SPECTRUM CO-EXISTENCE DOCUMENT

Spectrum Access 28 GHz

Updated February 2018

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Section

Annex

1. Foreword

The use of wireless telegraphy (radio communications) apparatus is regulated by the Wireless Telegraphy Act 2006[1]. Radio apparatus can only be used under the terms, limitations and provisions of a licence or a specific licence-exemption. 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 Spectrum Access in the 28 GHz frequency bands 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. 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’ emanating from non-radio devices.
- Interference arising from illegal transmissions.

[1] “Wireless Telegraphy Act” http://www.legislation.gov.uk/ukpga/2006/36/contents

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: www.ofcom.org.uk.

The latest copy of this co-ordination document is published on our website; a printed copy can be requested from:

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References may be 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.

2. 28 GHz Spectrum Access Licences

2.1 Licences for Spectrum Access in the 28 GHz band cover operation in equally paired spectrum blocks, shown in Table 1 in section 3.1.

2.2 14 regional licences which were awarded in December 2000, were originally used for Broadband Fixed Wireless Access (BFWA) with 28 MHz guardbands separating the three spectrum blocks. In 2008, additional spectrum was licensed and the original licences have since been liberalised to align with the later technical conditions.

2.3 The spectrum rights for these licences are defined on the basis of a block edge mask, shown in Table 2 in section 3.2. 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.

2.4 In 2016 the 14 original regional licences became subject to the payment of annual spectrum fees and the regions held by each licensee within each spectrum package were combined into individual Spectrum Access 28 GHz licences.

Ofcom's role

2.5 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;
- assisting in co-existence issues if co-operation between operators fails; and
- addressing both national and international co-ordination and policy issues.

General Considerations

2.6 Noting that the alignment of technical licence conditions which define the spectrum rights on the basis of a block edge mask, this co-existence document now considers the coordination between licences in adjacent geographic regions.

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

2.8 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. seek to 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.

3. Spectrum Rights

Frequencies

3.1 The frequency allocations for the spectrum access packages at 28 GHz are licensed within the spectrum bands in Table 1.

Package	Lower sub-band (GHz)	Upper sub-band (GHz)	Total
National	27.8285 to 28.0525	28.8365 to 29.0605	2 x 224 MHz
1	28.0525 to 28.1645	29.0605 to 29.1725	2 x 112 MHz
2	28.1925 to 28.3045	29.2005 to 29.3125	2 x 112 MHz
3	28.3325 to 28.4445	29.3405 to 29.4525	2 x 112 MHz

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 1008 MHz

Note 3 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 2 x 28 MHz of spectrum between packages 1 & 2 and 2 & 3.

Table 1: Frequency allocation for Spectrum Access 28 GHz packages

Emissions

3.2 The spectrum packages are 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 are shown in Table 2.

Terrestrial e.i.r.p. limits for in-block and out-of-block

Frequency offset from edge of block	Maximum permitted e.i.r.p. level
In block other than that defined below	55 dBW (in any measured bandwidth)
-14 MHz of block edge	30 dBW/MHz
Block edge when arrived at from in block	11 dBW/MHz
Block edge when moving out of block	3dB Beamwidth ≥ 5°: -39 dBW/MHz 3dB Beamwidth < 5°: -19dBW/MHz
+14 MHz of block edge	3dB Beamwidth ≥ 5°: -52 dBW/MHz 3dB Beamwidth < 5°: -32dBW/MHz
Where: - = in block + = out of block linear interpolation between points	

Table 2: In-block and out-of-block emission limits for 28 GHz Spectrum Packages

Satellite (up-link) e.i.r.p. Limits for in-block and out-of-block

3.3 Where the spectrum access licensee makes use of satellite up-links in the spectrum block the following rights will apply.

No limit upon the maximum permitted e.i.r.p. level.
the elevation angle of the main beam of the transmitting earth station shall be higher than 10° above the horizontal.
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.
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.

4. Co-ordination Environment

Co-ordination Trigger

4.1 The licences for the spectrum access packages permit licensees to deploy systems in defined geographical areas in the UK. These areas may share geographic borders with other licensees using the same frequency package. 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/m^2

Note 1 This figure is for a single station.

Note 2 ITU-R PN 452-X[2] 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 where separate considerations will apply.

Transmitter Deployment Limit

4.3 Ofcom does not prescribe a limit to transmitter deployment density for the spectrum access packages as set out 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.

[2] It is assumed that the most up to date version of ITU-R Recommendation PN452 at the time of installation of any apparatus will be used.

5. Background Information

International

5.1 The spectrum from which the Spectrum Access 28 GHz 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[3]. 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[4].

European Commission

5.3 This band is not subject to any EC Decisions. Use of Radio devices is covered by the Radio Equipment Directive (Directive 2014/53/EU)[5].

National

5.4 The National frequency allocations are set out in the UK Frequency Allocation Table.

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.

EMC (ElectroMagnetic Compatibility) Considerations

5.6 Spectral emissions from non-radio devices are subject to European Commission directive; 89/336/EEC[6].

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

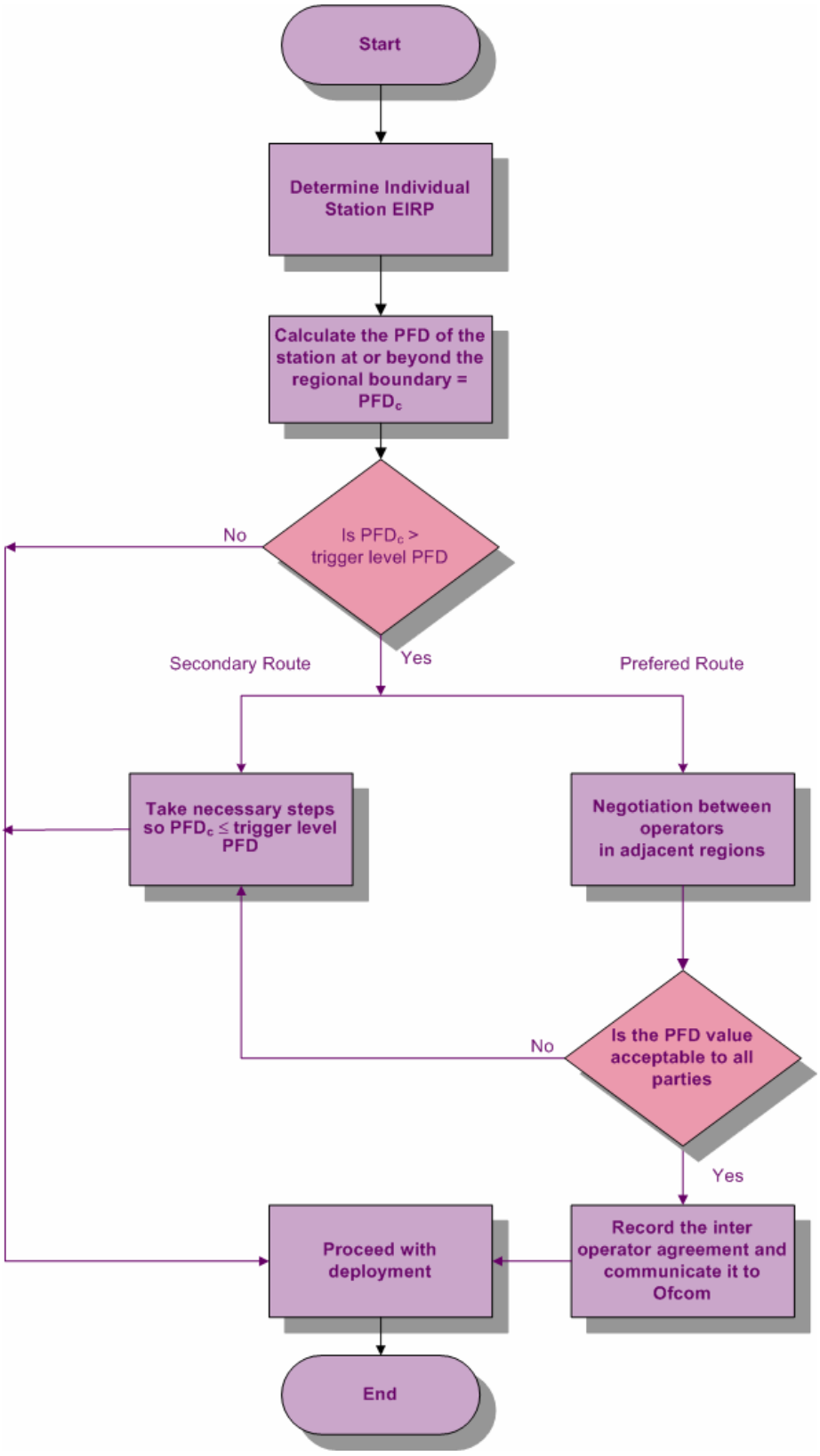
4 ERC/DEC/(00)09 "ERC Decision of 19 October 2000 on the use of the band 27.5 – 29.5 GHz by the fixed service and uncoordinated Earth stations of the fixed-satellite services (Earth-to-space)" Now withdrawn.

[5] http://ec.europa.eu/growth/sectors/electrical-engineering/red-directive_en

[6] "Directive EMC 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility" - http://ec.europa.eu/enterprise/newapproach/standardization/harmstds/reflist/emc.html

A1. Example Process Diagram

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



A2. 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/m^2 (as shown in Section 4.1). This figure is used by the Spectrum Access 28 GHz licensees to trigger cross border co-ordination between those affected parties. Whilst the spectrum 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 Spectrum Access 28 GHz packages.

A3. Sample boundary PFD calculations

A3.1 Remote PFD at range R kilometres

$$\textbf{PFD (dBW/MHz/m}^2\textbf{)} = P_{tx} + G_{tx} - 20\log R - A_{losses} - 71 - L452$$

Where:

P_{tx} = transmitter power

G_{tx} = transmitting antenna gain

R = distance to the boundary in km

A_{losses} = atmospheric losses (0.12 dB/km at 28 GHz)

L452 = additional losses derived from ITU-R Rec P.452-X[7] resulting from diffraction and clutter as appropriate.

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

Consider the following scenarios:

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

Case 1

A3.2 Nearest boundary point is on CS antenna boresight, clear line of sight with first fresnel zone clearance (i.e. L452 = 0 dB).

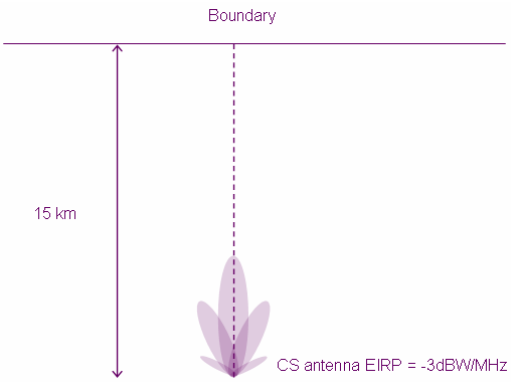


Figure A3.1: Terrestrial Station Boundary Consideration Case 1

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

[7] It is assumed that the most up to date version of ITU-R Recommendation PN452 at the time of installation of any apparatus 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 SS41, gain = -20 dB relative at 45degrees.)

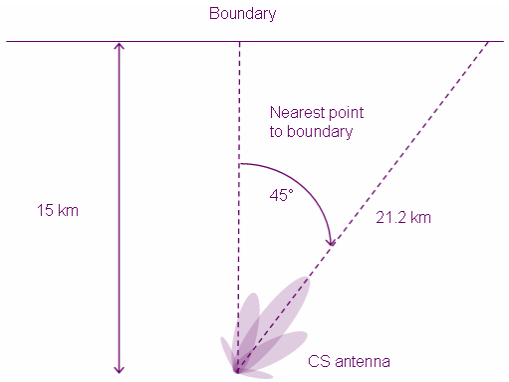


Figure A3.2: Terrestrial Station Boundary Consideration Case 2

Therefore boundary PFD on boresight =
-103.1 dBW/MHz/m^2 - no action needed

PFD at nearest point on boundary =
-119.3 dBW/MHz/m^2 - no action needed

Case 3

A3.4 Terminal station associated with the above CS located 2 km further away pointing towards the CS and the boundary. e.i.r.p. consistent with CS RSL +5 dB = -120.5 dBW/MHz. e.i.r.p. = -8 dBW/MHz. Antenna is EN 302 326-3 Class 3B2, gain = 28 dBi on boresight, 4 dBi at 45 degrees off boresight.

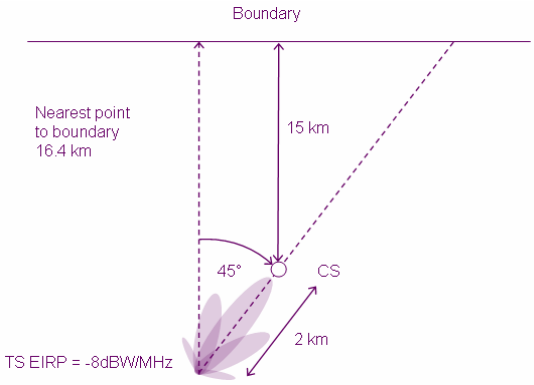


Figure A3.3: Terrestrial Station Boundary Consideration Case 3

Therefore PFD on TS boresight =
-109.1 dBW/MHz/m^2 – no action needed

PFD towards nearest point on boundary =
-129.3 dBW/MHz/m^2 – 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 25 dB is assumed then the PFD towards the boundary increases to -104.3 dBW/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 spectrum access 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 breach 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

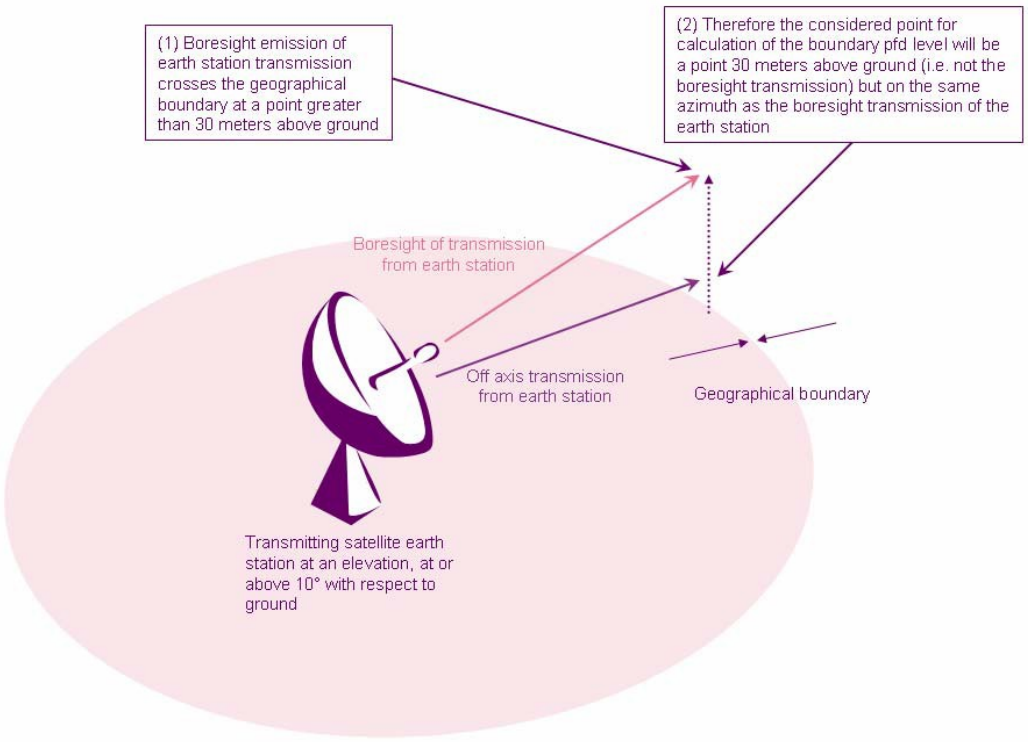


Figure A3.4: Earth Station Boundary Consideration On-Boresight

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 30 m 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

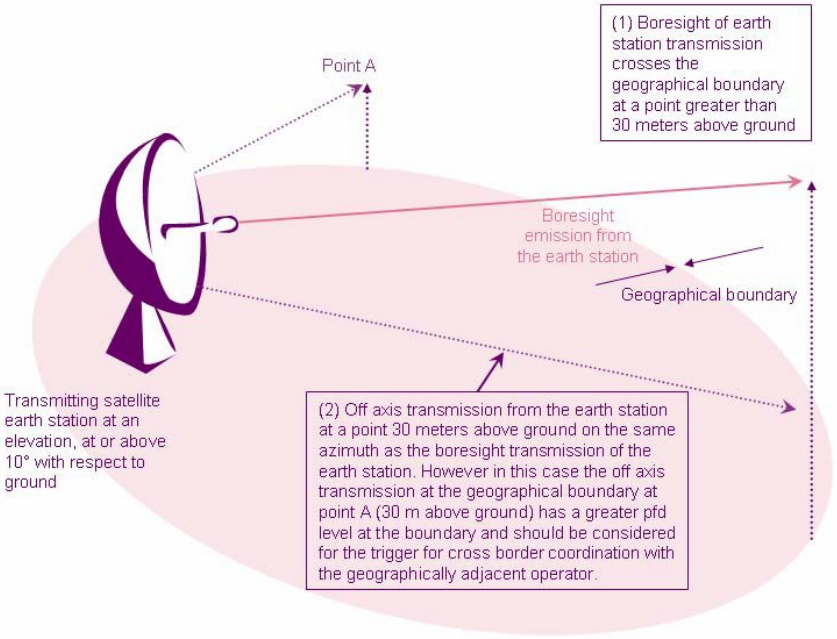


Figure A3.5: Earth Station Boundary Consideration Off-Axis

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.

A4. Guard band/spatial separation

Original Considerations for Spectrum Packages

A4.1 The spectrum allocations (originally licensed for Broadband Fixed Wireless Access in December 2000) were not defined on the basis of a block edge mask, but were established on the basis of a particular technology and deployment strategy[8]. 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. The original three packages at 28 GHz have a 28 MHz guard band between each block. The decision to include this guard band was made under that particular technology and platform deployment scenario and these original assumptions noted that where particular deployments strategies were made that the 28 MHz guard band assisted the co-existence environment.

Spectrum Access 28 GHz – Separation Considerations

A4.2 A4.2 In line with Ofcom's general policy, the spectrum blocks for Spectrum Access 28 GHz are defined by the use of a block edge mask, introduced when further spectrum was licensed in 2008. The use of the mask does not expressly define the placement of individual emissions; rather it is an envelope inside which transmissions are permitted. The earlier licences have since been liberalised to employ the same technical conditions, however the guardbands remain.

[8] 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"

A5. Spectrum Packages issued to Spectrum Access 28 GHz

Spectrum Access 28 GHz licences, frequencies and regions

	27.8285 – 28.0525 GHz paired with 28.8365 – 29.0605 GHz	28.0525 – 28.1645 GHz paired with 29.0605 – 29.1725 GHz	2 x 28 MHz	28.1925 – 28.3045 GHz paired with 29.2005 – 29.3125 GHz	2 x 28 MHz	28.3325 – 28.4445 GHz paired with 29.3405 – 29.4525 GHz
	(2 x 224 MHz)	(2 x 112 MHz)		(2 x 112 MHz)		(2 x 112 MHz)
A	Arqiva	Telefónica UK		Arqiva		UK Broadband
B		Vodafone		Telefónica UK		UK Broadband
C		Telefónica UK		Vodafone		UK Broadband
D		Vodafone		UK Broadband (Spectrum traded to Arqiva Ltd at 6 locations)		UK Broadband (Spectrum traded to Arqiva Ltd at 6 locations)
E						
F						
G						
H						
I		Telefónica UK		Vodafone		
J		Vodafone		Vodafone		
K				UK Broadband		
L				Telefónica UK		
M				UK Broadband		
N		Telefónica UK				

Spectrum Access complying with IR 2048 – First awarded December 2000

Spectrum Access complying with IR 2048 – First awarded February 2008

Spectrum Access frequency packages

National (Arqiva)	27.8285 – 28.0525 GHz	paired with	28.8365 – 29.0605 GHz	(2 x 224 MHz)
Package 1	28.0525 – 28.1645 GHz	paired with	29.0605 – 29.1725 GHz	(2 x 112 MHz)
Guard-band				(2 x 28 MHz)
Package 2	28.1925 – 28.3045 GHz	paired with	29.2005 – 29.3125 GHz	(2 x 112 MHz)
Guard-band				(2 x 28 MHz)
Package 3	28.3325 – 28.4445 GHz	paired with	29.3405 – 29.4525 GHz	(2 x 112 MHz)

January 2018

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Region A:	Greater London
Region B:	Greater Manchester, Merseyside & Cheshire
Region C:	West Midlands, Warwickshire, Staffordshire, Worcestershire, Shropshire & Herefordshire
Region D:	Isle of Wight, Hampshire, Berkshire & Oxfordshire
Region E:	Essex, Hertfordshire & Buckinghamshire
Region F:	Suffolk, Norfolk, Bedfordshire, Cambridgeshire & Northamptonshire
Region G:	Derbyshire, Lincolnshire (other than North & North East Lincolnshire District Councils), Leicestershire, Nottinghamshire & Rutland
Region H:	Kent, Surrey, East Sussex & West Sussex
Region I:	East Riding of Yorkshire, North, West & South Yorkshire, North & North East Lincolnshire District Councils
Region J:	Tyne and Wear, Durham, Northumberland, Cumbria & Lancashire
Region K:	Bristol, Devon, Cornwall and the Isles of Scilly, Dorset, Somerset, Wiltshire & Gloucestershire
Region L:	Scotland
Region M:	Wales
Region N:	Northern Ireland

Geographic regions A – N are shown in Annex 6

A6. Regional Map for 28GHz Spectrum Packages

Region A:	Greater London
Region B:	Greater Manchester, Merseyside & Cheshire
Region C:	West Midlands, Warwickshire, Staffordshire, Worcestershire, Shropshire & Herefordshire
Region D:	Isle of Wight, Hampshire, Berkshire & Oxfordshire
Region E:	Essex, Hertfordshire & Buckinghamshire
Region F:	Suffolk, Norfolk, Bedfordshire, Cambridgeshire & Northamptonshire
Region G:	Derbyshire, Lincolnshire (other than North & North East Lincolnshire District Councils), Leicestershire, Nottinghamshire & Rutland
Region H:	Kent, Surrey, East Sussex & West Sussex
Region I:	East Riding of Yorkshire, North, West & South Yorkshire, North & North East Lincolnshire District Councils
Region J:	Tyne and Wear, Durham, Northumberland, Cumbria & Lancashire
Region K:	Bristol, Devon, Cornwall and the Isles of Scilly, Dorset, Somerset, Wiltshire & Gloucestershire
Region L:	Scotland
Region M:	Wales
Region N:	Northern Ireland

Notes: Details of individual operators is available from the Wireless Telegraphy Act Register[9].

[9] http://spectruminfo.ofcom.org.uk/spectrumInfo/licences

A7. Glossary

3dB Beamwidth

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.

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.

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

The locating of systems adjacent either in spectrum or geographic location in a manner to avoid undue interference.

Co-ordination

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.

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.

FS

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

GHz

Gigahertz: a unit of frequency equal to 1,000 million (1×10^9) Hz or cycles per second.

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 (1×10^3) Hz 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 (1×10^6) Hz or cycles per second.

Ofcom

Office of Communications.

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.

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.

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.

PtP

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

RPE

Radiation Pattern Envelope is the measure of the performance of an antenna.

Radio Equipment Directive

The Radio Equipment Directive ensures a Single Market for radio equipment by setting essential requirements for safety and health, electromagnetic compatibility, and the efficient use of the radio spectrum. It applies to all products using the radio frequency spectrum. It was adopted into UK law as the "Radio Equipment Regulations" and came into force in December 2017. This implements EU Directive 2014/53/EU.

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.

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 Act

Wireless Telegraphy Act 2006 (as amended).

Document History

Version	Date	Changes
1.0	Aug 2004	New format for Ofcom and spectrum trading
1.1	Nov 2004	New flow diagram, editorials
2.0	August 2007	Update to include additional rights
2.1	October 2007	Editorials
3.0	February 2018	Update to reflect liberalisation of BFWA to Spectrum Access 28 GHz, and for the Radio Equipment Directive (RED) implementation.

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