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Spectrum Access: EHF Licence

Licensing guidance document

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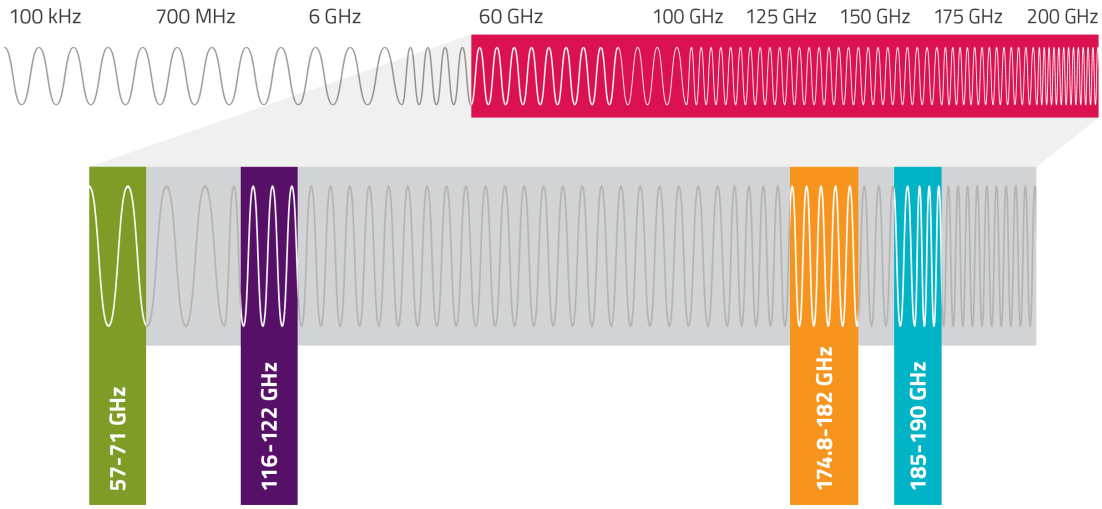
1. Overview

1.1 We want to support innovation and enable new uses of spectrum. To do this, we have introduced a new 'Spectrum Access: EHF' licence to enable simple, flexible access to over 32 GHz of radio spectrum across four bands:

- 57-71 GHz
- 116-122 GHz
- 174.8-182 GHz
- 185-190 GHz.

Figure 1.1: Spectrum in the 50-200 GHz range



1.2 With this licence, you will have access to one of these bands across the UK on a shared, uncoordinated basis. You may use multiple devices within the licence band, provided that these meet the licence technical conditions. Each licence costs £75, which is payable every five years.

1.3 This licence is intended to provide flexible access to spectrum on a technology-neutral basis. The technical and non-technical conditions for use are set out in the licence.

1.4 This document provides guidance on the Spectrum Access: EHF licence, including information on how much the licence costs, how you can apply for a licence, how you can pay the licence fees and what terms and conditions you must adhere to if you have a licence.

1.5 While every reasonable effort is made to ensure that the information provided in this document is accurate, you are advised to consult the conditions set out in the licence and the relevant interface requirement (IR 2106). For the avoidance of doubt, such conditions will take precedence over this guidance in the case of any difference between texts.

What can this licence be used for?

1.6 We created this licence to support research, innovation and the development and use of new products and applications in three Extremely High Frequency (EHF) bands. The licence can be used to deploy any device which meets the technical licence conditions, which are summarised in Section 2.

57-71 GHz

1.7 The 57 – 71 GHz band can be used to provide wireless access solutions (e.g. small base stations fixed to a lamppost) or to provide wireless backhaul (e.g. point to point links). These can be used to provide broadband services or help to connect a variety of other technologies such as Internet of Things or Machine-to-Machine networks. There are also other lower power uses such as high performance wireless data, display and audio applications.

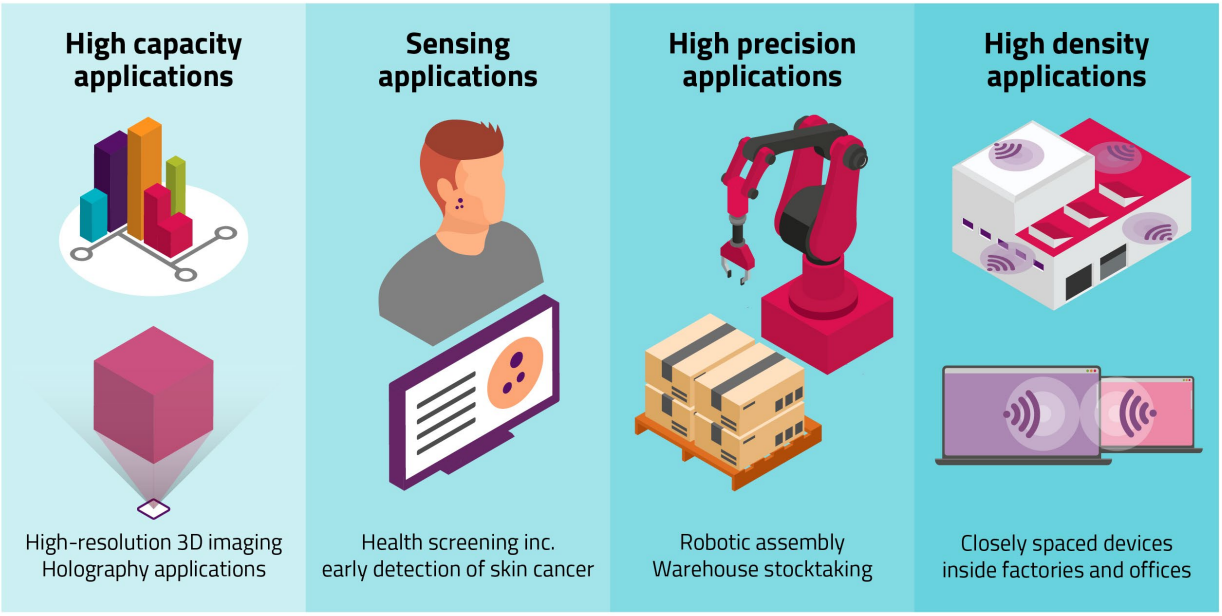
1.8 The authorisation needed to use the 57 – 71 GHz band varies depending on the equipment being used. If your 57 – 71 GHz system and/or stations operate at or below 40dBm EIRP then this equipment may (subject to other conditions) be covered by our licence exemption regulations. In these cases, you will not need to obtain a licence to use this equipment. Details of the technical conditions that must be met for licence exempt operation can be found in IR2030.[1] For the use of equipment that operates above an EIRP limit of 40dBm (to a maximum of 55dBm EIRP) you must have a licence to operate this equipment. The use of this higher power equipment is also restricted to fixed outdoor use only.

100-200 GHz

1.9 Although these technologies are at an early developmental stage, there is a range of envisaged applications including health screening such as skin cancer detection, non-invasive quality assurance in the pharmaceutical and manufacturing industries, high-resolution positioning, security systems and high-speed data links. The licence could be useful for a variety of different applications, such as those set out in the graphic below. This is not intended to be an exhaustive list. We recognise that innovation is likely to result in new uses.

[1] https://www.ofcom.org.uk/__data/assets/pdf_file/0028/84970/ir-2030.pdf

Figure 1.1: Potential uses of 100-200 GHz spectrum



1.10 We recognise that there is uncertainty around future demand for services using this spectrum, and what the applications developed will be. We will review developments in 2024 and will consider whether to propose changes to our approach.

How to apply

1.11 To apply for a Spectrum Access: EHF licence, you'll need to fill in an application form. You'll be able to access the form on the Ofcom website.

1.12 You should select your preferred band when you apply for your licence. You may not operate in any of the other available bands unless you obtain separate licences for them.

1.13 The licence will permit you to operate any number of devices in your selected band, anywhere in the UK. You will be required to compile and maintain accurate location records, as explained in section 2 of this document. For outdoor use of 100-200 GHz equipment you will also be required to compile and maintain accurate records of the antenna main beam elevation angle.

1.14 Once you've filled in the licence application form, email it to the Ofcom Licensing Team at spectrum.licensing@ofcom.org.uk.

1.15 Once you send in your completed application form, we'll provisionally assign you a licence for the frequency band you've selected. This does not permit you to start using your radio equipment. 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. You may then start using your radio equipment.

1.16 This process is summarised briefly in the graphic below.

Figure 1.2: Spectrum Access: EHF licence application process

2. The Licence

2.1 To help encourage innovation, we have designed the licence so that it minimises the administrative burden on users whilst still providing the necessary protection to satellite users of that spectrum. The licence has a number of technical and non-technical conditions that the licensee must adhere to. These are explained further in this section.

Technical licence conditions

2.2 The summary below sets out the main technical conditions of the licence. You should consult the licence and IR 2106[2] for the full technical conditions.

Frequencies available using this licence

2.3 There are four different spectrum bands available using the Spectrum Access: EHF licence, these are:

- 57-71 GHz;
- 116-122 GHz;
- 174.8-182 GHz; and
- 185-190 GHz.

2.4 In the future, we may look to make additional EHF bands available under this same spectrum framework.

Maximum power levels and pointing restrictions

2.5 The maximum permitted equivalent isotropically radiated power (EIRP) is 55 dBm. For outdoor use of 100-200 GHz equipment only, there are additional power limits on EIRP at angles relative to the main beam in the elevation plane. These vary by band and are set out in the table below.

2.6 Any device operating in an environment which does not meet the definition of "indoor" is required to meet the technical conditions for outdoor use. "Indoor" means inside premises which: (i) have a ceiling or a roof; and (ii) except for any doors, windows or passageways, are wholly enclosed. For example, a tent or an open-air stadium would be considered outdoor settings.

[2] https://www.ofcom.org.uk/__data/assets/pdf_file/0018/203652/IR-2106.pdf

Table 2.1: Power limits and restrictions on outdoor use

Power limits (*max EIRP in dBm*) and emissions restrictions on outdoor use				
USE	**57-71 GHz**	**116-122 GHz**	**174.8-182 GHz**	**185-190 GHz**
Indoor	Not permitted*	55	55	55
Outdoor	55 38 dBm/MHz e.i.r.p. density and a transmit antenna gain ≥ 30 dBi	55 (a)	55 (a)	55 (a)
For outdoor use, EIRP at angles (degrees°) relative to main beam in the elevation plane (a) shall not exceed.	Not applicable	13 at > 10° (b) 1 at > 40° (c) -3 at > 60° (d)	13 at > 10° (b) 1 at > 40° (c) -3at > 60° (d)	25 at > 10° (b) 14 at > 40° (c) 10 at > 60° (d)
Restrictions on outdoor use of equipment	Fixed deployments only. Not permitted to be used within 6km at three locations.	When devices are used outdoors, the main beam elevation angle (ϕ) of licensed devices shall not exceed 20° above horizontal.		
Airborne use	Airborne use not permitted.			
Other usage conditions	Adequate spectrum sharing mechanism must be used.	For all systems using bandwidths of less than 100 MHz, all of the above EIRP limits must be adjusted as follows: $EIRP\ Reduction\ =\ 10 \times log_{10}\left({}^{BW_{MHz}}/_{100}\right)$		

* see IR 2030 for licence exempt low power indoor use of this band

57-71 GHz outdoor restrictions

2.7 In the three geographical areas outlined in Table 2.2 no transmissions are permitted.

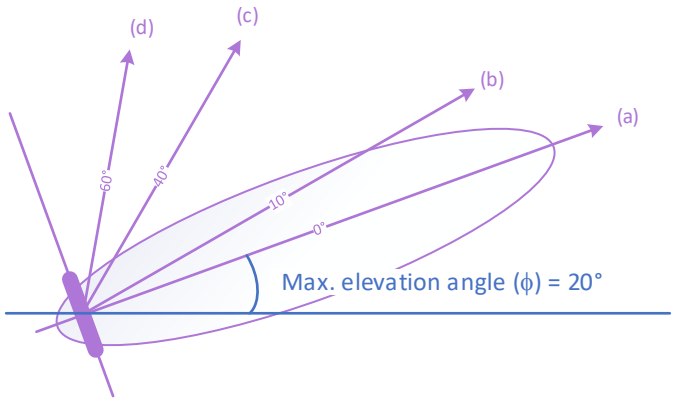
Table 2.2: 59 – 63.9 GHz transmission exclusion zones

Site name	Site location	Radius of exclusion zone from the centre of the site location
Site 1	07° 23’ 36.6” W, 57° 21’ 3.6” N	6 Km
Site 2	04° 58’ 21” W, 51° 37’ 16.8” N	6 Km
Site 3	00° 36’ 22.8” W, 52° 38’ 1.8” N	6 Km

100-200 GHz outdoor restrictions on use

2.8 For outdoor use of 100-200 GHz equipment only, the main beam elevation angle of the device must not exceed 20 degrees above horizontal. There are no elevation angle restrictions for indoor use.

Figure 3.2: 100-200 GHz Outdoor EIRP limits including device antenna elevation angle restriction



2.9 For mobile use, the licensee must adopt an appropriate method to ensure compliance. In some instances, visual checks and physical measurements may be enough: for example, if the device is fixed at a set elevation angle on an object or vehicle moving across a flat surface. If the angle of the device is likely to change, another solution might be needed. For example, the equipment could have a deactivation mechanism which automatically deactivates the equipment if the antenna main beam exceeds 20 degrees above horizontal.

Power limit adjustment for bandwidths of less than 100 MHz for 100-200 GHz equipment

2.10 The maximum permitted EIRP levels for 100-200 GHz equipment must be adjusted for systems using bandwidths of less than 100 MHz as follows:

$$EIRP\ Reduction\ =\ 10 \times log_{10}\left({BW_{MHz}}/{100}\right)$$

2.11 The EIRP reduction shown must be applied to both the maximum EIRP and also the reduced EIRP levels permitted at specified angles relative to main beam in the elevation plane. This is to ensure that the power spectral density of any narrowband use would not rise above that of a 100 MHz system.

100-200 GHz equipment out-of-band emissions limits

2.12 Out-of-band emissions are unintended emissions that occur immediately outside of the frequencies you are using. This is a normal effect resulting from the modulation process.

2.13 Any out-of-band emissions must be limited to -10 dBm/MHz EIRP.

Airborne use

2.14 Devices must not be used airborne. This means they cannot be used onboard or attached to an aircraft, drone or balloon.

Licence fee and non-technical licence conditions

Licence fee

2.15 We've decided to set a cost-based fee for the Spectrum Access: EHF licence; this means the amount we charge has been calculated to make sure Ofcom recovers the costs of administering the licence.

2.16 The fee for this licence is £75 payable every 5 years and gives access to one of the three available frequency bands. If you wish to access more than one band then you will need to apply for an additional licence.

2.17 The licence covers unlimited devices and locations, so no extra fee is required if you want to install additional devices once you have your licence.

Where it can be used

2.18 The licence authorises use of the designated spectrum across the UK, including UK territorial seas. This covers the area out to twelve nautical miles as well as other areas covered by UK law such as UK controlled areas of the North Sea. The licence also authorises use in the Channel Islands and Isle of Man.

Licence duration and revocation

2.19 The licence has an indefinite duration.

2.20 The licence permits Ofcom to give one year's notice to revoke the licence for spectrum management reasons. We normally only do this if we intend to change the way the band is used.

2.21 We may also revoke the licence at any time for other reasons set out in the licence, including if the conditions of the licence are breached or a licensed device is causing interference to other authorised spectrum users.

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

2.22 The 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.

2.23 For example, we could need to do this if your equipment was causing interference to a satellite user. We might request that you modify your equipment parameters and change the way it transmits so that the satellite user can operate without interference.

Keeping records and providing information to Ofcom

2.24 As part of Ofcom's duty to manage spectrum efficiently, our standard licence terms and conditions include a provision which requires licensees to provide information to us if we request it.

2.25 A condition of the Spectrum Access: EHF licence is that you must compile and maintain accurate records of the location of any devices you have deployed under this licence. This includes both postal address (including postcode) and National Grid Reference (to 1m resolution).

2.26 For any mobile use (where permitted by the licence), you must keep accurate records of the postal address (including postcode) and National Grid Reference (to 1m resolution) of the centre of any 5km radius within which the radio equipment is used. If a mobile device operates over an area with a radius larger than 5km, you must keep these records for the centre of as many 5km radius areas as are required to reflect the areas of use.

2.27 Additionally, for outdoor use of 100-200 GHz equipment only, you must keep records of the antenna main beam elevation angle, measured in degrees above horizontal. Where devices are used outdoors and are not in a fixed position, you must keep records of the antenna main beam elevation angle measured in degrees above horizontal at start of operation. You must ensure the antenna main beam elevation angle does not exceed 20 degrees above horizontal at any point during operation outdoors.

2.28 We can ask for this information at any time and will do so if we believe there may be an interference problem. For the period 2020-2024, we plan to ask for this information around twice each year to help us to monitor general use.

2.29 We may also ask for additional information about your licensed equipment. This might include, but is not limited to, how many devices you have deployed, their frequency, transmit power and the date that the equipment was first used.

2.30 We may visit your locations of use to inspect, examine and test your licensed equipment.

Compliance with EMF

2.31 All uses of radio spectrum generate electromagnetic fields (EMF). There are internationally agreed guidelines published by the International Commission for Non-Ionising Radiation Protection (ICNIRP)[3] to help ensure services operate in a way that the will not adversely affect health. These guidelines include limits on EMF exposure for the protection of the general public. We refer to these limits as the "ICNIRP general public limits".

2.32 In our "Statement on Measures to require compliance with international guidelines for limiting exposure to electromagnetic fields (EMF)" (the "EMF Statement"),[4] we explained that some spectrum users are not fully aware of the limits in the ICNIRP Guidelines or are not taking full account of EMF exposure when installing or modifying radio equipment. In order to address these risks, we decided to include a specific condition in licences requiring licensees to comply with limits in the ICNIRP general public limits. This condition applies to all licence classes which authorise equipment to transmit at powers higher than 10 Watts e.i.r.p. (including, for example, the licences of mobile phone companies, TV and radio broadcasters and most point-to-point microwave links).

2.33 Therefore, a requirement of the licence is that the licensee carry out an assessment of the equipment in order to ensure that the ICNIRP general public limits are being complied with. In summary, the EMF condition:

- includes a set of definitions relating to the EMF condition;
- imposes a requirement to comply with the ICNIRP general public limits for (i) sites not shared with other licensees; and (ii) where applicable, sites shared with other licensees (advice on how to comply is set out in our Guidance on EMF Compliance and Enforcement;[5]
- sets out an exemption where licensees are not required to comply with the ICNIRP general public limits in emergency situations;
- imposes a requirement to keep records demonstrating compliance with the ICNIRP general public limits; and
- imposes a requirement to take into account Ofcom's Guidance on EMF Compliance and Enforcement.

2.34 Further information on the EMF condition can be found on the Ofcom website.[6]

[3] International Commission for Non-Ionising Radiation Protection
[4] https://www.ofcom.org.uk/__data/assets/pdf_file/0014/204053/emf-statement.pdf
[5] https://www.ofcom.org.uk/manage-your-licence/emf/compliance-and-enforcement-guidance
[6] www.ofcom.org.uk/emf

3. Contact details

Ofcom Spectrum Licensing
PO BOX 1285
Warrington
WA1 9GL

Tel: 020 7981 3000

Website: www.ofcom.org.uk

Email: spectrum.licensing@ofcom.org.uk

4. Document history

4.1 This is a live document, and we may change it from time to time to update it with new information. Any changes that are made to the document will be outlined in the document history table below.

Version	Date	Changes
1.0	September 2020	First published
1.1	May 2021	Inclusion of 57-71 GHz band