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1. General

- 1.1 This document explains the application procedure for licences for point to point radio links above 1 GHz issued by the Minister for Communications. It is in the form of a set of Guidelines and does not purport to be a legal document.
- 1.2 The general policy of the Minister is to promote the development of high capacity electronic communications networks based on optical fibre which the Minister generally regards as the most appropriate medium for emerging broadband services especially for those parts of a network that require very high capacity. It is recognised that radio links facilitate the early development of infrastructure and competition in the provision of electronic communications services and particularly in this context the Minister will consider applications for licences for such links.
- 1.3 The Minister notes that radio links are also used by non-electronic communications network providers such as the emergency services, public utilities and private users.
- 1.4 It is the intention of the Gibraltar Regulatory Authority (GRA) that these Guidelines assist the use of the frequency spectrum in a fair and equitable manner thereby facilitating radio users.

2. The Regulations

- 2.1 A licence is required under Section 61 of the Communications Act 2006 to keep and operate apparatus for radiocommunications as defined in section 2 of the Act.
- 2.2 The applicant should be aware that any radio link licence granted by the Minister is for the keeping and operating of the apparatus for radiocommunications, which is specified in the licence. Any licence issued by the Minister does not absolve the licensee from complying with any other statutory obligations.

3. Frequency Spectrum Information

- 3.1 The spectrum available for radio links is a finite resource. It is the policy of the GRA to manage the spectrum, on behalf of the Minister, in an efficient and orderly manner in order to obtain the optimum use from this resource. The GRA does not make block allocations of spectrum to licensees for radio link purposes, rather it assigns frequency channels to individual links on a non-exclusive basis. Accordingly, licensees should be aware that the Minister licenses other users to use the same frequency channels at different geographic locations.
- 3.2 While the Minister will endeavour to minimise the potential for interference between users and services, no liability shall accrue to the Minister or the GRA arising from interference to licensees of radio systems.
- 3.3 A licence does not confer any right of ownership of the frequency spectrum. It allows the assigned frequency channel to be used during the term of the licence in accordance with the conditions of the licence.
- 3.4 Ordinarily the GRA has based the Gibraltar Frequency Allocation Table on internationally recommended band plans where they exist. Annex 1 sets out the frequency bands, the corresponding international plan, the channel bandwidths and the minimum capacity.

3.5 Changes in the spectrum available for radio links can arise for a number of reasons. These include:

- those required in accordance with the requirements of international organisations;
- those required in accordance with EU legislation;
- those necessary to meet local requirements.

In the interests of the efficient use of the radio spectrum it is the policy of the GRA to review the use of the spectrum on an ongoing basis.

3.6 The Minister will endeavour to accommodate the needs of the applicant, with due regard to the efficient and orderly use of the spectrum (the appropriate frequency band for use for a particular application is based on a number of factors such as path length and traffic capacity).

3.7 Where the applicant requests channels in a specified band, it should be noted that the Minister cannot guarantee that the requested band can be made available at specific locations.

3.8 The Table below illustrates the bands available for the different type of radio link applications

Type of Radio Link ¹	Frequency Bands (GHz)
International long haul trunk links	
Access links	

3.9 Applicants are referred to the latest Gibraltar Frequency Allocation Table² for details of other services sharing particular frequency bands with radio links. In that regard, applicants should be aware that some of the frequency spectrum available for use with fixed radio links will be shared with other services including satellite.

3.11 In the interests of the efficient and equitable use of the electro-magnetic spectrum the Minister does not generally permit the use of frequency diversity or the assignment of separate frequencies for standby purposes.

Licensees may improve the reliability of transmission networks by using the following network resilience techniques:

- the use of space diversity,
- the use of 'hot-standby' radio equipment redundancy based on one frequency channel,
- the use of routing diversity, which involves the construction of networks with ring or mesh architectures.

¹ Trunk links mostly comprise of high capacity connecting network nodal points. Access links usually involve medium capacity systems (e.g. 2x2 Mbit/s, 4x2 Mbit/s etc.) connecting to an access point. (e.g. a base station, call centre, customers premises, etc.)

² Updated from time to time. Currently available from the GRA.

- 3.12 Propagation availability for the purposes of these Guidelines will be determined by the application of the ITU-R recommendations set out in Annex 3. The propagation availability normally given will be 99.95%. Propagation availability levels of greater than 99.95% will be considered on a case by case basis (see Annex 3, Table An3-2). Each case will have to be justified and will require the deployment of high performance equipment with due regard to spectral efficiency. The use of network resilience techniques is generally required for radio availability levels greater than 99.99%.
- 3.13 Applicants are required to have regard to compatibility with other existing radio users at the same general location.
- 3.14 All radio equipment proposed will have to meet the minimum performance criteria (see Annex 4, Section 5).
- 3.15 The Minister will stipulate the channel and transmitter power to be used so as to minimise the risk of interference and facilitate greater frequency re-use. The transmitter power permitted will be the minimum power necessary in order for the link to operate to the specified propagation availability criteria. See Annex 3.

4. Pre-Application Consultation

As the application process is a single stage process, applicants will need to undertake detailed planning work prior to submitting an application. As this may require significant time and expenditure on the part of applicants, the GRA recommends that applicants undertake pre-application consultation with this office.

5. The Application Process

- 5.1 Applications in respect of licences for radio links must be made on the appropriate application form obtainable from the GRA. The application form (completed and signed) should be submitted to the GRA. The GRA will normally consider applications on a first come basis and advise the Minister on licensing.
- 5.2 It should be noted that all applications for licences will be evaluated on the basis of the written information provided on the application forms in addition to any supplementary written information supplied at the request of the Minister and that all decisions of the Minister and/or the GRA will be communicated in writing.
- 5.3 If the application is not in accordance with the Guidelines, the applicant will be notified with reasons as to why the application is being refused.
- 5.4 If the application is in accordance with the Guidelines (e.g. frequency band, bandwidth, HI/LO designations, capacity justifications) the application will be subject to a detailed evaluation of the technical details.
- 5.5 The application for each proposed link may be individually approved or refused or additional information may be requested from the applicant prior to a decision. Where the GRA considers it necessary consultation will take place with the applicant.

- 5.6 Upon written notification of the GRA's intention to issue a licence, payment of the relevant licence fee will be due within 1 month of the date on the notification. If the licence fee is not paid within 1 month, the application will be deemed to have lapsed.
- 5.7 A separate schedule to the licence will be issued in respect of each radio link.
- 5.8 On being issued with a licence, the licensee will be required to bring the radio link into operation in compliance with the terms of the licence, within a stated time (i.e. typically 3 months) failing which the licence may be revoked (see also Section 7.2).
- 5.9 Except in exceptional circumstances, licences for radio links will not be renewed if the radio link has not been put into service and the declaration form submitted to the Minister prior to the renewal date of a licence (see Section 9).

6. Evaluation of Applications

6.1 General

Each application will be evaluated using the information provided by the applicant on the application form and supplementary written information where applicable to determine the extent to which the following criteria would be satisfied by the Minister of the licence:

- the orderly and efficient use of the spectrum;
- fairness in the assignment of spectrum between licensees;
- compliance with other licensing regimes operated by the GRA;
- compliance with international obligations;
- the effective and efficient delivery of non-telecommunication essential services³.

6.2 Evaluation

The evaluation of an application will include the following:

- Type of Link & Capacity Required;
- Proposals for Frequency Bands;
- Radio Availability & Network Resilience.
- Link Planning Matters;
- Proposals for Radio Equipment, Antennas and Feeders.

Further explanation in regard to these aspects can be found in Annex 4.

³ Non telecommunication essential services include government/safety services, utilities etc.

7. Fees

7.1 Licence Fees

7.1.1 A fee is payable on the issue of a licence whether or not the applicant intends making immediate use of the assigned frequency spectrum. The application will be deemed to have lapsed if the relevant fee is not paid within the specified time and the proposed frequency assignment may be cancelled.

7.1.2 Manufacturing and delivery lead times for equipment and planning permissions lead times are not acceptable circumstances for a delay in payment of the appropriate licence fees.

7.1.3 The current fees are set out below:

Bandwidth of Radio Link	Radio Link Licence Fee (Point to Point)
Narrow Band (Up to 50) KHz)	[£450] per radio link
Medium Band (over 50 KHz up to 3.5 MHz)	[£600] per radio link
Wide Band (over 3.5 MHz)	[£750] per radio link
Short Range Devices (SRD)using Wide Band Data Transmission Systems (WBDTS)	£100

7.2 Temporary Licences.

Temporary radio link licences may be issued for any period up to a maximum of six months, subject to payment of 50% of the fee set above.

8. Commissioning/Site Inspections.

For the purpose of ensuring that the radio link is installed and operating in accordance with the licence conditions, a completed declaration form, indicating that the radio link has been installed and is conforming with the licence, must be submitted to the GRA within the time limit specified in the licence.

9. Period of Licences.

9.1 Licences will be issued for a period of 1 year. On written application for renewal, the Minister will review individual licences in each case. It may not in all cases be possible to effect renewal. In considering renewal the Minister will have regard to inter alia:

- whether the link is being operated in accordance with the terms of the expiring licence;
- whether changes in radio frequency management requirements, are being considered at a local or international level for the band in question;
- whether the link is subject to a review of spectrum (see Section 11);

9.2 It should be noted that licences issued on a temporary basis (maximum period six months) will not be renewed.

10. Modification to licences.

It is recognised that licensees may, from time to time, wish to request a modification to an existing licence. Modifications, which could increase the potential for interference with other users, may require a new application to be made and if a revised licence is issued the existing licence would be withdrawn. Modifications, which would not increase the potential for interference with other users will be considered on a case by case basis.

11. Review of use of spectrum.

It is the policy of the Minister to conduct, at regular intervals, reviews of spectrum and as a consequence of these reviews changes to licences may be required.

12. International Co-ordination Obligations

In some cases it may be necessary for the GRA to undertake international co-ordination procedures, particularly where there is a possibility of interference to/from the terrestrial and/or satellite services of another administration. As this may take some time, radio links may be licensed subject to a condition that the licence may have to be amended, or withdrawn if successful co-ordination is not achieved. Where changes arising from international co-ordination are required to be made to a licence, the licensee will be consulted on the necessary changes.

Frequency bands above 1 GHz currently in use for point to point radio links.

1.1 Frequencies are currently available for point to point links in bands between 1 and 60 GHz, in accordance with international frequency plans. The following table indicates the frequency bands, the corresponding plan^{4, 5}, the channel bandwidths and the minimum capacity for the band.

Table An1-1 Appropriate Spectrum for Radio Links.

Band	Plan	Channel Bandwidths	Minimum Capacity ⁶
1.3 GHz ⁷	CEPT/ERC/REC 13-01 E, Annex A	≤ 1 MHz	-
1.4 GHz ⁷	CEPT/ERC/REC 13-01 E, Annex B	≤ 1 MHz	-
2 GHz	CEPT/ERC/REC 13-01 E, Annex C	500 KHz, 1.75 MHz, 3.5 MHz, 7 MHz, 14 MHz	1 MBit/s
4 GHz	ITU-R F. 635-2, Annex 1	40 MHz	280 MBit/s
L6 GHz	CEPT/ERC/REC 14-01 E, Annex 1	29.65 MHz	140 MBit/s
U6 GHz	CEPT/ERC/REC 14-02 E, Annex 1	40 MHz	140 MBit/s
7 GHz	ITU-R F.385-6, Annex 1	28 MHz	140 MBit/s
L8 GHz	ITU-R F. 386-4, Annex 1	29.65 MHz	140 MBit/s
U8 GHz	ITU-R F. 386-4, Annex 3	7 MHz, 14 MHz	8 MBit/s
11 GHz	ITU-R F. 387-6, Annex 2	40 MHz	140 MBit/s
15 GHz	ITU-R F. 636-3	3.5 MHz, 7 MHz, 14 MHz	2 MBit/s
18 GHz	CEPT/ERC/REC 12-03 E, Annex A	55 MHz, 27.5 MHz	34 MBit/s
23 GHz	CEPT/ERC/REC 13-02 E, Annex A	3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 56 MHz	2 MBit/s
26 GHz ⁸	CEPT/ERC/REC 13-02 E, Annex B	3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 56 MHz	2 MBit/s
38 GHz	CEPT/ERC/REC 12-01 E, Annex A	3.5 MHz, 7 MHz, 14 MHz, 28 MHz	2 MBit/s
58 GHz	ETS 300 408 ⁹	100 MHz	-

1.2 In particular circumstances assignments for radio links may be used in spectrum other than in the bands mentioned in Table An1-1 (e.g. Outside Broadcasting links etc.).

1.3 Table An1-1 may be altered in the future in line with changing national and international circumstances.

1.4 A number of these bands are shared with other services including satellite¹⁰.

⁴ CEPT recommendations are available on the ERO web site (www.ero.dk).

⁵ It is the intention of the GRA to publish the relevant (CEPT and ITU plans) band plans.

⁶ The minimum capacity indicated relates to the minimum channel bandwidth given in the previous column.

⁷ These bands are reserved for low capacity radio link systems. Maximum preferred capacity of 2 MBit/s is applied.

⁸ This band may also be considered for point to multi-point purposes. Applications for point to point links in this band may be considered if there is insufficient spectrum in the 23 GHz band.

⁹ Awaiting the development of a CEPT/ERC channel plan.

Annex 2

Link Length Policy

1. Introduction:

- 1.1 This Annex describes the link length policy of the GRA as it applies to the radio links operating in bands at 2 GHz and above. The Annex indicates the minimum hop lengths appropriate to a particular frequency band. This policy will be reviewed as required.
- 1.2 Currently, the link length policy does not apply to the 1.3 GHz and 1.4 GHz bands.

2. Overview of link length policy:

- 2.1 This policy is being implemented in the interests of the efficient and orderly use of spectrum. In general, this means that the shorter the length of the link path, the higher the appropriate frequency band.
- 2.2 The GRA recognises that there are a number of factors which influence the choice of frequency band i.e. capacity requirements, service requirements, equipment characteristics etc. so that, in many cases, it may be necessary to undertake detailed link budget calculations to identify the most suitable frequency band.
The GRA will:
- in normal circumstances apply the minimum path length indicated in Table An2-1 attached.
 - in exceptional circumstances vary the application of this policy
- 2.3 Table An2-1 indicates minimum hop lengths below which the GRA would normally consider it to be unreasonable to use the frequency band in question. The Table does not indicate the maximum hop length possible in any frequency band.
- 2.4 For the bands 18 GHz, 23 GHz and 26 GHz two values of minimum path length are given in Table An2-1. The value used for a particular application relates to the capacity sought.

¹⁰ Applicants are invited to refer to the Gibraltar Frequency Allocations available from this office.

Table An2-1:- Frequency bands above 2 GHz and the appropriate link path lengths

Band (GHz)	Min. Path Length (Km)	Capacity for Digital Links (MBit/s)
2	25	See Annex 1
4	35	See Annex 1
L6	35	See Annex 1
U6	35	See Annex 1
7	35	See Annex 1
L8	35	See Annex 1
U8	35	See Annex 1
11	15	See Annex 1
15	10	See Annex 1
18	6	34
	0	> 34
23	4	2 to 34
	0	> 34
26	4	2 to 34
	0	> 34
38	0	See Annex 1
58	0	See Annex 1

Annex 3

Technical Assessment Criteria

- 1.1 In the promotion of the orderly and efficient use of the radio spectrum, the lower the max. transmitted power the greater the potential for spectrum reuse. Accordingly the Minister will licence as low a transmitted power as possible.
- 1.2 Factors which contribute towards greater outages and reduced quality of service, include;
- transmit powers,
 - low performance equipment,
 - small antennas,
 - inadequate network planning,
 - lack of resilience,
 - inadequate operational response,
 - atmospheric and reflections in the radio path (rain, multipath).
- 1.3 In determining the application's maximum permissible transmitted power, a path calculation (link budget) is undertaken by the GRA ensuring a particular target propagation availability figure (See Table An3-2).
- 1.4 Path calculations, which include propagation availability, should take into consideration the following radio factors, as determined by the International Telecommunication Union:

Table An3-1

Radio Factor	ITU-R Recommendation	Equation No. (or Table/Figure)
Free Space Loss	P. 525-2, Annex 1	4
Gaseous Absorption	P. 676-1, P. 530-5, Annex 1	1a, 1b, 2 1
Rain Attenuation	P. 838 P. 837-1 P. 841, Annex 1 P. 530-5, Annex 1	1, 2, 3 (Table 1-32mm/hour, Figure 2-H) 5 41, 42, 43, 44
Multipath Fading	P. 530-5, Annex 1 P. 841, Annex 1 or P. 530-5, Annex 1 P. 453-4, Annex 1	4, 8, 9, 11, 14, 15 5 or 39, 40 (Figure 9)

- 1.5 In addition to Table An3-1, transmitter output power levels, antenna gains, feeder losses¹¹ and receiver sensitivity levels (referenced to a bit error rate of 1×10^{-6}) should be taken into consideration in submitting path calculations with applications in respect to each proposed radio link.
- 1.6 The GRA only takes account of outages caused by the radio propagation. Other factors that are generally taken into account in determining circuit availability are a matter for the applicant.
- 1.7 The GRA applies the general criteria indicated in Table An3-2 in determining the licensed transmitter power. Operators may be able to improve the radio availability by using equipment operating to a higher standard than the minimum specified.
- 1.8 Some of the ITU-R Recommendations listed in the Table An3-1 have been updated by the ITU. As the GRA updates its software it is envisaged that the latest versions of these recommendations will be applied. Details concerning the ITU-R Recommendations current being applied by the GRA are available.

¹¹ In the absence of any information on feeder loss, combiners, etc. the GRA can, if appropriate, assume a maximum of 1.5 dB for all losses between the transmitter output and the antenna port. If equipment redundancy is used but no duplication of antennas is provided, then the GRA can, if appropriate, assume a maximum of 3 dB for insertion losses in the combiner.

Table An3-2

Target Outage (Radio only)	Radio Availability	Level of Resilience for bands below 3 GHz.	Level of Resilience for bands above 3 GHz.
Approx. 10 hours	99.9%	Meets Guidelines but antenna is not compliant with class 3 in ETSI standard EN 300 631 at either site	Meets Guidelines but antenna smaller than preferred minimum size at either site
Approx. 5 hours	99.95%	Meets Guidelines and is compliant with class 3 in ETSI standard EN 300 631	Meets Guidelines including preferred minimum antenna sizes at both sites
Approx. 53 minutes (1 hour)	99.99%	Meets Guidelines and compliant with class 3 in ETSI standard EN 300 631 and (1 or 2) 1) including equipment redundancy at both sites 2) routing diversity using network meshing, rings etc. on radio, fibre or coax	Meets Guidelines; 1) including preferred minimum antenna sizes at both sites and (2 or 3 or 4) 2) including equipment redundancy at both sites 3) including, where appropriate (i.e. generally greater than 3.5 GHz and less than 12 GHz), space diversity at both sites 4) routing diversity using network meshing, rings etc. on radio, fibre or coax
Approx. 27 minutes.	99.995%	Meets Guidelines and is compliant with class 3 in ETSI standard EN 300 631 and 1) includes equipment redundancy at both sites and 2) routing diversity using network meshing, rings etc. on radio, fibre or coax.	Meets Guidelines; 1) including preferred minimum antenna sizes at both sites and 2) including equipment redundancy at both sites and 3) including, where appropriate (i.e. generally greater than 3.5 GHz and less than 12 GHz) space diversity at both sites. and 4) routing diversity using network meshing, rings etc. on radio, fibre or coax.
Approx. 6 minutes	99.999%	Meets conditions for 99.995% and satisfies the GRA that the higher availability of 99.999% is necessary.	Meets conditions for 99.995% and satisfies the GRA that the higher availability of 99.999% is necessary.

Annex 4

Evaluation

1. Type of Link & Capacity Required

- 1.1 Except in exceptional circumstances, the Minister is unlikely to issue licences for analogue radio links as analogue radio links are generally less spectrally efficient than digital links.
- 1.2 In cases where radio networks are being established, the applicant should provide an overview of the network. This diagram should include details of the capacity contribution/distribution on a geographic basis.
- 1.3 The capacity requested is a material factor in evaluating radio link applications where there is a consequential increase in bandwidth sought above the minimum bandwidth for the relevant frequency band (see Annex 1).
- 1.4 The purpose of the proposed link, what alternatives have been considered, if any, and why radio is favoured over non-radio alternatives.
- 1.5 Details of the relevant licences held/applied for must be provided in the application form.

2. Proposals for Frequency Bands

Applicants may request access to a particular frequency bands. In doing so the basis for their preference should be indicated. Any proposal put forward should take cognisance of the link length policy set out in this document. Notwithstanding preferences submitted, the Minister shall, having regard to path length, availability of the restricted spectrum and policy considerations, make the final decision concerning the frequency band to be used for each link.

3. Radio Availability & Network Resilience

The applicant should indicate the radio availability and network resilience used in the preliminary calculations and where relevant indicate the calculation basis if they differ from that indicated in Annex 3 of these Guidelines.

4. Planning Approach

- 4.1 Consideration will be given to the following:
 - maximum repeat usage of the same frequency channel throughout the network;
 - existing sites and surrounding areas may be designated 'transmit high or transmit low', depending on frequencies currently in use on the site. The applicant should have regard to this (see Section 3.13 of the Guidelines);
 - Other services may share the same band with radio links. The applicant is required to show how it has taken this into account. For further information

on these shared bands please consult the Gibraltar Frequency Allocation Table

- 4.2 Planning should be based on the minimum equivalent isotropic radiated power (EIRP) necessary. The most directional antennas possible should be proposed, in order to minimise the risk of interference to others.
- 4.3 In submitting an application the following support documentation should be included:
 - Path calculations (link budgets), see Annex 3;
 - Path profiles;
 - Intrasystem interference calculations, if applicable.
- 4.4 Applicants should assume 4/3 earth radius (K) and fresnel factor (F) of 0.6 and must satisfy the GRA that they have established that there is a clear line of sight between the transmitting and receiving stations. Applicants wishing to use other values for K and F should consult with the GRA.
- 4.5 Where no clear line of sight exists, then the application for that/those particular radio link/s will be refused.
- 4.6 It is in the applicants' interest to provide path calculations consistent with the formulae outlined in Annex 3. Path calculations using different procedures will require additional work to be undertaken by the GRA and this may delay the processing of the application.

5. Proposals for Radio Equipment, Antennas and Feeders

5.1 General

- 5.1.1 Equipment specifications (i.e. manufacturer's data sheets) will need to be submitted in respect of proposed transmitters, receivers, antennas and feeder cable/waveguide.
- 5.1.2 Equipment, which is flexible in terms of frequency tuning and output power level adjustment, is favoured.
- 5.1.3 It is recommended that approval from the GRA should be obtained prior to ordering or purchasing, as the equipment and antenna details permitted will be specified in the licence.
- 5.1.4 Those applicants, who frequently apply to the GRA for licences using the same equipment, antennas and feeders, may supply this information once to the GRA in the form of a reference file. In subsequent applications the applicant can refer to the relevant sections of the reference file. Applicants will however be required to supply information on a regular basis (at least annually) to facilitate the updating of the reference file. It should be noted that applications will be assessed using the information supplied by the applicant. Consequently such applicants should ensure that their reference file is kept up to date.

5.2 Radiocommunications Equipment

- 5.2.1 All radiocommunications equipment proposed should be type approved to the relevant ETSI standards and variants indicated in Table An4-2. Certification documentation indicating type approval will have to be submitted to the GRA.
- 5.2.2 If an ETSI standard is not available then the applicant should consult with the GRA.
- 5.2.3 Table An4-2 details the standards and variants, which are presently applicable. This table may need to be altered in line with emerging developments.
- 5.2.4 Equipment which is more spectrally efficient such as the provision of capacities > 155 MBit/s (STM-1) in one radio channel (which is less than or equal to 40 MHz bandwidth) would be favoured.
- 5.2.5 The GRA recognises that automatic transmit power control (ATPC) is a useful technology for radio link operators to use in the avoidance of signal outages due to anomalous fading. However, as an instantaneous increase in EIRP due to ATPC can give rise to harmful interference to other radio link operators, in the interest of the orderly and efficient use of spectrum the maximum EIRP possible with ATPC will need to be equivalent to the maximum permitted EIRP on the licence.

Table An4-2

Frequency Band	ETSI Standard	Comment
2 GHz	pr ETS 300 633	Classes 2, 3 applicable.
2.4 GHz (SRD)	ETS 300 652 (WBDS)	WBDS must conform with ERC/ Rec. 70-03 Annex3
4 GHz		Drafting of standards for very high capacity (>1xSTM-1) systems based on 40 MHz channel bandwidth underway in ETSI. Consultation with GRA required.
6 GHz	ETS 300 234	Consultation with GRA required.
7.5 GHz	ETS 300 234	
8 GHz	ETS 300 234	Consultation with GRA required.
11 GHz		Consultation with GRA required
15 GHz	Draft EN 301 128	Classes 1, 2 applicable
18 GHz	pr ETS 300 430	STM-1 with 55 MHz channel spacing only
	ETS 300 639	Sub STM-1 SDH with 27.5 MHz channel spacing.
	Draft EN 301 128	PDH; Classes 1, 2 applicable
23 GHz	ETS 300 198	Class 2 applicable for PDH.
		Class 3 applicable for PDH and SDH.
26 GHz	ETS 300 431	Ministerde B equipment applicable (PDH and SDH)
	ETS 300 632	Analogue point to point applicable
38 GHz	EN 300 197	Class 2 applicable to PDH.
		Class 3 applicable to SDH
58 GHz	ETS 300 408	

5.3. Antennas

5.3.1 Radiation Pattern Envelopes (RPEs) for all the intended antennas for use should be supplied to the GRA.

5.3.2 Antennas with high directionality will assist in reducing the potential of interference to or from other users

5.3.3 Below 3 GHz.

Except in exceptional circumstances the use of class 3 antennas in accordance with the ETSI standard EN 300 631 is required for systems in the 1.3 GHz, 1.4 GHz and 2 GHz bands.

The use of yagi, sectoral and omnidirectional antennas will only be permitted by the GRA in exceptional circumstances.

5.3.4 Above 3 GHz.

The following table indicates the preferred minimum antenna sizes and antenna types in the various frequency bands above 3 GHz.

Table An4-3

Band	Antenna Size	Antenna Type
4 GHz	2.4 m	Solid Parabolic
6 GHz	2.4 m	Solid Parabolic
7 GHz	2.4 m	Solid Parabolic
8 GHz	2.4 m	Solid Parabolic
11 GHz	2.4 m	Solid Parabolic
15 GHz	1.2 m	Solid Parabolic
18 GHz	1.2 m	Solid Parabolic
23 GHz	0.6 m	Solid Parabolic
26 GHz	0.6 m	Solid Parabolic
38 GHz	0.3 m	Solid Parabolic/flat panel
58 GHz	-	Solid Parabolic/flat panel

5.3.5 The GRA may, in particular circumstances, require the use of antennas with higher gain and directionality than those specified above.