SPECTRUM CO-EXISTENCE DOCUMENT

Broadband Fixed Wireless Access (BFWA) and Spectrum Access – Sub National (SA-SN) - in 28 GHz
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Section 1

Foreword

The Wireless Telegraphy Act 2006 requires all radio apparatus to be licensed by Ofcom before being established, installed or used unless it is of a type that has been exempted from licensing. Exemption is typically granted to low power, short-range devices that are unlikely to cause interference.

Ofcom has a statutory duty to secure the optimal use of the radio spectrum. Radio spectrum is a finite resource used by a wide range of services that generate very considerable benefits. However, radio transmissions can interfere with each other and reduce or destroy this value. Within this context, Ofcom sets parameters for spectrum use that keep interference to an acceptable level and allow spectrum-using services to co-exist. Wireless Telegraphy Act licences contain technical and other restrictions that are necessary to achieve this.

In particular, Wireless Telegraphy Act licences for Broadband Fixed Wireless Access services and Spectrum Access – Sub National in 28 GHz define geographical boundaries of regions of the country where stations can be deployed and their general technical characteristics. Any interference between assignments is managed through co-ordination procedures based on principles and criteria, which are set out in this document. The co-ordination principles, specify the environment in which co-ordination should be undertaken, but do not dictate the form of the co-ordination agreement between geographically or spectrally adjacent licensees.

In planning their own services, users can have a degree of confidence that their own assignments will not be affected by unwanted signals from neighbouring assignments. It is not possible to offer an absolute guarantee, however, as co-ordination principles and criteria are based on engineering calculations and actual levels of interference may differ in practice for various reasons such as those listed below.

- Spectrum quality experienced in practice may differ from the theoretical prediction.
- Radio frequency ‘noise’ emanates from non radio devices.
- Interference might arise from illegal transmissions. Ofcom will act to discontinue these but cannot preclude them.

Ofcom considers the co-ordination principles, criteria and benchmarks in deciding whether to agree to requests for licence variations to permit different services to be offered or technologies to be employed where these are outside the scope of the existing licence. Ofcom will not usually agree to such requests if the effect would be to depress the spectrum quality of neighbouring assignments below their benchmark level unless the affected users have agreed.

- It is open to neighbouring users to negotiate different levels of spectrum quality as long as third parties’ spectrum quality remains at or above their benchmark. For example, a user may wish to operate at a higher power or change to a technology causing higher levels of interference. That user may enter into an agreement with the affected user or users on commercial terms whereby they accept a lower level of spectrum quality than their benchmark.

Ofcom uses these considerations as a threshold to decide whether to intervene in the event that interference arises. Ofcom will not usually intervene where the technical requirements of both parties are being adhered to.

Further guidance on licence variation and interference investigation may be found at Ofcom website (address shown below).

You can obtain the latest copy of this Co-ordination document from our website. If you do not have access to the Internet, you can request a printed copy from the Ofcom Contact Centre (OCC).

Please see below for our contact details:

Ofcom website: [www.ofcom.org.uk](http://www.ofcom.org.uk)

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London SE1 9HA

Tel: 0845 456 3000
Fax: 0845 456 3333

Email: contact@ofcom.org.uk

References have been given to documents that are not produced, maintained or collated by Ofcom. Licensees/Operators may find the information in these documents useful. However reference should not be taken as endorsement or a compliance requirement (other than European Directives as referenced). Also Ofcom is not responsible for the content of external websites.
Section 2

28 GHz Licences

28 GHz (Regional) BFWA Licences

2.1 Licences for Broadband Fixed Wireless Access (BFWA) in the 28 GHz band cover operation in one equally paired-spectrum block, detailed in Table 1. These blocks were originally allocated in 14 geographical regions throughout the UK. The actual details of such are reflected in the applicable licence documents.

2.2 These spectrum rights were established by basing them upon a specific technology and deployment model, Point to Multipoint Fixed Wireless Access with 28 MHz channel spacing. This model gave a certain co-existence environment by assuming the use of the CEPT channel plan for the band and the performance characteristics of the applicable standards.

28 GHz Spectrum Access - Sub National - Licences

2.3 Licences for Spectrum Access - Sub National - (SA-SN) in the 28 GHz band cover operation in one equally paired spectrum block detailed in Table 1. These blocks have been allocated in 3 aggregated regions as reflected in the associated licence documents.

2.3 The spectrum rights in these blocks are defined differently to the original 28 GHz BFWA spectrum packages. The spectrum rights for these licences are defined on the basis of a block edge mask, shown in Table 3. No technology or platform has been assumed as the most likely service as there are a number of candidate technologies and uses in these bands.

Ofcom’s role

2.4 Ofcom will undertake to support licence holders and subsequent trading parties by:

- providing advice and guidance on best practices and processes to facilitate co-existence of operators which are geographically or spectrally adjacent;
- Recording of 28 GHz BFWA and SA-SN assignments through the UK national (e.g. National Frequency Assignment Panel) and international procedures (e.g. International Master Frequency Register);
- Assisting in co-existence issues if co-operation between operators fails and
- addressing both national and international co-ordination and policy issues.

General Considerations

2 CEPT/ECC Recommendation (01)03 "Use of Parts of the Band 27.5-29.5GHz for Fixed Wireless Access".
3 Harmonised Standard ETSI EN 301 213 – Now superseded by ETSI EN 302 326.
4 Both these processes are currently under review
2.5 This co-existence document considers the originally awarded BFWA spectrum and the spectrum awarded under the SA-SN packages.

2.6 Management of deployment situations within an allocated band, are in general a matter for the licensees concerned. However, breach of a co-ordination agreement entered into pursuant to a licence condition will be treated as equivalent to failure to enter into the co-ordination agreement, i.e. as an enforcement matter. Ofcom will not specify grounds on which co-ordination may be refused.

2.7 The licensees shall:

i. notify Ofcom of all inter-operator co-ordination agreements;

ii. analyse the co-existence requirements with all potentially affected parties before any segmentation of an assigned frequency band takes place. Where an assignment is segmented the parties shall define their own boundary conditions along with spectrum block definitions;

iii. resolve any interference dispute between themselves. A dispute not involving a licence breach may be referred to Ofcom under the Communications Act (2003) dispute procedure s190(7a). However, licensees are encouraged to use alternative dispute resolution procedures, where these can be agreed between the parties.
Section 3

Spectrum Rights

Transmission

3.1 The frequency allocations for both the BFWA Regional Packages and the SA-SN packages at 28 GHz are licensed within the spectrum bands in Table 1.

<table>
<thead>
<tr>
<th>Package</th>
<th>Lower sub-band (GHz)</th>
<th>Upper sub-band (GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28.0525 to 28.1645</td>
<td>29.0605 to 29.1725</td>
</tr>
<tr>
<td>2</td>
<td>28.1925 to 28.3045</td>
<td>29.2005 to 29.3125</td>
</tr>
<tr>
<td>3</td>
<td>28.3325 to 28.4445</td>
<td>29.3405 to 29.4525</td>
</tr>
<tr>
<td>Total</td>
<td>112 MHz</td>
<td>112 MHz</td>
</tr>
</tbody>
</table>

Note 1 The individual spectrum limits of the licensed package will appear in the schedule of the licensee.

Note 2 Duplex spacing between the upper and lower sub-bands is 1008MHz

Note 3 For the BFWA Regional package this transmission limit is for the emission limits based on the applicable ETSI Standard emission masks (or equivalent) and the applicable CEPT channel plan. For the Spectrum Access - Sub National licence packages the frequency limits are for the necessary bandwidth of emissions as defined in ITU-R Recommendation SM.328-10 in conjunction with the limits for out-of-block emissions.

Note 4 There is an unassigned 28 MHz of spectrum between package 1 & 2 and 2 & 3.

Table 1: Frequency allocation for 28 GHz; BFWA and SA-SN Spectrum Packages

Broadband Fixed Wireless Access Licences

3.2 The spectrum rights for the originally awarded BFWA licences were not defined on the basis of a block edge mask but were based on an assumed deployment and technology strategy\(^5\). In that environment the indicated maximum e.i.r.p. figure is:

| Central/Hub/Base stations in Point to Multipoint (PtMP) stations | 0.5 dBW/MHz |
| Terminal/Subscriber (PtMP) Multipoint to Multipoint (MPtMP) stations | 11.5 dBW/MHz |
| Point to Point (P-P) stations | 11.5 dBW/MHz |

Note 2 An Automatic Transmitter Power Control (ATPC) range of at least 15dB is assumed for all PtMP terminal station transmitters and for all MPtMP and P-P transmitters.

Note 3 Channel sizes of greater than 28MHz are not permitted.

Table 2: Maximum e.i.r.p. figures for the BFWA licence packages.

\(^5\) Documents BFWATG(00)03 & BFWATG(00)46 available from http://www.ofcom.org.uk/static/archive/ra/topics/bfwa/technical.htm
3.3 Emissions that fall into the 28 MHz guard band are limited to the in-block use that complies with the channel plan raster for the band\(^6\) and system types assumed when the original rights were established (Annex D).

**Spectrum Access - Sub National - Licences**

3.4 The frequency allocations for the SA-SN licences are drawn from the same frequency allocations noted in Section 1.1, Table 1. For these packages the allocations are further qualified by a block edge mask that defines, absolutely, the permitted out of block emissions, independent of the assumed deployment strategies, emission bandwidths and CEPT channel plan. The spectrum rights for the SA-SN packages are shown in Table 2.

**Terrestrial e.i.r.p. Limits for In Block and Out of Block\(^7\)**

<table>
<thead>
<tr>
<th>Frequency Offset from edge of block</th>
<th>Maximum permitted e.i.r.p. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>in block other than that defined below</td>
<td>55 dBW (in any measured bandwidth)</td>
</tr>
<tr>
<td>-14 MHz of block edge</td>
<td>30 dBW/MHz</td>
</tr>
<tr>
<td>Block edge when arrived at from in block</td>
<td>11 dBW/MHz</td>
</tr>
<tr>
<td>Block edge when moving out of block</td>
<td>-39 dBW/MHz</td>
</tr>
<tr>
<td>+14 MHz of block edge</td>
<td>-52 dBW/MHz</td>
</tr>
</tbody>
</table>

Where:
- = in block
+ = out of block
linear interpolation between points

Where an individual radiating antenna has a 3 dB beamwidth of less than 5°, then the values of out of block emissions shown above can be increased by 20 dB.

The 3dB beamwidth of an antenna corresponds to the angle between the directions in which the gain of the antenna falls to half its maximum value.

**Table 3: In Block and Out of Block emission limits for the 28 GHz SA-SN Spectrum Packages**

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\(^6\) ERC/REC 13-04 “Preferred frequency bands for fixed wireless access in the frequency range between 3 and 29.5 GHz”

\(^7\) Noting that these rights may be changed following a successful liberalisation request.
### Satellite (up-link) e.i.r.p. Limits for In Block and Out of Block

3.3 Where the SA-SN licensee makes use of satellite up-links in the spectrum block the following rights will apply;

<table>
<thead>
<tr>
<th>No limit upon the maximum permitted e.i.r.p. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>the elevation angle of the main beam of the transmitting earth station shall be higher than 10° above the horizontal;</td>
</tr>
<tr>
<td>the off axis e.i.r.p. density radiated into spectrum immediately adjacent to the licensed frequency block shall be limited to -35 dBW/MHz; (off axis refers to angles greater than 7° from the axis of the main beam of transmission) except into the spectrum from 27.5 GHz up to and including 27.8285 GHz and from 28.4445 GHz up to and including 28.8365 GHz and from 29.4525 GHz up to and including 29.5 GHz where this limit will not apply and where only spurious emission limits will then apply;</td>
</tr>
<tr>
<td>satellite earth stations shall not have their transmitted occupied band edges closer than 10 MHz from the edge of the frequency blocks as referred to in the table in Section 3.1, except where that block edge directly abuts spectrum at; 27.8285 GHz, 28.4445 GHz, 28.8365 GHz and 29.4525 GHz;</td>
</tr>
</tbody>
</table>

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8 Noting that these rights maybe changed following a successful liberalisation request.
Section 4
Co-ordination Environment

Co-ordination Trigger

4.1 The licences for both the BFWA and SA-SN packages permit operators to deploy systems in defined geographical areas in the UK. These areas will have a border that shared with other licensees who in turn may share the same frequency allocation. As radio transmissions do not respect geographical boundaries, a PFD level is used to indicate the need for those operators, who share geographical borders and spectrum allocations, to commence co-ordination. This level is not an indication of interference it is only used as a coordination trigger.

| Geographical Boundary Trigger Level | -102.5 dBW/MHz/m² |

Note 1 This figure is for a single station.
Note 2 ITU-R PN 452-X² Propagation model assumed with excess loss time period of 50%.
Note 3 At any height between 0 and 30 metres for all transmitting stations, except for those stations identified as satellite earth stations where the height above ground level that will be considered is greater 30 metres.

The exception to this rule is where the bore-sight of an earth station transmission actually crosses the geographical boundary between 0 and 30 metres above ground. In those cases, regardless of the measured pfd level, the trigger for coordination has been met.

Non land shared geographical borders

4.2 Licensed geographical areas are reflected in the licence. When stations are deployed along or near a coastline, and the coastline of another licensed area is less than 60km away from the deployed station, then the remote coastline should be considered as part of the licence area boundary for the purposes of checking the boundary PFD level. This only applies to national boundaries and excludes the coast lines of the Channel Islands and the Isle of Man. Here separate considerations will apply.

Transmitter Deployment Limit

4.3 Ofcom does not prescribe a limit to transmitter deployment density for the spectrum packages BFWA and SA-SN as documented in this document. This shall be subject to review from time to time.

Spectrum Adjacent to Licensed Block

4.4 The use the bands adjacent to the blocks referenced in Table 1 (excluding the guard bands) is not covered within this document.

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² It is assumed that the most up to date version of ITU-R Recommendation PN452 will be used.
Section 5

Background Information

International

5.1 The spectrum from which the BFWA and SA-SN allocations are drawn (27500 – 29500 MHz) is listed in Article 5 of the ITU-R (International Telecommunications Union) Radio Regulations. This band is allocated on a co-primary basis to the fixed service (FS), fixed satellite service (FSS) and the mobile service (MS).

ECC Reports, Recommendations and Decisions for the bands

5.2 Within Europe this allocation is shown within ERC Report 025. There are a number of CEPT documents (Reports, Recommendations, Decision) that cover the 28 GHz band, which may offer guidance and information regarding operation within the band. The spectrum blocks shown in Table 1 were drawn from spectrum identified in ERC/DEC/(00)09.

European Commission

5.3 This band is not subject to any EC Decisions. Use of Radio devices is covered by the R&TTE Directive 1999/5/EC.

National

5.4 The National considerations are drawn from the UK Frequency Allocation Table 2007 Edition.

Shared user sites

5.5 Site specific deployments may give rise to technical considerations that cannot be anticipated, at a generic spectrum authorisation level. The impact from intermodulation products and adjacent spectrum block emissions, whilst low in probability, may necessitate site specific engineering solutions that are not directly considered in the equipment compliance assumptions for this spectrum block. Ofcom considers that appropriate action should be taken by operators, to minimise those cases.

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10 "The European Table of Frequency Allocations and Utilisations covering the Frequency Range 9 KHz To 275 GHz - http://www.ero.dk/eca-change

11 ERC/DEC/(00)09 “ERC Decision of 19 October 2000 on the use of the band 27.5 – 29.5 GHz by the fixed service and uncoordinated Earth stations of the fixed-satellite services (Earth-to-space)” Now withdrawn.

12 http://ec.europa.eu/enterprise/rtte/dir99-5.htm
EMC (ElectroMagnetic Compatibility) Considerations

5.6 Spectral emissions from non radio devices are subject to European Commission directive; 89/336/EEC\textsuperscript{13}.

Supplementary Background

5.7 Information on the original “Inter-operator Co-existence and Co-ordination Guidelines for BFWA Systems Operating in the Band 27.5 - 29.5GHz”; can be found at the Ofcom website under legacy regulator archives.

Annex 1

Example flow diagram for operators using the same original un-segmented frequency blocks (Table 1, Section 3.1) in neighbouring and unaltered geographical areas.
Annex 2

Derivation of the boundary PFD trigger level

A2.1 The original derivation for the boundary PFD figure was based on a particular technology and platform deployment scenarios. This resulted in the value: -102.5 dBW/MHz/m² (as shown in Section 4.1). This figure is used by the current 28 GHz BFWA licensees to trigger cross border co-ordination between those affected parties. Whilst the SA-SN packages are technology neutral (i.e. not limited to the model used to establish the boundary figure), the same boundary figure is retained as appropriate for the following reasons:

- The figure quoted is not an indication of interference; it is used to trigger the process of cross border co-ordination, between operators;
- Having different figures for different platform types (i.e. Fixed - PtP, PtMP, Fixed Satellite and Mobile), would be confusing, it would not be technology neutral and would lead to operators sharing a geographical boundary working to different levels;
- In some cases the trigger value can be considered purely as informative (e.g. in cases where the operators who share geographical borders exclusively use satellite up-links that are highly unlikely to down-link in the 28 GHz band and hence will not cause interference to one another).

A2.2 The examples shown later in this Annex make a number of assumptions based on:

- The original derivation assumptions and;
- The rights contained within the Spectrum Access – Sub National packages.

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14 Documents BFWATG(00)03 & BFWATG(00)46 available from http://www.ofcom.org.uk/static/archive/ra/topics/bfwa/technical.htm
Annex 3

Sample boundary PFD calculations

A3.1 Remote PFD at range R kilometres

\[ \text{PFD (dBW/MHz/m}^2) = P_{tx} + G_{tx} - 20 \log R - A_{losses} - 71 - L_{452} \]

Where:

- \( P_{tx} \) = transmitter power
- \( G_{tx} \) = transmitting antenna gain
- \( R \) = distance to the boundary in km
- \( A_{losses} \) = atmospheric losses (0.12dB/km at 28GHz)
- \( L_{452} \) = additional losses derived from ITU-R Rec P.452-X\(^\dagger\) resulting from diffraction and clutter as appropriate.

Remember: The PFD threshold is based on a typical PtMP victim antenna gain of 15dBi (Annex B).

Consider the following scenarios:

PtMP Central Station (CS) located 15km from the boundary, antenna = 60° sector, 15dBi gain, e.i.r.p. (\( P_{tx} + G_{tx} \)) = -3dBW/MHz:

**Case 1**

A3.2 Nearest boundary point is on CS antenna boresight, clear line of sight with first fresnel zone clearance (i.e. \( L_{452} = 0dB \)).

Therefore boundary PFD on boresight = -99.3dBW/MHz/m\(^2\) - action needed

\( ^\dagger \) It is assumed that the most up to date version of ITU-R Recommendation PN452 will be used.
Case 2

A3.3 As Case 1 but antenna boresight 45 degrees to the boundary. (Antenna is EN 302 326-3 class SS4\(^1\), gain = -20dB relative at 45 degrees.)

Therefore boundary PFD on boresight = \(-103.1\text{dBW/MHz/m}\) - no action needed

PFD at nearest point on boundary = \(-119.3\text{dBW/MHz/m}\) - no action needed

Case 3

A3.4 Terminal station associated with the above CS located 2km further away pointing towards the CS and the boundary. e.i.r.p. consistent with CS RSL +5dB = -120.5dBW/MHz. e.i.r.p. = -8dBW/MHz. Antenna is EN 302 326-3 Class 3B\(^2\), gain = 28dBi on boresight, 4dBi at 45 degrees off boresight.

Therefore PFD on TS boresight = \(-109.1\text{dBW/MHz/m}\) – no action needed

PFD towards nearest point on boundary = \(-129.3\text{dBW/MHz/m}\) – no action needed
A3.5 Note that in deriving the latter result for Case 3 the correlation of rain fade cannot be assumed. Therefore if a maximum ATPC range of 25dB is assumed then the PFD towards the boundary increases to -104.3dBW/MHz/m² – still no action needed.

A3.6 It can be seen that ATPC action could increase the PFD over the trigger threshold but ATPC operation is time dependent. Therefore in marginal cases a more rigorous calculation may be appropriate to assess the percentage time against e.i.r.p. increase due to ATPC.

**Satellite Earth Station use**

A3.7 The spectrum rights under the SA-SN packages permit the use of the spectrum for satellite uplinks. Whilst the original boundary PFD was established for particular types of terrestrial use, the same level is deemed suitable for satellite earth stations, although some clarification as to where that level is measured is required.

A3.8 Transmissions from satellite earth stations could breech the boundary PFD figure when some distance from the border due to the required on-boresight e.i.r.p. level to establish the required link budget with the satellite. The height above ground at which that breech would occur could be at a distance above the ground that will have no effect on a terrestrial system. Therefore the following considerations should be taken into account when assessing the boundary figure in those situations.

**Satellite Earth Station Case 1**

![Figure A3.4: Earth Station Boundary Consideration On-Boresight](image)

(1) Boresight emission of earth station transmission crosses the geographical boundary at a point greater than 50 meters above ground

(2) Therefore the considered point for calculation of the boundary plot level will be a point 50 meters above ground (i.e. not the boresight transmission) but on the same azimuth as the boresight transmission of the earth station
A3.9 Figure A3.4 gives an example of where the on-boresight transmission crosses the geographical boundary at a height above ground of greater than 30 metres. In this case an upper limit on the height consideration is required. For this example the height at which the PFD boundary calculation is made is no more than 30 metres above ground but on an azimuth the same as the boresight direction. The elevation antenna envelope should be considered when calculating the PFD level i.e. the highest PFD is not necessarily at exactly 30m above ground, but will be between 0 and 30 metres. Therefore the highest value between those heights will be used. The off-axis boundary PFD, between 0 and 30 metres, may be of a higher level than that shown above. For those cases Satellite Earth Station Case 2 should be considered.

**Satellite Earth Station Case 2**

![Diagram of Earth Station Boundary Consideration Off-Axis](image)

**Figure A3.5: Earth Station Boundary Consideration Off-Axis**

A3.10 Figure A3.5 gives an example of where the off-axis (off-axis in terms of azimuth and elevation) PFD at the geographical boundary (Point A), at a height of 30 metres, is greater than the level at the same height but on the boresight azimuth. Therefore in these cases the level recorded at Point A should be considered.

A3.11 As in the previous example, it is the highest value of PFD at the boundary, between 0 and 30 metres above ground, which should be considered.
A3.12 Finally there maybe cases where the boresight of transmissions from a satellite earth station may cross the geographical boundary at a height of less than 30 metres. These cases are likely to result in the recorded/measured pfd value being above -102.5 dBW/MHz/m². In those circumstances, regardless of the pfd figure, coordination should be triggered where the elevation of the earth station results in the boresight from that satellite earth station, crossing the geographical boundary at a height of less than 30 metres above ground.

A3.13 In conclusion, for satellite earth station uplinks, the following points need to be additionally considered when establishing the geographically boundary PFD level.

- Satellite antenna Radiation Pattern Envelope (RPE) in both azimuth and elevation.
- Point above ground that the boresight of transmission crosses the geographical boundary.
Annex 4

Guard band/spatial separation

Original Considerations for BFWA Spectrum Packages

A4.1 The spectrum allocations for the BFWA were not defined on the basis of a block edge mask, but were established on the basis of a particular technology and deployment strategy. The spectrum environment directly outside these allocations varied dependent upon placement of the transmission, e.i.r.p. of the transmission and channel width employed. Both licence packages at 28 GHz (BFWA and SA-SN) have a 28 MHz guard band between each block. The original decision to include this guard band was made under the particular technology and platform deployment scenario mentioned. These original assumptions noted that where particular deployments strategies were made that the 28 MHz guard band assisted the co-existence environment. Outside those deployment considerations spatial separation in conjunction with the 28 MHz guard band, maybe required.

Spectrum Access – Sub National - Considerations

A4.2 In line with Ofcom’s general policy, the spectrum blocks for Spectrum Access – Sub National are defined by the use of a block edge mask. The use of the mask does not expressly define the placement of individual emissions; rather it is an envelope inside which transmissions are permitted. Therefore the co-existence situation is not directly comparable. This does not imply that interference is any more or less likely to occur, as individual system deployment parameters will play a far greater part in the overall environment than the mask alone. These variables are under the direct control of the licensed operators.

Conclusions for Guard Band and Spatial Separation

A4.3 As the operational environment is defined by system deployments, operators should therefore cooperate to minimise the impact on their deployments. Operators will be better placed to understand the overall technical environment through this cooperation. Testing the adequacy of a particular guard band size is complicated and dependent upon many specific operational, technical and deployment characteristics. These considerations, in conjunction with any management of the duplex arrangement at shared sites, will need to be assessed by spectrally adjacent licensees for their potential impact. Ofcom will not set these variables in a technology and service neutral licensing regime.

\footnote{CEPT Report 99 “The analysis of the coexistence of two FWA cells in the 24.5 - 26.5 GHz and 27.5 - 29.5 GHz bands” CEPT Report 32 “Mechanisms to improve co-existence of Multipoint (MP) systems"}
Spectrum Packages issued to both 28 GHz BFWA and Spectrum Access – Sub National

Spectrum in geographical areas for both BFWA and SA-SN

A → B

Spectrum adjacent at point A and C is licensed to Spectrum Access use with rights identical to those for SA-SN.


Each package is a total amount of 2 x 112 MHz (within the limits shown in Section 3.1). The hatched areas between packages 1 & 2 and 2 & 3 is an unassigned 28 MHz
### Annex 6

#### Region Spectrum Package 1 Spectrum Package 2 Spectrum Package 3
A BFWA BFWA BFWA
B BFWA BFWA BFWA
C BFWA BFWA BFWA
D SA-SN SA-SN SA-SN
E SA-SN SA-SN SA-SN
F SA-SN SA-SN SA-SN
G SA-SN SA-SN SA-SN
H SA-SN SA-SN SA-SN
I BFWA BFWA SA-SN
J SA-SN BFWA SA-SN
K SA-SN SA-SN SA-SN
L SA-SN BFWA SA-SN
M SA-SN SA-SN SA-SN
N BFWA BFWA SA-SN

Notes: Details of individual operators is available from the Wireless Telegraphy Act Register\(^{17}\).

Geographical rights may change following a successful variation request.

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Annex 7

Glossary

**ATPC**
Automatic Transmit Power Control: a technical method where the power is automatically adjusted to level where the required link budget is maintained but not exceeded at higher than required level.

**BFWA**
Broadband Fixed Wireless Access: similar to Fixed Wireless Access, but generally with data speeds higher than that used by Fixed Wireless Access, see FWA.

**Base Station**
See ‘CS’

**CEPT**
Conference of European Postal and Telecommunications administrations, comprising over 40 European administrations.

**CS**
Central Station. Another name given to a Base or Hub Station when used in a Point to Multipoint system, a station which is fixed at a given known location.

**Communications Act**
Communications Act 2003, which came into force in 2003.

**Co-existence**
This term refers to the process under which users seek to come to a mutual agreement to share access to a particular range of frequencies while avoiding undue interference.

**Co-ordination**
Similar in meaning to co-existence.

**dBW**
Decibels above one Watt: a logarithmic representation of radio frequency power with respect to one Watt.

**EC**
European Commission.

**ECC**
Electronic Communications Committee: a committee that reports to CEPT.

**e.i.r.p.**
Equivalent Isotropically Radiated Power: a theoretical measure of the power radiated by a transmitter/antenna - defined as the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.

** ERC**
The previous name for the ECC.

**e.r.p.**
Effective Radiated Power: a theoretical measure of the power radiated by a transmitter/antenna - defined as the product of the power supplied to the antenna and its gain relative to a halfwave dipole.

**FS**
Fixed Service is a term to describe radio systems that are fixed during transmission.

**GHz**
Gigahertz: a unit of frequency equal to 1000 million (1 x 10^9) MHz or cycles per second.

**Hub Station**
See ‘CS’
ITU

International Telecommunication Union: an international organization within the United Nations System where governments and the private sector coordinate, discuss and agree the logistics of global telecom networks and services.

kHz

Kilohertz: a unit of frequency, equal to 1000 \( (1 \times 10^3) \) MHz or cycles per second.

Liberalisation

Allowing licence holders to change the use to which they put their spectrum, within constraints to prevent interference.

MHz

Megahertz: a unit of frequency equal to 1,000,000 \( (1 \times 10^6) \) MHz or cycles per second.

PtMP

Point to Multipoint is a radio architecture where transmissions are made from a central location out to terminal stations at various and varying locations.

PFD

Power Flux Density. A measurement of radio frequency energy, either physically measured or calculated and referenced as a logarithmic value (dB) over one square metre.

PtP

Point to Point; A radio architecture where transmissions are made between two specific locations.

R&TTE Directive

The R&TTE Directive is part of the “New Approach” series of European Directives that simplifies the procedures for placing on the market, free circulation and putting into service of R&TTE. It was adopted into UK law as the “Radio Equipment and Telecommunications Terminal Equipment Regulations 2000” and came into force in April 2000.

Out of block emissions

Emissions cause by use of the spectrum covered by a particular licence that fall immediately outside the spectrum block covered by that licence.

Partial transfer

In a spectrum trading market, licence holders may transfer only a part of the rights and obligations associated with their spectrum licence - whereby the licence can be divided (e.g. partitioned) by geography, frequency and by time.

MHz

Megahertz: a unit of frequency equal to 1,000,000 \( (1 \times 10^6) \) MHz or cycles per second.

Ofcom

Office of Communications. Ofcom took over the RA’s responsibility for spectrum management in the UK in December 2003.
Sub National

A term used to describe a spectrum licence that has limited geographical coverage when compared to national coverage.

Terminal Stations

Wireless stations that are part of a wider wireless network and normal connect to hub/base/central stations. These stations are not considered the stations which are the primary source of traffic in the network.

Trading Regulations

The Statutory Regulations that facilitate spectrum trading.

Undue interference

Interference in relation to any Wireless Telegraphy which is considered harmful (as described in Sections 115(4) and 115(5), of the Wireless Telegraphy Act 2006. In summary this includes interference that creates dangers or risks of dangers to the functioning of any radiocommunications service designed for the purposes of navigation or safety services, or if the interference degrades, obstructs or repeatedly interrupts authorised broadcasting or other wireless telegraphy.

Wireless telegraphy

The means of sending information without the use of a wired system.

Wireless telegraphy licences

Licences issued under the Wireless Telegraphy Act 2006 (as amended).

WT Acts

Wireless Telegraphy Act 2006 (as amended).
Document History

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<td>1.0</td>
<td>Aug 2004</td>
<td>New format for Ofcom and spectrum trading</td>
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