

Licence-Exemption Framework Review

A consultation on the framework for
managing spectrum used by
licence-exempt devices

A Plain English Summary of the Consultation

Consultation

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An introduction to radio spectrum

Every day we take for granted that wireless communications will be there to serve us. From mobile phone calls and broadband connections, to the radio and television programmes we flick through without a thought, to radio taxis and Wi-Fi enabled laptops – our need for wireless communication never stops and, indeed, is growing as new technology creates new demands. Wireless communications are also the backbone of safety-critical operations in air-traffic control and the railways, and the rapid response of the emergency services.

Wireless devices work by sending signals to each other through the air. The radio waves that carry these signals form part of what is known as the spectrum – or more precisely, the “electromagnetic spectrum”.

A key property of wireless transmissions is the frequency of the signal being transmitted. In the same way that sound can be at a low frequency (for example, a drum beat) or at a higher frequency (such as a whistle), so wireless transmissions have different frequencies. These vary according to the electrical signal used to generate them.

Usefully, different frequencies do not interfere with one another, even if they are transmitted in the same place. That is also why you can hear many different FM radio stations, simply by changing the frequency on your dial. So by licensing different broadcasters and users on different frequencies we can avoid one interfering with another.

However, not all frequencies are the same. At lower frequencies, signals travel a long way, but they have limited room for carrying information or different services. At high frequencies, signals may only travel tens of metres from the transmitter, but can carry massive amounts of information.

What does exemption from licensing mean?

In general, an individual requires a licence if they wish to transmit a radio signal. However, in some cases, a wireless device is “licence-exempt” – meaning individuals are allowed to operate the device without a licence.

From the point of view of the spectrum regulator, there are broadly two reasons why devices might be exempted from licensing. The first is if the economic benefits of the exempted use are greater than those of alternative licensed use. The second reason is if there is a low risk of harmful interference (e.g. where the demand for spectrum in a given frequency band is less than the supply), in which case the overhead of licensing as a tool for interference management is an unnecessary burden on the spectrum user.

In our everyday lives we use many wireless devices that do not need a licence to transmit radio waves. These licence-exempt devices range from wireless headsets, cordless phones and car key-fobs to baby monitors, garage-door openers and Wi-Fi systems in the home, office, and public hot-spots. Licence-exempt devices are also widely used by businesses, including anti-theft systems in shops, identity cards to activate doors or ticket barriers and, in some cases, for data links to remote base stations as part of mobile phone networks. Future applications might include car radar

systems, product tracking devices, networks of sensors around the home and office, wireless payment systems and much more.

These uses are highly valuable to citizens and consumers. The development of a framework for managing licence-exempt devices is in line with Ofcom's role in maximising the efficient use of the spectrum, and serving the interests of consumers and citizens.

The process of making a device licence-exempt requires Ofcom to identify the technology or standard that can be used in this way. A key issue is to limit a device's transmission power: radio signals from high-powered devices travel further, increasing the chances of interference with others using the same frequencies. If too much interference is created, the frequencies will become of limited use – this is the so-called “tragedy of the commons”.

Users should be aware that there are no guarantees that the spectrum will be free from interference. Some may even invest in licence-exempt equipment, only to discover there is too much interference for the equipment to work in the way that they require. However, by carefully managing a range of factors such as radiated power levels, it is possible to increase licence-exempt usage without materially affecting the cost or functionality of the devices. Other factors to consider include the way devices behave when they discover other transmissions that could potentially interfere, or so-called “polite protocols”.

The Licence Exempt Framework Review (LEFR), published alongside this guide looks at ways in which licence-exempt devices might be managed in order to maximise the value of the spectrum they use and whether there is merit in dedicating more spectrum to licence-exempt uses.

The document considers three key issues:

- 1) What rules might be used to maximise the capacity and value of bands set aside for licence-exempt devices.
- 2) Whether licence-exempt devices should be allowed to operate in any spectrum band if they transmit at a sufficiently low power level.
- 3) Whether the little-used higher frequency bands should be released for licence-exempt devices.

The guide should be read alongside the main consultation document on this subject which can be found at: <http://www.ofcom.org.uk/consult/condocs/lefr/>.

Each of the above issues are discussed below.

Rules for management of licence exempt devices

Ofcom believes in general that the best way to promote innovation and generate value is not to restrict the range of technologies and applications that are allowed to use the spectrum. This allows the market, rather than the regulator, to decide the best use of spectrum. In the case of licence-exempt devices this can be achieved by adopting a

“spectrum commons” model of use, where a range of different licence-exempt applications are allowed to share a common set of frequencies.

The motorway is another example of a type of “commons”. A range of different vehicles can share the road efficiently as long as drivers do not exceed certain limits on size, weight and speed, and adhere to well-defined driving etiquettes. Failure to comply with the rules and etiquettes increases the likelihood of accidents and traffic jams.

As with the motorway analogy, it is important to define appropriate rules and etiquettes (or protocols) to make sure that a wide range of licence-exempt devices can co-exist and share the spectrum in a fair and efficient manner. Such rules and protocols are needed to minimise the likelihood of harmful interference. An example of an appropriate protocol might be that a device should only transmit infrequently if it detects a number of other devices operating in the same band, so giving others the opportunity to communicate.

For this reason, we propose that licence-exempt devices should be allowed to operate in a spectrum commons as long as they;

- 1) do not exceed certain limits on radiated power (defined by Ofcom), and;
- 2) operate according to one or more harmonised “polite protocols” (defined by technical standards bodies).

Licence-exemption of low-power devices

Devices which transmit at sufficiently low power levels are unlikely to cause harmful interference to other users of spectrum, and are candidates for licence-exemption. An example of this is the licence-exempt use of the spectrum by ultra-wideband (UWB) devices. These devices transmit with wide bandwidths but at very low power levels and so can use the same frequencies as those used by other wireless services.

Any device that transmits at a power level which is lower than the UWB limits would, at worst, cause as much interference as a UWB device, and would therefore also be a likely candidate for licence-exemption. Based on this argument, we believe that one may define generic power limits, such that *any* transmission below the specified limits may be exempt from licensing. We propose that such power limits could be equivalent to the UWB limits, with an increase in the limits for frequencies above 10.6 GHz to account for increased losses that radio waves experience at these frequencies.

Licence-exemption at high frequencies

A considerable amount of spectrum above 40 GHz is currently unused because technology for devices operating at very high frequencies is specialised and expensive and the radio waves have poor propagation characteristics (i.e. they do not travel very far at these frequencies). This means that future uses of this spectrum are likely to be either short-range (order of metres) for consumer devices, or medium-range (order of few hundred metres) for point-to-point fixed links. The large amount of available spectrum above 40 GHz, and the low-range nature of the potential services mean that congestion is unlikely, and so licensing is not necessary.

As a result, we propose that around 100 GHz of spectrum between 40 and 275 GHz, as well as all spectrum above 275 GHz, be considered for future licence-exempt use. We exclude frequencies from this proposal that are exclusively assigned for passive services such as radio astronomy, those assigned for primary use by amateur and amateur satellite services, and those where there exists a potential risk of interference towards future passive services.

Impact of our proposals

As part of the LEFR proposals, Ofcom sets out a framework for licence-exemption but does not propose any imminent changes to the licence-exempt use of specific bands. If, as a result of this consultation, we decide that certain changes will be in line with our statutory duties, we will address these through further consultations along with impact assessments as appropriate.

If the proposals set out in this document are agreed and lead to changes in the way we manage the spectrum we would expect to see:

- More intensive use of future bands set aside for licence-exempt applications and perhaps eventually of existing bands, resulting in more exempt devices, higher data rates from existing devices, or a combination of both.
- Increased use of very low power devices, particularly for short-range communications, perhaps within the home.
- Innovative applications developed at high frequencies possibly including short-range radars and networks of high-speed radio relay.
- Greater clarity for manufacturers resulting in devices being developed more quickly.

Of course, these all depend on appropriate action being taken by stakeholders such as manufacturers, consumers, and standardisation bodies, and might in some cases take many years to materialise.

Affected parties

These proposals could potentially bring benefits for:

- consumers, who might benefit from new innovative uses of wireless technologies in the home and office, or from improvements such as higher speeds or greater ranges in existing uses;
- manufacturers, who may be able to produce new and innovative products;
- spectrum licence holders who may find that additional use of licence-exempt devices allows further use of licensed spectrum. For example, it might be easier to connect a mobile phone to a laptop or camera using licence-exempt wireless technologies rather than licensed cellular technologies, which would then free up transmission capacity over the mobile networks; and

- Government, who may be able to use licence-exempt equipment to help achieve policy goals, such as aiding with traffic congestion reduction measures.

The proposals address licence-exemption primarily in unused spectrum and licence-exemption of very low-power transmissions in spectrum used by other services where there is very low risk of increased interference. However this may affect current uses such as direct broadcast satellite, point-to-point fixed links, and use by the MoD.

Any change in licence-exemption might have an impact on the users of licensed spectrum because in some cases users have a choice of whether to use licensed services or licence-exempt devices. For example, in the home a user might use a Wi-Fi base station to provide wireless voice communications or might acquire from their mobile phone network operator a small base station operating in the licensed frequencies. We have noted above how better use of licence-exempt devices might result in more use of licensed spectrum, but it is possible that the opposite may also occur. To date there has been minimal impact on licensed services of increasing availability of licence-exempt devices.

Next steps

The deadline for responses to this consultation is 21 June 2007.

We will then consider responses and subsequently issue a statement providing a framework for our future decisions relating to specific bands. Our expectation is that these decisions will relate predominantly to unused bands that may be released for licence-exempt use. We may apply these decisions to currently used bands but only in cases where we believe there would be limited impact on existing users.

If you have any questions about this consultation process please contact:

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