

1. Overview

- 1.1 On 25 July 2019, Ofcom published a Statement, *Enabling wireless innovation through local licensing*, which sets out two new licence products we are introducing to make it easier for a wider range of users in the UK to access radio spectrum on a shared basis.¹
- 1.2 These are:
- a) **the Shared Access licence**, which gives access to four spectrum bands which support mobile technology; and
 - b) **the Local Access licence**, which provides a way for other users to access spectrum which has already been licensed to the UK's Mobile Network Operators (MNOs), in locations where an MNO is not using their spectrum.
- 1.3 This document is about the **Shared Access licence**, and is intended to outline everything that new users (who might not be familiar with obtaining licences from Ofcom or be aware of what spectrum options are available) need to know about the new Shared Access licence product. It includes information on how much the licence costs, how you can apply for a licence, and what terms and conditions you have to adhere to if you have a licence.
- 1.4 You can find the guidance document for the **Local Access licence** on the Ofcom website.²
- 1.5 The Shared Access licence may open up new options for users, such as small businesses and community groups which could support innovation and enable new uses. The licence could be useful for all sorts of different businesses and industries, such as those set out in the graphic below.

¹ Ofcom, *Enabling wireless innovation through local licences: Shared access to spectrum supporting mobile technology*, 25 July 2019, https://www.ofcom.org.uk/_data/assets/pdf_file/0033/157884/enabling-wireless-innovation-through-local-licensing.pdf

² Ofcom, *Local Access licence: Guidance document*, 25 July 2019, https://www.ofcom.org.uk/_data/assets/pdf_file/0037/157888/local-access-licence-guidance.pdf

- 1.8 In the future, we may look to make additional bands available under the same spectrum sharing framework as appropriate.
- 1.9 The type of application you want to provide will determine which band is most appropriate for you, as the characteristics and bandwidth available in each band differs.
- 1.10 For example, lower frequencies such as in the 1800 MHz or 2300 MHz shared spectrum have better propagation characteristics; this means that transmissions in these bands can “bend” around obstacles or penetrate through buildings much more easily than at higher frequencies. However, the smaller amount of bandwidth available in these two bands (2 x 3.3 MHz and 10 MHz respectively) means that you probably can’t use these bands for applications that need to transmit large amounts of data. If you need larger bandwidth, the 1800 MHz shared spectrum could be coupled with licence exempt LTE in the 5150-5925 MHz band (3GPP Band 46) to provide additional channels to support higher capacity applications.
- 1.11 The table below shows some examples of different uses which the different bands could be suitable for. This is not intended to be an exhaustive list, and you might find other uses we haven’t included.
- 1.12 It is not permitted to use the 3.8-4.2 GHz band to provide national mobile broadband services; we’re preparing to award national licences for spectrum in the 3.6-3.8 GHz band for that purpose.

Table 1: Potential uses for the four shared access bands

Uses	1800 MHz shared spectrum	2300 MHz shared spectrum	3.8-4.2 GHz	Lower 26 GHz band
Private network	✓ (narrowband)	✓	✓	✓ (indoor)
Mobile coverage (rural)	✓	certain locations ³	✗	✗
Mobile coverage (indoor)	✓	✓	✗	✓
Fixed wireless access ⁴	✗	✗	✓	✓ ⁵

³ Due to coexistence with other users, the availability of medium power licences in the 2300 MHz shared spectrum will be limited initially.

⁴ Fixed wireless access (FWA) networks provide an alternative solution to traditional fixed broadband services. These networks use a wireless link for the final connection to a home or business, avoiding the installation of a line into the building.

⁵ FWA is available through existing fixed links authorisation. However, we are not encouraging people to apply for new licences in the band. See paragraph 5.29 of our Statement for more information.

- i) GCHQ Bude, Cornwall
 - ii) RAF Menwith Hill, North Yorkshire
- e) In the lower 26 GHz band, we are not initially accepting applications within 1km of each of the following radio astronomy sites:
- i) Harwell Earth Exploration Satellite Service earth station, Oxfordshire
 - ii) Jodrell Bank Observatory, Cheshire
 - iii) Cambridge Radio Astronomy Site
- f) There are some restrictions in the Crown Dependencies:
- i) On the Isle of Man, neither the 1800 MHz or 2300 MHz shared spectrum bands are available. Use of the other bands may be possible but you might need to talk to the Isle of Man Communications Commission⁷ as well as Ofcom.
 - ii) On the Channel Islands, the 1800 MHz shared spectrum is currently unavailable. Use of the other bands may be possible but you might need to talk to the Channel Islands Competition & Regulatory Authorities⁸ as well as Ofcom.

2.22 Additionally, while these are not restrictions, users should also be aware of the following:

- a) **1800 MHz shared spectrum:** It's possible that users of the 1800 MHz shared spectrum could experience periodic interference from MOD use of this band in some locations. This could happen near three specific sites: RAF Colerne in Wiltshire, RAF Oakhanger in Hampshire, and RAF Menwith Hill in North Yorkshire. We consider the risk of interference to be very low.
- b) **2300 MHz shared spectrum (in band):** Users of this band should be aware that the band is shared by amateur radio users. These uses are mainly temporary and we expect the risk of interference to be very small. However, it is possible that Shared Access licence users in this band could experience interference from amateur radio users, as Ofcom does not coordinate these. If you do receive interference to your licensed equipment, you can report this to Ofcom – although it should be noted that Ofcom cannot guarantee spectrum will always be free of interference.⁹
- c) **2300 MHz shared spectrum (adjacent band):** The 2400 MHz band, adjacent to the 2300 MHz shared spectrum, contains a number of different services. These include Wi-Fi, Zigbee (used, for example, in smart meters and home automation) and Assistive Listening Devices (ALDs), devices used in conjunction with hearing aids to help people with hearing impairments hear properly.

⁷ <https://www.iomcc.im/>

⁸ <https://www.cicra.gg/>

⁹ You can find more information on doing this on the Ofcom website: <https://www.ofcom.org.uk/spectrum/interference-enforcement/troubleshooting-interference/reporting-interference>

- i) To avoid interference to Wi-Fi and Zigbee, it's probably best to make sure your Wi-Fi access point or smart meter is not located next to (i.e. within a few metres of) your 2300 MHz shared spectrum base station.
 - ii) Regarding ALDs, we'd advise prospective users of the 2300 MHz shared spectrum to consider very carefully if they intend to install a base station anywhere ALDs are likely to be used. In particular, we'd advise against using this band inside a school and recommend that you consider if any of the other shared access bands might suit your intended application instead. This is because younger school pupils who use hearing aids and ALDs are much less likely than adult users to understand why their devices are not working correctly, if these were receiving interference from mobile terminals or base stations in the 2300 MHz shared spectrum in the same location.
- d) **3.8-4.2 GHz band:** We don't expect that this spectrum will be used as part of national mobile networks. Users looking to provide wide-area coverage should look for spectrum in other bands.

How to apply for a licence

- 2.23 To apply for a Shared Access licence, you'll need to fill in an application form. You'll be able to access the form on the Ofcom website¹⁰.
- 2.24 Once you've filled in the licence application form, email it to the Ofcom Licensing Team at spectrum.licensing@ofcom.org.uk.
- 2.25 Once you send in your completed application form, we'll carry out a technical assessment to make sure your new deployment wouldn't interfere with anyone else's equipment – and that their equipment won't interfere with your deployment. We'll notify you of the result of our assessment, and if your application is successful we'll assign you a frequency to transmit on.
- 2.26 If you're happy with the frequency we've assigned you, we'll then send an invoice and request payment. You have 30 days to pay for the invoice. Once you pay your licence fees, we'll then issue you with your licence.
- 2.27 This process is summarised briefly in the graphic below.

¹⁰ <https://www.ofcom.org.uk/manage-your-licence/radiocommunication-licences/shared-access>

- 2.35 If we decide to transition to DSA in the future, we will vary the Shared Access licences. When we do this, the new licence may include an additional requirement for equipment to be able to contact any future DSA database.
- 2.36 When we introduce DSA in the shared access bands, the first come, first served principle will remain. This means that existing installations would generally be able to continue their deployment as long as their equipment remains operational and, once an automated database is in place, they continue to request spectrum from the database and comply with any technical parameters, for example, in relation to maximum transmission power, etc.

3. The low power Shared Access licence

- 3.1 Rather than authorising one specific base station, the low power licence authorises any number of base stations located in a circular area with a radius of 50 metres, centred on a coordinate provided to Ofcom by the user.
- 3.2 You can connect fixed, mobile or nomadic terminals to any base stations operating within the area covered by your licence, and these terminals will also be authorised by your licence.
- 3.3 Additionally, mobile and nomadic terminals connected to base stations using the 1800 and 2300 MHz shared spectrum will also be licence exempt.
- 3.4 Users are free to deploy as many base stations as they like in the licensed area, and can move base stations around within this area without needing to inform Ofcom of such changes.
- 3.5 If you want to deploy base stations in a larger area, you can apply for multiple areas as part of the same licence application. It could be that you need these areas to be next to each other and overlapping, as shown in Figure 4 below, or spaced out around a larger site, like in Figure 5 further down.

restricted to indoor use only and will be breaking your licence conditions if you deploy outdoors.

Technical conditions

3.12 The following table contains the technical conditions for the low power Shared Access licence. You should consult the licence for the full technical conditions.¹¹

Table 2: Technical licence conditions for low power Shared Access licence

Condition	Parameters (by band)			
	1800 MHz shared spectrum	2300 MHz shared spectrum	3.8-4.2 GHz	Lower 26 GHz band
Permitted deployment	Indoor and outdoor Outdoor antennas limited to 10m height above ground	Initially likely to be widely available for indoor only Outdoor antennas limited to 10m height above ground	Indoor and outdoor Outdoor antennas limited to 10m height above ground	Indoor only
Authorised bandwidth	2 x 3.3 MHz	10 MHz	10, 20, 30, 40, 50, 60, 80 and 100 MHz	50, 100, 200 MHz
Maximum base station power	24 dBm / carrier (up to 3 MHz) ¹² (EIRP)	24 dBm / carrier (up to 10 MHz) (EIRP)	24 dBm / carrier for carriers ≤ 20 MHz; or 18 dBm / 5 MHz for carriers > 20 MHz (EIRP)	23 dBm / 200 MHz (TRP)
Maximum terminal station (TRP for mobile/nomadic; EIRP for fixed)	23 dBm	25 dBm ¹³	28 dBm ¹⁴	23 dBm
Frame structure requirements	N/A	3:1 structure for all outdoor deployments	N/A (but see notes below)	N/A

¹¹ Ofcom, *Enabling wireless innovation through local licences: Annexes 6-10*, 25 July 2019,

https://www.ofcom.org.uk/_data/assets/pdf_file/0036/157887/annexes-6-10-licences-and-interface-requirements.pdf

¹² This power will only be available over 3 MHz of the 3.3 MHz bandwidth as existing power density requirements restrict the power in the first 200 kHz and last 100 kHz of the bandwidth

¹³ The authorisation will list this as 25 dBm **including** a 2 dB tolerance consistent with the European harmonisation.

¹⁴ The authorisation will list this as 28 dBm **including** a 2 dB tolerance consistent with the European harmonisation.

3.13 The tables on the following pages outline the out of channel and in band/ out of band emissions limits for the four Shared Access bands. You need to ensure your equipment complies with these limits.

Table 3: 1800 MHz shared spectrum base station in band emission limits

Frequency offset from the lower frequency of the band edge	Maximum mean EIRP density
0 to 0.05 MHz	$-33.6 + 153.3 \times \Delta_{FL}^*$ dBm / kHz
0.05 to 0.1 MHz	$-26 + 60 \times (\Delta_{FL}^* - 0.05)$ dBm / kHz
0.1 to 0.2 MHz	$-23 + 230 \times (\Delta_{FL}^* - 0.1)$ dBm / kHz
0.2 to 3.2 MHz	24 dBm / carrier
3.2 to 3.3 MHz	$-23 + 230 \times (3.3 - \Delta_{FL}^*)$ dBm / kHz

* Note: Δ_{FL} in MHz is the offset from the lower edge of the permitted frequency band at 1876.7 MHz (it has values in the range 0 to +0.2 MHz and +3.2 to +3.3MHz)

Table 4: 1800 MHz shared spectrum base station out of band emission limits

Frequency offset from the lower frequency of the band edge	Maximum mean EIRP density
-6.2 to -3.2 MHz	-55 dBm / kHz
-3.2 to 0 MHz	$-45 + 10 \times (\Delta_{FL}^* + 0.2)/3$ dBm / kHz
Frequency offset from the upper frequency of the band edge	Maximum mean EIRP density
0 to 0.05 MHz	$-23 - 60 \times \Delta_{FH}^*$ dBm / kHz
0.05 to 0.1 MHz	$-26 - 153.3 \times (\Delta_{FH}^* - 0.05)$ dBm / kHz
0.1 to 2.8 MHz	$-45 - 10 \times (\Delta_{FH}^* + 0.2)/3$ dBm / kHz
2.8 to 5.8 MHz	-55 dBm dBm / kHz

* Note: Δ_{FL} in MHz is the offset from the lower edge of the permitted frequency band at 1876.7 MHz (it has values in the range -3.2 to 0 MHz)

Δ_{FH} in MHz is the offset from the upper edge of the permitted frequency band at 1880 MHz (it has values in the range 0 to 2.8 MHz)

Table 5: 2300 MHz shared spectrum base station out of band emission limits

Frequency	Maximum mean EIRP density
2385 to 2390 MHz 2400 to 2403 MHz	(Pmax - 40) dBm / 5 MHz EIRP per antenna
2300 to 2385 MHz	(Pmax - 43) dBm / 5 MHz EIRP per antenna
Above 2403 MHz	-17 dBm / 5 MHz EIRP*

* The maximum mean power relates to the EIRP of a specific piece of Radio Equipment irrespective of the number of transmit antenna.

Pmax is the maximum mean carrier power for the base station in question.

Table 6: 3.8-4.2 GHz base station out of channel emission limits

Frequency offset	Maximum mean EIRP density
-5 to 0 MHz offset from lower channel edge 0 to 5 MHz offset from upper channel edge	(Pmax - 40) dBm / 5 MHz EIRP per antenna
-10 to -5 MHz offset from lower channel edge 5 to 10 MHz offset from upper channel edge	(Pmax - 43) dBm / 5 MHz EIRP per antenna
Out of block baseline power limit (BS) < -10 MHz offset from lower channel edge > 10 MHz offset from upper channel edge	(Pmax - 43) dBm / 5 MHz EIRP per antenna

Table 7: 3.8-4.2 GHz base station out of band emission limits

Frequency	Maximum mean EIRP density
3795 MHz-3800 MHz 4200 MHz-4205 MHz	(Pmax - 40) dBm / 5 MHz EIRP per antenna
3760 MHz-3795 MHz 4205 MHz-4240 MHz	(Pmax - 43) dBm / 5 MHz EIRP per antenna
Below 3760 MHz Above 4240 MHz	-2 dBm / 5 MHz EIRP per antenna

Table 8: 24.25-26.5 GHz base station and terminal station out of channel and out of band emission limits

Condition	Parameters
Maximum base station out of channel power (TRP)	<i>Up to 50MHz below or above channel edge: 12dBm / 50MHz</i> <i>Beyond 50MHz below or above channel edge: <4dBm / 50MHz</i>
Maximum base station power in the frequency range 23.6-24.0 GHz (TRP)	-42dBW/200MHz
Maximum terminal station power in the frequency range 23.6-24.0 GHz (TRP)	-38dBW/200MHz

Synchronisation

- 3.14 Synchronisation is not required in
- the 1800 MHz shared spectrum;
 - the 2300 MHz shared spectrum for indoor deployment;
 - the 3.8-4.2 GHz; and
 - the lower 26 GHz band.
- 3.15 Synchronisation is required in the 2300 MHz shared spectrum for outdoor deployment. There may be some circumstances where it is required in the 3.8-4.2 GHz band and for indoor deployment in the 2300 MHz shared spectrum.

2300 MHz shared spectrum

- 3.16 If you have a licence for the 2300 MHz shared spectrum and you have deployments outdoors, you will need to make sure your transmissions are synchronised with those of the adjacent user in the 2350-2390 MHz band (this is Telefónica). You will need to use the frame structure in the diagram below and Coordinated Universal Time (UTC) as the common reference time. A new frame should start at the start of the UTC 1 second boundary.

Figure 6: Frame structure for 2300 MHz shared spectrum¹⁵

DL/UL ratio	Subframe number									
	0	1	2	3	4	5	6	7	8	9
3:1	D	S	U	D	D	D	S	U	D	D

- 3.17 This frame structure means:

¹⁵ We refer to this as Frame Structure A in our Statement.

- timeslots (or subframes) 0, 2 to 5 and 7 to 9 must be allocated to Downlink (D) or Uplink (U) transmissions as indicated or may be left with no transmissions;
 - the licensee must ensure that the special subframe (S) in timeslots 1 and 6 has a structure that is compatible with TD-LTE special subframe configuration 6, also known as 9:3:2;
 - all timeslots must be 1 millisecond in duration and the frame must start at a common reference time so that frames are aligned with Telefónica and transmissions synchronised; and
 - TD-LTE frame configuration 2 (3:1) is compatible with this frame structure. Other technologies are permitted provided that the requirements are met.
- 3.18 If you have an indoor-only deployment this does not have to be synchronised – however, if other users (including Telefónica in the 2350-2390 MHz band as well as other users in the 2390-2400 MHz band) reports that they are receiving interference from an indoor base station, we may require this to be synchronised to the same frame structure so that all users can coexist without causing interference.
- 3.19 If Telefónica requests a variation of its licence to change the way it transmits, you will also need to have your licences varied and ensure that your transmissions still synchronise with Telefónica's. If this needs to happen, we will consult on this at the same time we consult on any proposed variation to Telefónica's licence, and licensees in the 2300 MHz shared spectrum will be notified so they can have their say.

3.8-4.2 GHz

- 3.20 We're not planning on imposing a synchronisation requirement in the 3.8-4.2 GHz band. However, we reserve the rights to mandate synchronisation at a later date if this turns out to be necessary to ensure spectrum is being used efficiently.
- 3.21 This means there's a small chance that if licensees in this band operating in very close proximity to each other happen to be using adjacent channels within the band, they may interfere with each other. In these situations, we'd encourage both parties to work together and reach a mutual agreement on how to avoid this. Measures to avoid interference might include users synchronising their transmissions.
- 3.22 If the licensees can't come to a mutual agreement to avoid interference within a reasonable time, say, within a few months, we may require the licensees to adopt a synchronisation regime which we consider to be appropriate in the circumstances. The factors that we may take into account when deciding an appropriate synchronisation regime may include which user deployed first in an area, and the size/extent of networks that have been deployed – though we may also consider other factors depending on the circumstances of each case.
- 3.23 There's also a chance that if you use spectrum at the lower end of the band, you could possibly experience interference from users in the adjacent 3.6-3.8 GHz band. If you do have a problem with this, you may want to consider adopting the synchronisation

requirement which we have outlined for users of the 3.6-3.8 GHz band.¹⁶ You could also consider other methods of protecting yourself from interference, such as screening your site from unwanted transmissions.

- 3.24 Since it's possible that you might have to synchronise with other users, or adopt a different synchronisation regime if we do in the future choose to impose one, we would recommend that you bear this in mind when procuring your radio equipment. If the equipment you buy isn't capable of synchronising with other users in these ways, you may have to replace it if we mandate synchronisation in the future.

¹⁶ This is outlined in paragraphs 11.32-11.36 of the consultation on the award of the 700 MHz and 3.6-3.8 GHz spectrum (https://www.ofcom.org.uk/_data/assets/pdf_file/0019/130726/Award-of-the-700-MHz-and-3.6-3.8-GHz-spectrum-bands.pdf) and in conditions 12 and 13 of the draft 3.6-3.8 GHz licences (https://www.ofcom.org.uk/_data/assets/pdf_file/0014/130730/Annexes-19-26-licences-and-licence-procedures.pdf)

4. The medium power Shared Access licence

- 4.1 The medium power licence will authorise a single base station and any connected terminal stations. Additionally, mobile terminal stations in the 1800 MHz and 2300 MHz shared spectrum will be licence exempt.
- 4.2 The medium power licence is available for the 1800 MHz and the 3.8-4.2 GHz band, but it's not available for the lower 26 GHz band. It's also not currently available in the 2300 MHz shared spectrum. We will need to gather more evidence before making outdoor low power and medium power uses more generally available in the 2300 MHz shared spectrum.
- 4.3 We think that this licence could be suitable for users who need a longer transmission range from their base station, but don't expect to need to change the locations of base stations once they're deployed. This could suit providers of Fixed Wireless Access (FWA) services in rural areas, along with industrial or enterprise users with sites spread over a larger area, such as ports, agriculture or forestry. It could also be suited to providing mobile coverage extension schemes in rural areas, as the 1800 MHz and 2300 MHz shared spectrum bands are in wider bands which already support mobile technology.
- 4.4 Users will not be permitted to deploy wide area networks in the 3.8-4.2 GHz band; this includes national or regional mobile networks.

Availability in rural areas

- 4.5 In our Statement, outlining how we came to our decision on the approaches for these new licence products,¹⁷ we explained that we think users of the low power Shared Access licence are more likely to want to deploy in urban areas. We expect that if we allowed medium power users to deploy in urban areas, with their higher power and increased range, this could risk low power users suffering from limited or no availability of spectrum.
- 4.6 For this reason, we will generally only consider applications for medium power in rural areas. We currently define "rural areas" as:
 - a) any location in England or Wales in an ONS 2011 Census Output Area which falls into categories D1, D2, E1, E2, F1 or F2 (i.e. "town and fringe", "villages" and "hamlets and isolated dwellings");¹⁸

¹⁷ Ofcom, *Enabling wireless innovation through local licences: Shared access to spectrum supporting mobile technology*, 25 July 2019, https://www.ofcom.org.uk/_data/assets/pdf_file/0033/157884/enabling-wireless-innovation-through-local-licensing.pdf

¹⁸ Office of National Statistics, "2011 Rural/Urban Classification", <https://www.ons.gov.uk/methodology/geography/geographicalproducts/ruralurbanclassifications/2011ruralurbanclassification>

- b) any location in Scotland which falls into categories 3-8 based on the Scottish Government's 8-fold Urban Rural Classification;¹⁹ and
- c) any location in Northern Ireland which falls into bands E-H of the Northern Ireland Statistics and Research Agency's settlement classification bands.²⁰

4.7 We're currently working on an interactive map for the Ofcom website, so that users can check to see if locations where they'd like to deploy are categorised as "rural" or "urban". We expect this tool to be ready to use by the time we open applications for Shared Access licences by end 2019.

Medium power operation in urban areas

- 4.8 Our general guidance on the availability of medium power licences being limited to rural areas means there could be some legitimate users who may not be able to deploy using this licence.
- 4.9 If you think you are one of these users, you can contact spectrum.licensing@ofcom.org.uk to discuss your application. We may consider exceptions to allow medium power licences in urban areas on a case-by-case basis.
- 4.10 In assessing whether to allow a medium power licence application in an urban area, there are several factors we'll be looking for – as the applicant, you'll have to provide us with some evidence supporting your case that we should allow your application.
- 4.11 Here are some of the key factors we're likely to consider (although this list is not exhaustive, and it could be that in your particular case some other factor not listed here is relevant):
- a) What you want to do would not be technically possible using one or more low power licences; for example, you need the extra range made possible by the higher power limit in the medium power licence.
 - b) Emissions from your site, to the extent that these would be likely to reduce access to spectrum for other users, would not be higher using a medium power base station than they would using low power base stations. For example, this could be because in practice nobody else would be able to deploy anything near enough to your site to make any difference, because the land is owned or operated only by the one user. This could also be because your site is in some way shielded from the outside, for example if it is underground.
 - c) The boundaries between what's classed as a rural area and an urban area can be quite irregular. It could be that these boundaries place your site in an "urban" area even

¹⁹ Scottish Government, "Scottish Government Urban Rural Classification", <https://www.gov.scot/Topics/Statistics/About/Methodology/UrbanRuralClassification>

²⁰ Northern Ireland Statistics and Research Agency, "Urban-Rural Classification", <https://www.nisra.gov.uk/support/geography/urban-rural-classification>

though surrounding locations with similar conditions on the ground have been classed as “rural”.

Using the licence at sea

- 4.12 Any location which falls outside one of the “rural areas” defined in paragraph 4.6 above, but which falls inside the limits of the UK’s territorial seas, will also be treated as a rural area.
- 4.13 For any location further out to sea than this, you should consider a different licence product, such as a Spectrum Access Offshore licence. Any equipment installed on a ship may also have to be recorded on a separate Ship Radio licence. You can find more information about these on the Ofcom website.²¹

Technical conditions

- 4.14 Table 9 below outlines the technical licence conditions for the medium power Shared Access licence. You should consult the licence for the full technical conditions.²²

²¹ <https://www.ofcom.org.uk/manage-your-licence/radiocommunication-licences>

²² Ofcom, *Enabling wireless innovation through local licences: Annexes 6-10*, 25 July 2019, https://www.ofcom.org.uk/_data/assets/pdf_file/0036/157887/annexes-6-10-licences-and-interface-requirements.pdf

Table 9: Technical licence conditions for the medium power Shared Access licence

Condition	Parameters by band		
	1800 MHz shared spectrum	2300 MHz shared spectrum	3.8-4.2 GHz
Permitted deployment	Rural areas Outdoor antenna systems limited to 10m height above ground	Rural areas Outdoor antenna systems limited to 10m height above ground Initially limited availability	Rural areas
Authorised bandwidth	2 x 3.3 MHz	10 MHz	10, 20, 30, 40, 50, 60, 80 and 100 MHz
Maximum base station power (EIRP) per sector	42 dBm / carrier (up to 3 MHz) ²³	42 dBm / carrier (up to 10 MHz)	42 dBm / carrier for carriers ≤20 MHz; or 36 dBm/5 MHz for carriers > 20 MHz
Maximum terminal station (TRP for mobile/ nomadic or EIRP for fixed/ installed)	23 dBm	25 dBm ²⁴	28 dBm ²⁵ TRP 35 dBm / 5 MHz EIRP
Frame structure requirements	Not applicable	3:1 structure for all deployments	Not applicable (but see notes below)

4.15 The following tables outline the out of channel and in band/ out of band emissions limits for the three bands available under the medium power Shared Access licence.

²³ This power will only be available over 3 MHz of the 3.3 MHz bandwidth as existing power density requirements restrict the power in the first 200 kHz and last 100 kHz of the bandwidth.

²⁴ The authorisation will list this as 25 dBm **including** a 2 dB tolerance consistent with the European harmonisation.

²⁵ The authorisation will list this as 28 dBm **including** a 2 dB tolerance consistent with the European harmonisation.

Table 10: 1800 MHz shared spectrum base station in band emission limits

Frequency offset from the lower frequency of the band edge	Maximum mean EIRP density
0 to 0.05 MHz	$-33.6 + 153.3 \times \Delta_{FL}^*$ dBm / kHz
0.05 to 0.1 MHz	$-26 + 60 \times (\Delta_{FL}^* - 0.05)$ dBm / kHz
0.1 to 0.2 MHz	$-23 + 300 \times (\Delta_{FL}^* - 0.1)$ dBm / kHz
0.2 to 3.2 MHz	42 dBm / carrier
3.2 to 3.3 MHz	$-23 + 300 \times (3.3 - \Delta_{FL}^*)$ dBm / kHz

* Note: Δ_{FL} in MHz is the offset from the lower edge of the permitted frequency band at 1876.7 MHz (it has values in the range 0 to +0.2 MHz and +3.2 to +3.3MHz)

Table 11: 1800 MHz shared spectrum base station out of band emission limits

Frequency offset from the lower frequency of the band edge	Maximum mean EIRP density
-6.2 to -3.2 MHz	-55 dBm / kHz
-3.2 to 0 MHz	$-45 + 10 \times (\Delta_{FL}^* + 0.2)/3$ dBm / kHz
Frequency offset from the upper frequency of the band edge	Maximum mean EIRP density
0 to 0.05 MHz	$-23 - 60 \times \Delta_{FH}^*$ dBm / kHz
0.05 to 0.1 MHz	$-26 - 153.3 \times (\Delta_{FH}^* - 0.05)$ dBm / kHz
0.1 to 2.8 MHz	$-45 - 10 \times (\Delta_{FH}^* + 0.2)/3$ dBm / kHz
2.8 to 5.8 MHz	-55 dBm dBm / kHz

* Note: Δ_{FL} in MHz is the offset from the lower edge of the permitted frequency band at 1876.7 MHz (it has values in the range -3.2 to 0 MHz)

Δ_{FH} in MHz is the offset from the upper edge of the permitted frequency band at 1880 MHz (it has values in the range 0 to 2.8 MHz)

Table 12: 2300 MHz shared spectrum base station out of band emission limits

Frequency	Maximum mean EIRP density
2385 to 2390 MHz 2400 to 2403 MHz	(Pmax - 40) dBm / 5 MHz EIRP per antenna
2300 to 2385 MHz	(Pmax - 43) dBm / 5 MHz EIRP per antenna
Above 2403 MHz	(Pmax - 41) dBm / 5 MHz EIRP*

* The maximum mean power relates to the EIRP of a specific piece of Radio Equipment irrespective of the number of transmit antenna.

Pmax is the maximum mean carrier power for the base station in question.

Table 13: 3.8-4.2 GHz base station out of channel emission limits

Frequency offset	Maximum mean EIRP density
-5 to 0 MHz offset from lower channel edge 0 to 5 MHz offset from upper channel edge	(Pmax - 40) dBm / 5 MHz EIRP per antenna
-10 to -5 MHz offset from lower channel edge 5 to 10 MHz offset from upper channel edge	(Pmax - 43) dBm / 5 MHz EIRP per antenna
Out of channel baseline power limit (BS) < -10 MHz offset from lower channel edge > 10 MHz offset from upper channel edge	(Pmax - 43) dBm / 5 MHz EIRP per antenna

Table 14: 3.8-4.2 GHz base station out of band emission limits

Frequency	Maximum mean EIRP density
3795 MHz-3800 MHz 4200 MHz-4205 MHz	(Pmax - 40) dBm / 5 MHz EIRP per antenna
3760 MHz-3795 MHz 4205 MHz-4240 MHz	(Pmax - 43) dBm / 5 MHz EIRP per antenna
Below 3760 MHz Above 4240 MHz	-2 dBm / 5 MHz EIRP per antenna

Synchronisation

- 4.16 Synchronisation is not required in
- the 1800 MHz shared spectrum,
 - the 3.8 – 4.2 GHz and
 - the lower 26 GHz band.
- 4.17 Synchronisation is required in the 2300 MHz shared spectrum. There may be some circumstances where it is required in the 3.8-4.2 GHz band.

2300 MHz shared spectrum

4.18 If you have a licence for the 2300 MHz shared spectrum, you will need to make sure your transmissions are synchronised with those of the adjacent user in the 2350-2390 MHz band (this is Telefónica). You will need to use the frame structure in the diagram below and Coordinated Universal Time (UTC) as the common reference time. A new frame should start at the start of the UTC 1 second boundary.

Figure 7: Frame structure for 2300 MHz shared spectrum²⁶

DL/UL ratio	Subframe number									
	0	1	2	3	4	5	6	7	8	9
3:1	D	S	U	D	D	D	S	U	D	D

4.19 This frame structure means:

- timeslots (or subframes) 0, 2 to 5 and 7 to 9 must be allocated to Downlink (D) or Uplink (U) transmissions as indicated or may be left with no transmissions;
- the licensee must ensure that the special subframe (S) in timeslots 1 and 6 has a structure that is compatible with TD-LTE special subframe configuration 6, also known as 9:3:2;
- all timeslots must be 1 millisecond in duration and the frame must start at a common reference time so that frames are aligned with Telefónica and transmissions synchronised; and
- TD-LTE frame configuration 2 (3:1) is compatible with this frame structure. Other technologies are permitted provided that the requirements are met.

4.20 If Telefónica requests a variation of its licence to change the way it transmits, you will also need to have your licences varied and ensure that your transmissions still synchronise with Telefónica's. If this needs to happen, we will consult on this at the same time we consult on any proposed variation to Telefónica's licence, and licensees in the 2300 MHz shared spectrum will be notified so they can have their say.

3.8-4.2 GHz

4.21 We're not planning on imposing a synchronisation requirement in the 3.8-4.2 GHz band. However, we reserve the rights to mandate synchronisation at a later date if this turns out to be necessary to ensure spectrum is being used efficiently.

4.22 This means there's a small chance that if licensees in this band operating near each other happen to be using adjacent channels within the band, they may interfere with each other, particularly if deploying antenna heights significantly above the surrounding clutter. In these situations, we'd encourage both parties to work together and reach a mutual agreement on how to avoid this. Measures to avoid interference might include users synchronising their transmissions.

²⁶ We refer to this as Frame Structure A in our Statement.

- 4.23 If the licensees can't come to a mutual agreement to avoid interference within a reasonable time, say, within a few months, we may require the licensees to adopt a synchronisation regime which we consider to be appropriate in the circumstances. The factors that we may take into account when deciding an appropriate synchronisation regime will probably include which user deployed first in an area, and the size/extent of networks that have been deployed – though we may also consider other factors depending on the circumstances of each case.
- 4.24 There's also a chance that if you use spectrum at the lower end of the band, you could possibly experience interference from users in the adjacent 3.6-3.8 GHz band. If you do have a problem with this, you may want to consider adopting the synchronisation requirement which we have outlined for users of the 3.6-3.8 GHz band. You could also consider other methods of protecting yourself from interference, such as screening your site from unwanted transmissions.
- 4.25 Since it's possible that you might have to synchronise with other users, or adopt a different synchronisation regime if we do in the future choose to impose one, we would recommend that you bear this in mind when procuring your radio equipment. If the equipment you buy isn't capable of synchronising with other users in these ways, you may have to replace it if we mandate synchronisation in the future.

5. Licence fees and non-technical licence conditions

Licence fees

- 5.1 We've set the fees for the Shared Access licence to be cost-based; this means the amount we charge has been calculated to make sure Ofcom recovers the costs of administering the licence.
- 5.2 Demand for these new licences is currently uncertain and we will keep fees under review as we gather more evidence on actual use. We expect to consult on proposals to change the fee if we believe there is evidence to do so.
- 5.3 The fees below are all applicable per licence – this means you'll pay for each low power area you have a licence for, and each medium power base station you have a licence for. The fees are payable annually.

1800 MHz and 2300 MHz shared spectrum, and 3.8-4.2 GHz band

- 5.4 For the lower three shared access bands, we are charging fees based on the bandwidth used – this only makes a big difference for the 3.8-4.2 GHz band, as the 1800 MHz and 2300 MHz shared spectrum only have one channel each. This means that licence fees for the lower three shared access bands look like this:

Table 15: Licence fees by bandwidth for the Shared Access licence

Channel size	Price per channel
2 x 3.3 MHz	£80
10 MHz	£80
20 MHz	£160
30 MHz	£240
40 MHz	£320
50 MHz	£400
60 MHz	£480
80 MHz	£640
100 MHz	£800

26 GHz band

- 5.5 For the 26 GHz band, the fee we are charging does not change based on the bandwidth the user applies for; this is because there is more spectrum available in this band compared to the lower three bands.
- 5.6 For the 26 GHz band a licence will cost **£320** regardless of how much bandwidth you use.

Non-technical licence conditions

- 5.7 Below is an overview of the main non-technical licence terms and conditions which are common to both the low power and medium power Shared Access licences.
- 5.8 It is your responsibility to ensure that you understand and can meet the licence obligations, and you should look at the example licences we have included in our Statement to see these and the other conditions in full.²⁷

Licence duration and revocation

Duration

- 5.9 The Shared Access licence is indefinite; as long as you pay your licence fees each year and don't break any of the licence terms and conditions, you can keep it for as long as you like.
- 5.10 If, however, you would like a licence of less than one year, we can issue a short-term licence. This would mean you would not have to pay the full annual licence fee as we would charge you pro rata per month, based on how long you wanted the licence for. There is a minimum licence fee of £32 per licence if you do this, however, as we have to recover the cost to Ofcom of issuing and administering the licence.

Revocation, including for non-use

- 5.11 You should also be aware of the requirement in the licence to continue transmitting, which is in clause 6 of the Shared Access licence. This clause means that if you don't start transmitting within six months of getting your licence and remain operational after this, we can revoke your licence with one month's notice. We're including this condition so that new users aren't prevented from deploying their equipment by existing users who are no longer operational but have not surrendered their licences, or by users who acquired more spectrum than they needed in order to make it harder for other companies to compete.
- 5.12 We can also revoke your licence for spectrum management reasons. We normally only do this if we intend to change the way the band is used, and we currently do not have any plans to do this as we have only just introduced the new licensing regime. Should we consider repurposing the band for alternative use, we will give a reasonable notice period. This will be longer than one month and would not occur without us first conducting a

²⁷ Ofcom, *Enabling wireless innovation through local licences: Annexes 6-10*, 25 July 2019, https://www.ofcom.org.uk/_data/assets/pdf_file/0036/157887/annexes-6-10-licences-and-interface-requirements.pdf

formal consultation, of which current users would be notified. The timing of any such process would be informed by an assessment of the impact of our decision.

- 5.13 Finally, if you break the terms of your licence, or if you're causing interference to other users and don't cooperate with us to stop the interference, we can also revoke your licence because of this. Again, you would be given one month's notice for this.

Trading the licence to someone else

- 5.14 Users are allowed to transfer their rights to access spectrum (and their obligations to pay the associated fees, and stick to the licence conditions) to another party by trading them. This might be especially relevant if one company is acquired or bought out by another.
- 5.15 We allow two kinds of trade:²⁸
- a) **Outright total trades**, where all the rights and obligations of the licence are completely transferred to one user; or
 - b) **Concurrent total trades**, where all the rights and obligations of the licence are completely transferred to two or more users.

Keeping records and providing information to Ofcom

- 5.16 As part of Ofcom's duty to manage spectrum efficiently, our standard licence terms and conditions include a provision which says that licensees are required to provide information to us if we request it. The Shared Access licence includes this condition, and you'll therefore need to keep records of your deployments in case we ask you for them.
- a) If you have a **low power licence**, you'll need to keep a record of the address, antenna type and antenna height above ground for all base stations.
 - b) If you're using **fixed terminals**, with either the low or medium power licence, you'll need to keep a record of the location (using the National Grid Reference system to 1m resolution), antenna type and antenna height above ground.
 - c) If you're using **mobile terminals in the 3.8-4.2 GHz band**, with either the low or medium power licence, you'll need to keep a record of the number of terminals, and the address of the site or building where the terminals will be operating. This is to make sure that mobile terminals are only used within the user's site, and are not used to form part of a regional or nationwide public mobile network, as the Shared Access licence is not intended for this.
- 5.17 Recording this information is important because if somebody has a problem with interference, it will help us narrow down the source if we need to investigate it. This information will also be needed if we move towards a DSA approach in the future (see Section 2) and all equipment will need to be recorded in order to access spectrum.

²⁸ You can find more information on trading in Ofcom's Trading Guidance Notes (https://www.ofcom.org.uk/_data/assets/pdf_file/0029/88337/Trading-guidance-notes.pdf)

- 5.18 Any commercially sensitive information which you give to us is subject to a number of different legal provisions which govern how we keep and use it. These provisions include the Wireless Telegraphy Act 2006, the Communications Act 2003, the Data Protection Act 2018, the Freedom of Information Act 2000 and the Environmental Information Regulations 2004.

Accessing, modifying and shutting down your equipment if something goes wrong

- 5.19 The Shared Access licence includes terms that allow Ofcom to instruct you to provide access to, modify or shut down your equipment – but we will only do this if there is a problem of some sort that we consider requires such action.
- 5.20 For example, we could need to do this are if an emergency meant that some sort of equipment for public safety needed to be deployed, and your equipment would interfere with this.
- 5.21 Another example might be if your equipment was causing interference to another user. We might request that you modify your equipment parameters and change the way it transmits so that both you and the other user can transmit without interference. For instance, if we were to require users to synchronise their transmissions (we talk about this at the ends of Section 2 and 3), this provision allows us to do that.

Changing frequency if we ask you to do so

- 5.22 In Section 2, we outlined that your Shared Access licence will also allow Ofcom to request that you change frequency from time to time, as we prepare to implement a DSA approach in the future. We may do this because we want to accommodate new users in the same area or on the same frequency, or if we need to deal with interference.
- 5.23 If we need to do this, we will email you the frequency you need to change to, and the time by which you will need to have changed frequency by. This means that you will have to deploy equipment that can be tuned across an entire band (that is, for the 3.8-4.2 GHz band and 26 GHz band where this is relevant).

6. Mobile Network Codes and telephone numbers

Introduction

- 6.1 For some mobile technologies to work, they may require the mobile network to be identified by a Mobile Network Code (MNC) and may require the use of telephone numbers.
- 6.2 It is Ofcom's duty to administer the UK's National Telephone Numbering Plan, including MNCs and telephone numbers. Allocations of numbers to communications providers for public network use is carried out via Ofcom's Number Management System (NMS).²⁹ Our policy is not to allocate an exclusive MNC or telephone numbers for use in private networks.

MNCs

- 6.3 For private networks needing to input an MNC, the International Telecommunications Union (ITU) has made available the Mobile Country Code (MCC) 999 for internal use within a private network.³⁰ Users are able to select any two- or three-digit code for their network. No interaction with ITU or Ofcom is required for using an MNC under this MCC for internal use within a private network. However, please note that as they are not subject to assignment, they are not unique.
- 6.4 Licensees wishing to deploy a public network and in need of an MNC should apply for allocation via NMS. Any questions may be directed to Ofcom's Numbering Team directly by emailing numbering@ofcom.org.uk.

Telephone numbers

- 6.5 Ofcom's NMS allows communications providers to apply for the allocation of numbers and to manage their existing resource. Communications providers are required to provide certain information when applying for numbers. Ofcom will only allocate numbers to communications providers and only for use in public networks.
- 6.6 For those companies wanting to provide telephony services using VoIP and/or WiFi, and for interconnection with other networks, various number ranges are available. We encourage providers to consider the number types available for allocation, including, for example, 056 Location Independent ECS numbers. We also allocate National Signalling Point Codes (NSPCs), if required. Further information is available on Ofcom's website.³¹

²⁹ https://ofcom.force.com/NMS_LoginPage

³⁰ Appendix III ITU-T E.212, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.212-201807-I!Amd1!PDF-E&type=items

³¹ <https://www.ofcom.org.uk/phones-telecoms-and-internet/information-for-industry/numbering>

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8. Document history

8.1 This is a live document, and we may change it from time to time to update it with new information. Any changes that have been made on the document history is outlined at the table below.

Version	Date	Changes
1.0	July 2019	First published
1.1	December 2019	Changes to reflect that licences are now available for application
1.2	July 2020	Clarification that airborne use is not permitted, users have up to 30 days to pay for invoice and users should deploy equipment that can tune across the band to ensure continuity of access