
Notice of coordination procedure for MOD sites related to 3.4 GHz licences

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1. Introduction

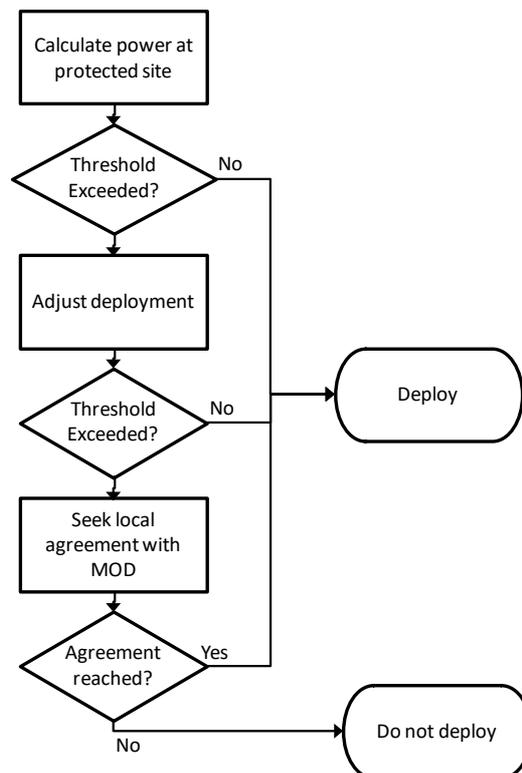
- 1.1 This Notice is notified to each 3.4 GHz Licensee under their respective 3.4 GHz licences.
- 1.2 MOD has a small amount of ongoing use within the band at one location in Cornwall. It also requires protection for a number of Royal Navy and other radar locations in addition to those covered by the coordination procedure for air traffic control radar.
- 1.3 This Notice specifies the protection thresholds and coordination procedure necessary to ensure the protection of existing and continuing MOD usage in the 3.4 to 3.6 GHz band from potential harmful interference from the networks in the 3.4 GHz Band.
- 1.4 In this Notice:
- “3.4 GHz Band” means the following frequencies: 3410 MHz to 3600 MHz;
 - “3.4 GHz Base Station” means a Base Station which are licensed to transmit using frequencies in the 3.4 GHz Band;
 - “3.4 GHz Fixed or Installed Terminal Station” means a fixed or installed Terminal Stations which is not exempt from licensing by the Wireless Telegraphy Act (Exemption) Regulations and which is licensed to transmit using frequencies in the 3.4 GHz Band;
 - “3.4 GHz Licensee” means the licensee under a licence authorising use in the United Kingdom of frequencies in the 3.4 GHz Band;
 - “Base Station” means radio equipment that transmits to a Terminal Station(s);
 - “3.4 GHz Deployment” means a 3.4 GHz Base Station or a 3.4 GHz Fixed or Installed Terminal Station deployed by a 3.4 GHz Licensee. For the purposes of this Notice indoor femtocells and indoor smart/intelligent repeaters, as defined in Schedule 1 of the 3.4 GHz licence, are excluded from a 3.4 GHz Deployment;
 - “MOD” means the Ministry of Defence;
 - “Protected Site” means the list of sites set out in this Notice;
 - “Signals” means the transmission in the 3410 to 3600 MHz band from the 3.4 GHz communications equipment;
 - “Site Protection Threshold” means the threshold that the 3.4 GHz Licensee must comply with as specified in this Notice;
 - “Terminal Station” means radio equipment that receives downlink transmissions from Base Stations.

2. The procedure

Overview of coordination procedure

- 2.1 When planning its network deployment, the 3.4 GHz Licensee must check whether the protection thresholds set out in this document would be exceeded as a result of any proposed 3.4 GHz Deployment. To do so, the 3.4 GHz Licensee will need to calculate the communications signal at the relevant Protected Site location(s) (see protection thresholds section below).
- 2.2 If these calculations show that the relevant threshold will not be exceeded as a result of the planned deployment, then deployment can go ahead. If the calculations show that the relevant threshold(s) would be exceeded as a result of the planned deployment, the 3.4 GHz Licensee may consider adjusting the deployment.
- 2.3 If it is not possible to adjust the deployment so that the threshold(s) are not exceeded, the 3.4 GHz Licensee may only deploy if agreement is reached with the operator(s) of the relevant site(s).
- 2.4 In the first instance, contact should be made via Ofcom who will facilitate a discussion between the licensee’s appropriately security cleared personnel and the operator of the Protected Site.

Figure 2:1: Flowchart illustrating coordination procedures for deployments within the coordination zone



List of sites to be protected

2.5 The sites to which these coordination procedures apply are listed in Figure 2.2 below.

Figure 2.2: 3.4 GHz Band Protected Site Locations

Site	Location
Bude	SS 208 126
Portsmouth Area	SU 632 013 SZ 489 945 SU 642 067
Portland Area	SY 836 593 SY 491 685
BUTEC Area	NG 635 490
Airborne Locations	1 SV 765 726 2 SS 437 670 3 TF 762 073 4 SE 555 695 5 NT 904 234 6 ¹ 55.469417, 2.976250 7 ² 56.200611, -8.466556 8 OL 106 675 9 NO 148 989 10 NE 225 490 11 HV 569 504 12 HT 347 471 13 OW 009 782

Protection thresholds

2.6 The 3.4 GHz Licensee must use the methodology in this Notice to ensure that emissions from each proposed 3.4 GHz Deployment (or combination of deployments) in its licensed

¹ This position is outside the region covered by the OS grid reference

² This position is outside the region covered by the OS grid reference

3.4 GHz Band do not exceed the threshold for the in-band communications signal given in Figure 2.3.

Figure 2.3: Site Protection Thresholds

In-band communication signal		
Bude		
Site Protection thresholds	Threshold for Signals in the 3410 to 3600 MHz band ^[1]	-56 dBm / 5 MHz
	Height	18m above ground level
	Area where calculation is to be performed	Up to 25km from Bude
Portsmouth Area		
Site Protection thresholds	Threshold for Signals in the 3410 to 3600 MHz band ^[1]	-56 dBm / 5 MHz
	Height	35m above ground level
	Area where calculation is to be performed	Up to 8km from each site
Portland Area - this requirement will cease on 31 December 2020		
Site Protection thresholds	Threshold for Signals in the 3410 to 3600 MHz band ^[1]	-103 dBm / 5 MHz
	Height	30m above sea level
	Area where calculation is to be performed	<p>Within an area described by the following 10km grid squares (reference point is the lower left hand corner):</p> <p>ST10 (i.e. ST 1000 0000)</p> <p>ST20 SX57 SX83 SY07 SY66 SZ07</p> <p>ST21 SX58 SX84 SY08 SY67 SZ08</p> <p>ST30 SX65 SX85 SY18 SY68 SZ19</p> <p>ST40 SX66 SX86 SY19 SY69 SZ28</p> <p>ST50 SX67 SX87 SY28 SY77 SZ29</p> <p>ST60 SX68 SX88 SY29 SY78 SZ38</p> <p>ST70 SX69 SX89 SY38 SY79 SZ39</p> <p>ST80 SX73 SX94 SY39 SY87 SZ47</p> <p>ST81 SX74 SX95 SY48 SY88 SZ48</p> <p>SU30 SX75 SX96 SY49 SY89 SZ49</p> <p>SU40 SX76 SX97 SY58 SY97 SZ57</p> <p>SU50 SX77 SX98 SY59 SY98 SZ58</p> <p>SX78</p> <p>Additionally, the 3.4 GHz Licensee cannot deploy Base Stations with an effective EIRP (including antenna pattern effects) of more than 60 dBm / 5 MHz in the direction of the Portland Area Protected Site location in the following grid squares without prior coordination and agreement from the MOD. In this case, coordination will be required with a small number of additional locations within the sea around Portland</p> <p>ST90 ST91 ST92 SU00 SU01 SU02</p> <p>SY99 SZ09</p>
BUTEC Area - this requirement will cease on 31 December 2023		
Site Protection thresholds	Threshold for Signals in the 3410 to 3600 MHz band ^[1]	-100 dBm / 5 MHz
	Height	30m above sea level
	Area where calculation is to be performed	Within an area described by the following 10km grid squares (reference point is the lower left hand corner):

		NG44 (i.e. NG 4000 4000) NG61 NG54 NG78 NM78 NG81 NG62 NG55 NG66 NM79 NG82 NG63 NG74 NG70 NM68 NG86 NG64 NG75 NG72 NM69 NG87 NG65 NG76 NG56 NG73 NG53 NG77 NM77 NG79 NB30 NB31 NB41 NG45 NG46 NG47 NG52
Airborne Locations - this requirement will cease on 31 December 2018		
Site Protection thresholds ³	Maximum power-summed power density from all licensee’s Base Stations in the 3410 to 3600 MHz band ^[1]	$-58.3 \text{ dBm} / \text{m}^2 / 5 \text{ MHz} + 10 * \log_{10} \left(\frac{BW}{BW_{used}} \right)$ [see note 2]
	Height	9,000m above mean sea level
	Area over which power integration calculation is to be performed [see note 3].	Sectors 1.2° wide in bearings of 1.2° steps east of true north from each Airborne Location. 93.5km from Airborne Location out to RF horizon (at least 410km for a 30m mast)
	Area where calculation is to be performed	For all Base Stations within power integration area above for relevant location.
<p>Note ^[1]: The protection thresholds are defined during the ‘on’ period of the transmit signal and referenced to a 0dB receive antenna</p> <p>Note ^[2]: Where: <i>BW</i> is the total 3.4 GHz bandwidth (in MHz) assigned to the licensee for downlink transmissions in the band 3410 to 3600 MHz in MHz and <i>BW used</i> is the amount of spectrum in this band in use by the licensee (in MHz). The additional term allows a licensee to associate its full allowance of the coordination threshold to only the part of its allocated spectrum that is in use within the coordination area.</p> <p>Note ^[3]: The calculation shall be undertaken for and every 1.2° wide sector associated with the Airborne Location (limited by the minimum distance and maximum distance). The calculation for each sector shall comply with the threshold specified.</p>		

Compliance with the thresholds

- 2.7 Prior to deployment, the 3.4 GHz Licensee must use the methodology in this Notice to assess whether the protection thresholds specified in Figure 2.3 will be exceeded as a result of its planned 3.4 GHz Deployment for any Protected Site. There is no requirement to undertake an assessment outside of the calculation areas given in Figure 2.3 except as described in paragraph 2.8 below.
- 2.8 The calculation areas in Figure 2.3 have been developed on the basis of Base Stations at 30m above ground level in order to constrain the area over which coordination must be undertaken. However, Licensees are advised that sites which are higher than this but

³ Radar parameters and platform altitude derived from airborne system A in “Recommendation ITU-R M.1465-2”

located outside of the coordination area may still cause interference to MOD systems in certain circumstances. The 3.4 GHz Licensee must therefore consider whether any of its deployments which are greater than 30m above ground level are likely to cause any impact to the Protected Site and coordinate if it deems necessary.

- 2.9 In carrying out this assessment for deployments within the calculation areas described in Figure 2.3 the 3.4 GHz Licensee must use propagation models described below with the parameters given in Figure 2.4.
- 2.10 The 3.4 GHz Licensee must maintain records of its calculations and assessments and make these available to Ofcom if required.

Exceeding the threshold

- 2.11 The thresholds may only be exceeded in relation to a specific Protected Site if the 3.4 GHz Licensee has reached an agreement with the operator of that Protected Site (Ofcom will facilitate the necessary introductions). Any such agreement must be recorded in writing in a form agreed by both the 3.4 GHz Licensee and the site operator. The 3.4 GHz Licensee must maintain a record of all such agreements, and make them available to Ofcom on request.

Propagation Model

- 2.12 With the exception of the airborne locations, the path loss will be calculated using ITU-R Recommendation P.452-16 "Prediction procedure for the evaluation of microwave interference between stations on the surface of the Earth at frequencies above 0.7 GHz"⁴.
- 2.13 It predicts signal levels exceeded for a given percentage of time. The assessment will use a time percentage of 10% as included in Figure 2.4 below.
- 2.14 Predictions are based on the terrain profile and clutter along the path.
- 2.15 Additional losses due to protection from local clutter shall be applied at both the transmitter and receiver where they are on land. This is based on a nominal clutter height and nominal obstacle distance assigned to each clutter category. The required values are given in Figure 2.5.
- 2.16 In the case of the airborne locations, the path loss will be calculated using ITU-R P.528-3 "Propagation curves for aeronautical mobile and radionavigation services using the VHF, UHF and SHF bands"⁵. It predicts signal levels exceeded for a given percentage of time, the assessment will use a time percentage of 50%. Predictions are based on the terrain profile which must be modified by the nominal clutter height assigned to each clutter category. The required values are given in Figure 2.5.

⁴ www.itu.int/rec/R-REC-P.452/en

⁵ www.itu.int/rec/R-REC-P.528/en

Figure 2.4: ITU-R P.452 parameters

Time percentage	10%
Sea level surface refractivity, N_0 (N-units)	Bude: 327 Portsmouth Area, Portland Area: 327 BUTEK Area: 321
The average radio-refractive index lapse-rate through the lowest 1km of the atmosphere, ΔN (N-units/km)	Bude: 42 Portsmouth Area, Portland Area: 42 BUTEK Area: 41
Dry air pressure (hPa)	1013
Temperature (°C)	15.0
Nominal path centre latitude φ (°)	Bude: 51 Portsmouth Area, Portland Area: 51 BUTEK Area: 57
Clear-air propagation attenuation components included:	Line of sight/Diffraction - Diffraction - Multipath and focusing effects - Gaseous absorption Tropospheric scatter - Gaseous absorption Ducting/Layer reflection - Gaseous absorption
The path centre latitude φ may be selected on a case by case basis, in this case N_0 and ΔN should be calculated using the following equations: $N_0 = 328 - (\varphi - 50)$ $\Delta N = 42.5 - 0.25(\varphi - 50)$	

Terrain database

2.17 Digital terrain map data with 50m resolution shall be used. Examples include Ordnance Survey “Landform Panorama®” or “OS Terrain® 50” datasets⁶.

Clutter database

2.18 A digital land classification (“clutter”) dataset with 50m resolution such as “Infoterra 50m clutter”⁷ or equivalent shall be used.

⁶ <http://www.ordnancesurvey.co.uk/business-and-government/products/opendata-products-grid.html>

⁷ <http://www.space-airbusds.com>

2.19 The Infoterra dataset identifies 10 different clutter categories. For location variation these are mapped to the required clutter designations with nominal clutter heights and nominal obstacle distances.

2.20 The default parameters, given in Figure 2.5 for nominal clutter heights and nominal obstacle distances are as defined in ITU-R Recommendation P.452-16.

Figure 2.5: Infoterra clutter code mapping

Infoterra Clutter Code	Description	Nominal height (m)	Nominal distance (km)
1	Open	4	0.1
2	Suburban	9	0.025
3	Urban	20	0.02
4	Villages	5	0.07
5	Open in Urban	4	0.1
6	Forest	15	0.05
7	Water	Not applicable	Not applicable
8	Dense Urban	25	0.02
9	Park recreation	4	0.1
10	Industry	20	0.05