Guidance to protect MoD systems using the 2.3 GHz band

A1.1 Amateurs are required to operate in such a way as to not cause interference to other lawful uses of the spectrum. This includes MoD uses. However as part of the preparations for release of spectrum in the 2.3 GHz band, MoD has undertaken some analysis of coexistence between amateurs and their own systems. This guidance note therefore provides some information to amateurs in order to help them ensure that harmful interference is not caused to MoD uses. Compliance with this guideline does not alter the overarching conditions in the licence to not cause interference.

Guidance for use of 2350 – 2390 MHz (the 2.3 GHz release band)

A1.2 This band is due to be removed from the Amateur Radio Licence in April 2015.

A1.3 As part of the MoD remediation of systems from this band it will be making temporary use of this band with immediate effect for systems not previously operating in this spectrum.

A1.4 Therefore Amateurs are advised to note MoD usage in the following areas:

- Boscombe Down (SU 172 404)
- Salisbury Plain (airborne receive)
- West Wales Airport (SN 247 494)
- Cardigan bay (airborne receive)

A1.5 MoD usage is typically during business day daylight hours only (daylight hours as defined by sunrise to sunset in the relevant location on any given day)

A1.6 Amateurs must therefore take whatever steps may be necessary when transmitting in the direction of the two ground sites and associated use areas locations to avoid causing interference to MoD systems. The MoD has not specified a protection threshold for these locations but these are expected to be similar to those specified in the 2310 to 2340 MHz band for Boscombe Down below.

Guidance for use of 2390 to 2450 MHz (the adjacent band)

A1.7 There are no proposed restrictions in this band.

Guidance for use of 2310 to 2350 MHz (the adjacent band)

A1.8 During and after their remediation is complete, MoD will make greater use of the 2310 to 2350 MHz band than they have done previously. In particular amateurs' attention is drawn to some aeronautical telemetry uses received at the following locations (Sites):

- St Kilda (NF 094 987)

- Aberporth (SN 247 518)
- Boscombe Down (SU 172 404)

St. Kilda and Aberporth

A1.9 Relevant MoD uses at each site are typical daylight hours on business days.

A1.10 MoD calculations indicate that to protect its systems using frequencies between 2310 and 2350 MHz when the Site is in use, amateurs must limit the received power at the Sites from their stations (including temporary or mobile use) to below the thresholds specified. The Site may be in use at short notice, so amateurs need to check before transmitting to establish whether the threshold is applicable for that Site.

A1.11 Amateurs should consider the effect of the receive antenna gain at Aberporth when determining whether their signals are below the thresholds as shown in the following table (absolute gain is included within thresholds in Table 12)

Table 12: St. Kilda and Aberporth site protection thresholds

In-band communication signal		
	St Kilda	
Site Protection thresholds	Threshold for Signals in the 2310 to 2350 MHz band [1]	-145dBm / 5 MHz
	Height	370m above mean sea level
	Time where threshold applies	Daylight hours business days
	Aberporth	
Site Protection thresholds	Threshold for Signals in the 2310 to 2350 MHz band [1]	-147dBm / 5 MHz
	Height	143m above mean sea level
	Time where threshold applies	Daylight hours business days
Note [1]: The protection thresholds are defined during the 'on' period of the transmit signal and referenced to a 0dBi receive antenna Daylight hours are defined as the times between sunrise and sunset for the relevant location and time.		

Table 13. Antenna discrimination present at Aberporth

Angle from grid north (degrees)	Gain with respect to peak (dB) at Aberporth
0 to ≤ 63	0
63 < to ≤ 64	-1
64< to ≤ 65	-3
65 < to ≤ 66	-12.5
66 < to ≤ 72	-24
72 < to ≤ 75	-30
75 < to ≤ 243	-31
243 < to ≤ 246	-30
246 < to ≤ 255	-24
255 < to ≤ 256	-12.5
256< to ≤ 257	-3
257< to ≤ 258	-1
258 < to ≤ 360	0

Boscombe Down

A1.12 Relevant MoD uses at this site are typically daylight hours on business days between May and October inclusive every year.

A1.13 MoD calculations indicate that to protect their systems from amateur narrowband systems using frequencies between 2320 and 2322 MHz and general uses between 2310 and 2340 MHz when the Site is in use, amateurs must limit the received power at the Sites from their stations (including temporary or mobile use) to below the thresholds specified.

A1.14 We have also provided thresholds for general use in 2340 to 2350 MHz.

Table 14. Boscombe Down site protection thresholds

In-band communication signal		
	Boscombe	
Site Protection thresholds	Threshold for Signals in the 2314 to 2330 MHz band [1]	-129dBm / carrier
	Threshold for Signals in the 2310 to 2314 and 2330 to 2340 MHz band [1]	-96dBm / carrier (for systems with BW <5MHz) -96dBm / 5 MHz (for systems with BW >=5MHz)
	Threshold for Signals in the 2340 to 2350 MHz band [1]	-74 dBm / carrier (for systems with BW <5MHz) -74dBm / 5 MHz (for systems with BW >=5MHz)
	Height	15m above ground level
	Time where threshold applies	Daylight hours business days May – October inclusive
Note [1]: The protection thresholds are defined during the 'on' period of the transmit signal and referenced to a 0dBi receive antenna Daylight hours are defined as the times between sunrise and sunset for the relevant location and time.		

Illustration of affected areas

A1.15 As an illustration of areas where an amateur may have to consider protecting the MoD system at St. Kilda, Aberporth or Boscombe Down when each Site is in use, two example amateur systems have been analysed (a narrow band and a lower power wider band data link transmission). Please note that the requirement applies to all amateur systems within the relevant bands. If an amateur station is operating with different parameters from those used in our analysis, then the amateur must consider whether it is appropriate to consider their signal strength incident at the MoD site (whether they are in the highlighted areas or not).

A1.16 The MoD systems being protected are intermittent users of spectrum. The Radio Amateur systems are also typically intermittent users of the spectrum and are guided to operate at weekends and evenings when MoD systems are generally not being used. Therefore the risk of enhanced propagation conditions, such as ducting, is deemed to be low and in our analysis of impacted amateurs, ITU-R 452[1] has been used with a 50% time criteria.

A1.17 However, in times of propagation lift, extra care may be needed to protect MoD systems. Therefore the use of a 10% time criterion may be more appropriate for these circumstances. If amateurs systems are transmitting more than intermittently then the use of the propagation model the use of 10% time criterion may also be more appropriate in determining if thresholds will be exceeded.

A1.18 The examples identified are shown below:

- narrow band equipment at a transmit height of 10 m, using an EIRP of 40 dBW with 16 dB of antenna discrimination, i.e. it is pointing away from the MoD system(effective EIRP in the direction of the Site is 24 dBW) [blue and red squares];

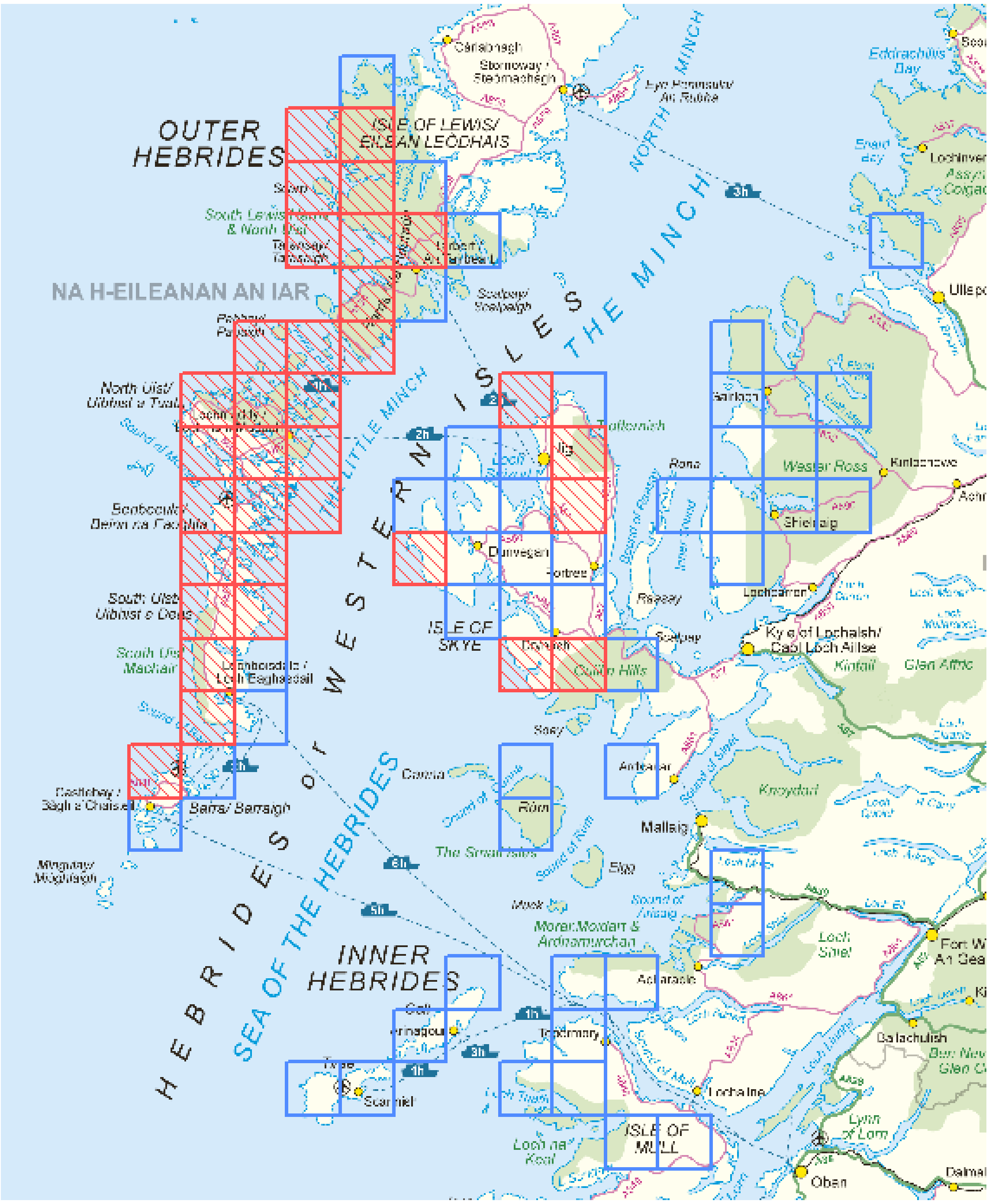
- data link equipment at a transmit height of 10m, using an EIRP of 17 dBW with 16 dB of antenna discrimination, ie it is pointing away from the MoD system (effective EIRP in the direction of the Site is 1dBW) [red squares only].

A1.19 The figures below show an example where amateurs may need to consider additional mitigations in order to protect MoD systems around St. Kilda, Aberporth or Boscombe Down, based on the assumptions listed above. This is to provide an illustration of the areas where there could be restrictions in place. It is the responsibility of individual amateurs to ensure that they do not cause harmful interference irrespective of their location.

[1] www.itu.int/rec/R-REC-P.452/en

St Kilda

Figure 4. Illustration of land based areas around St. Kilda where mitigations are likely to be considered



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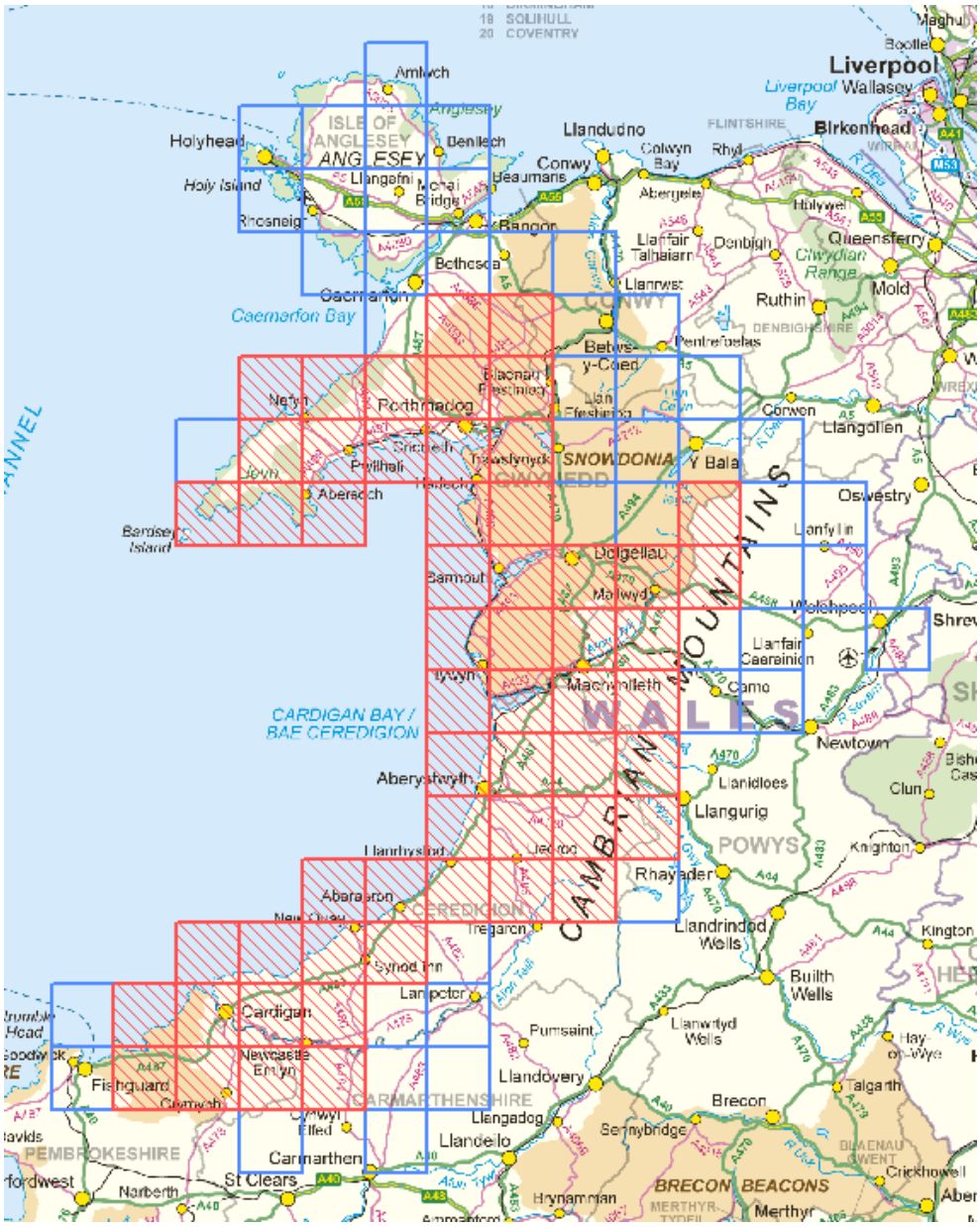
A1.20 The 10Km^2 land based squares identified in the figure above are tabulated in the table below by the coordinates of the bottom left corner. For example the square NF60, has the bottom left hand co-ordinate of NF 600 000 and the top right hand co-ordinate of NF 700 100.

NA91	NC00	NF77	NF96	NG24	NG42	NG74	NG97	NM45
NA92	NF60	NF81	NF97	NG25	NG43	NG75	NL69	NM46
NB00	NF70	NF82	NF98	NG26	NG44	NG76	NL94	NM53
NB01	NF71	NF83	NG08	NG30	NG45	NG77	NM04	NM56
NB02	NF72	NF84	NG09	NG32	NG46	NG78	NM15	NM63
NB03	NF73	NF85	NG14	NG33	NG47	NG85	NM26	NM77
NB10	NF74	NF86	NG15	NG34	NG50	NG86	NM34	NM78
NB11	NF75	NF87	NG19	NG35	NG52	NG87	NM39	
NB20	NF76	NF95	NG23	NG36	NG65	NG95	NM44	

Aberporth

Figure 5. Illustration of land based areas around Aberporth where mitigations are likely to be considered

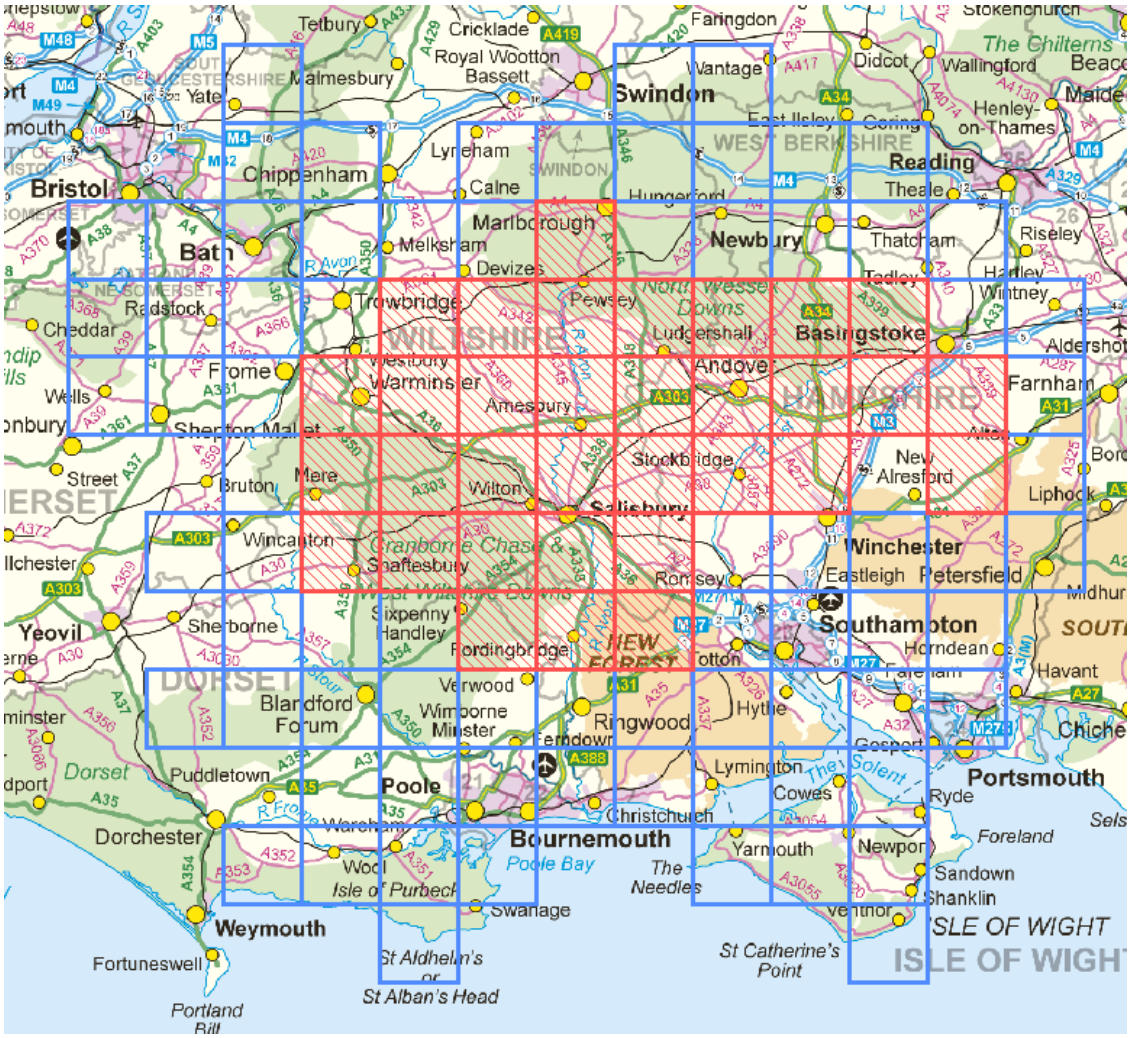


A1.21 The 10Km^2 land based squares identified in the figure above are tabulated in the table below by the coordinates of the bottom left corner.

SH12	SH38	SH54	SH70	SH85	SJ20	SN33	SN56	SN86
SH13	SH43	SH55	SH71	SH90	SM93	SN34	SN57	SN87
SH22	SH44	SH56	SH72	SH91	SM94	SN35	SN58	SN88
SH23	SH45	SH57	SH73	SH92	SN03	SN36	SN59	SN89
SH24	SH46	SH58	SH74	SH93	SN04	SN42	SN66	SN99
SH27	SH47	SH60	SH75	SH94	SN13	SN43	SN67	SO09
SH28	SH48	SH61	SH76	SJ00	SN14	SN44	SN68	
SH32	SH49	SH62	SH80	SJ01	SN15	SN45	SN69	
SH33	SH50	SH63	SH81	SJ02	SN22	SN46	SN76	
SH34	SH51	SH64	SH82	SJ03	SN23	SN53	SN77	
SH36	SH52	SH65	SH83	SJ11	SN24	SN54	SN78	
SH37	SH53	SH66	SH84	SJ12	SN25	SN55	SN79	

Boscombe Down

Figure 6. Illustration of land based areas around Boscombe Down where mitigations are likely to be considered



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A1.22 The 10Km^2 land based squares identified in the figure above are tabulated in the table below by the coordinates of the bottom left corner.

ST78	ST74	ST91	SU07	SU24	SU38	SU54	SU74	SZ39
ST54	ST75	ST92	SU10	SU25	SU40	SU55	SU75	SZ48
ST55	ST76	ST93	SU11	SU26	SU41	SU56	SY78	SZ49
ST56	ST77	ST94	SU12	SU27	SU42	SU57	SY88	SZ57
ST60	ST80	ST95	SU13	SU28	SU43	SU60	SY89	SZ58
ST62	ST81	ST96	SU14	SU30	SU44	SU61	SY97	SZ59
ST64	ST82	SU00	SU15	SU31	SU45	SU62	SY98	
ST65	ST83	SU01	SU16	SU32	SU46	SU63	SY99	
ST66	ST84	SU02	SU17	SU33	SU47	SU64	SZ08	
ST70	ST85	SU03	SU20	SU34	SU50	SU65	SZ09	
ST71	ST86	SU04	SU21	SU35	SU51	SU66	SZ19	

ST72	ST87	SU05	SU22	SU36	SU52	SU72	SZ20
ST73	ST90	SU06	SU23	SU37	SU53	SU73	SZ29