



Office of the Director of
**Telecommunications
Regulation**

**WIRELESS TELEGRAPHY ACT, 1926
WIRELESS TELEGRAPHY (RADIO LINK LICENCE) REGULATIONS, 1992**

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

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1. General

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.

The general policy of the ODTR is to promote the development of high capacity telecommunications networks based on optical fibre which the ODTR regards as the most appropriate medium for emerging broadband services. 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.

2. The Statutory Regulations

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 Licences 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.

3. Frequency Spectrum Information

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 links on an individual and non-exclusive basis. Accordingly, licensees should be aware that the ODTR licences other users to use the same frequency channels elsewhere in the country.

While the ODTR will endeavour to minimise the potential of interference between users and services, no liability shall accrue to the ODTR arising from interference to licensees of radio systems.

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.

Ordinarily the ODTR, bases the national frequency plans for radio links on internationally recommended band plans. Annex 1 sets out the frequency bands, the corresponding international plan, the preferred channel bandwidths and the related capacities.

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

- those required in accordance with 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.

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. The ODTR will assign channels in the highest frequency band compatible with the proposed use. This is to ensure that spectrum is available in the lower frequency bands for those longer links which can only be accommodated in these bands. See Annex 2.

It should be noted that the ODTR can not guarantee that spectrum at specific locations can be made available.

For the purposes of this document, the bands 2 GHz, 4 GHz, L6 GHz, U6 GHz, 7 GHz, L8 GHz, U8 GHz, 11 GHz and 15 GHz are considered long haul bands. The bands 4 GHz, L6 GHz, U6 GHz, 7 GHz, L8 GHz and 11 GHz are reserved for high capacity systems (≥ 140 MBit/s) while the 2 GHz, U8 GHz and 15 GHz bands are reserved for medium capacity systems (2 to 34 MBit/s).

The ODTR will reserve some spectrum in the long haul bands to make provision for certain future users, (e.g. certain mobile telephony operators, etc.).

The ODTR will apply upper limits for individual licensees on the total number of assigned radio channels in the long haul bands along any link path. In the case of licensees who require links for the provision of telecommunications services to third parties, the upper limit will be two channels. If it transpires that multiple applications are being made to overcome this limitation they will be rejected.

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 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.

Radio availability for the purposes of these guidelines is based on radio propagation matters only. A list of the relevant ITU-R recommendations applicable is set out in Annex 3.

Radio availability levels of greater than 99.9% will be considered on a case by case basis. 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 of >99.99%.

The ODTR will stipulate the channel and transmitter power to be used so as to minimise the risk of interference and facilitate greater frequency reuse. The transmitter power permitted will be the minimum power necessary in order for the link to operate to the specified radio availability criteria.

Applicants are required to have regard to the requirements of existing radio users at the same general location.

All radio equipment proposed will need to meet the minimum performance criteria.

4. The Licensing Framework

Prospective applicants for radio links licences should note that the application procedure is a two stage process:

Stage 1: Assessment of applications to determine whether they meet the general criteria for which Radio Link Licences will be considered.

Applicants successful at Stage 1 may proceed to Stage 2.

Stage 2: Detailed assessment of applications on a link by link basis.

5. Application Process

Applications in respect of licences for radio links should make this application initially on the appropriate stage 1 application form obtainable from the ODTR.

The Stage 1 application form (completed and signed) should be submitted to the ODTR as quickly as possible in order to allow assessment as to whether the application accords with the general criteria applied by the Director (see section 7.2). The emphasis in stage 1 of the evaluation process will focus on the general aspects of the application.

If this stage of the application is successful the applicant will be so advised and the application will proceed to the second stage. If unsuccessful, the applicant is notified with reasons as to why the application (stage 1) has been refused.

Stage 2 of the application process will require individual applications to be made in respect of each proposed radio link. The applicant is obliged to submit these on the appropriate application form (completed and signed) along with the appropriate application fee as set out in section 8.1 below, within 3 months of notification by the ODTR of the success of the first

stage of the application. Otherwise, after a 7 day notice period, the application is refused due to non receipt of stage 2 of the application.

The application is further assessed based on stage 2 evaluation criteria. The emphasis in this evaluation process will be on the technical details relating to each individual link. The stage 2 application for each proposed link may be individually approved or disapproved or additional information may be requested from the applicant prior to the a decision; this may necessitate a resubmission of Stage 2 of the application form.

If approved, the applicant is notified and payment of the licence fee is due within 1 month thereafter. If the licence fee is not paid within 1 month, following the issue of a reminder the applicant is given 7 days to comply. Following this period if the licensee fee is still outstanding the application is rejected due to non payment of the licence fee.

A radio link licence will be issued in respect of each radio link.

If unsuccessful, the applicant is notified with reasons as to why the application (stage 2) has been rejected.

On being issued with a licence, the licensee is required to bring the radio link into operation in compliance with the terms of the licence, failing which the licence may be revoked.

At any stage prior to a licence being granted, the ODTR may request further information in writing from the applicants.

6. Meetings with Applicants

When the ODTR considers it appropriate it may request meetings between applicants and the ODTR, in particular for new applicants and where networks are proposed to be established. The purpose of such meetings will be to facilitate the finding of optimum radio solutions and to provide further guidance to applicants to assist in the preparation or further detailing of their applications.

However, it should be noted that all applications for licences will be evaluated on the basis of the written information provided on the application forms and any supplementary written information and that all decisions of the ODTR will be communicated in writing.

7. Evaluation of Applications

7.1 General

Each application will be evaluated using the information provided by the applicant on the application forms 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;

the promotion of the development of national infrastructure for advanced telecommunications services;

compliance with other licensing regimes operated by the ODTR

compliance with international obligations;

As outlined in the application process, evaluation is a two stage procedure.

7.2 Stage 1 Evaluation

In this stage of the evaluation, the general information provided by the applicant is considered, including the following aspects:

- Justification for the Proposed Link(s);
- Transition to a Wired Infrastructure;
- Timing & Operational Commitments;
- Type of Link & Capacity Required;
- Proposals for Frequency Bands;
- Incumbent Users of Spectrum;
- Radio Availability & Network Resilience.

Further explanation on these aspects can be found in Annex 4.

7.3 Stage 2 Evaluation

In this stage of the evaluation, the detailed information provided by the applicant in respect of each link is considered, including the following aspects:

- Link Planning Matters;
- Proposals for Radio Equipment, Antennas and Feeders.

Further explanation on these aspects can be found in Annex 5.

8. Schedule of Fees Payable

8.1. Application Fees

An application fee of £10 shall be submitted in respect of each radio link licence application in Stage 2.

8.2. Licence Fees

A fee in accordance with section 8.1 of SI 319/92 shall be payable on the issue of and on each renewal of a licence and are set out below:

Bandwidth of Radio Link	Radio Link Licence (Point to Point)
Narrow Band (Up to 50 KHz)	£450
Medium Band (over 50)KHz up to 3.5 MHz)	£600
Wide Band (over 3.5 MHz)	£750

These fees are also applicable in the case of a network of radio links to a single licensee.

In accordance with SI 319/92 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.

8.3 Review of fees

Due to the increasing demand for radio links, the current licence fees will need to be reviewed in order to ensure efficient and equitable use of the available spectrum. It is the intention of the Director to initiate a review, and users should note that it is probable that this will result in a significant increase in the current level of charges. However, regard will be had to the cost of comparable land based services in the review.

9. Specific conditions of licence

9.1 Commissioning/Site Inspections

To ensure that radio links are operated within the licence conditions, completed commissioning test reports are required to be submitted to the ODTR within the time limit specified in the licence. In accordance with regulation 14c of SI 319 of 1992, the licensee shall allow an authorised officer entry onto any site which contains apparatus for wireless telegraphy. This is to facilitate the inspection of installations, the attendance at commissioning tests and the monitoring of the radio spectrum.

9.2 Period of Licences

Licenses will be issued for a period of 1 year. At renewal the ODTR will review individual licences in each case. Although the user's requests will be taken into consideration, it may not in all cases be possible to effect renewal.

9.3. International Co-ordination Obligations

In some cases it may be necessary for the ODTR to undertake international co-ordination procedures. As this may take some time, radio links may be licensed subject to a condition that the licence may terminate if successful co-ordination is not achieved within a specified time.

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

Frequencies are presently 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, the preferred channel bandwidths and the related capacities.

Band	Plan	Preferred Channel Bandwidths	Minimum Preferred Capacity	Maximum Preferred Capacity
1.3 GHz	CEPT/ERC/REC 13-01 E, Annex A	25 KHz, 250 KHz, 1 MHz	-	2 MBit/s
1.4 GHz	CEPT/ERC/REC 13-01 E, Annex B	25 KHz, 250 KHz, 1 MHz	-	2 MBit/s
2 GHz	CEPT/ERC/REC 13-01 E, Annex C	1.75 MHz, 3.5 MHz, 7 MHz, 14 MHz	2 MBit/s	16 MBit/s
4 GHz	ITU-R F. 382-6	29 MHz	140 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 Rep. 1055, 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	16 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	110 MHz, 55 MHz, 27.5 MHz	140 MBit/s	-
23 GHz	CEPT/ERC/REC 13-02 E, Annex A	1.75 MHz, 3.5 MHz, 7 MHz, 14 MHz, 28 MHz, 56 MHz	2 MBit/s	34 MBit/s
38 GHz	CEPT/ERC/REC 12-01 E, Annex A	1.75 MHz, 3.5 MHz, 7 MHz, 14 MHz, 28 MHz	2 MBit/s	34 MBit/s
58 GHz	ETS 300 408	100 MHz	-	-

A number of these bands are shared with satellite users.

Annex 2

Link Length Policy

Introduction:

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.

Overview of link length policy:

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.

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 be applying the minimum path length indicated in the table below. The ODTR may, in exceptional circumstances vary the application of this policy.

Table 1:- Frequency bands and the appropriate link path lengths

Band (GHz)	Min. Path Length (Km)	Capacity for Digital Links (MBit/s)
2	25	2 to 16
4	35	>=140
L6	35	>=140
U6	35	>=140
7	35	>=140
L8	35	>=140
U8	35	2 to 16
11	15	>=140
15	10	2 to 16
18	0	>=34
23	4	2 to 155
38	0	2 to 155
58	0	2 to 155

Note: Table 1 indicates minimum hop lengths below which the ODTR would 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.

Annex 3

Path Calculations and Radio Availability-List of Formulae Applicable

Path calculations which include radio availability should take into consideration the following radio factors, as determined by the International Telecommunications Union.

Radio Factor	ITU-R Recommendation	Equation No. (or Table/Figure)
Free Space Loss	PN. 525-2, Annex 1	4
Gaseous Absorption	PN. 676-1, PN. 530-5, Annex 1	1a, 1b, 2 1
Rain Attenuation	PN. 838 PN. 837-1 PN. 841, Annex 1 PN. 530-5, Annex 1	1, 2, 3 (Table 1-32mm/hour, Figure 2-H) 5 41, 42, 43, 44
Multipath Fading	PN. 530-5, Annex 1 PN. 841, Annex 1 or PN. 530-5, Annex 1 PN. 453-4, Annex 1	4, 8, 9, 11, 14, 15 5 or 39, 40 (Figure 9)
Space Diversity	PN. 530-5, Annex 1	61, 62, 63

In addition to the above, transmitter output power levels, antenna gains, feeder losses 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.

Annex 4

Stage 1 Evaluation

Justification for the Proposed Link(s)

The applicant will need to state the purpose of the proposed links, what alternatives have been considered if any and why radio is favoured over non-radio alternatives.

In making a case for justifying the application for radio links, 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.

Details of the relevant telecommunications licences held/applied for must be provided in the application form.

Transition to a Wired Infrastructure

It is the policy of the ODTR to promote the development of wired networks (fibre optic, cable etc.) as these are most appropriate for emerging broadband services.

Applicants should indicate any proposals or commitments for the development of wired infrastructure and the replacement of some or all of their radio links proposed to be used. Timescales for replacements should be indicated.

Timing & Operational Commitments

The ODTR will take into consideration the applicant's proposals regarding time scales for the provision of links and carrying of services over the links. Applicants should note that they are expected to have all links in operation within a time to be determined by the ODTR in consultation with the applicant. Failure to do so may result in the licence being revoked.

Type of Link & Capacity Required

Except in exceptional circumstances, the ODTR is unlikely to issue licences for analogue radio links.

The extent to which capacity will be made available by the licensee to other telecommunications infrastructure licensees or to other third parties may be an important consideration.

The extent to which spectrum is sought in the long haul bands relative to other bands is also an important factor.

In cases where radio networks are being established, the applicant should provide an overview diagram of the network showing the distribution of capacity on a geographic basis.

Proposals for Frequency Bands

Applicants may submit proposals for frequency bands to be used and they must give the basis for their preference. Any proposal put forward should take cognisance of the link length policy set out in Annex 2. Notwithstanding preferences submitted, the ODTR shall make the final decision concerning the frequency band to be used for each link.

Incumbent Users of Spectrum

In the case of applicants who are incumbent users regard will be had to the current use they make of the spectrum.

Progress on rationalisation will be taken into account when evaluating new applications for links from such users.

Radio Availability & Network Resilience

The applicant should indicate his proposals regarding radio availability and network resilience taking into account section 3 of these guidelines.

Annex 5

Stage 2 Evaluation

Link Planning Matters

Selection of Frequency Band

The length of the path is an important consideration in the selection of the appropriate frequency band (See Annex 2). The final decision as to the frequency band(s) to be used will be made by the ODTR.

Planning Approach

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;
- satellite use in bands shared with radio links. The applicant is required to show how it has taken this into account.

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.

In submitting an application for stage 2, it will be necessary to supply:

- Path calculations (link budgets), see Annex 3;
- Path profiles for those links proposed in the frequency range 4-11 GHz in the long haul bands;
- Intersystem interference calculations, if applicable.

Applicants must satisfy the ODTR that they have established that there is a clear line of sight (i.e. 1st Fresnel Zone Clearance) between the transmitting and receiving stations. Due regard should be had to the possible future variation in terrain and building clutter.

Where no clear line of sight exists, then the application for that/those particular radio link/s will be refused.

Proposals for Radio Equipment, Antennas and Feeders

Equipment specifications will need to be submitted in respect of proposed transmitters, receivers, antennas and feeder cable/waveguide.

Equipment which is flexible in terms of frequency tuning and output power level adjustment is favoured.

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.

Radio Equipment

All radio equipment proposed should be type approved to the relevant ETSI standards. Where an ETSI standard is not available, an equivalent national standard of an EU Member State may suffice. Certification documentation indicating type approval will have to be submitted to the ODTR.

If neither an ETSI or equivalent national standard of an EU Member State exists then the applicant should consult with the ODTR.

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

Capacity Per Bandwidth

It is expected that links with the following telecommunications capacities can be accommodated in the corresponding radio channel bandwidths on an adjacent channel, co-polar basis:

Telecommunications Capacity	Radio channel bandwidth
2 MBit/s	3.5 MHz
4 MBit/s, (2 x 2 MBit/s)	3.5 MHz
8 MBit/s, (4 x 2 MBit/s)	7 MHz
16 MBit/s, (8 x 2 MBit/s)	14 MHz
34 MBit/s, (16 x 2 MBit/s)	28 MHz
≥ 34 MBit/s	28 MHz
≥ 140 MBit/s	40 MHz

As developments in radio equipment technology are continually progressing, the above table will be subject to review.

Applications proposing to use equipment which is less capacity efficient for a particular radio channel bandwidth than expected in the above table may be refused.

Equipment which is more spectrally efficient than that in the above table, 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.

Antennas

Radiation pattern envelopes (RPEs) for all the intended antennas for use should be supplied with Part 2 of the application form to the ODTR.

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

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

Band	Antenna Size	Antenna Type
1.3 GHz	1.8 m	Parabolic Grid/Solid Parabolic
1.4 GHz	1.8 m	Parabolic Grid/Solid Parabolic
2 GHz	1.8 m	Parabolic Grid/Solid Parabolic
4 GHz	3 m	Solid Parabolic
L6 GHz	3 m	Solid Parabolic
U6 GHz	3 m	Solid Parabolic
7 GHz	3 m	Solid Parabolic
L8 GHz	3 m	Solid Parabolic
U8 GHz	1.8 m	Solid Parabolic
11 GHz	3 m	Solid Parabolic
15 GHz	1.2 m	Solid Parabolic
18 GHz	1.2 m	Solid Parabolic
23 GHz	0.6 m	Solid Parabolic
38 GHz	0.6 m	Solid Parabolic
58 GHz	-	Solid Parabolic

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

Compliance with Statutory Obligations

The applicant should be aware that any radio link licence granted by the ODTR is for the keeping and operating the apparatus for wireless telegraphy specified in the licence. Any licence issued by the ODTR does not absolve the licensee from complying with any other statutory obligations.