# Improvements to existing coverage and coverage extensions for community radio services

Guidance document

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# Contents

## Section



## Annex

# 1. Overview

1.1 Following on from our statement on Community radio: future licensing and technical policy, published on 28 April 2017, this document provides guidance for Community radio services who wish to apply for an improvement to existing coverage within the current licensed coverage area or, in specific circumstances, for an extension of the licensed coverage area.

No areas are excluded on the basis of frequency availability, but this does not indicate that an improvement to existing coverage or a coverage extension will be possible in every area. Community radio is licensed using different frequencies to the extent they are available and unused by other radio services in different places, and is dependent on whether services cause harmful outgoing interference.

This document sets out guidelines and procedures for submitting applications.

# 2. Introduction

2.1 Community radio services "are local services provided primarily (a) for the good of members of the public, or of particular communities, and (b) in order to deliver social gain, rather than primarily for commercial reasons or for … financial or other material gain …".[1] There are more than 250 Ofcom-licensed community radio stations broadcasting in locations across the UK. These services were awarded licences based on a coverage and planning policy that limited the transmission power and the coverage radius to typically around 5km for FM.

2.2 In order for us to take into account the different requirements of individual stations, we have decided to invite licensees to request changes to their current licence requirements, if they wish. The statement on Community radio: future licensing and technical policy (April 2017) explains these changes, which are also consistent with our updated Coverage and planning policy for analogue radio broadcasting services (7 June 2018).

2.3 Accordingly, where appropriate, Ofcom invites community radio licensees to request technical changes to their transmission arrangements to:

a) improve existing coverage within their licensed coverage area; and

b) in specific circumstances, extend their licensed coverage area[2].

There is no formal 'window' for these applications, but licensees should be aware that Ofcom will deal with applications on a case-by-case basis, depending on available resources and other priorities. It therefore may be a number of months before we can turn to assess the application.

2.4 Existing community radio services can find their current licensed coverage area maps are on our website.

2.5 Every community radio licensee holds a community radio licence (granted under the Broadcasting Act 1990 ("BA")), and also a Wireless Telegraphy Act ("WTA") licence. The WTA licence authorises radio transmissions for the purposes of broadcasting. It does this by setting out the maximum technical limits on power and direction of transmissions (among other things). Radio transmissions are authorised if they are within those limits. Exceeding the limits of the authorisation set out in the licence can be, in some cases, an offence under the Wireless Telegraphy Act 2006.

[1] Section 3(1) of the Community Radio Order 2004 ("CRO")

[2] In Section 3 of this document you can find guidance about the difference between coverage improvements and extensions.

2.6 We recommend that licensees first check the existing transmission limits in their WTA licence, to see if they are making full use of their equipment to reach these upper limits. If not, there might be scope for changing or upgrading equipment in order to improve the radio signal while remaining within the limits authorised under their WTA licence Schedule Part 1 and the coverage limit in the community radio licence as it stands now. If this were possible, there would be no need to apply to Ofcom for a change to their licences. We also recommend that licensees check the key commitments and other technical specifications in their licences.

2.7 Applications for extension requests will be published on the community radio page of our website. A copy of the application form, accompanying letters of support and details of transmission parameters will be published with the following information redacted:

- Name and contact details of the applicant/person submitting the form
- Personal information from letters of support
- Details of the proposed transmission site(s)
- Proposed technical parameters for the proposed transmission sites(s)
- Application annexes such as photographs of proposed transmission site(s)

Ofcom will accept representations up to one month following publication before we make a formal decision.

2.8 If this is not possible and a licensee wishes to apply to Ofcom for an improvement to existing coverage or an extension to the licensed coverage, Ofcom may approve this by varying the licensee's community radio licence and WTA licence, as appropriate.[3] If a licensee has applied for an extension to the licensed coverage area, Ofcom can approve this if the extension is not significant or can otherwise be justified in the exceptional circumstances.[4]

2.9 The success of an application is, amongst other things, dependent on frequency availability and whether there may be an increase in harmful outgoing interference to other stations. In addition to its broadcasting functions and duties, Ofcom has overarching legal statutory duties which relate to using the radio frequencies (which are limited and therefore a scarce resource) efficiently.[5] For this reason, Ofcom is keen to enable best use of the spare radio

[3] Ofcom has the power to vary a community radio licence in accordance with Section 86(5) BA and Condition 21 of the relevant licence. Ofcom has the power to vary the terms of a Wireless Telegraph Act licence (including technical limits) with the agreement of the licensee in accordance with Schedule 1 of the Wireless Telegraphy Act 2006.

[4] Ofcom also has an explicit power to agree to an extension of the licensed coverage area pursuant to sections 106(4) – (6) BA (as amended by the Communications Act 2003 ("CA") and the CRO).

[5] Section 3(2)(a) CA.

frequency capacity in different parts of the country by community radio broadcasters, but not in such a way that harmful radio interference can occur between radio stations, or between radio uses and other uses of the radio spectrum. The frequencies available for community broadcasting are different in different parts of the country, owing to the fact that there are other pre-existing users in different places.

2.10 We are only inviting applications from FM and AM services with a community radio licence (i.e. already broadcasting under an Ofcom community radio licence). Services that have been awarded a community radio licence, but that are not on air and do not hold a licence on the day of the closing of the application, cannot apply for a coverage extension or improvement now.

2.11 If an application is successful, the change will apply for the licence period and any subsequent extensions.

2.12 Ofcom will not charge any fees for applications for coverage improvements or extensions.

# 3. General guidance for coverage changes

## Our objectives

3.1 Our aims are to give existing community radio licensees the opportunity to apply for: 1) an *improvement to their radio broadcast signal* if they suffer from significant and harmful interference or other forms of poor coverage within their existing licensed coverage area, and 2) an *extension of their licensed coverage area* into an adjoining area or locality.

3.2 For some community radio services, it might be possible to improve coverage without applying for a change. Accordingly, licensees should first check the technical conditions in their WTA licence and assess if there might be scope for changing or upgrading equipment in order to improve the radio signal while remaining within the limits authorised under the WTA licence and the community radio licence as it stands now.

3.3 If this is not possible and a licensee wishes to apply to Ofcom for an improvement to their existing coverage or an extension to their licensed coverage, the success of an application is, amongst other things, dependent on frequency availability and any increase in harmful outgoing interference to affected stations.

## Difference between applying for a change to your licence(s) for an existing coverage improvement and a coverage extension

3.4 A coverage improvement within an existing licence area is designed to:

a) Help overcome significant and harmful incoming interference on your frequencies by making the signal more robust within your existing licensed coverage area and making it easier for people in that area to receive the signal;
b) 'Fill a hole' in the reception of your service within your existing licensed coverage area. An area of non-existent or very poor reception of your service will usually be caused by terrain or buildings blocking reception;
c) Ensure that the overall size of the licensed coverage area is not greatly increased as a result of 'overspill' into surrounding areas; and
d) Ensure that the description of the licensed area in your Key Commitments in your community radio licence is unlikely to require amendment, as a result of any coverage improvement.

3.5 A coverage extension is designed to result in a coverage area which is larger than the existing licensed area (when measured at 10m above ground level for a field strength of 54dBuV/m). This might include a neighbouring town/area that is currently unable to receive the service (and a subsequent variation to the licensed area in your Key Commitments in your community radio licence may result in the addition of another town/area).

## Technical ways to improve or extend your coverage

3.6 Poor coverage can be the result of many different factors, including interference from other services or because of poor coverage from your own transmitter.

3.7 There are different technical solutions to improve or extend the coverage of your service, explained further below:

a) Improvements at your existing transmitter site, for example by:

i) Improving your aerial, for example by changing the aerial height or pattern
ii) Increasing the power of your transmitter

b) Changing transmission site
c) Building an additional relay transmitter

3.8 Community radio licensees should read the guidance below about the different ways to change coverage and assess the best way to improve or extend the coverage of your service.

3.9 As stated above, it may be possible to improve coverage within the limits authorised under a WTA licence (and community radio licence) as it stands now. For example, if your licence allows you to have an aerial at a maximum 20 metres above the ground on your transmitter site, but your aerial is only 10 metres high, you can increase the height of your aerial without applying for a change. You can also check that your aerial is radiating the maximum allowable power in both the vertical and the horizontal plane (if your licence allows this). Adjustments to the mounting of your aerial may be required to achieve this.

3.10 If it is not possible to improve your coverage within the limits authorised under a WTA licence (and community radio licence) as it stands now, and you want to apply to Ofcom for an improvement to existing coverage, the more realistic your proposal is, the more likely it is to be successful.

3.11 It is possible to request more than one technical change. You can combine two options, for example, by moving your transmitter site and building a relay transmitter, to improve or extend your coverage.

3.12 You may also provide Ofcom with more than one option to fulfil your coverage aspirations, if you are not completely sure if your preferred technical change would be the best way to

reach your coverage goals. For example, you can apply for a power increase as your preferred option and apply for a relay transmitter as a second option, in case the power increase will not give you the desired coverage (or is not an available option in your circumstances).[6]

## Transmitter site – general guidance

3.13 There are both technical and practical considerations which should be considered if you are considering improvements to your coverage area in relation to the transmitter site.

3.14 VHF FM signals generally work best over a line of sight path. That means that signals are easiest to receive when they travel in a straight line from the aerial until they meet an obstacle or become too weak to provide satisfactory reception.

3.15 In some instances, signals can bend around buildings or landscape and thereby increase the distance travelled beyond line of sight. The coverage planning tool used by Ofcom takes these factors into account.

3.16 Therefore, buildings and the landscape can reduce the strength of the signal (or stop it altogether) as the signal does not travel well around obstacles. Even natural obstructions like trees can significantly attenuate signals.

3.17 When the transmitter height is lower than the surrounding landscape (for example, in a valley, or if it is surrounded by tall buildings), an increase in power will have little effect in increasing the coverage. If the transmitting aerial is not sufficiently elevated above the surrounding building clutter, the received signal maybe distorted by signal reflections.

3.18 The higher the transmitting aerial is in relation to the surrounding area, the better coverage is likely to be. As a rule of thumb, a doubling of height is roughly equivalent to a quadrupling in power.

3.19 Increasing the aerial height is preferable to increasing the power as the impact to other stations is likely to be less severe. An increase in power may give rise to out-going interference or prevent the same frequency being used at a different location.

3.20 Your transmitter needs to be close to the target audience. A transmitter on the edge of your area may not provide good coverage to the listeners you want to serve. You should consider whether there is a church tower or tall building in a central location which you could use.

3.21 Sometimes, if there are flats or houses very nearby, your transmitter may cause reception problems for nearby listeners of other radio services. This is known as blocking. Having the

[6] If you apply for a site move or a relay transmitter, you must provide the exact details of the new transmitter site, even if you applied for it as a second option.

transmitter aerial sufficiently high should help to minimise the problem. The onus will be on you to rectify any reception issues in nearby buildings and dwellings.

3.22 There are also a number of practical considerations. You should consider:

- whether you will need planning permission at your chosen site. Securing planning permission, particularly on listed buildings, can be a lengthy process.
- whether the prospective site is secure enough and whether it will be cost-effective and affordable over the duration of your licence.
- the availability of a reliable mains supply and, if your transmitter is some distance from the studio, whether you can get your signal from the studio to the transmitter, for example using a radio link or a line fed circuit.

3.23 A short guidance video about choosing a transmitter site is available on YouTube.

3.24 Please ensure that you give us the correct details of the location of the new site. We are unlikely to be able to accept site changes after we have agreed to a proposed coverage improvement or extension.

## Aerial

3.25 The aerial you use to broadcast your service influences your coverage. Further guidance is provided in Annex 1 to this document. Our key advice is as follows:

- Stations without restrictions should use omni-directional aerials;
- Simple, vertically polarised aerials are less prone to problems than complex arrays; and
- Height is might! Ensure aerials are mounted away from local obstructions and at least three metres away from surrounding metallic roofs and objects. See below discussion on potential changes to the transmitter site for further guidance on aerial height.

3.26 You do not need to apply for changes in the first two cases, provided you comply with any restrictions. You would need to apply for a change if you were seeking to exceed the licensed maximum aerial height.

## Power increase

3.27 An increase of the power of a transmitter can improve and extend the coverage, but it also has some disadvantages. An increase in power may result in harmful outgoing interference to existing services, sometimes quite far away. Outgoing interference may be a reason for Ofcom to reject an application. It can also result in an obligation to employ a directional aerial, in order to ameliorate the harmful interference. This can be costly. A transmitter capable of producing more power may also be required.

3.28 A power increase may also necessitate the fitting of additional filtering if it can interact with other transmitters operating in the vicinity, or if it is calculated to be required in order to protect aeronautical services. Such mitigation is likely to incur further costs.

## Additional relay

3.29 Building an additional relay is generally the best solution if there is an area in your licensed coverage area that cannot be reached by your current transmitter because of the terrain.

3.30 You will need to consider the surrounding terrain as relays can receive their input signals by direct reception of the main transmitter off-air signal and then rebroadcasting the received signal on another frequency. Usually relay stations operate at medium or low power and are used to fill in pockets of poor reception within, or at the fringe of, the service area of the main transmitter. Such relays may also be line-fed.

3.31 The operation of relay transmitters can come with considerable additional overheads. Careful consideration should be given to the ongoing financial burden of operation.

3.32 Relay transmitters must be licensed through Ofcom, and usually require an additional frequency, albeit usually on a lower power than your main transmitter.

3.33 Please ensure that you give us the correct details of the location of the new relay transmitter site. We are unlikely to be able to accept site changes after we have agreed to a proposed coverage improvement or extension.

## Conclusion

3.34 We recommend assessing the performance of your existing aerial system and the location of your transmitter site in the first instance. If you think you can improve your coverage by changing one of those, we highly recommend you to do so. You may be able to do this within the limits authorised under a WTA licence (and community radio licence) as it stands now. If not, you can apply to Ofcom for an improvement to existing coverage or a coverage extension. Increasing power is unlikely to resolve coverage deficiencies that are predicated by the local terrain or clutter.

3.35 Our updated Coverage and planning policy for analogue radio broadcasting services (7 June 2018) contains more detailed information.

# Improvements to existing coverage within licensed coverage area

3.36 You can apply for an existing coverage improvement change to your WTA and community radio licences if:

a) you can show us that your radio service is suffering from significant and harmful incoming interference or other forms of poor coverage in your licensed area; and
b) the request will not result in a significant extension of the coverage area. We will assess this by looking at the size of any extra area that will be covered and the size of the population in that area. We ask you to make a realistic judgement about this yourself when you apply.

3.37 You can find a map of your current licensed coverage area on the Ofcom website.

## Your application

3.38 Your application for a coverage improvement must include:

a) a completed technical change request form for community radio;

b) evidence of coverage problems in your licensed area, for example by providing complaints from listeners in specific areas, measurements and a detailed map that marks the poor coverage; and

c) a map with the areas in which you would like to improve your coverage. This can be a simple sketch map, as long as you are precise about the areas you wish to improve. Please refer to the licensed coverage area map for your service.

3.39 It is important that you send all the information we have requested when you apply to prevent delays in our assessment of your application.

3.40 Ofcom will take into account whether:

a) You have met the two conditions at paragraph 3.36 above;

b) Your request will result in an increase to harmful outgoing interference; and

c) There is competing demand for the spectrum from another community radio licensee.

3.41 In some cases, if there is a conflict between different applications in the same areas, Ofcom may need to make some difficult judgements and decide between applications. In such cases, we will use the following principles:

a) Our highest priority will be to help stations suffering significant and harmful levels of incoming interference.

b) We also wish to help stations with areas of poor reception within their existing licensed coverage area.

c) If two or more applications fall into the same category, we may need to take into account the evidence of the coverage problems that was provided.

3.42 If you cannot provide Ofcom with evidence of coverage problems but still want to improve your coverage or if you think the request will result in a significant extension of the coverage area, please request a coverage extension instead of an improvement.

3.43 If you apply for an improvement of your existing coverage but Ofcom considers that your request would result in a significant extension of your coverage area, Ofcom is likely to reject your application for a coverage improvement and ask you to resubmit your application as an extension to the licensed area.

3.44 If Ofcom approves a power increase, the addition of a relay transmitter or a subsequent site move, some technical modifications may be required (such as a restriction in the aerial pattern in a certain direction or a power reduction) if other existing services would be impacted, or if the service would extend beyond the existing licensed coverage area.

# Extension of the existing licensed coverage area

3.45 In accordance with Sections 106(4) – (6) BA, as amended, Ofcom can authorise an extension to a licensed area into an adjoining area or locality only if: it would not result in a significant increase in the licensed area, or if Ofcom considers that the increase in the licensed area is justifiable in the exceptional circumstances of the case.

3.46 When applying this test, we will take into account a range of factors, in particular the following six 'core considerations'.

## Significant increase in the licensed area

a) Whether the increase in the licensed area could be reasonably considered to be "significant";

i) in determining this, Ofcom will have regard to the size of the population increase which would result from the extension to the licensed area, and also to the size of the adjoining area or locality;

b) Whether the area or locality into which the licensee wishes to extend its coverage has a relationship or affinity to the existing licensed area (e.g. whether a coverage extension would be appropriate in view of a station's stated target community, as described in its Key Commitments 'description of character of service' in its community radio licence);

i) an extension of coverage to small villages surrounding a central town or city is less likely to be considered "significant" than an extension of coverage to another sizeable population centre. Each case will be different and will be judged on its merits.

## Exceptional circumstances

c) Whether there are any exceptional circumstances which would justify an increase which would be reasonably considered to be "significant";

i) We may take into account original application proposals; requests to extend coverage to include people in the same target community who are in neighbouring underserved areas, and whether the service is likely to cater for their tastes and interests; evidence of demand or support for services in neighbouring underserved areas; and changes to local demographics, for example.

## Other considerations

d) Whether there are any exceptional circumstances which would justify an increase which would be reasonably considered to be "significant";

e) The impact that a change (e.g. the addition of a relay transmitter or an increase of the power of an existing transmitter to bring coverage to an extended area) would have on frequency availability over a (much) wider area; and

f) The potential impact on other licensed commercial and community radio services;

i) We will consider how much the proposed extended coverage would geographically overlap with existing commercial and community radio stations. Where a community radio licence has a restriction on funding (a cap on income from on-air advertising and sponsorship of £15,000 per year) due to overlap with a commercial service, we are unlikely to agree to an extension that would increase the overlap with that service. Where an extension would extend coverage of one service into the core area of an overlapped commercial or community service (for example into the main town served by that station) we may not agree to a request.

3.47 Each station must already be providing a service that conforms with the 'characteristics of service' legal requirements for community radio, as set out in their licence in accordance with Section 106(1) BA, as amended. It must define its target community or communities (people in an area or locality, or a community of interest) and provide benefits that are accessible to people across the proposed coverage area. These include (but are not limited to):

a) giving opportunities to members of the target community to participate in the station (e.g. as volunteers producing content or running the station);[7]
b) delivering benefits (social gain) to the target community, including providing training.[8]

These obligations will continue if an application for an extension is granted.

3.48 If there is a conflict between applications in the same area, requests for coverage improvements within the existing licensed area will be considered first and available frequencies will be used for coverage improvements first.

## Your application

3.49 When you apply for an extension of your licensed coverage area you need to put forward a reasoned argument as to why an extension of the existing licensed area into an adjoining area or locality is requested, along with supporting evidence.

3.50 Your application for a coverage extension must contain a completed technical change request form for community radio, including:

a) a description of the area you wish to extend existing coverage to include (e.g. the streets, council ward(s) or town), along with a map illustrating the area concerned (a map with the requested area marked/circled);
b) the reason why you are requesting an extension into this area;
c) an estimate of the size of the population in the area you wish to extend into and the source of this information (e.g. local council statistics) and any evidence of demand or support for the service in the extended area;
d) whether the area or locality into which you wish to extend coverage has a relationship or affinity to the existing licensed area, and a description of that relationship or affinity;
e) whether there are any exceptional circumstances which would justify an increase which would be reasonably considered to be "significant";
f) a short description of how the station will provide a community radio service for the target community in the extended area, in accordance with the characteristics of service requirements set out in paragraph 3.47 above; and
g) any other reasons for the request that you wish us to consider.

3.51 Ofcom will consider your request (along with your reasons and the evidence you provide with the application) in accordance with the statutory requirements and six core considerations referred to above.

3.52 We advise stations to consider their requests carefully, taking into account the matters set out above.

[7] Section 3(4) CRO
[8] Section 3(3) CRO

## Likelihood of success for applications

3.53 Your application is likely to be successful if:

a) you make a reasonable and realistic proposal, taking into account the factors set out above; and
b) there is sufficient spectrum resource available in your area.9

3.54 Your application is not likely to be successful if:

a) we are unable to identify a suitable frequency available in your area;
b) the change would cause or increase harmful outgoing interference to existing services;
c) your transmission proposals are technically unsuitable for the requested improvement or extension;
d) the proposal is deemed to be spectrally inefficient (e.g. if you are requesting a power increase where an improved transmitting aerial or use of a better transmission site would provide a much better coverage improvement whilst minimising outgoing interference); or
e) your application is incomplete.

[9] The general scarcity of spectrum means that it will in most parts of the UK not usually be possible to add more resources (power, relays) to a radio licence during its term. This has to do with avoiding interference to existing services. Areas with high frequency congestion do typically already have transmitters at higher power levels. In these areas, it is less likely that applications for coverage changes will be successful.

# 4. Process of assessment of applications

## Application

4.1 Ofcom will process applications on a first-come, first-served basis.

4.2 Applications for coverage extensions will be published on the website and Ofcom will accept representations up to one month following the publication before a formal decision is taken.

4.3 Applications for site moves and coverage improvements will not be subject to publication.

4.4 The assessment of an application for a coverage improvement or extension will be based primarily on the proposal presented in the completed application. While assessing an application, Ofcom may seek clarification and/or further information relating to a proposal.

4.5 Ofcom will assess the applications based on the considerations that are set out in Section 3 of this document.

## Decision

4.6 Ofcom will send you a letter (by email) that will tell you if your application is successful or if it is rejected. If the decision relates to an extension of the licensed area, Ofcom will send you the reasons it is approving the request, which will ultimately be published in one of our radio broadcast monthly updates.

4.7 If your application is unsuccessful, you will be contacted in writing to set out the reasons for the decision.

## Positive decision

4.8 If your application is successful, Ofcom will send you details about the steps to take next in order for you to make the approved technical change.

4.9 The following steps will be part of the procedure:

a) You will need to confirm that you want to go ahead with the change. Any necessary permissions such as planning permission should be in place before any coverage improvement or extension is implemented.

b) Ofcom will carry out the formal clearance process, which includes seeking agreement from outside agencies (such as the Civil Aviation Authority). Typically, this may take around 4-8 weeks. In some circumstances, for example, where a station is near to the coast, international coordination may also be required which can take up to six months - this period of time is by international agreement to which Ofcom is a signatory.

c) Your site will probably need to be (re-)commissioned to ensure the new transmission installation complies with Section 2 of the Ofcom Site Engineering code for Analogue Radio Broadcast Transmission Systems. This entails an Ofcom engineer visiting your transmission site to check your installation (although self-commissioning is possible).

d) Ofcom will make any necessary changes to your community radio and WTA licences.

4.10 Please be aware that the final site details should be the same as the details in the application. We are unlikely to be able to accept site changes at a subsequent stage (i.e. after we have agreed to your proposed coverage improvement or extension).

4.11 All improvements and extensions must be implemented within 12 months of clearance being completed, otherwise Ofcom reserves the right to reduce the transmission parameters to the original levels.

## 4. Process of assessment of applications

# 5. Guidelines and procedures for submitting applications

5.1 Documents for applicants are available on the Ofcom website. These include:

a) a technical change request form (application form) for community radio; and
b) our coverage and planning policy for analogue radio broadcasting services.

5.2 If you have any questions about the application process, please email us at broadcast.licensing@ofcom.org.uk

5.3 You should submit your completed application form by email to broadcast.licensing@ofcom.org.uk. You can submit supporting documents in all conventional document formats (for example .docx, .rtf, .pdf or .jpeg). We do not require a paper copy of your completed document, but if any of the permissible supporting documentation is only available as paper copies, these should be sent to Community Radio Licensing, Ofcom, Riverside House, 2a Southwark Bridge Road, London SE1 9HA.

5.4 One electronic copy of a completed application form, and any paper copies of the supporting documentation, must be received by Ofcom no later than the closing date specified in Section 2 of this Notice. Applications received after the specified date will not normally be accepted. Receipt of an application will be acknowledged (usually by email). If you have not received a personalised response after sending in an application, you will need to contact Ofcom (at the email address specified above) to check that the submission has been received (automated delivery messages cannot be relied upon; nor can 'bounceback' messages be guaranteed if an email is rejected by Ofcom's server).

5.5 In connection with the electronic submission of documents, applicants should be aware that email is not an instant means of communication, especially when there are large attachments. If you have a number of large documents to submit, you may need to send them by separate emails (or as compressed files). It is recommended that an email should not have attachments larger than 10 megabytes in total size to reach Ofcom's community radio email inbox. Applicants are strongly advised to submit email applications at least 48 hours in advance of the closing date, so that urgent steps can be taken by the applicant if no acknowledgement from Ofcom is received.

5.6 Material amendments to the application may be made by the applicant after the submission of the application.

# A1. Guidance on transmitting aerials

## Practical transmitting aerials for VHF FM community radio

A1.1 VHF FM broadcasting within the UK commenced in the 1950s with the aim of providing better sound quality and greater noise reduction than what could be delivered via the Medium Frequency (AM) waveband. The AM band was also crowded and services were often subject to heavy interference from distant stations during the hours of darkness. The FM system was designed to operate with a single plane of polarisation and all services at the time employed horizontally polarised (HP) transmitting aerials. FM coverage is planned to a given field strength contour achieved with a 'reference' directional receiving aerial mounted at 10 metres above ground level because when the system was established, it was assumed that reception would be to fixed receivers.

A1.2 HP was primarily chosen for the FM sound broadcasting service because the receiving aerials can be positioned to provide better directivity and this can help to reject interfering signals. Such aerials are normally mounted on rooftops and are directed towards the nearest main FM transmitting station.

A1.3 Later it became much more common for listeners to consume FM radio through portable sets and car receivers. Such receivers use aerials which are (mostly) vertically polarised (VP). VP is also better suited for low receiving aerial heights.

A1.4 FM transmission systems were modified to add a VP component to their radiated signal to better serve this increasingly popular mode of reception and it quickly became the optimum polarization for FM broadcasting. The HP component became optional for new stations as it provided only limited benefit in areas where interference to fixed installations could be ameliorated by the additional directivity that HP receiving aerials can provide.

A1.5 Given the decline in the use of directional HP aerials for reception, and that because ones may not necessarily be in use or be pointed favourably, it may be worthwhile for those planning a new service to consider only implementing VP. There are advantages that may not necessarily be recognised by all suppliers and installers.

A1.6 Wherever possible, community radio services in the UK are assigned frequencies that can be placed into service without any constraints on the radiation characteristic of their signal beyond the maximum power permissible. Where required, directional restrictions are usually put in place to protect other broadcasting services in adjacent areas from

unacceptable interference. Even when there is a restriction, it can usually be achieved with a common 'centre-fed dipole' mounted on a pole, a 'yagi' or 'cardioid' type transmitting aerial. These aerials are simple, effective and low-cost.

A1.7 Where there are no directional restrictions, the best aerial for most community radio services is the 'end-fed dipole'. As well as being readily available and least-cost, it enables the service to radiate the full licensed power level on all compass bearings. There is no benefit in using directional aerials where there is no restriction in place. In fact, doing so is most likely to result in a smaller coverage area.

A1.8 Community radio operations are most often sensitive to cost and are resource constrained. New operators might wish to consider not just the capital cost of the transmission system, but also the ongoing cost of ownership of their transmission system.

A1.9 Operators are required to demonstrate the radiating properties of unusual or exotic aerials. This is to ensure that there is no interference to existing broadcasting stations or to the aeronautical services which occupy the upper adjacent band. Unusual aerials must therefore be modelled using a computer application based on the Numerical Electromagnetics Code (NEC). The cost of this modelling can be high as it can be a complicated task. This modelling is usually an additional cost - sometimes exceeding that of the aerial itself.

A1.10 Certain designs of transmitting aerials provide omni-directional mixed or circularly polarised signals, but they can rarely provide the theoretical performance without considerable NEC modelling, careful optimisation and commissioning. These aerials tend to be far more complex and therefore field strength measurements should be taken throughout the predicted coverage area during the test transmission period and the results correlated to verify that the performance is in line with the expected performance.

A1.11 Such measurements are essential as otherwise there is no way to determine if the radiated signal is optimal – even if the transmitter is indicating a good match. It is also important to establish a reference to compare against further periodical measurements that are also necessary to confirm that the array is continuing to perform normally. Debugging defective arrays is also expensive and requires the services of specialist riggers.

A1.12 As has been implied, complicated aerials are formed of more elements and connections than the simple aerials that have been mentioned previously. Added complexity increases the probability of water ingress, phasing errors and bad connections. As a failure might only occur in a portion of a complex array, the transmitter may well continue to operate with little to indicate that something is wrong. It may also be that the return loss (or reflected power) does not increase noticeably - particularly if the feeder cable is very long. This can result in deficient coverage which can persist for months or even years.

A1.13 Failure in simple aerials tends to be more clearly indicated on metering of the transmission apparatus. While a failure can be more dramatic, and at worst cause a break in transmission, it should be a simple matter of replacing the failed aerial. Simpler aerials are also inexpensive enough that a spare could be kept in reserve. They are also more likely to be available from stock, or otherwise with a shorter lead-time. This can also save additional expenditure of an emergency temporary aerial system.

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