

## **Business Radio licensing for systems in buildings that dominate the skyline.**

This guidance note is provided for equipment suppliers and Business Radio licensees, the advice is suitable for the Business Radio Simple Site and Business Radio Technically Assigned licences. If you have any comments or questions about the guidance note please contact [kevin.delaney@ofcom.org.uk](mailto:kevin.delaney@ofcom.org.uk)

In recent months the need to make assignments for tall buildings that extend well above the local building height in cities has become increasingly apparent. Buildings that give tremendous views will also give extended radio coverage if transmitter installations are not carefully planned. Receivers located in these elevated positions are also susceptible to receive signals from far away. For the purposes of spectrum planning Ofcom defines a tall building as being greater than 30 metres in height.

In London and other major conurbations radio spectrum is heavily used and systems with large coverage areas or which through their structure may cause a large coverage area are very difficult to accommodate. In most cases the requirement for a radio system associated with these tall buildings is for reliable communication throughout the entire building and for a small area outside at ground level for events such as fire evacuation. To enable a successful assignment to be made the system will need to be carefully planned.

Modern building techniques can present challenges for indoor coverage and in most cases the design of the radio system infrastructure can address internal coverage and also minimise the impact outside the building itself.

The most successful implementation will be one that can be installed during the fit out of the building.

This information sheet has been produced with being able to make an assignment in an already busy and congested radio environment; however it has been developed with industry contributing to the best practice approach.

### **Radiating Cable.**

Radiating cable is an ideal way of delivering low levels of radio frequency (RF) throughout a building. It provides 'a slight leak' of transmitted RF along its length and so the cable can be routed to provide coverage into the most inaccessible parts of a building and throughout each floor, including basements etc. The cable must be terminated into a dummy load rather than feeding a conventional antenna. Most radiating cables have a coupling loss of over 50dB but the transmitted signal is delivered to the areas that need reliable coverage. The cables will also pick up the transmitted signals from the terminals within its vicinity. As the cable is quite deaf it will help minimise signals from radio installations using the same frequency from causing interference. Power levels still need to be carefully controlled and a maximum power at the highest terminated cable end should not exceed 100 milliwatts (mW) (20dBm)

From an Ofcom perspective, installations using a radiating cable give the best chance of us being able to make an assignment but we also have to take into account the effect of handheld transceivers or mobiles operating at the high elevations.

The handheld receivers though are going to be quite sensitive and a simple way of limiting the chance of them picking up signals from other users is to use an antenna with approximately 10dB loss. This means the antenna will make the radio less sensitive to more distant signals. Also digital colour codes or CTCSS tones will help reject any transmissions not intended for reception.

The terminals are likely to be the limiting factor for us to make an assignment and these will need some technical attention as well. The transmit power must be reduced to a level that just meets the in building coverage requirement. The handheld transmit power should be limited to a maximum of 250mW (24dBm)

### **Distributed Antenna Systems**

This type of system is more difficult to accommodate but in some cases may be chosen. These systems employ several conventional antenna's arranged throughout the building. It is common to use fibre optic systems to transport the signal to and from the antenna but whatever is used the RF level transmitted from each antenna should be no more than 10mW (10dBm per carrier) above ground and 100mW below ground as it is assumed that any transmission below ground will not permeate the surface. This type of system does not benefit from the 50dB coupling loss that a radiating cable provides and so it is more likely to receive transmissions from users outside the building. It is therefore even more important to use Digital Colour Codes or CTCSS to lock out unwanted transmissions.

The handheld receivers though are going to be quite sensitive and a simple way of limiting the chance of them picking up signals from other users is to use an antenna with approximately 10dB loss. This means the antenna will make the radio less sensitive to more distant signals. Also digital colour codes or CTCSS tones will help reject any transmissions not intended for reception.

The terminals are likely to be the limiting factor for us to make an assignment and these will need some technical attention as well. The transmit power must be reduced to a level that just meets the in building coverage requirement. The handheld transmit power should be limited to a maximum of 250mW (24dBm)

### **Outdoor Coverage**

Coverage outside for logistics, building evacuation or to couple the Fire service communications into the building will need separate consideration but here again the choice of antenna and where it is mounted is important. It may be possible to meet the requirement with radiating cable but in some cases a down fire (or up-fire) antenna radiating at a low level may be needed. Ofcom will need to know about all the radiating components when we make an analysis and your licence should include reference to radiating cable and any other antenna integrated into the system.

## Licensing Process

If the proposed installation site is above 30 metres and the application proposes use of an antenna that is not a radiating cable or distributed antenna system then you will be asked to provide the site engineering justification of the proposed choice of antenna such as an omnidirectional.

Ofcom as part of its spectrum management remit is entitled to ask the applicant to change the proposed antenna to ensure that a frequency assignment can be made.

As part of the licensing process you should also let Ofcom know the highest point of a mobile terminal so that this can be modelled to give an accurate coverage prediction rather than using the default mobile height of 1.5 metres.

## Licence Fee

If the antenna is used indoors or underground or is a downfire, leaky feeder or radiating cable type, it will fall within the lowest priced category 1. For further information please note a link to the fee guidance note <http://licensing.ofcom.org.uk/binaries/spectrum/business-radio/forms/nonexcelguide.pdf>

## Additional information

[https://en.wikipedia.org/wiki/Leaky\\_feeder](https://en.wikipedia.org/wiki/Leaky_feeder)

[https://en.wikipedia.org/wiki/Distributed\\_antenna\\_system](https://en.wikipedia.org/wiki/Distributed_antenna_system)

[https://en.wikipedia.org/wiki/Dummy\\_load](https://en.wikipedia.org/wiki/Dummy_load)

[https://en.wikipedia.org/wiki/Coupling\\_loss](https://en.wikipedia.org/wiki/Coupling_loss)