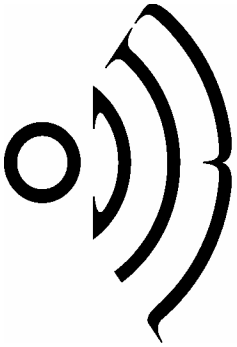


Office of the Director of
Telecommunications
Regulation

Consultation Document

A Review of Document ODTR 98/14 "Guidelines for Applicants for Point to Point Radio Link Licences in Spectrum Above 1GHz."

Document No. ODTR 00/69 **September 2000**

Oifig an Stiúrthóra Rialála Teileachumarsáide
Office of the Director of Telecommunications Regulation
Abbey Court, Irish Life Centre Lower Abbey Street, Dublin 1.
Telephone +353-1-804 9600 *Fax* +353-1-804 9680

Table of Contents

1 Introduction

The Director of Telecommunications Regulation ("The Director") is responsible for the regulation of the telecommunications and radiocommunications sectors in Ireland, in accordance with National and EU legislation.

As part of her responsibility in the radiocommunications sector, the Director is responsible for the licensing of point to point radio links[1]. Radio links play an important role in the provision of public utility, broadcasting, emergency and public telecommunications services in Ireland.

The guiding principles, explaining the criteria under which applicants for point to point radio link licences will be licensed are contained in document ODTR 98/14, "Guidelines for Applicants for Point to Point Radio Link Licences in Spectrum Above 1 GHz." (this document is available from the ODTR website, www.odtr.ie, and is also set out at Annex 1).

The Director is now undertaking a consultation with a view to revising these Guidelines and the purpose of this document is to invite comments from interested parties on a number of relevant issues that have come to light since the previous guidelines were published. These comments will be taken into account as part of the document revision process.
This consultation paper does not constitute legal, commercial or technical advice. The Director is not bound by it. The consultation is without prejudice to the legal position of the Director or her rights and duties under legislation.

2 Background

The licensing of point to point radio links above 1 GHz is governed by national legislation – the Wireless Telegraphy (Radio Link Licence) Regulations, 1992 (the 'Regulations') [2]. The power to grant these licences was transferred to the Director by the provisions of the Telecommunications (Miscellaneous Provisions) Act, 1996, as amended. These Regulations provide that the Director may, from time to time determine the conditions by which radio link licences may be issued to applicants.

Following the liberalisation of infrastructure[3], in July 1997, The Director issued guidelines relating to the application process for point to point links. The aim of these guidelines was to set out the Director's policy relating to radio links thereby providing information and assistance to intending applicants for radio link licences. The original guidelines were the subject of a previous public consultation in February 1998 (Document ODTR 98/02) and a revised document was issued in June 1998. The revised document (ODTR 98/14) has now been in operation for over 2 years. The Director believes that it is now time to revise these Guidelines, in the light of:

[1] For the purposes of this document the term "radio link" refers to point-to-point radio links above 1 GHz. A radio link provides communication between 2 fixed locations by using the medium of radio to link the 2 locations. It is an alternative to more permanent infrastructure such as copper and optical fibre and can be more economically attractive, particularly in rural areas.
[2] S.I. 319/92:. Copies are available from the ODTR or from the Publications Office, Molesworth Street.
[3] Prior to July 1997, Telecom Eireann (eircom) had a monopoly on the provision of telecommunications infrastructure.

1. The recent updating of the ODTR links application process as a result of software enhancements;

2. The ongoing automation of the ODTR wireless telegraphy licensing procedures, to speed up and simplify the processing of licence applications; The automation of the radio links licensing process is now nearing completion;

3. Recent technological and regulatory developments, which impact upon the guidelines. For example, the ITU recommendations, which form the basis for calculating the performance characteristics of the link, have been revised.

4. Comments have been received from a number of licensees (An Garda Siochana - Telecommunications Division, Esat Digifone, Eircell, ESB, Eircom, Ocean Communications, Princes Holdings Limited, RTE) who have suggested that the guidelines should be revised. These comments have related to a number of issues, including:

    - Link propagation availability[4];
    - Link Length Policy;
    - Whether a database of high/low sites[5] should be made available to help avoid problem applications containing high /low conflicts;
    - Use of automatic transmitter power control.

A number of licensees have also indicated that they would be in favour of the establishment of a licensee's forum. On this issue, the Director agrees that periodic meetings with licensees may be useful and will arrange for these in due course.

3 The Consultation

The Director now invites comments from existing links licensees and other interested parties in relation to the document "Guidelines for Applicants for Point to Point Radio Link Licences in Spectrum Above 1 GHz." (Document ODTR 98/14).

In particular, comments are invited on the following:

3.1 The Propagation availability:

Q.1 Do you have any comments on the way availability is defined and calculated?

Q.2 Should Table An3-2 (of document ODTR 98/14) be revised? If yes, please suggest alternatives with supporting arguments.

[4] Propagation availability defines the percentage time per year that a link, operating continuously, will not suffer from outages due to radio propagation fading.

[5] Each radio link channel is divided into 2 frequencies, the higher frequency is called the highfrequency and the lower frequency is called the low frequency. In order to minimise interference; the ODTR divides radio sites into high sites and low sites. Applicants will not be licensed for a high frequency on a low site and vice versa.

Q.3 Should specific allowances be made for radio link(s) situated in geographical areas where there are no spectrum congestion issues? If so, how should these geographical areas be determined? This may increase the potential for future congestion problems in these areas.

Q.4 Should higher propagation availabilities be made available for those employing high quality spectrally efficient equipment? If yes, how should these be determined? What parameters should be used to determine whether equipment is classified as "high quality spectrally efficient"?

Q.5 Should providers of specific services (e.g. public telecommunications or safety related) qualify for higher availabilities? If yes, which services should qualify and what levels of availability should be made available? What will be the impact on spectrum efficiency?

Q.6 Should the highest propagation availabilities only be granted where appropriate measures are in place to ensure corresponding levels of equipment reliability (e.g. hot standby working) and where alternative methods (e.g. routing diversity) are not feasible?

3.2 Link length Policy

Q.7 Do you believe there are instances where the link length policy defined in document ODTR 98/14, Annex 2, need not be applied? If so, please describe these circumstances, with particular reference to why the absence of link length controls will not increase the probability of future congestion.

3.3 High/Low site database

With the new software system currently being implemented, the ODTR can make available a database of high/low sites.

Q.8 Do you agree that a database of high /low transmit sites should be made publicly available?

3.4 Use of Automatic Power Control (ATPC)

Q.9 Do you have a view on whether the use of ATPC can benefit overall spectrum utilisation efficiency for point-to-point fixed links. If you believe ATPC can provide benefits, how might its use be encouraged in the future?

3.5 The Licence Application Form

The current application form is contained in document ODTR 98/15 " Application for Point to Point Radio Link Licences above 1 GHz.". Copies of this document can be obtained from the website (www.odtr.ie).

Q.10 Do you have any views on the content or layout of the current application form?

3.6 General

All comments on document ODTR 98/14 should take cognisance of the fact that the ODTR is responsible for managing the use of the radio spectrum – a scarce national resource – and will ensure that the revised guidelines are drafted so as to:

- optimise the use of the radio spectrum,
- encourage competition in the telecommunications industry, and
- Optimise the benefits to the consumer.

The following issues will not be addressed in the consultation:

- Spectrum fees
- Radio links below 1 GHz

4 The Application Process

The ODTR, in automating its procedures for issuing radio licences, has introduced and updated software used in both the processing of links applications and in the technical analysis of the links.

Information on the new licensing process can be obtained from:

Ms Margaret O' Sullivan,
ODTR,
Irish Life Centre,
Abbey Street,
Dublin 1
E-mail: osullivanm@odtr.ie
Phone: (01) 804 9600

5 Consultation Procedure, Timetable and Contact Personnel

All comments are welcome but it would make the task of analysing responses easier if:

- Comments reference the relevant question numbers from this document (Q.1 - Q.10)
- Where general comments are made on the Document ODTR 98/14 or ODTR 98/15 the document, section, paragraph and page under discussion were all clearly referenced.

In order to ensure openness and transparency, the ODTR will publish responses received to this consultation paper, excluding commercially sensitive information. Where material that is commercially sensitive is included in a response, this should be clearly marked as such and included in an Annex to the response.

The closing date for comments is **October 13, 2000.**

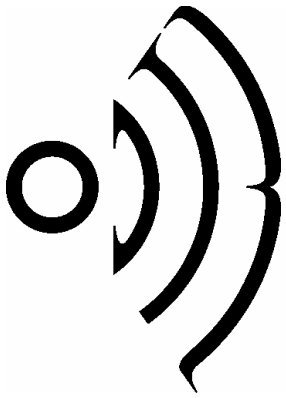
Comments, marked "**Radio Link Consultation**" should be sent to:

Ms Margaret O' Sullivan,
ODTR,
Irish Life Centre,
Abbey Street,
Dublin 1
E-mail: osullivanm@odtr.ie
Phone: (01)8049600

6 Response to the Consultation

Following the consultation process a "Response to the Consultation" document will be issued in addition to the revised guidelines.

Annex 1
Document 98/14



Office of the Director of
Telecommunications
Regulation

GUIDELINES FOR APPLICANTS FOR POINT TO POINT RADIO LINK LICENCES IN SPECTRUM ABOVE 1 GHz.

Document No. ODTR 98/14 **June 1998**

Contents

Annexes

1. General

1.1 This document explains the application procedure for licences for point to point radio links above 1 GHz issued by the Office of the Director of Telecommunications Regulation (ODTR). It is in the form of a set of Guidelines and does not purport to be a legal document. It should be read in conjunction with the statutory regulations governing the licensing of radio links.

1.2 The general policy of the ODTR is to promote the development of high capacity telecommunications networks based on optical fibre which the ODTR 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 telecommunications services and particularly in this context the ODTR will consider applications for licences for such links.

1.3 The ODTR notes that radio links are also used by non-telecommunications network providers such as the emergency services, public utilities, broadcasting services and private users.

1.4 It is the intention of the ODTR that these Guidelines will assist the use of the frequency spectrum in a fair and equitable manner thereby facilitating radio users.

2. The Statutory Regulations

2.1 A Wireless Telegraphy Licence is required under Section 3 of the Wireless Telegraphy Act 1926 to keep and operate apparatus for wireless telegraphy. The specific regulations governing the issue of Radio Link Licenses are contained in the Wireless Telegraphy (Radio Link Licence) Regulations, 1992 (Statutory Instrument No. 319 of 1992). It should be noted that the functions of the Minister specified in these Regulations have been transferred to the Director in accordance with the provisions of the Telecommunications (Miscellaneous Provisions) Act 1996.

2.2 The applicant should be aware that any radio link licence granted by the ODTR is for the keeping and operating of the apparatus for wireless telegraphy which is specified in the licence. Any licence issued by the ODTR 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 ODTR to manage the spectrum in an efficient and orderly manner in order to obtain the optimum use from this national resource. The ODTR does not make block allocations of spectrum to individual 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 ODTR licences other users to use the same frequency channels at different geographic locations.

3.2 While the ODTR will endeavour to minimise the potential for interference between users and services, no liability shall accrue to the ODTR 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 ODTR, bases the national frequency plans for radio links on internationally recommended band plans where existing. 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 national requirements.

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

3.6 The ODTR 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 including path length, traffic capacity etc.). Except in exceptional circumstances the ODTR, will assign channels in the highest frequency band compatible with the proposed use. This will help to facilitate the availability of spectrum in the lower frequency bands for those longer links which can only be accommodated in these bands. See Annex 2.

3.7 Where the applicant requests channels in a specified band, it should be noted that the ODTR can not 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 [6]	**Frequency Bands (GHz)**
Long haul trunk links	4, L6, U6, 7, L8, 11.
Short haul trunk links	18, 23, 26, 38.
Access links	1.3 (up to 2 Mbit/s only), 1.4 (up to 2 Mbit/s only), 2, U8, 15, 18, 23, 26, 38, 58.

3.9 Applicants are referred to the latest National Table of Frequency Allocations[7] 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.

3.10 In exceptional circumstances the ODTR may assign to an individual licensee, more than two radio channels for any given path in bands below 12 GHz. In all cases the ODTR will have regard to the principles specified in Section 6.1 .

3.11 In the interests of the efficient and equitable use of the radio spectrum the ODTR 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.

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%.

---

[6] Trunk links mostly comprise of high capacity connecting network nodal points. Long haul and short haul generally refer to the length of the specific link path. 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.

[7] Updated from time to time. Currently document number ODTR 98/03 and available from this office.

3.13 Applicants are required to have regard to compatibility with other existing radio users at the same general location. The ODTR will, on request, make information available on Hi / Lo site designations (see Annex 4, Section 4)**.** The ODTR will examine the possibility of publishing a list of sites where frequency bands are being used and indicating for a given band whether a site transmits on the high or low frequency within that particular band.

3.14 All radio equipment proposed will have to meet the minimum performance criteria (see Annex 4, Section 5).

3.15 The ODTR 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

4.1 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 ODTR recommends that applicants undertake pre-application consultation with the Office, particularly where :-

- the applicant is not familiar with the ODTR's application/licensing process;

- the application is not of a routine / repetitive nature (e.g. is not for the re-use of a previously licensed channel) ;

- there are particular considerations which an applicant wishes to clarify (e.g. possible access to a particular band before equipment is ordered).

Pre-consultation is intended to:-

- facilitate an exchange of views,
- facilitate the finding of optimum radio solutions
- help to avoid or reduce the potential for applications being refused.

4.2 The ODTR will, where both parties deem it necessary, communicate its understanding in writing of the outcome of any formal pre-application consultation to the prospective applicant. An application will be required to be submitted within a specified time period thereafter.

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 ODTR or from the Web Site www.odtr.ie. The application form (completed and signed) should be submitted to the ODTR.. The ODTR, will normally consider applications on a first come basis.

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 ODTR and that all decisions of the ODTR 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 ODTR considers it necessary consultation will take place with the applicant.

5.6 Upon written notification of the ODTR'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 radio link 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 ODTR 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 grant of the licence:

- the orderly and efficient use of the spectrum;
- fairness in the assignment of spectrum between licensees;
- the promotion of fair competition for the provision of telecommunications services;
- compliance with other licensing regimes operated by the ODTR
- compliance with international obligations;
- the effective and efficient delivery of non-telecommunication essential services[8] .

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.

7. Fees

7.1 Application Fees

An application fee of £10 shall be submitted in respect of each proposed point to point radio link along with the completed application form. In the absence of the relevant fees, the submission will not be treated as an application and consequently will not be processed.

7.2 Licence Fees

7.2.1 A fee is payable on the issue of a licence whether the applicant intends making immediate use of the assigned frequency spectrum or not. The application will be deemed to have lapsed if the relevant fee is not paid

[8] Non telecommunication essential services include state/safety services, utilities etc.

within the specified time and the proposed frequency assignment may be cancelled**.**

7.2.2 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.

7.2.3 The current fees are specified in Section 8.1 of SI 319 of 1992 and 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

7.3 **Temporary Licences.**

In accordance with SI 319 of 1992 temporary radio link licences may be issued for any period up to a maximum of six months, subject to payment of a fee calculated on a pro- rata basis with the rates set above.

7.4 **Review of fees.**

It is the intention of the Director to undertake a review of current radio link licence fees. This review will be the subject of a separate consultation and licensees will be notified prior to implementation of changes.

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 ODTR within the time limit specified in the licence.

9. Period of Licences.

9.1 Licenses will be issued for a period of 1 year as prescribed in legislation. On written application for renewal the ODTR will review individual licences in each case. It may not in all cases be possible to effect renewal. In considering renewal the office 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 national 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, from time to time, may 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 granted 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.

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

11.2 It is noted that some radio links (e.g. links first licensed prior to the establishment of the ODTR) may not be in accordance with these Guidelines. The ODTR will set down timescales to bring such systems into line with the Guidelines.

11.3 In deciding timescales, the ODTR will consult with the licensee in any revision of their use of spectrum.

12. International Co-ordination Obligations

In some cases it may be necessary for the ODTR 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.

Annex 1
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 national and international frequency plans. The following table indicates the frequency bands, the corresponding plan[9, 10], the channel bandwidths and the minimum capacity for the band.

Table An1-1 Appropriate Spectrum for Radio Links.

Band	Plan	Channel Bandwidths	Minimum Capacity[11]
1.3 GHz[12]	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 [13]	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 [14]	100 MHz	-

[9] CEPT recommendations are available on the ERO web site (www.ero.dk).

[10] It is the intention of the ODTR to publish the relevant (CEPT and ITU plans) band plans.

[11] The minimum capacity indicated relates to the minimum channel bandwidth given in the previous column.

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

[13] 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.

1.2 In particular circumstances assignments for radio links may be granted 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 satellite[15].

[14] Awaiting the development of a CEPT/ERC channel plan.

[15] Applicants are invited to refer to the National Table of Frequency Allocations (currently document ODTR 98/03) available from this office.

Annex 2

Link Length Policy

1. Introduction:

1.1 This Annex describes the link length policy of the ODTR 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 ODTR 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 ODTR 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 ODTR 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.

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 ODTR 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,
- atmospherics 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 ODTR 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 Telecommunications 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,	1a, 1b, 2
	P. 530-5, Annex 1	1
Rain Attenuation	P. 838	1, 2, 3
	P. 837-1	(Table 1-32mm/hour, Figure 2-H)
	P. 841, Annex 1	5
	P. 530-5, Annex 1	41, 42, 43, 44
Multipath Fading	P. 530-5, Annex 1	4, 8, 9, 11, 14, 15
	P. 841, Annex 1 or P. 530-5, Annex 1	5 or 39, 40
	P. 453-4, Annex 1	(Figure 9)

1.5 In addition to Table An3-1, transmitter output power levels, antenna gains, feeder losses[16] and receiver sensitivity levels (referenced to a bit error rate of $1x10^{-6}$) should be taken into consideration in submitting path calculations with applications in respect to each proposed radio link.

1.6 The ODTR 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 ODTR, 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 ODTR 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 ODTR are available.

[16] In the absence of any information on feeder loss, combiners, etc. the ODTR 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 ODTR 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 ODTR that the higher availability of 99.999% is necessary.	Meets conditions for 99.995% and satisfies the ODTR 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 ODTR 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 diagram 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 In making a case for justifying the application for radio link, the applicant should have regard to the following:

- the extent to which provision of radio links is likely to result in increased competition in the provision of telecommunications services to third parties,
- the extent to which radio links are intended for uses which meet other national policy objectives, e.g. broadcasting.

1.6 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. Not withstanding preferences submitted, the ODTR 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 Table of Frequency Allocations.

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 ODTR 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 ODTR..

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 ODTR. and this may the delay the processing of the application.

5. Proposals for Radio Equipment, Antennas and Feeders

5.1 <u>General</u>

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 ODTR 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 ODTR for licences using the same equipment, antennas and feeders, may supply this information once to the ODTR 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 Radio Equipment

5.2.1 All radio 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 ODTR.

5.2.2 If an ETSI standard is not available then the applicant should consult with the ODTR.

5.2.3 The applicant should produce evidence that the proposed equipment is compliant with European Community Directive 89/336/EEC on Electromagnetic Compatibility (EMC).

5.2.4 Table An4-2 details the standards and variants which are presently applicable. This table may need to be altered in line with emerging developments.

5.2.5 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.

5.2.6 The ODTR 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**
1.3 GHz	ETS 300 630	Classes 1, 2, 3 applicable
1.4 GHz	ETS 300 630	Classes 1, 2, 3 applicable
2 GHz	pr ETS 300 633	Classes 2, 3 applicable
4 GHz		Drafting of standards for very high capacity (>1xSTM-1) systems based on 40 MHz channel bandwidth underway in ETSI. Consultation with ODTR required.
L6 GHz	ETS 300 234	
U6 GHz		Consultation with ODTR required.
7.5 GHz	ETS 300 234	
L8 GHz	ETS 300 234	
U8 GHz		Consultation with ODTR required.
11 GHz		Consultation with ODTR 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	Grade 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 ODTR.

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 ODTR 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
L6 GHz	2.4 m	Solid Parabolic
U6 GHz	2.4 m	Solid Parabolic
7 GHz	2.4 m	Solid Parabolic
L8 GHz	2.4 m	Solid Parabolic
U8 GHz	1.8 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 ODTR may, in particular circumstances, require the use of antennas with higher gain and directionality than those specified above.

5.3.6 The ODTR is currently considering adopting variants of the ETSI standard ETS 300 833 in regard to radiation pattern envelopes (RPEs).