is inspected 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 inspections and maintenance work undertaken. A copy of the maintenance programme and the log shall be made available to an authorised officer of the Director of Telecommunications Regulation on request.

**12. Measurement procedures.**

Where procedures for the measurement of certain parameters ( e.g. signal leakage ) are specified by the Director of Telecommunications Regulations the licensee shall comply with these procedures.

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

13.1 Regular performance Audits

Licenseses will be required to carry out six monthly performance audits on their cable relay system and submit the results to the Director of Telecommunications Regulation for her consideration. These audits must be carried out in strict compliance with any methodology or requirements specified by the Director of Telecommunications Regulation.

Seeking the views of the industry on point 13.1
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13.2 Regular Signal Leakage audits

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

14.3 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 cable relay system
- the number of system outlets in the cable relay system

14.4 The licensee shall submit to the Director of Telecommunications Regulation on a six monthly basis an up to date frequency plan indicating the name of each television channel and its vision carrier frequency and shall also submit an up to date list of all the names of the FM sound radio channels and their respective carrier frequencies.

14.5 Update of system diagrams (Maps)

The licensee shall submit to the Director of Telecommunications Regulation, on a six monthly basis, an updated network diagram/map of their system clearly indicating:

- the most up to date geographical area of operation of their cable distribution system.
- the location of feeders and headends