OFFICE OF COMMUNICATIONS

# Award of available spectrum: 1781.7-1785 MHz paired with 1876.7-1880 MHz

## Technical note on licence conditions, rights and obligations

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# Contents

## Section 1

# Introduction

1.1 This technical note ("Technical Note") has been prepared by Ofcom, in connection with the proposed award of wireless telegraphy licences to use the spectrum bands 1781.7 – 1785 MHz paired with 1876.7 – 1880 MHz (the "Spectrum Bands"). The purpose of this Technical Note is to provide background information for the seminar scheduled for 26 October 2005. Accordingly, it discusses some of the issues that have arisen out of responses to the Ofcom Consultation Document "Award of unused spectrum: 1781.7-1785 MHz paired with 1876.7-1880 MHz" dated 28 July 2005 ("July Consultation ") and out of the associated seminar hosted by Ofcom on 8 September 2005. It is intended to provide background material to assist discussions at the follow up seminar scheduled for 26 October 2005. Terms and expressions used in this Technical Note are as defined in the July Consultation.

1.2 The Technical Note is being made available for information purposes only. It is made available on the express understanding that it will only be used for the sole purpose of assisting in reviewing Ofcom's proposals for certain technical licence conditions, and not in assessing whether to participate in the proposed award of licences to use the Spectrum Bands. The Technical Note is not intended to form any part of the basis of any investment decision or other evaluation or any decision to participate in the proposed award of licences to use the Spectrum Bands and should not be considered as a recommendation by Ofcom or any of its advisers to do so. Any party considering participating in the proposed award of licences to use the Spectrum Bands must make its own independent assessment of the technical viability of using the Spectrum Bands and the potential value of a licence to use the Spectrum Bands after making such investigation as it may deem necessary in order to determine whether to participate. All information contained in this Technical Note is subject to updating, modification and amendment.

1.3 No person should construe the content of the Technical Note, or any other communication by or on behalf of Ofcom or any of its other advisers, as technical, financial, legal, tax or other advice. Accordingly, any person considering participating in the proposed award of licences to use the Spectrum Bands (either directly or by investing in another enterprise) should consult its own advisers as to these and other matters or in respect of any other assignment of any radio spectrum.

1.4 This Technical Note does not constitute a decision by Ofcom on any matter that was subject to the July Consultation. A statement setting out Ofcom's conclusions following the July Consultation will be published in due course.

## Section 2

# Specification of the power level

### Maximum EIRP

2.1 The original proposal, discussed at paragraphs 6.3 to 6.10 of the July Consultation, was to specify an in-band equivalent isotropically radiated power (EIRP) limit of 23 dBm per carrier. Our interference analysis was based on the assumption that the most likely technology to be deployed would be GSM with a nominal 200 kHz carrier bandwidth and therefore the power would be constrained to bandwidths of 200 kHz or greater. However, if the carrier bandwidth is unspecified, a system radiating multiple narrowband carriers (i.e. <<200 KHz) could produce a higher interference power than a single 200 kHz carrier. In order to resolve this issue and to ensure that, regardless of technology choice, the interference power that any licensed system can generate is no greater than a 23 dBm GSM carrier could produce, Ofcom is considering modify the way the EIRP limit is specified as follows.

*2.2 The maximum mean EIRP density in the Permitted Frequency Bands shall not be greater than 0 dBm per kHz within the occupied bandwidth of the system.*

2.3 Where the occupied bandwidth is not clearly understood for any particular systems it should be defined as the width of the frequency band occupied such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5% of the total mean power of the emission.

2.4 Some examples of how the revised limit applies to different carrier bandwidths:

- for GSM (occupied bandwidth of 200 kHz) this equates to 23 dBm (200 mW) per carrier which is identical to our original proposal;
- for a cdma 1x based system (occupied bandwidth of 1.25 MHz) this equates to 31 dBm per carrier; and
- for a narrowband system with an occupied bandwidth of say 25 kHz this equates to 14 dBm per carrier.

### Duplex arrangements

2.5 It has been suggested that uplink and downlink transmit and receive paths should not be prescribed, but that each licence holder should be free to choose which technology is deployed for each of the paired bands and how this is configured. Provided that the same EIRP and out-of-block emissions limits are applied, there should not be any greater interference potential if alternative duplex arrangements are allowed. Therefore, Ofcom is considering not specifying a particular duplex (uplink/downlink) direction in the licences. Rather, the licence will specify the same EIRP limit and out-of-block emission mask for both the 1781.7 – 1785 MHz and 1876.7 – 1880 MHz bands.

### Allowing higher powers

2.6 A few respondents to the July Consultation made a case for allowing higher power transmissions (up to 30 dBm per carrier). They argued that under certain conditions, i.e. where systems are geographically or physically isolated (for instance in basements or tunnels), use of higher powers would not adversely effect interference

to other systems. Ofcom is sympathetic to this and recognises that in practice, the licensees themselves will often be best placed to decide on the interference costs of allowing higher powers in particular circumstances. Ofcom, however, recognises that any such flexibility must be kept to within defined bounds to ensure interference is effectively managed.

2.7 Ofcom is therefore considering whether there is a mechanism which could allow licensees the flexibility to agree amongst themselves the use of powers up to an EIRP density of 7 dBm per kHz (equivalent to 30 dBm for a 200 kHz GSM carrier) in particular locations or in particular circumstances. This agreement might apply nationally or locally, possibly over a limited period of time, and may or may not be limited to a subset of licensees. If such flexibility can be allowed the agreement would have to be reached unanimously by all licensees and any such agreement would almost certainly also have to be notified to Ofcom in writing (potentially this could be incorporated into the industry Code of Practice on engineering coordination).

## Section 3

# Antenna height

3.1 Ofcom proposed, in paragraph 6.15 of the July Consultation, to apply a restriction on the maximum height of outdoor antenna systems as follows.

*3.2 The highest point of outdoor antenna systems shall be no more than 10 metres above ground level.*

3.3 Ofcom has been requested to provide greater clarity on the term outdoor and has been asked how the restriction will be enforced.

3.4 Ofcom does not believe that there is any ambiguity in the term outdoor. It is obvious that if an antenna system is mounted within the fabric of a building then the antenna cannot be outdoors, the material from which the building is constructed is to a certain extent irrelevant (though there is an implicit assumption that it will typically provide the necessary attenuation to facilitate sharing). It is true that different building materials have different propagation characteristics, for instance glass is likely to attenuate a radio signal to a much lesser extent than brick or steel. However, whilst this may be relevant to engineering coordination considerations, it is incidental to whether an antenna system is considered to be outdoors or not.

3.5 It is interesting to note that the recent European Commission Decision on wireless assess systems at 5 GHz[1] contained differing provisions for indoor and outdoor use. In this Decision indoor use was defined as:

> 'indoor use' shall mean use inside a building, including places assimilated thereto such as an aircraft, in which the shielding will typically provide the necessary attenuation to facilitate sharing with other services.

3.6 Enforcement of the height restriction for outdoor antenna systems will be treated in the same manner as the enforcement of any other licence condition.

[1] Commission Decision of 11 July 2005 on the harmonised use of radio spectrum in the 5 GHz frequency band for the implementation of wireless access systems including radio local area networks (WAS/RLANs) (2005/513/EC)

## Section 4

# Out-of-block emissions mask

4.1 The out-of-block emissions mask proposed in the July Consultation at paragraph 6.22 and Table 6.1 was derived from the GSM 05.05 standard. It was implicitly based on power levels (expressed as dBc) relative to a 30 kHz measurement on a 200 kHz carrier.

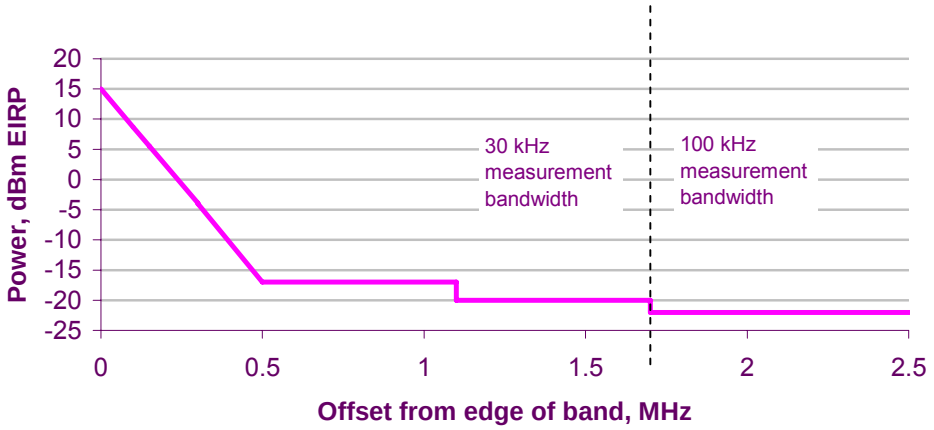
4.2 In order to clarify how the out-of-block emissions mask applies to technologies that do not employ carrier bandwidths of 200 kHz, Ofcom is proposing to revise the way the mask is specified in terms of absolute EIRP values within a specified measurement bandwidth. The revised mask is as follows:

| Offset from edge of block | Maximum permitted level | Measurement bandwidth |
|---|---|---|
| 0 MHz to 0.3 MHz | 15 - 63 × Δ*f* dBm EIRP | 30 kHz |
| 0.3 MHz to 0.5 MHz | - 4 - 65 x (Δ*f* - 3) dBm EIRP | 30 kHz |
| 0.5 MHz to 1.1 MHz | -17 dBm EIRP | 30 kHz |
| 1.1 MHz to 1.7 MHz | -20 dBm EIRP | 30 kHz |
| 1.7 MHz to 6 MHz | -22 dBm EIRP | 100 kHz |

where Δ*f* is the frequency offset in kHz,

and the block edges are defined as 1781.9 MHz and 1784.9 MHz, and1876.9 MHz and 1879.9 MHz respectively.

4.3 A pictorial representation of the mask is as follows:



## Section 5

# Licence exemptions for user stations

### Conventional duplex direction

5.1 In the case of user stations (i.e. handsets) that fall within the scope of the current licence exemption regulations[2], the requirements of the exemption regulations will continue to apply. At the present, these regulations cover the use of personal communications networks (PCN) user stations transmitting in the 1710 – 1785 MHz band, therefore user stations complying with these regulations may be used in conjunction with base stations transmitting in the 1876.9 – 1879.9 MHz band.

5.2 Ofcom intends to maintain this situation (though we may in future expand the scope of the exemption regulations to cover a wider range of user stations than the current PCN definition). PCN user stations will therefore be exempt from licensing and outside the scope of the concurrent licences for the Spectrum Bands.

### Reverse duplex direction (or TDD use)

5.3 Ofcom has no plans to extend the exemption regulations to cover user stations transmitting in the 1876.9 – 1879.9 MHz band. User stations in this band may fall within the scope of the concurrent licences for the Spectrum Bands subject to complying with the provisions of those licences. Ofcom has no plans to include these user stations in the exemption regulations, though the scope and content of the exemption regulations will be kept under review.

[2] Licence Exemption Regulations (SI No. 74/2003)

## Section 6

# Engineering coordination

6.1 Ofcom's proposed approach to engineering coordination was outlined in paragraphs 6.29 to 6.36 of the July Consultation. The fundamental principle is to allow licensees to manage engineering coordination themselves via the establishment of an industry Code of Practice. A number of responses to the July Consultation commented on this; but Ofcom sees no reason to revise the general approach. However, the following paragraphs should provide greater clarity on a number of the issues raised.

### Different technologies and/or uses of the spectrum

6.2 Concerns were raised on what would happen if different licensees wanted to use the Spectrum Bands in 'incompatible' ways or if the industry Code of Practice favoured some technologies more than others. Ofcom does not consider it necessary to vet or approve the industry Code. However, Ofcom will need to assess whether or not the objectives sought by the Code are being achieved. In cases where, in Ofcom's sole opinion, the objectives are not being met (either through lack of cooperation or shortcomings in the code itself), Ofcom intends to reserve the right to impose its own engineering coordination procedure. In making such a decision, Ofcom will need to take into consideration how the industry Code deals with the situation where licensees wish to deploy different technologies and/or uses the spectrum in different ways. However, prior to imposing its own coordination procedure, Ofcom is likely to inform licensees where it thinks the industry Code might be deficient and, at its discretion, may give licensees an opportunity to amend the Code accordingly.

### International obligations and the Code

6.3 In the unlikely situation where the industry Code does not comply with international obligations, it is clear that any international obligations would have to take precedence. If such a situation arose, Ofcom is likely to inform the licensees and would expect them to amend the Code accordingly. Ofcom also intends to have the right to impose its own engineering coordination procedure where needed.

### Ofcom's role in the development of the Code

6.4 Ofcom believe that the licensees are best placed to assess their own needs and Ofcom does not intend to actively participate in the Code's development. Ofcom will, within its statutory functions and duties, respond to specific requests for information and advice that the licensees may need to complete it but, as already stated, Ofcom does not intend to approve the Code. Ofcom's role will be to assess whether the Code is achieving the objectives set out for it in the licence and this may well be best achieved by monitoring the results as licensees roll out services to their customers. However, it is the responsibility of the licensees to ensure that it is consistent with relevant legislation and regulations and to get their own legal, technical or other advice as may be necessary.

### Enforcement

6.5 Ofcom believes that it will be in the licensees' best interest to abide voluntarily by the Code and therefore it is likely to be self enforcing. As a matter of principle Ofcom would expect the Code itself to contain some form of dispute resolution procedure. In cases where this is not working it is likely that this would be through a lack of

cooperation and in such circumstances Ofcom has the right to impose its own engineering coordination procedure. Failure to abide by an Ofcom imposed procedure would constitute a breach of licence conditions which could ultimately result in the revocation of a licence.

6.6 There were some respondents to the July Consultation who favoured the creation of an independent group or body responsible for overseeing/managing engineering coordination. Ofcom sees this as a matter for the licensees to decide. If they feel that the establishment of such a body would be beneficial, they are free to agree such an arrangement amongst themselves.

## What happens in the first 6 months

6.7 There were some comments on what would happen in the first six months before the industry Code is agreed. Where licensees choose to roll out services prior to the agreement of the Code, they will obviously need to be mindful that their deployment could potentially be incompatible with the future Code and as such may require significant re-engineering. However, provided that licensees act responsibly, the chances of such a situation arising in practice seems small. The fact that licensees will be negotiating the Code at the same time as they are making early deployments should enable them to make reasonable judgments on whether they are likely to need to adjust their deployment once the Code is agreed.

## Ongoing maintenance of the Code

6.8 Though Ofcom expects the licensees to agree the Code within six months of award of the licences, Ofcom anticipates that there will be an ongoing need to maintain and update the Code in light of experience in its use and to adjust to changing circumstances. Ofcom may make it a condition of the licence that it is notified of any such modifications to the Code after the initial agreement.

## What should the Code cover?

6.9 It is not Ofcom's intention to dictate to licensees what the Code should contain, however potential licensees might like to consider the following:

- General principles
  - Use of site surveys
  - Use of the minimum number of carriers necessary
  - Use of the minimum transmitter power necessary
  - Positioning of base station to take advantage of natural shielding
- Sharing of information
  - What information needs to be shared?
  - How will the information be shared?
  - When should information be shared?
- Local agreements

- How are they reached?
- How are they recorded?

- Coordination procedure
  - When is coordination needed?
  - What propagation models to use?
  - Methodology for calculating potential interference?
  - What level of interference is acceptable?
  - Site engineering
  - Band segmentation
  - Response time to requests for coordination
- Dispute resolution

6.10 It should be stressed that the above is not an exhaustive list of issues that may need to be addressed, nor is it a suggested structure for the Code.

## Section 7

# Other interference management issues

### Coordination with licensees in adjacent spectrum

7.1 As was outlined in paragraphs 6.70 – 6.71 of the July Consultation, Ofcom does not believe that specific coordination with users of the neighbouring spectrum will be necessary.

7.2 It should be noted that between the Spectrum Bands and the neighbouring GSM licence, there is presently 200 kHz of unassigned spectrum. This is to ensure that holders of concurrent licences and the neighbouring GSM spectrum user are protected form interference.

7.3 It may be that, in light of experience gained from the actual deployment of services, these unassigned frequencies could be brought into use without causing undue interference to either parties. If the licensees of the Spectrum Bands and the neighbouring GSM licensee can agree on a mutually acceptable set of conditions then they would be free to request license variations to enable these frequencies to be brought into use.

### MoD use

7.4 The July Consultation highlighted, in paragraphs 6.72 to 6.77, existing MoD use in the Spectrum Bands at three specific sites. It was made clear that any interference from MoD operation at these sites will have to be accepted by the licensees.

7.5 The information given in the July Consultation covers current and known potential future use by the MoD in the Spectrum Bands. Once the award process has taken place, any other military use would have to be on a non-protection non-interference basis.