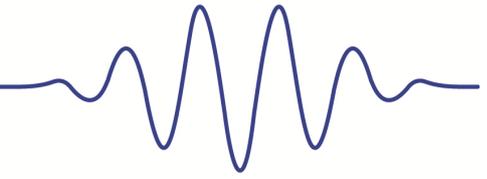




Radio Society of Great Britain

Advancing amateur radio since 1913



**Guide to Repeater and Internet Gateway Licensing**  
**Section 1 Repeaters**  
**Section 2 Gateways**  
**Section 3 Packet Radio**

Under Review

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Under Review

## Repeater Licensing

### 1.1 Introduction

This document provides guidance to potential Amateur Radio Repeater Keepers. To run a Repeater in the UK, you must apply for a Notice of Variation (NoV) to your Amateur Radio Licence. This varies your licence and confers additional responsibilities on you as a Repeater Keeper. These responsibilities are defined in the terms of the Notice of Variation. From January 2006, the licensing arrangements have been modified and the Office of Communications (Ofcom) will now issue the NoV after an initial assessment by the Emerging Technology Co-ordination Committee (ETCC) of the Radio Society of Great Britain (RSGB).

The role of the Office of Communications (Ofcom) is to define the rules under which radio amateurs operate and to grant the NoV. The ETCC is responsible for the initial technical assessment of the Repeater network and Internet gateways on behalf of Ofcom. A list of contact points is provided at the end of this document.

This document explains the process and procedures necessary to establish a Repeater Station conforming to established modes, specifications and operation. Ofcom and the RSGB also encourage innovative proposals as part of the experimental nature, development and self-training of radio amateurs. Such proposals can be accepted at any time by Ofcom (after vetting and advice by the ETCC) who will work in conjunction with the applicant and the ETCC to accommodate any special provision in the form of a Notice of Variation to the applicant's Amateur Radio Licence.

### 1.2 Principles of Repeater Management

The principal reasons for managing the Amateur Repeater network are to provide efficient use of the spectrum, to reduce interference, and to combat cases of abuse. There are only a small number of frequencies available for use by Amateur Repeaters and if their use were not planned and co-coordinated there would be significant potential for interference between other services and other Repeaters, thereby reducing their effectiveness. The nature of Repeaters is such that when abuse occurs, the effect can be more serious than that from other types of Amateur station. It is therefore important that Ofcom hold the necessary records, to enable them to deal with cases of abuse or interference.

#### 1.2.1 Purpose of the Repeater Network

Ofcom has identified two principal purposes for establishing Amateur Repeaters. These are to provide improved coverage for those operating voice mobile stations and/or fixed stations using modes such as TV at microwave frequencies, and to provide opportunities for experimentation. The majority of existing Repeater networks operates in the UHF and VHF bands. There are several other less congested bands in the Amateur Service allocations where there is more scope for the establishment of Repeaters. Proposals for Repeaters, which fulfil purposes other than those mentioned or operate in different bands, will be treated in the same way. Many areas of the country are fully served by established Repeaters and this leaves less opportunity for more Repeaters to be established. However, anyone believing they have identified a genuine requirement for a new Repeater should not be discouraged from submitting a proposal, including a statement of the requirement for the Repeater, which will be considered as part of the Repeater network planning and spectrum management process. Such proposals or newly identified requirements should be discussed with the ETCC, who will be pleased to discuss and develop any ideas or plans with potential applicants.

### 1.2.2 Service Areas and Overlap

Originally, it was possible for the first repeaters to provide coverage over large areas of the country. Gradually, the size of each coverage area has become limited by neighbouring Repeaters and the subsequent frequency congestion. As Repeaters are closed down, any subsequent applications to establish new Repeaters in the same area should be designed, and will be assessed, on the basis of what is technically and geographically appropriate for the region, rather than on the basis of how the old Repeater was permitted to operate.

Once a Repeater has ceased operation for more than six months, or as soon as a second Notice of Variation (which effectively removes the authority for the Repeater) has been issued, any site and/or frequency clearances for a Repeater covering the same area may need to be reapplied for. This is because the situation with respect to frequency or site use by other radio users in the region may have changed since the original Repeater was first approved. **Applicants should be clear that there is no such thing as a perpetual approval for a Repeater.** Applications will always be considered on their merits whether they are in relation to previously served areas or entirely new proposals.

If a Repeater is temporarily closed down by Ofcom, or if the running of a Repeater is taken over by a new Keeper without a break in operation or change in any technical details, then this Repeater will continue to operate without new formal clearances. If a new Repeater Keeper is appointed, NoV's must be issued to both the old (a second NoV cancels the first) and new Repeater Keepers.

In the UHF and VHF bands, the prime purpose of establishing a Repeater is for the purpose of providing improved communications for those operating mobile stations and fixed stations in difficult terrain. As a communications service with a limited number of available channels, it is necessary to encourage the use of standard spectrum management principles in order to achieve a workable system. This includes the principle of efficient frequency use, in which any given area may be covered by only one channel in any given band. To provide coverage to a single service area from more than one Repeater in the same band is wasteful of spectrum, unless justified to solve a particular problem, such as congestion. There may be certain conditions under which significant overlap may be desirable, for example where high population density causes congestion or where interference or geographical conditions give rise to holes in the coverage. In these cases, a solution should be found through agreement between Repeater Keepers and network planners. There may also be sound experimental reasons why overlap coverage is desirable and such proposals will be considered on their merits.

The extent of each Repeater's service area will be determined by a number of factors, including the local terrain, the position of neighbouring Repeaters, the reason for establishing the Repeater and its target audience. Once the applicant has identified the need for a new Repeater, the ETCC will be able to help develop the initial idea into a successful application. The ETCC will be able to provide advice on the service-area which would provide a useful service and complement existing Repeaters, and on the technical and physical implementation of the Repeater to achieve the declared service. Factors such as site height, antenna type, antenna height, and effective radiated power will need to be used to achieve the requirement identified in the application. As part of the assessment of the application, a computer-generated prediction will be carried out in order to identify any potential interference to other users of the channel.

### 1.2.3 Technical Requirements

In order to ensure successful co-existence with other Services and with other operators in the Amateur Service, Ofcom requires all Repeaters to meet certain technical performance criteria which affect spectrum occupancy, spurious emissions, interference to other services and accessibility to users. The main parameters are set out in Annex 2. These parameters may need to be modified from time to time, as technologies, standards and international requirements change.

It is acknowledged that emerging digital technologies may not yet have fully developed standards and will require special consideration in respect of spectrum allocation and separation from existing analogue systems.

The requirements for the repeater are contained in the Notice of Variation (NoV) to the Licence of the Repeater Keeper. The NoV places the responsibility on the Repeater Keeper (the licensee) to ensure that the Repeater: meets certain minimum technical requirements and the parameters given in the Schedule; and continues to meet these requirements throughout its life.

The Repeater Keeper may be required to implement a programme of periodic testing using appropriately calibrated test equipment. The relevant technical parameters which each Repeater is required to meet will be listed in the Schedule to the NoV when it is issued. The principal parameters will be those listed in the specification, but the Schedule may include others. Any changes to the parameters listed in the Schedule issued for a particular Repeater will require the prior written approval of Ofcom.

If any Repeater Keeper is unsure whether any parameter, they wish to change requires Ofcom approval, advice should be sought in the first instance from the RSGB. Annex 11 contains useful references.

## **1.3 The Application Process**

### **1.3.1 How to Get Started**

If you feel there is a need for a Repeater in your area, the first action you must take is to clearly identify the area that you wish to cover. A map showing the desired service area should be produced and accompany your proposal to the RSGB. The more realistic you make the coverage map, the easier it will be to assess and subsequently approve. Computer generated maps are also acceptable and the RSGB can assist potential applicants with the generation of predicted coverage maps. To ensure that your application is processed as quickly as possible, which in general will take a number of months, you are strongly encouraged to speak to the RSGB at an early stage, and to carry out as much preparatory work as possible before submitting the application. The RSGB will be able to advise you of any potential problems with your proposals. It will also be helpful to the RSGB in their assessment of any competing applications within the same area, to have evidence of strong support for the Repeater from local amateurs and clubs and to provide an estimate of the amount of traffic likely to be carried. This evidence should be provided initially in the form of a proposal letter (preferably by email) to the RSGB stating the aims and objective for the proposed repeater and including supporting letters from the amateur community in the predicted service area.

When selecting a site for the Repeater, you should ensure that you are aware of any requirements or conditions placed on the use of that site by the site owner or local authorities. These sites are often subject to conditions of use relating to on-site safety and insurance, which should be discussed with the Site Owner. In the case of a new mast, or if the height of an existing mast or structure is increased by the addition of the Repeater mast or antenna, then Local Authority planning permission may be required. It is the responsibility of the applicant to establish whether or not such permission is necessary and then to obtain written permission from the Site Owner to use the site.

### **1.3.2 The Application Form (Annex 3)**

The application form e1 (see: <https://ukrepeater.net/>) asks for the minimum information required for your application to be processed. The information is required for four main purposes:

Frequency Clearance: Many repeater stations operate in bands shared with other, mainly government, services. Ofcom, therefore, has a duty to consult these users over proposals for new assignments in these bands. Consultation procedures have been established to notify interested parties of the application.

Enforcement Purposes: Because of the potential for abuse to Repeaters or interference problems, Ofcom needs to hold details of Repeaters and be able to shut them down quickly when required. The requirements

for these purposes include information concerning closedown procedures and operators, and contact details for the site owner.

Network Management Purposes: Information is required to ascertain the service area of a new Repeater and its impact on the existing network. The applicant also needs to make clear the intended aims and coverage of the new Repeater. If there is likely to be significant overlap with existing repeaters an explanation will be required to clarify the need for this overlap as outlined in paragraph 2.2.

### **1.3.3 How the Application is processed**

Processing the application may seem a complicated process, although we have tried to simplify the procedure as much as possible. Annex 1 details the various processes that are carried out. There may well be a need for proposals to be modified during the application process and this will inevitably introduce some delays. In general, the detailed discussions necessary to modify/complete the application will take place between the applicant and their local ETCC managers, and ideally any problems will be resolved in this manner and the application process continued. Applicants are encouraged to have these discussions with the ETCC as early as possible in the process as this can avoid significant delays at a later stage.

: Proposals are submitted electronically and may be subject to change and modification until both the applicant and the RSGB are satisfied the proposal is ready to be forwarded to Ofcom  
If nothing is heard from the applicant within 3 months, the application will be cancelled.

The ETCC will carry out the technical analysis defining the coverage of the base station and the interference area taking into account all the co-channel repeaters.

Once the frequency is selected, if it is in an 'Amateur Primary' band the ETCC will prepare an NoV and forward it by email to Ofcom Spectrum Licensing with a recommendation to issue. If the proposal is in a shared band a frequency request will be forwarded for onward transmission by Ofcom to the relevant Primary User for assessment and frequency clearance.

The RSGB (ETCC) will publish the list of received applications on their website. This allows all radio amateurs to comment/raise any issues on the application. The RSGB will also publish progress data showing progress through the various stages from acceptance by the ETCC to final issue of the NoV by Ofcom. (see <https://ukrepeater.net/>)

The 2 main stages of approval are as follows:

1. Ofcom Spectrum Licensing
2. Ofcom Spectrum Licensing to Primary Users (for shared bands), await return

It should be noted that for any application received which has gone through the approvals process, Ofcom and the ETCC will only be able to deal with the nominated Repeater Keeper (the licensee). Ofcom and ETCC can only deal with the individual who makes the application for an NOV

### **1.3.4 Issuing of the Notice of Variation**

Once the Repeater has been formally approved, Ofcom will issue a Notice of Variation (NoV) to the Repeater Keeper. To facilitate Ofcom the ETCC will prepare the NoVs and forward to Spectrum Licensing for issue.

## **1.4 Changes to the Repeater**

### **1.4.1 Technical Changes**

The Repeater technical parameters will be detailed in the Schedule to the Notice of Variation. If it is necessary to change any of these parameters, you will need to discuss them with the ETCC as the

changes may need to be cleared with Ofcom. If you change equipment without altering any of the technical parameters, then there is no need to give such notification. Moves to a new site will normally require full clearance by Ofcom. However, where the new site is within 2 km of the original Repeater site, full clearance may not be required and processing times may be correspondingly reduced.

### **1.4.2 Repeater Closedown**

The application form requires the provision of a list of closedown operators to enable Ofcom's staff to contact the duly nominated personnel and arrange for the Repeater to be switched off. It is the Repeater Keeper's responsibility to ensure that this list is kept up to date and that any changes are notified to Ofcom. Changes may be notified electronically using the reporting facilities found under the 'Forms' tab on the ETCC website <https://ukrepeater.net/>

In certain circumstances, it is possible that a closedown-operator may not be a licensed amateur, but someone who is available at the transmitter site for a high percentage of the time, and who has been trained in the procedure to switch off the Repeater. However, such nominated personnel will not be permitted to switch the Repeater back on again.

The Repeater may be switched off for brief periods, for example, to undertake routine maintenance. The Repeater Keeper is also responsible for turning the repeater off if abuse is discovered. In these circumstances and where practicable, a prior announcement of the closedown should be made on air. When the repeater is to be taken off air for periods exceeding 72 hours, the RSGB and Ofcom must be notified in writing. This may be done electronically using the status change reporting facility available on the website <https://ukrepeater.net/> under the 'Forms' tab.

If you decide that you no longer wish to be responsible for your Repeater it would be helpful if you were able to identify someone else who is willing to take on this responsibility so that the Repeater can be kept operational. Otherwise you should request a 2<sup>nd</sup> NOV via the website <https://ukrepeater.net/> under the 'Forms' tab. A second NoV will then be issued which removes the authority for that Repeater which will also be the case if a Repeater is off the air for longer than six months unless agreed in writing.

### **1.5 Additional Facilities**

Ofcom encourages experimentation and is prepared to look positively at requests for new facilities. However, this does not mean that every request will be agreed automatically. Ideas should be submitted in the first instance to the RSGB (ETCC), who will be able to help Ofcom to assess the application.

#### **1.5.1 Repeater Linking**

Applications for repeater linking including Internet linking, should be sent to the ETCC where a particular need can be identified. Consideration would need to be given to levels of abuse in the area. In cases where problems exist, it is unlikely Ofcom would agree to increased coverage.

#### **1.5.2 Repeater Internet Linking**

Proposals for the linking of repeaters to the Internet by means of an RF linked Internet Gateway may be made either by the Repeater Keeper, or where a third party wishes to do the linking, by that third party together with evidence of permission from the relevant Repeater Keeper. An application form is available from the 'forms' section of the ETCC website <https://ukrepeater.net/>  
The keeper may now make a "hard wired" Gateway connection under the standard NOV terms without additional permission. It would be helpful to inform ETCC so the Website can show this.

#### **1.5.3 Remote Control**

The use of remote control to close down a Repeater is mandated by Ofcom for all new NOV's as a means of quickly closing when required and as a useful aid in combating abuse. Remote control facilities must

also comply with any local site management and Health & Safety requirements.

#### **1.5.4 Voice Announcements**

Ofcom allows limited use of voice announcements on Repeaters. General broadcast announcements should be pertinent to the operation of the repeater concerned.

#### **1.6 Contact Points**

For general information on Repeaters, and enquiries on individual applications:

Radio Society of Great Britain 3 Abbey Court, Fraser Road, Priory Business Park, Bedford MK44 3WH

Tel:

**+44 (0)1234 832 700**

Fax: +44 (0)1234 831 496 e-mail: [ar.dept@rsgb.org.uk](mailto:ar.dept@rsgb.org.uk) or see the RSGB ETCC website  
<https://ukrepeater.net/>

For enquiries about licensing matters:

Ofcom Spectrum Licensing e-mail: [Spectrum.Licensing@ofcom.org.uk](mailto:Spectrum.Licensing@ofcom.org.uk)

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## **Simplex Voice Internet Gateway Licensing**

### **2.1 Introduction**

This document provides guidance to potential Amateur Radio Simplex Voice Internet Gateway NoV holders. To run a Simplex Voice Internet Gateway in the UK, you must apply for a Notice of Variation (NoV) to your Amateur Radio Licence. This varies your licence and confers additional responsibilities on you as a Internet Gateway Keeper. These responsibilities are defined in the terms of the Notice of Variation. From January 2006, the licensing arrangements have been modified and the Office of Communications (Ofcom) will now issue the NoV after an initial assessment by the Emerging Technology Co-ordination Committee (ETCC) of the Radio Society of Great Britain (RSGB).

The role of the Office of Communications (Ofcom) is to define the rules under which radio amateurs operate and grant the NoV. The ETCC is responsible for the initial technical assessment of the internet gateways on behalf of Ofcom. A list of contact points is provided at the end of this document.

This document explains the process and procedures necessary to establish a Simplex Voice Internet Gateway Station conforming to established modes, specifications and operation. Ofcom and the RSGB also encourage innovative proposals as part of the experimental nature, development and self-training of radio amateurs. Such proposals can be accepted at any time by Ofcom (after vetting and advice by the ETCC) who will work in conjunction with the applicant and the ETCC to accommodate any special provision in the form of a Notice of Variation to the applicant's Amateur Radio Licence.

### **2.2 Principles of Simplex Voice Internet Gateway Coordination**

The principal reasons for coordinating the Amateur Simplex Voice Internet Gateway Network are to provide efficient use of the spectrum, to reduce interference. There are only a small number of frequencies available for use by Amateur Simplex Voice Internet Gateways and if their use were not planned and co-ordinated there would be significant potential for interference between other services and other Gateways, thereby reducing their effectiveness. The nature of Gateways is such that when abuse occurs, the effect can be more serious than that from other types of Amateur station. It is therefore important that Ofcom holds the necessary records, to enable them to deal with cases of abuse or interference.

A MB7I/Axx call sign would be issued for unattended operation, whilst a MB7Axx call sign is used for attended operation.

#### **2.2.1 Purpose of the Simplex Voice Internet Gateway Network**

Ofcom has identified two principal purposes for establishing Amateur Simplex Voice Internet Gateways. These are to provide improved coverage for those operating voice mobile stations and/or fixed stations using voice communications and to provide opportunities for experimentation with using the internet as a hidden communications link. The majority of the existing the Internet Gateways operate in the UHF and VHF bands. There are several other less congested bands in the Amateur Service allocations where there is more scope for the establishment of Gateways. Proposals for Gateways which fulfil purposes other than those mentioned or operate in different bands will be treated in the same way. Many areas of the country are fully served by established Gateways and this leaves less opportunity for more Gateways to be established. However, anyone believing they have identified a genuine requirement for a new Gateway should not be discouraged from submitting a proposal. Such proposals or newly identified requirements should be discussed with the ETCC, who will be pleased to discuss and develop any ideas or plans with potential applicants.

### 2.2.2 Service Areas and Overlap

Originally, it was possible for the first gateways to provide coverage over large areas of the country. Gradually, the size of each coverage area has become limited by neighbouring Gateways and the subsequent frequency congestion. As Gateways are closed down, any subsequent applications to establish new Gateways in the same area should be designed, and will be assessed, on the basis of what is technically and geographically appropriate for the region, rather than on the basis of how the old Gateway was permitted to operate.

**Applicants should be clear that there is no such thing as a perpetual approval for a Gateway.** Applications will always be considered on their merits whether they are in relation to previously served areas or entirely new proposals.

In the UHF and VHF bands, the prime purpose in establishing a Gateway is for the purpose of providing improved communications for those operating mobile stations and fixed stations in difficult terrain. As a communications service with a limited number of available channels, it is necessary to encourage the use of standard spectrum management principles in order to achieve a workable system. This includes the principle of efficient frequency use, in which any given area may be covered by only one channel in any given band. To provide coverage to a single service area from more than one Gateway in the same band is wasteful of spectrum, unless justified to solve a particular problem, such as congestion. There may be certain conditions under which significant overlap may be desirable, for example where high population density causes congestion or where interference or geographical conditions give rise to holes in the coverage. In these cases, a solution should be found through agreement between Gateway Keepers and network planners. There may also be sound experimental reasons why overlap coverage is desirable and such proposals will be considered on their merits.

The extent of each Gateway's service area will be determined by a number of factors, including the local terrain, the position of neighbouring Gateways, the reason for establishing the Gateway and its target audience. Once the applicant has identified the need for a new Gateway, the ETCC will be able to help develop the initial idea into a successful application. The ETCC will be able to provide advice on the service-area which would provide a useful service and complement existing Gateways, and on the technical and physical implementation of the Gateway to achieve the declared service. Factors such as site height, antenna type, antenna height, and effective radiated power will need to be used to achieve the requirement identified in the application. As part of the assessment of the application, a computer-generated prediction will be carried out in order to identify any potential interference to other users of the channel.

### 2.2.3 Technical Requirements

In order to ensure successful co-existence with other Services and with other operators in the Amateur Service, Ofcom requires all Gateways to meet certain technical performance criteria which affect spectrum occupancy, spurious emissions, interference to other services and accessibility to users. The main parameters are set out in Annex 2. These parameters may need to be modified from time to time, as technologies, standards and international requirements change.

It is acknowledged that emerging digital technologies may not yet have fully developed standards and will require special consideration in respect of spectrum allocation and separation from existing analogue systems.

The requirements for the Gateway are contained in the Notice of Variation (NoV) to the Licensee (Gateway Keeper). A sample copy of an NoV is given at Annex 9. The NoV places the responsibility on the Gateway Keeper to ensure that the Gateway: meets certain minimum technical requirements and the parameters given in the Schedule; and continues to meet these requirements throughout its life. The Gateway Keeper may be required to implement a programme of periodic testing using appropriately calibrated test equipment. The relevant technical parameters which each Gateway is required to meet will be listed in the

Schedule to the NoV when it is issued. The principal parameters will be those listed in the specification, but the Schedule may include others. A sample copy of a Schedule is given at Annex 9. Any changes to the parameters listed in the Schedule issued for a particular Gateway will require the prior written approval of Ofcom. If any Gateway Keeper is unsure whether any parameter, they wish to change requires Ofcom approval, advice should be sought in the first instance from the RSGB.

## **2.3 The Application Process**

### **2.3.1 How to Get Started**

Once you have decided that there is a need for an Simplex Voice Internet Gateway in your area and you have the appropriate equipment and internet service to support your application you will need to visit the website:

The whole application process is conducted on-line, there are no handwritten forms to fill in.

### **2.3.2 The Application Form**

The application form is relatively straight forward, it's been used successfully hundreds of times over the last few years, so we know it is possible to use without too much trouble.

However, please take note that although it looks simple, please pay attention to the notes against each field of the form. Applications can be 'lost' if the form is filled in incorrectly.

All fields need to be completed before an application can be processed. 'Guessing' answers is easy to spot and your application will be declined, or the accurate information will be requested, thereby delaying the processing of your application.

The same application form is used for gateways as repeaters, details on how to fill in the form can be found in Annex 3

### **2.3.3 How the Application is processed**

Once you have submitted your application, a copy of your application is returned to the email address you gave on the application form, so it's important that you give a valid email address. Invalid email addresses will instantly result in your application being deleted from the system. Contained in the returned email is a link for you to monitor progress of your application(s).

Normally within 48 hours (often less) your application will be checked and processed to see how it fits in to the existing Simplex Voice Internet Gateway Network.

It is important to remember that it's not just the distance and the terrain between Gateways that can affect the acceptance of a new proposal. The users of a new gateway application and their likely location is also considered.

If your application is successful it will be passed to Ofcom for processing and the issuing of an NoV.

If your application is declined, you will receive an email containing the details of which frequency is declined and which other gateways it potentially could cause interference to. You will also be invited to reapply for an alternative frequency or band.

#### Additional Notes:

- Applications must be for your Main Station Address as shown on your licence documents and not at a remote site.
- Applications for Club Callsign Stations cannot be currently be accepted. Checks are carried out to verify the holder of the callsign.
- Please be considerate and ask only for the minimum ERP necessary to achieve your objectives for this gateway station. It may be necessary - for frequency coordination purposes - for you to accept a lower than requested ERP.
- It may not be possible to assign your requested frequency because your proposed use might cause harmful interference to users of already established gateways. Where possible, you will be offered an alternative frequency to use.

#### **2.3.4 Issuing of the Notice of Variation**

Once your application has been processed by ETCC, it is passed to Ofcom to issue your NoV. The NoV will be emailed to you as a pdf file to the email address specified on the application. The NoV will be valid for 12 months from the date of issue for a simplex gateway, packet gateway or repeater link. Or 3 years (36 months) for a duplex voice repeater or ATV repeater. Please ensure you apply for renewal of your NoV at least 2 weeks before the expiry date shown on the NoV.

## Section 3

### Introduction

#### Packet Radio Licensing.

This section is designed to provide guidance on the different types of licensing requirements for Amateur Data Communications in the United Kingdom. This generally refers to Mailboxes and Packet Nodes (including APRS – Automatic Position Reporting System).

##### 3.1.0 Operations.

The three different categories of permitted operations are:

- 1) Attended Operation (not including mailbox operation)
- 2) Unattended Operation (not including mailbox operation)
- 3) Mailbox Operation

##### 3.1.1 Attended Operation

The Amateur Licence does not permit general unsupervised operation on an unattended basis. This includes the operation of cross frequency/cross band nodes. Any port that is not cleared for unattended operation either under the terms of the licence generally or formally frequency cleared by the Ofcom must be turned off when the station is unattended.

Attended operation is defined as operation where the licensed operator is on the premises and in control of the station.

##### 3.1.2 Unattended Operation

The Amateur licence no longer permits operation on an unattended basis

Unattended operation on any frequency requires full formal frequency clearance from Ofcom.

##### 3.1.3 Mailbox Operation

Operation of a mailbox carrying traffic other than that aimed specifically at the operator (a Personal Mail System or PMS) requires permission in the form of a Notice of Variation (NoV) after full formal frequency clearance from Ofcom. All mailboxes must be sited at the applicants home main station address.

##### 3.2.0 Licensing.

Notice of Variation and formal frequency clearance are the procedures by which these additional facilities can be obtained.

##### 3.2.1 Notice of Variation

A Notice of Variation is an enhancement to the operators own amateur licence to permit mailbox operation. All the normal terms and conditions apply along with any extra specific requirements (such as frequency, power etc.) noted on the NoV. Callsigns are issued - e.g. GB7xxx.

##### 3.2.2 Formal Frequency Clearance

Applications for Mailboxes and Packet Nodes on non-primary Amateur Bands such as 70cms will require full frequency clearance. This procedure can take many months. The ETCC data applications co-ordinator will advise you at the time you apply.

### **3.2.3 Vetting Procedures for Node and Mailbox Applications**

All applications for MB7xxx or GB7xxx calls will be checked by the ETCC. The first stage is carried out by the data applications co-ordinator member of the ETCC. His role will be to apply the following tests:

- a) Will the unit enhance the network by providing any of the following:
  - Extended coverage
  - More efficient coverage
  - New facilities
  - Replacement facilities
- b) Are the proposed channels compatible with the band-plan and the existing network.
- c) Has the applicant provided evidence that his node or mailbox will be accepted into the existing network.

The data applications co-ordinator does not have the power to reject an application, only a full meeting of the ETCC can do this. If the recommendation is for approval and the applicant agrees to any limitations the application will be processed immediately and the application will be forwarded to Ofcom. If recommended for rejection, or if the data applications co-ordinator is unable to agree any limitations with the applicant, the application will be referred for discussion at the next full meeting of the ETCC.

### **3.3.0 Frequencies currently approved for Data Communications.**

As the band plans are a very dynamic set of tables, please consult the ETCC website <https://ukrepeater.net/> (Guidance section) for the latest and up to date copy of the data band plans.

## Annex 1

### NoV Application Process Workflow

A1.1 For all new applications or requests for changes an applicant should complete the relevant on line form at <https://ukrepeater.net/> and submit it for vetting. Proposals are automatically directed to the appropriate ETCC regional or specialist member.

A1.2 The ETCC member examines the application and will discuss any errors or omissions with the applicant so that these can be rectified. Where the requirements cannot be met in full, the applicant will be contacted so that the matter can be resolved. It is in the interests of repeater groups and gateway operators to co-operate with the ETCC to minimize any delay to the application process.

A1.3 When finalised the ETCC member will sign off the proposal as 'vetting completed' and it will be routed automatically to senior ETCC members for final approval and onward transmission to Ofcom. If the proposal is in an Amateur Primary frequency band an NoV will be generated and forwarded to Ofcom with a recommendation for issue to the applicant.

If the proposal is in a frequency band which is Amateur Secondary a frequency clearance request is generated and forwarded to Ofcom Spectrum Licensing.

Ofcom will then consult with the Primary Users of the band who will assess the proposal and if acceptable issue frequency clearance to Ofcom who will inform the ETCC,

An NoV will be generated by the ETCC and forwarded to Ofcom Spectrum Licensing for issue to the applicant.

If frequency clearance is not forthcoming the ETCC will inform the applicant and decide whether alternative frequencies should be submitted, and the procedure repeated.

When Ofcom Spectrum Licensing send Notices of Variation to applicants the ETCC will also be informed so that records may be updated.

A1.4 The RSGB will publish the list of received applications on their repeater website (<https://ukrepeater.net/>). The RSGB will also record the application on a progress table on their repeater web site. Radio Amateurs and other interested parties are invited to raise any issues they may have with individual applications at this stage.

A1.5 If the operational repeater does not meet the applicant's desired coverage requirements, the applicant may choose to submit a subsequent application to make the required changes. A fast-track arrangement has been agreed whereby if the site is within 2 km of the original then Ofcom may not need to invoke the previous referral processes. If the repeater exceeds the coverage area or causes undue interference, any necessary amendments will be discussed between the RSGB and the applicant with a view to modification of the repeater parameters. The repeater must be operational within 3 months of the issue of the NoV.

## Annex 2

### A2.1 Technical Requirements and Specifications

The RSGB uses proprietary radio coverage software to make predictions of the coverage from proposed stations. Where necessary, Ofcom is able to correlate results of the predictions.

The RSGB makes available the results of the predictions to applicants or potential applicants via a map which accompanies their on-line application on the RSGB repeaters web site (<https://ukrepeater.net/>)

### A2.2 Channel Plan

The list of channels available to repeaters can be found on the ETCC website <https://ukrepeater.net/> It should be noted that applicants may not always get their first choice of channel especially in shared bands, and they must be prepared to accept suggested alternatives. The ETCC will take many factors into account before assigning a new station to a channel.

### A2.3 Service Areas

The predicted Service Area for each Repeater is calculated from the data given in the application form using radio coverage prediction tools used by Ofcom and the RSGB. Every effort will be made to find the combination of Repeater parameters necessary to achieve the Service Area identified in the application. This could include proposals that the Repeater should be implemented using a lower or a higher power than proposed, or by using, for example, a different antenna type.

A convenient parameter set which has been found to be relevant to amateur radio repeaters uses the internationally recognized propagation algorithm outlined in ITU Recommendations P.525/526. The calculations are carried out up to a 100km radius circle from the location of the base station. "Clutter" attenuation will be used as appropriate. Digital mapping used for the prediction typically has a resolution between 50 metres and 500 metres.

The edge of the service area is defined in the same way for every Repeater. Minimum practical field strengths suitable for the type of mobile receivers for which the Repeater network is established will be used to define the edge of the Service Area. This has been calculated in accordance with ITU-R Report 358; "Protection ratios and minimum field strengths required in the mobile services". The edge of the service area of a Repeater will be represented by a contour of field strengths which are given in the table below:

29 - 50 MHz	14 dB $\mu$ V/m
50 - 52 MHz	24 dB $\mu$ V/m
144 - 146 MHz	20 dB $\mu$ V/m
430 - 440 MHz	24 dB $\mu$ V/m

Note: Amateurs may, using more powerful or higher quality equipment, use or hear the Repeater outside this Service Area. However, this additional coverage would be considered to lie outside the normal operating range of the Repeater and therefore is not guaranteed or considered as part of the Service Area.

### A2.4 Overlap of Service Areas

The Service Area of a Repeater should, as far as possible, avoid overlapping the Service Area of the neighbouring Repeaters. There may be certain conditions under which significant overlap may be desirable, for example where high population density causes congestion or where interference or geographical conditions cause holes in the coverage. In these cases, a solution agreeable by the relevant

Repeater Keeper(s) working with the ETCC must be found.

### **A2.5 Co and Adjacent-channel interference**

Technical calculations are carried out to assess the application and assign a channel.

Map of relevant sections of the UK is loaded into the technical planning tool (image, data terrain model (DTM) and Clutter data 50 metres).

The propagation model and thresholds will be set according to the frequency band.

The database will be refreshed using available data. The details of the proposed assignment will be entered into the technical tool. (Base station location, Requested Service Area, ERP if provided, Antenna details including pattern, direction and tilt, antenna height and polarisation).

A coverage plot representing the predicted coverage will be calculated using the receiver at 2 meters above ground level for amateur speech repeaters (receiver gain is 0dB), 4 meters for amateur television (receiver gain is 12dB) and 10 metres for internet gateways with the agreed threshold.

Appropriate adjustments of the thresholds will be implemented so that coverage is shown to the agreed threshold for the band.

Once this has been carried out, the new repeater will be attributed this coverage and the service edge is represented by the minimum service contour (see A2.3).

All existing assignments using the same frequency band within 100-200km are selected from the database. In some cases, the assessing officer will filter per frequency or smaller bandwidth to limit the number of calculations at this stage - local knowledge will be valuable.

Each existing assignment will be represented on a map showing the technical parameters and the previously calculated coverage.

The assessing officer will then be able to identify a list of potential frequencies where the minimum field strength for the band does not significantly overlap. The coverage plot of the existing systems will then be brought onto the screen or recalculated.

The channel selected will be based on least incursion of projected coverage into the minimum service area of other repeaters on the frequency. A written analysis of the effect of proposed repeaters on each channel may be prepared.

If no frequencies can be identified, the assessing officer will investigate the best possible case from the previous investigation and modify the station parameters and calculated ERP so that the criteria is met, making use of local knowledge of the area as well as current users. The assessing officer will then provide the applicant with the alternative details and agree the way forward.

As well as assigning a channel, it is also necessary to assign a CTCSS Code in the case of FM repeaters. Assignment Officers should not, where possible, assign the same tone to any users within 100 km of each other. Where it is not practical to do so, the assessment officer shall allocate the CTCSS tone from published standards, bearing in mind other repeaters in the area.

### **A2.6 Specifications**

The following specifications give the minimum requirements to ensure minimum interference to other services, and to ensure consistency of access arrangements across the whole Repeater network.

In some cases, particularly for TV Repeaters, the requirements have become more stringent in recent years. This is due to the need to prevent any interference to the Aeronautical Radio Navigation Service. For all Repeaters, specific cases of interference may require that the operation of a particular Repeater

be modified to meet more stringent requirements. This will be particularly important where interference is being experienced by a safety of life service.

Approval MUST be sought from RSGB in writing first, for all proposed changes to the parameters of the repeater as specified in the schedule to the NoV. You MUST NOT implement these changes until they have received approval in writing and the amended NoV has been issued by ETCC.

## A2.7 SPECIFICATION FOR UK AMATEUR RADIO FM SPEECH REPEATERS

The specifications below define the equipment parameters for UK Speech Repeaters. Those which relate to interference causing potential are marked mandatory and form part of the schedule to the Notice of Variation (NoV) issued by Ofcom. Others indicate recommendations which it is believed will allow the Repeaters to offer the best performance and minimise the chances that they will suffer degradation from other users. The repeater equipment MUST equal or better the mandatory specifications for the appropriate frequency band.

Emission codes e.g., 8 K 0 0 G 3 W W N for 12.5 kHz and 1 6 K 0 G 3 W W N for 25 kHz are to be used in the application form and will be quoted in the NoV. In general, the 12.5 kHz standard is applied to repeaters operating below 439MHz and the 25 kHz standard to those above, with the exception of 1.6 MHz 433 MHz repeaters being 25 kHz standard.

### RECEIVER

Sensitivity (Recommended):

12dB SINAD for a signal of  $-117.5\text{dBm}$  ( $0.3\mu\text{V PD}$ ) or less, modulated with a 1 kHz tone at 60% peak deviation.

IF bandwidth (Recommended):

This determines the ability of the receiver to withstand signals on adjacent channels.

29MHz/10m	50MHz/6m	145MHz/2m	430MHz/70cm s	1.3/2.3/10GHz
+/-3.75kHz min at -3dB points and +/- 12.5kHz max at -70dB points.	+/-3.75kHz min at -3dB points and +/- 12.5kHz max at -70dB points.	+/-3.75kHz min at -3dB points and +/- 12.5kHz max at -70dB points.	+/- 7.5kHz min at -3dB points and +/- 25kHz max at -70dB points.	+/- 7.5kHz min at -3dB points and +/- 25kHz max at -70dB points.

Spurious emissions (Mandatory):

With the receiver terminated in its design input impedance the level of any signal power (e.g. local Oscillator) at this point should not exceed 20nW (1mV into 50Ω)

Frequency stability (Recommended):

Under all operating conditions, the nominal input centre frequency shall remain within the limits given for "Transmitter Frequency Stability" below. (AFC may be used).

Squelch (Recommended):

Hysteresis should be designed into the squelch such that the level required to open the squelch is 3-6dB greater than that required to shut it.

### TRANSMITTER

Effective Radiated Power (Mandatory):

The effective radiated power must not exceed that specified in the schedule to the NoV.

Modulation level (Mandatory):

The peak modulation level (peak carrier deviation) shall not exceed the amount quoted in the table under any circumstances.

29MHz/10m	50MHz/6m	145MHz/2m	430MHz/70cm s	1.3/2.3/10GHz
+/- 2.5kHz	+/- 2.5kHz	+/- 2.5kHz	+/- 5kHz	+/- 5kHz

\* For 2.3GHz repeaters, the audio bandwidth of the input modulation shall be limited to 7 kHz with the level of speech components at 9 kHz to be suppressed by 20db with respect to that at 1 kHz.

Modulation frequency response (Mandatory):

The level of deviation for modulating frequencies above 3 kHz shall decrease at a rate of no less than 14dB/octave up to 6 kHz, to reduce adjacent channel "splatter".

Spurious emissions: (Mandatory)

With the transmitter operating into its design load impedance, the power of any spurious signal at any frequency removed from the carrier frequency by more than the amount in the table shall not exceed 0.25µW (-36dBm). This may need to be improved upon if a particular spurious emission is proven to be causing interference to other users.

29MHz/10m	50MHz/6m	145MHz/2m	430MHz/70cm s	1.3/2.3/10GHz
+/-25kHz	+/-25kHz	+/-25kHz	+/-50kHz	+/-50kHz

Frequency stability (Mandatory):

The output centre frequency shall remain within the tolerance quoted in the table below.

29MHz/10m	50MHz/6m	145MHz/2m	430MHz/70cm s	1.3/2.3/10GHz
+/-0.6kHz	+/-1kHz	+/-1kHz	+/-2kHz	+/-2.5 kHz

## CONTROL LOGIC

Initial Access (Mandatory)

The repeater must not be carrier accessed directly from "cold", and adequate immunity must be provided against access by speech.

For repeaters licensed after 1/1/2004, access shall, as a minimum, be by the CTCSS tone specified on the schedule to the NoV. Keepers may request any of the nine tone frequencies listed below. The original geographical plan recommended by RSGB may offer suggestions, but the keeper should make a choice based on local knowledge.

The transmitter should indicate that the repeater is accessed, by radiating the same CTCSS tone at a nominal level of 14% of maximum. Repeaters using Morse identification should identify the tone used by appending a word gap (7 dot units) and then the CTCSS tone identification letter to its Morse identification so that all users are made aware of the tone used.

The CTCSS tone lettering system is as follows:

A = 67.0Hz	B = 71.9Hz	C = 77.0 Hz	D = 82.5Hz	E = 88.5Hz
F = 94.8Hz	G = 103.5Hz	H = 110.9Hz	J = 118.8Hz	

Optionally, access may also be by a tone of 1750Hz plus or minus 25Hz at half system deviation, in which case the acceptance time of the tone shall be between 200 and 400ms.

Other internationally recognised CTCSS frequencies may be used in certain circumstances.

**Re-access (Recommended):**

Once the repeater is accessed, subsequent control of talk-through should normally be by carrier alone, unless CTCSS-only access has been explicitly permitted by Ofcom and using the tone quoted in the schedule to the NoV.

**Time-out (Recommended):**

The time that the squelch may be open without interruption should not exceed 5 minutes.

**Close-down after use (Recommended)**

When the repeater is no longer required (no signals on input) it should automatically close down within a recommended period of 5-15 seconds. In exceptional cases, the repeater may remain carrier accessed for up to 30 seconds after it has shut down. After this, the requirements of "Initial Access" should apply.

**Station identification (Mandatory):**

For analogue voice repeaters the callsign as stated in the repeater NoV must be transmitted automatically at not less than 15-minute intervals when the repeater is in use.. Digital voice repeaters should identify by the same type of transmission that is being used for the communication.

Voice announcements may be used but must be kept to a minimum (e.g. Repeater name, identity, location and other factors relevant to the repeater) or to that stated in the NoV.

**REMOTE CONTROL (Mandatory)**

Repeaters licensed since 1st January 2004, must have a mechanism for shutting down the repeater remotely if the repeater equipment becomes defective and is causing interference to others or if it is undergoing unacceptable abuse by users. Repeater Keepers are recommended to consider the use of GSM remote switches although other methods may be acceptable as long as they are adequately secure.

**ANTENNAS/FILTERS**

**Desensitisation (Recommended):**

A receiver signal input level set to achieve 12dB SINAD (20dB S/N) from a signal modulated with 1 kHz at 60% deviation, with the transmitter off. When the transmitter is keyed with no modulation, the receiver level required to produce the same SINAD (S/N) should be less than 1dB different to that required with the transmitter off.

**Antennas (Mandatory)**

Vertical polarisation must be used for all speech repeaters unless explicitly authorised. The height of the antenna must be no greater than that specified on the NoV, and the polar diagram must not be changed without written permission.

**ADMINISTRATION**

**Changes (Mandatory):**

Approval must be sought from the RSGB for all proposed changes to the parameters of the repeater. This does not apply to a change in the actual equipment used as long as it maintains the mandatory parameters. You MUST NOT implement any other changes until RSGB approval has been received in writing. Where necessary, Ofcom will update the Notice of Variation.

**Off-air periods (Mandatory):**

All off air periods exceeding 72 hours MUST be notified – e.g. in accordance with section 2(l) of the NOV at Annex 6.

Note: This specification may have to be modified in the light of operational experience and advances in technology. It is essential, therefore, that Repeater Keepers maintain familiarity with the requirements of the specifications laid down in the NoV with which they have been issued.

Copies of the latest specifications may be obtained from the RSGB.

Under Review

## A2.8 Amateur Television Repeaters - Spectrum management parameters

Note: This specification may be varied in the light of operational experience and advances in technology.

<b>Bands</b>	
Applicable frequencies	All allocations above 1,240 MHz
<b>Transmitter</b>	
Modes of emission Either analogue or digital.	Analogue: 16M0F8WWN Digital: 16M0G9WWT or 16M0D9WWT (note: This allows for Analogue, DVBS or DVBT modulation etc.)
Mode of emission, digital only.	For repeaters operating only with digital transmissions, the mode will be defined on the individual NOV to enable narrower band systems to be specified if required. Otherwise the modes listed above will apply.
Digital Compression modes.	Any publicly available method, example MPEG2, MPEG4 etc.
Maximum Radiated Output Power	Not to exceed 14dBW e.r.p. unless otherwise defined on an individual NOV.
Maximum Level of Spurious Emissions	-70dB or better, at all frequencies >+/- 20MHz away from the centre of the allocated spectrum.
Audio bandwidth	Audio bandwidth of the input modulation will be limited to 15kHz. For analogue systems, pre-emphasis of 50 µSecs and a peak deviation of 50kHz will be used.
Video bandwidth	Analogue: 5.5 MHz max. Digital: any that will fit into the specified emission code.
Video Pre-Emphasis	Analogue: As per CCIR recommendation 405.1 / Rec ITU F.405
Sound	Analogue: Subcarrier normally 6.0 MHz with additional subcarriers may be used, e.g. 5.5 MHz, 6.5 MHz provided that the overall deviation is adjusted to be within the spectrum mask. Digital: Multiple audio channels may be multiplexed.
Carrier Frequency Stability	+/-1MHz or 0.01% of the carrier frequency whichever provides the best stability
<b>Receiver</b>	
Maximum Level of Spurious Emissions	The spurious emissions of the receiver to be used shall not exceed 20 nano-watts (1mV into 50Ω), measured at the receiver input terminals.
Audio Bandwidth	Audio bandwidth of the input modulation will be limited to 15kHz. For analogue systems, de-emphasis of 50 µSec. will be used.
Signal to noise ratio	The receiver RF noise factor should be 1dB or better measured at the receiver input terminals. A bandpass filter will be required in series with the receive antenna centred on the receive frequency.
Frequency Stability	The receiver tune frequency prior to AFC operation, shall be maintained to better than +/- 1MHz or 0.01% of the operating frequency whichever provides the best stability . AFC may be provided to cater for received signals whose frequencies are in the range +/- 1 MHz from nominal.

<b>Antenna</b>	
Polarisation	Horizontal
<b>Access Arrangement</b>	
Station identification	<p>In repeat mode, identification of the station will be accomplished by modulating the audio transmitted by an automatic callsign generator, using F2 modulation and International Morse Code at a nominal speed of 12 words per minute and, additionally, may use F3 modulation, speech. Identification shall occur at periods of not greater than 15 minutes.</p> <p>The video transmitter will identify with its callsign.</p> <p>When not in repeat mode, the repeater will identify itself at least every 15 minutes with a callsign sent in Morse code or speech and with a callsign caption in vision as above.</p>
Access and Control	<p>The repeat mode of the station may be accessed by receipt of a valid video signal at the receiver.</p> <p>When the accessing signal is removed and the repeater is not accessed within 10 seconds, the repeater will:-</p> <p>Sound - send the callsign in Morse code or speech.</p> <p>Vision - send a callsign caption for at least 30 seconds.</p>
Remote Control	<p>Control of the repeater including remote close down may be effected by the use of DTMF tones or data on the receive audio or digital data channel and/or on a specified frequency on another band as specified in the NoV.</p> <p>Remote control may be used for controlling the transmitter modulation method, for switching the repeater input to alternative sources.</p> <p>See Remote Control Notes for Guidance for further information.</p>
<b>Changes</b>	
Approvals	<p>Prior approval must be sought by keepers from Ofcom on all proposed changes to the parameters of the repeater, which affect coverage area (e.g. Antennas, Output power, Transmitter, Receiver, etc).</p> <p>Keepers MUST NOT implement these changes until they have received OFCOM approval in writing.</p>
Off air periods	<p>All off-air periods exceeding 72 hours, MUST be notified to OFCOM in writing on the same day as the repeater goes off the air - e.g. in accordance with section 2(l) of the NoV at Annex 6.</p>
Interference	<p>This specification may need to be changed for individual repeaters if interference is caused to primary users.</p>

## A2.9 Digital Voice Digital Repeaters

As this is a rapidly evolving technology no specific parameters have been set at this time in order to encourage innovative technology and ideas. Such proposals will have to meet the normal ERP limits and have an occupied bandwidth no greater than the spectrum mask for analogue service.

## Guidance on completing the Online Repeater Application Form Type E1

### E1 Section 1



## ETCC FORMS CENTRAL

Please select the form you require from the list below:

The form below can be used to create a new application.	
<b>NEW REPEATER/GATEWAY</b>	Apply for a new Repeater, Gateway or Packet NoV
<b>NEW BEACON</b>	Apply for a new UK AMATEUR BEACON (includes BEACON Site Changes)
<b>VETTING UPDATES</b>	Use your Secure Access Code for continuing VETTING (all types)
<b>STATUS REPORTING</b>	Report a Change of Operational STATUS
<b>CONTACT US</b>	Send a short message to an ETCC member
<b>NEWS ITEM</b>	Send us a NEWS item for publication
<b>RENEWALS</b>	Apply to RENEW your NOV when applicable
<b>APPLY for SECURE CODE</b>	Apply for your Secure Access Code (Licence copy will be required)
<b>CHANGE of KEEPER</b>	Apply for a Change of KEEPER (by existing Keeper)
<b>SECOND NOV</b>	Permanently Closedown Station (by the Keeper)
<b>UPDATE DETAILS</b>	UPDATE non-NoV details, e.g. Closedown Ops, email or group web link
<b>SITE CHANGE</b>	Use your Secure Access Code to part-populate a new application form

### Callsign checker (for new callsign allocations)

Enter Callsign  Enter Callsign  [For existing repeaters, for example a Site or Mode Change, you can ignore this checker]

### Section 1 - The Applicant/Keeper

<b>1.1 Your Name:</b> <input type="text"/>	<b>1.2 Your Callsign:</b> <input type="text"/>
<b>1.3 Address:</b> <input type="text"/>	
<b>1.4 Town/County:</b> <input type="text"/>	
<b>1.5 Postcode:</b> <input type="text"/>	
<b>Phone Numbers:</b>	<b>1.6 Principal contact (mobile):</b> <input type="text"/>
	<b>1.7 Alternative (landline):</b> <input type="text"/>
<b>1.8 E-mail address:</b> <input type="text"/>	
<b>1.9 Optional Web address:</b> <input type="text"/>	
please omit http://	
<b>1.10 Ofcom Licence:</b> <input type="text"/>	<small>*(likely be in format similar to 1-8543-123456)</small>

**All applications:** It is important to fill in all the details on this section. The phone numbers will be used as the numbers associated with Closedown Operator number 1.

It is important that you include a valid email address, if the email address does not work then your application will be rejected.

Your web address isn't important but if you have a website a link will be put to it from the ETCC site for users to find out local details about your repeater/gateway etc.

Please ensure you fill in the Ofcom Licence Number you will find this on the Licence Validation document it is normally in the format 1-1231-1283012 or similar.

## E1 Section 2.

### Section 2 - Service

**2.1 Requested Callsign:**  NOTE: For **RF INTERNET REPEATER LINK** enter the **REPEATER** callsign here.

**2.2 ETCC Region:** (select)  If unsure check details [here](#) (opens a separate page)

**2.3 Type Code:** (select)  \*

ANALOGUE VOICE\*

TELEVISION

PACKET DATA

BEACON

(none of above)

DV DMR

DV DSTAR

**2.4 MODES REQUIRED:**  DV FUSION

DV P25

DV NXDN

M17

TETRA [Note: Requires a separate simplex frequency, this is NOT a multimode add-on]

OTHER

\* Please note that **ANALOGUE VOICE** repeat is not permitted on the 9MHz (439/430MHz DV channels)

**2.5 DMR Network:**  (for DMR only)

**2.6 DMR COLOUR CODE:** (select)  (Select colour code if using DMR)

**2.7 CTCSS:** (select)  (Select CTCSS code for analogue mode if applicable)

**2.9 Reason:** NEW APPLICATION  \*

**2.10 Band:** (select)  \* (Currently there are very long delays for applications on 4M or 23CM)

Please note that the ETCC will allocate a channel based on the band you have selected above and the availability of channels/spectrum appropriate to your application.

**2.11 Channel:** Please note that for frequencies in secondary use amateur bands (such as 70cm) we will seek frequency clearance from the primary user/s on your behalf.

**2.12 TX (TV and non std):**  MHz (If you have a preferred frequency you can enter it here)

**2.13 RX (TV and non std):**  MHz (Note that frequencies will be allocated by the RSGB)

**2.14 alt.RX Frequency:**  MHz

**2.15 Channel**  kHz [TX]

**Bandwidth:** (All 2m and 70cm voice repeaters use 12.5kHz except 70cm [RB0-RB15] still on 25kHz)

### Requested Callsign:

- **Analogue Voice Repeaters:** GB3??
- **Digital Voice Repeaters:** GB7??
- **Simplex Analogue Internet Gateways:** MB7I?? for gateways with unattended operation eg 2 metres. MB7A?? for gateways which can only operate attended only operation in the physical presence of the NoV holder eg 70cms and 4 metres
- **Simplex Digital Internet Gateways:** MB6?? for gateways with unattended operation eg 2 metres. MB6I?? for gateways which can only operate attended only operation in the physical presence of the NoV holder eg 70cms
- **Repeater RF Links:** The same as the repeater callsign
- **Packet Radio Mailboxes:** GB7xxx

- **Pagers** MB7Pxx
- **APRS iGates:** MB7Uxx
- **RX Only APRS iGates** MB7Rxx
- **APRS Digipeaters:** MB7Ux or MB7Vx

### **Region/Location**

All applications: Select the county the station is located in. This is used to send the application to the relevant ETCC committee member who will be vetting your application.

### **Type:**

All Applications: Select the appropriate type of application for the station you are setting up. Note repeaters are dual frequency duplex devices; gateways are single frequency simplex devices.

### **Principle Digital Mode:**

Only applicable to Digital Applications. Please select the type of system you will be installing. Note that the frequency assignment criteria will vary depending on the type of system you are using. Please note we do not support Dual Mode Simplex Gateways, these have to be either Analogue or Digital not both.

### **Reason:**

All applications: Why are you submitting this application? Please select the most appropriate description from the list.

### **Band:**

All applications: Select the band of operation for your application.

### **Frequency:**

All applications: Either select a channel to type in the frequencies. If you are unsure then please select 'To be assigned' this will help the person vetting your application. For RF repeater links please ensure you get the Tx and Rx frequencies the correct way around (opposite to the repeater!)

### **Channel Bandwidth:**

All Applications: With a few exceptions 12.5 kHz bandwidth will be used in all cases please ensure the equipment you propose to use is compatible with narrow band usage on both transmit and receive.

On transmit deviation should be no higher than 2.5 kHz peak deviation. The few exceptions that still allow 25 kHz bandwidth are the 70cms 1.6 MHz split channels for voice repeater channels.

### **DMR&CTCSS**

**All Analogue Voice Repeaters:** Choose the accepted CTCSS frequency for your region from this page: [www.ukrepeater.net/access.htm](http://www.ukrepeater.net/access.htm) CTCSS access is compulsory for all new applications.

**All Analogue Simplex Gateways:** Choose the accepted CTCSS frequency for your region from this page: [www.ukrepeater.net/access.htm](http://www.ukrepeater.net/access.htm), but please note that often a different tone might be assigned to your application depending on the existing usage in your region. CTCSS access is compulsory for all new applications.

**All DMR applications:** Please select the colour code, but please be aware this might be changed depending on the existing usage in your region.

**All Dstar applications:** Select not applicable (n/a)

**All Dual Mode Fusion repeater applications:** Choose the accepted CTCSS frequency for your region from this page: [www.ukrepeater.net/access.htm](http://www.ukrepeater.net/access.htm) CTCSS access is compulsory for all new applications for the analogue mode of these systems.

All Repeater links: Choose the same CTCSS frequency as the repeater you will be linking to.

## E1 Section 3

### Section 3 - The Site

3.1 Describe Site:	<input type="text"/> km *	3.2	(select) ↓	of 3.3 (town)	<input type="text"/>	* (within 6km)
You can use Grid Reference Finder to check NGR and grid references (separate window)						
3.4 NGR:	<input type="text"/>	*	or Irish Grid (NB: Minimum 3+3 digits, e.g. TQ123987)			
For RF INTERNET LINK the NGR and other site details should be for <b>your</b> station, NOT the repeater.						
WGS84:	3.5 Latitude	<input type="text"/>	3.6 Longitude	<input type="text"/>		
Use decimal format, e.g 55.12346,-2.98754 (West of Greenwich is "-")						
3.7 Previous site (NGR):	<input type="text"/>	NGR of current/prev site for <b>SITE CHANGES</b>				
3.8 IARU Locator:	<input type="text"/>					
3.9 Site Address:	<input type="radio"/> different (enter below) <input type="radio"/> same as applicant (now goto <b>3.13 Base of mast</b> )					
3.10 Site Name/Address:	<input type="text"/>					
3.11 Town/County:	<input type="text"/>					
3.12 Site Postcode:	<input type="text"/>					
3.13 Base of Mast (asl):	<input type="text"/>	Metres *	(This will be equivalent to pavement/field level NOT roof level)			
3.14 Mast Owner:	(select) ↓					
3.15 Is site shared?	<input type="radio"/> Yes	<input type="radio"/> No	3.14 If Yes, list:	<input type="text"/>		

This section is about the location of the station. We require accurate information to be able to determine which is the best frequency to assign to your application.

**Describe site:** this is the approximate distance your station is from the nearest town.

**NGR:** This is the ordnance survey national grid reference, if you don't know this already go to this site to find it. [wtp2.appspot.com/wheresthepath.htm](http://wtp2.appspot.com/wheresthepath.htm)

For detailed help see: [wtp2.appspot.com/help3.htm](http://wtp2.appspot.com/help3.htm)

Lat Long also available at: [wtp2.appspot.com/wheresthepath.htm](http://wtp2.appspot.com/wheresthepath.htm) use WGS84

If your station is in Northern Ireland then you must quote the Irish grid reference, you can find this by using this site: [gridreference.ie/](http://gridreference.ie/)

**IARU Locator:** once you know your NGR you can find your locator using this site. [www.carabus.co.uk/jscalculators.html](http://www.carabus.co.uk/jscalculators.html)

**Site address:** This is the postal address of the site. Please note that all gateways, packet mailboxes and APRS iGates must be at the applicants main station address as shown on your Ofcom licence document.

**Base of the Mast:** [wtp2.appspot.com/wheresthepath.htm](http://wtp2.appspot.com/wheresthepath.htm) will also give you an accurate figure for the height above sea level in metres.

**Mast Owner:** This is to indicate who the owner of the site is and if the station will be sharing with other radio users, try to indicate frequency bands in use on the site (if known)

## E1 Section 4.

### Section 4 - Equipment

4.1 Transmitter type:	<input type="text"/>	include Make/Model
4.2 Receiver type:	<input type="text"/>	(for repeaters)
4.3 Transmitter Antenna [make and model]: <input type="text"/> *		
4.4 Antenna Gain:	<input type="text"/> dBd	* (Quote dBd NOT dBi -check spec sheet!)
4.5 Height agl:	<input type="text"/> Metres	* (This is the height above GROUND level, NOT sea level!)
4.6 Transmitter Power Output (Watts):	<input type="text"/> Watts	
Power Levels:	4.7 Losses in System:	<input type="text"/> dB * (Includes feeder and duplexer losses)
(important!)	ERP Check <input type="button" value="Click   Check   Adjust"/>	
	Voice Repeater will not be licensable above 25W (14dBW)	
	Gateways Maximum ERP limits 2 metres, 4 metres, 6 metres and 10 metre gateways = 3 dBW, 70cms gateways 7 dBW and Packet Radio stations Max ERP 10 dBW	
4.8 Receive Antenna:	<input checked="" type="radio"/> different (enter below) <input type="radio"/> same as TX (now goto <b>Direction</b> )	
RX if different:	4.9 Type: <input type="text"/>	4.10 Gain: <input type="text"/> dBd 4.11 Height agl: <input type="text"/> M
4.12 Direction:	<input type="text"/> OMNI <input type="checkbox"/> If not OMNI enter degrees ETN	
4.13 Polarisation:	<input type="radio"/> Vertical <input type="radio"/> Horizontal	
4.14 Elevation:	<input type="text"/> 0 degrees <input type="checkbox"/> If not 0, enter tilt applied	
4.15 Baud Rate:	<input type="text"/> (PACKET only)	
4.16 Port usage:	<input type="text"/> (PACKET only)	
4.17 Attended:	<input type="radio"/> Attended <input checked="" type="radio"/> Unattended (default use is Unattended)	

In this section we require details of the equipment you propose to use for your repeater or gateway.

**Transmitter/Receiver type:** The make and model of each.

**Transmitter aerial type:** if possible, include the make and model

**Gain:** The gain in Decibels relative to a dipole. Be aware that a lot of manufacturers quote gain relative to an isotropic radiator, which is 2.15 dB higher than dBd.

**Height agl:** This is the height of the base of the antenna above ground level in metres not feet.

**Transmitter output power:** The RF power output in Watts that you are requesting. Please note that the power may be revised downwards to be able to assign you a channel in your area and to comply with our guideline limits. See below for details.

**Losses in system:** The losses in dB between the transmitter and the antenna. This includes the coax and any filters that will be permanently in line. Do not overestimate the loss.

For coax loss use this site: [www.timesmicrowave.com/calculator](http://www.timesmicrowave.com/calculator) or the manufacturers own data sheets. For filter loss consult the manufacturer or have the filter measured on a network analyser or similar test instrument.

Click on ERP check to see what your ERP will be. ERP equals Tx output in dBW minus cable/filter loss plus antenna gain in dBd

#### Effective Radiated Power (ERP) limits.

ERP limits are defined as follows:

Voice repeaters = 14 dBW

2 metre gateways = 3 dBW

2 metre APRS stations = 3 dBW

2 metre packet stations = 7 dBW

70 cm gateways and packet stations = 7 dBW

10 metre, 6 metre and 4 metre gateways = 3 dBW

However, all gateway applications are assessed on a case-by-case basis and are often assigned power lower than the limits. Applicants are encouraged to apply for a power level that will only cover the main towns of interest.

Repeater applications, applicants are encouraged to apply for a power level that will only cover the main towns of interest.

Occasionally we will have to request lower power levels to be able to gain frequency clearance on secondary amateur bands.

**Receive Antenna:** Give the details if a separate antenna is in use for receiving.

**Polarisation:** Please indicate the transmit antenna polarisation.

**Elevation:** The angle of downward tilt if a tilting antenna is in use. This can help control the coverage area and improve coverage close to the transmitter site.

## E1 Section 5.

### Section 5 - Closedown Details

Note: For **RF INTERNET REPEATER LINK** the closedown details refer to **your** station, NOT that of the linked repeater. It is good practice to nominate someone else who can disable the station in your absence.

<b>5.1 Access:</b>	Describe briefly access to the site. Include how Closedown Ops will get to site. <input type="text"/>
<b>5.2 OnSite:</b>	Describe where repeater is located on site. <input type="text"/>
<b>5.3 Disabled:</b>	How is repeater disabled? <input type="text"/>
<b>5.4 Person to Repower:</b>	WHO will re-power the station? <input type="text"/> <small>NOTE: Normally this will be the NoV holder. The Keeper can delegate the actual action of re-powering the station to someone else, but responsibility to do it should be with the named person.</small>
<hr/>	
<b>Closedown Operator 1: (Keeper) [mandatory]</b>	<b>Closedown Operator 1 must be the Keeper/Applicant</b> (Confirm for the Keeper the time to carry out closedown) 5.5 Expected time for Keeper to close down station from home: <input type="text"/> 5.6 Estimate of time to close down station if not from home: <input type="text"/>
<hr/>	
<b>Closedown Operator 2 [optional]</b>	<b>It is advisable to have other people who could be called on to switch off the repeater if instructed by Ofcom, when you are not available.</b> <b>If you nominate someone, under GDPR we must ask them for permission to hold their contact information on your behalf for the sole purpose of closing down the repeater in your absence, if instructed by Ofcom.</b> 5.7 Full name: <input type="text"/> 5.8 Callsign: <input type="text"/> All Closedown Operators MUST be aged 16 or over. 5.9 Mobile: <input type="text"/> 5.10 Alternative Number: <input type="text"/> 5.11 Email of cdo#2: <input type="text"/> 5.12 Estimated/Average response time for cdo#2 to effect closedown: <input type="text"/>
<hr/>	
<b>Closedown Operator 3 [optional]</b>	<b>It is advisable to have other people who could be called on to switch off the repeater if instructed by Ofcom, when you are not available.</b> <b>If you nominate someone, under GDPR we must ask them for permission to hold their contact information on your behalf for the sole purpose of closing down the repeater in your absence, if instructed by Ofcom.</b> 5.13 Full name: <input type="text"/> 5.14 Callsign: <input type="text"/> All Closedown Operators MUST be aged 16 or over. 5.15 Mobile: <input type="text"/> 5.16 Alternative Number: <input type="text"/> 5.17 Email of cdo#3: <input type="text"/> 5.18 Estimated/Average response time for cdo#3 to effect closedown: <input type="text"/>
<hr/>	
<b>Closedown Operator 4 [optional]</b>	<b>It is advisable to have other people who could be called on to switch off the repeater if instructed by Ofcom, when you are not available.</b> <b>If you nominate someone, under GDPR we must ask them for permission to hold their contact information on your behalf for the sole purpose of closing down the repeater in your absence, if instructed by Ofcom.</b> 5.19 Full name: <input type="text"/> 5.20 Callsign: <input type="text"/> All Closedown Operators MUST be aged 16 or over. 5.21 Mobile: <input type="text"/> 5.22 Alternative Number: <input type="text"/> 5.23 Email of cdo#4: <input type="text"/> 5.24 Estimated/Average response time for cdo#4 to effect closedown: <input type="text"/>
<hr/>	
<b>5.25 Remote Closedown:</b>	Remote closedown is compulsory and your method should be described above. <input type="text"/>

This section is very important for stations that are going to be operated on an unattended basis. Not all applications can be granted unattended operation.

Please note that at the time of writing Simplex Gateways can only be granted unattended operation on Primary Amateur bands (10 metres, 6 metres, 2 metres) Operation on 4 metres and 70cms must be in the physical presence of the NoV holder at other times the radio equipment should be turned off.

**Access:** How will be the Closed Down Operators (CDO's) get to the site and gain access to the site? If keys are required to get into the site, include a statement that all CDO's are key holders.

**On-site:** Indicate the location on the site to the extent of someone not familiar with the site being able to find the equipment and the controls.

**Disabled:** What is the method of disabling the transmitter? Please note that Ofcom now require that all unattended stations are equipped with some means of remote shutdown. Most stations achieve this by using a GSM power switch to remove the power from the transmitter. However, this should be tested on a regular basis (monthly) to ensure the SIM card is still active. Wifi controlled power switches can also be used. The essential requirement is that the power is removed from the Transmitter not just disabled in the logic software.

**Repower:** This is the person (singular) that will be authorised to power up the equipment or repower the equipment after any shutdown. This has to be a named person not a group of people. It is normally the NoV holder, only exceptionally would it be someone else. The named person must be a licenced radio amateur holding the correct class of licence for the NoV issued. For repeaters this must be a full licence holder.

**Close Down Operators 2, 3 4** Ofcom require all 4 closedown operators to be included on the list. By default, the keeper/applicant is CDO1. Please note that CDO's 2-4 do not have to be licensed radio amateurs just competent people and aware that they are on the list of the close down operators for your station and what their responsibilities are if they are called to shut down the station.

Please do not include people on the list without making them aware you have included them in the list.

Please fill in all the information for each one.

At minimum we require the following information:

- Full name
- Callsign if they have one
- Mobile number
- Hometown they are located in
- Times to get to the site from home and at other times. Please try to select local people i.e. less than an hour from the site if possible and people that have their own means of transport.

**Remote Closedown:** Indicate the mechanism/system used to shut down the station remotely. Ofcom now require that all unattended stations have some means of emergency shutdown even when all closedown operators are not in the coverage area of the station. Most keepers use a GSM power switch, or Wi-Fi Controlled Power Switch or similar to remove the power from the transmitter remotely.

Please note that all stations have to comply with the closedown requirements irrespective of when they were licensed. On renewal you will be expected to comply with any changes set out by Ofcom and advised by RSGB ETCC

## E1 Section 6

### Section 6 - Additional Data

A coverage prediction map (for repeaters only) is prepared by the ETCC.

You should attach any maps you may have already received or prepared yourself.

<b>6.1 coverage description:</b>	<input type="text"/>
<b>6.2 Support Message:</b> (may be published)	<input type="text"/>
<b>6.3 Private Message:</b> (seen by ETCC agents only)	<input type="text"/>

The following may be required to support your application.

A facility to send up to **2 documents** with this application (max.size 4MB) is available below and can be used to send items required.

**Your Licence copy please:**  no file selected (to demonstrate amateur status)

(Click [here](#) for some screenshots taken from the Ofcom Licensing web pages should you need help with this)

**Anything else:**  no file selected (optional)

(max.file size 4MB total)

**All applications: Coverage:** Describe the coverage in terms of the towns/villages that you would consider to be within the coverage area and are not already served by a repeater or simplex Internet gateway.

**All applications: Licence:** Applicants need to supply a copy of their own licence issued by Ofcom with an issue date that is less than 5 years old on the day that they apply. The document must be the actual PDF that you have downloaded from the Ofcom website, it cannot be a photograph or scan or screenshot of the document.

## E1 Section 7

### Section 7 - Data Security [Important Final Bits!!]

**\*\* Please note that there are mandatory response boxes in this final section! \*\***

- 7.1 We recommend that you have 3rd Party insurance liability cover, but it is your responsibility.  
 ACCEPT  DO NOT ACCEPT
- 7.2 It is YOUR responsibility to ensure compliance with current EMF requirements around the station.  
Click [here](#) for further information. [opens in separate page]  
Are you aware of this requirement?  
 YES  NO \*

#### Data Protection and Privacy

Please [click here](#) to read about our privacy and data protection policies.

- 7.3 Please indicate your agreement to the collection of information.  
Even if you previously agreed, this must be re-confirmed under current data protection rules.  
In agreeing, you are also stating that you are over the age of 16.  
 AGREE  DISAGREE \*
- 7.4 Please indicate your agreement to showing site detail and any associated coverage map.  
 PUBLIC  RESTRICT \*

**NOTE:** Choosing site privacy (RESTRICT) in 7.4 above will mean the following:

1. We will NOT display a detailed coverage prediction map for your station.
2. Where possible we will truncate or omit your site Grid Reference from lists.
3. We will not provide links to mapping which show the repeater site.
4. Your site will not appear in lists used by equipment suppliers for rig programming.
5. We will try and keep as low a profile for your repeater as practical.

If you have previously agreed to us displaying accurate locations, you may change your mind at any time by contacting us from the [ukrepeaters website](#).

Click [here](#) to view the RSGB ETCC Privacy policy document.

**PLEASE NOTE THAT IF YOU DO NOT AGREE TO THE COLLECTION OF YOUR DATA WE WILL BE UNABLE TO PROCESS YOUR APPLICATION AND YOU WILL HAVE TO CONTACT OFCOM DIRECTLY.**

Before we finish, please take a note of the unique secure access code for this application which will allow you to make changes during vetting, then subsequently to make changes to parameters that would not affect the licence footprint.

**KtLyPTnVzb**

Finally, check you have answered ALL questions, not forgetting the potential show-stopper if you fail to respond to the important data security questions in Section 7 above!

**Submit**

Just once only please, and good luck with your application!

**All applications:** Please read this section in detail it important you read and understand what you are applying for, so the necessary technical assignment criteria are used for your application.

It is important you understand and agree to the data protection statements if you disagree ETCC will not be able to process your application.

**Security code:** Make a note of this code, as you will be using it to access your application for any amendments/updates during the vetting period.

Have you completed everything? Fill in the text in the image and then hit the Submit button and this will then start off the application vetting process. A member of the ETCC will be assigned your application. They will check it and contact you if they need clarification or more information or errors corrected.

## Annex 4

### Useful Reading

#### Available from Ofcom ([www.ofcom.org.uk](http://www.ofcom.org.uk))

MPT 1351 Code of Practice for Repeater Operation at Communal Sites;  
MPT 1326 superseded by EN 300 086  
MPT 1362 superseded by EN 301 489  
MPT 1368 Code of Practice for the inspection of a Land Mobile Radio System for conformity with the Wireless Telegraphy Act Licence and Performance Specification;  
MPT 1372 Code of Practice for field maintenance and repair of civil land mobile radio;

#### Available from the RSGB

RSGB Yearbook Radiocommunication Handbook

The VHF/UHF Handbook

#### Available from the ITU

CCIR Recommendation 405-1 Pre-emphasis characteristics for frequency modulation radio-relay systems for television)

The above can be found in Recommendations of the CCIR, 1990 Volume IX-Part 1 and available from the ITU at [www.itu.int](http://www.itu.int) (See also Rec ITU F. 745 and F.405)

ITU R – P. 1546-2., “Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 3000 MHz” available from the ITU at [www.itu.int](http://www.itu.int)

## Annex 5

**Glossary of Terms**

<b>Abbreviation</b>	<b>Meaning</b>	<b>Remarks</b>
AGL	Above ground level	
AMSL	Above mean sea level	
CAA	Civil Aviation Authority	
CTCSS	Continuous Tone Controlled Squelch System (Signalling System)	
dB	Decibel	Logarithmic ratio
dBc	Decibels relative to the unmodulated carrier power of the emission	
dBd	Decibels relative to dipole antenna	
dB <sub>i</sub>	Decibels relative to an isotropic radiator	
dBm	Decibels relative to 1 milliWatt	
dBuV/m	Decibels microvolts per metre, unit of field strength	Used in computer mapping
dBW	Decibels relative to 1 Watt	
DCC	Data Communication Committee	Former Committee of RSGB
DCSS	Digital Code Squelch Signalling (Signalling System)	
EIRP	Equivalent isotropically radiated power	
EMC	Electro Magnetic Compatibility	
ETCC	Emerging Technology Co-ordination Committee	RSGB Committee
ERP	Effective radiated power	
FM	Frequency Modulation	
GHz	GigaHertz	Unit of frequency x10 <sup>9</sup>
GMSK	Gaussian Minimum Shift Keying	Used in digital communications
Hz	Hertz	Unit of frequency
IARU	International Amateur Radio Union	
ITU	International Telecommunication Union	Agrees and publishes ITU Radio Regulations
ITU-R	ITU Recommendation (for specifications)	
kHz	KiloHertz	1000 Hz
km	Kilometre	1000m
km <sup>2</sup>	Kilometre squared	Unit of Area
Lat	Latitude	
Long	Longitude	
m	metre(s)	Unit of distance
MHz	MegaHertz	Unit of frequency x10 <sup>6</sup> Hz
ms	Millisecond(s)	Unit of time x10 <sup>-3</sup> s
mV	milli-Volt(s)	Unit of voltage x10 <sup>-3</sup> V
mW	milli-Watt(s)	Unit of power x10 <sup>-3</sup> W
NGR	National Grid Reference	
NoV	Notice of Variation (to Amateur Radio Licence)	
Ofcom	Office of Communications	

Abbreviation	Meaning	Remarks
RA	Radiocommunications Agency (Former Regulator)	
RMC	Repeater Management Committee	Former committee of RSGB
RSGB	Radio Society Great Britain	
RSGB HQ	RSGB Headquarters	RSGB A.R. Dept 3 Abbey Court, Fraser Road, Priory Business Park, Bedford MK44 3WH
RX	Receiver	
s	Second	Unit of time
SINAD	(Signal+Noise+Distortion)/ (Noise+Distortion)	Signal to noise and distortion ratio
TV	Television	
TX	Transmitter	
UHF	Ultra High Frequency	300 MHz - 3 GHz
V	Volts	Unit of voltage
$\mu$ V	micro-Volts	Unit of voltage x $10^{-6}$ V
VHF	Very High Frequency	30 MHz - 300 MHz
W	Watt	Unit of power