

Crown Recognised Spectrum Access in 3400 to 3600 MHz

A Consultation on: Spectrum Policy and on
Terms of New Grants and Licences

Joint response from the Radio Society of Great Britain, UK Microwave Group, Amsat-UK and BATC.

November 2009



Introduction

This response is a joint one to the above Ofcom consultation document from the Radio Society of Great Britain (RSGB, www.rsgb.org.uk) and its national affiliates who have microwave spectrum interests - Amsat-UK (www.uk.amsat.org), UK Microwave Group (UKuG, www.microwavers.org), and the British Amateur Television Club (BATC, www.batc.org.uk).

RSGB is recognised as one of the leading organisations in the world in the field of amateur radio. It collaborates with its fellow national societies via the International Amateur Radio Union (IARU) through IARU Region-1 (www.iaru-r1.org).

Amateur radio is a science-based technical hobby that contributes to education, innovation, skills and emergency communications. It is enjoyed by over three million people worldwide. From a statutory point of view it is fully recognised by the International Telecommunication Union (ITU) as a Service and is listed in the ITU Radio Regulations as the Amateur Service and the Amateur-Satellite Service.

RSGB and its affiliates have previously participated in consultations from Ofcom, MoD and Europe in relation to this specific band and appreciate the good relationship that generally occurred throughout. Whilst RSA/Release is inevitably of considerable concern we are keen that this relationship continues and the investments and innovations by the 60000+ licensed amateurs are safeguarded.

We would be pleased to provide any additional information on request or participate in any future discussions, both with Ofcom, MoD and any other stakeholder who has an interest.

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RSGB, Amsat-UK, UKuG & BATC, November 2009

Consultation Questions & Answers

Much of the formal consultation document Q&A is relevant to frequencies outside of the amateur allocation or far too specific to certain types of equipment and future use.

This leaves little opportunity for existing users who have their own developments, equipment characteristics and plans for the band to adequately describe their interests

Therefore we provide below a relatively limited response where appropriate to the main questions. However in order to improve Ofcom and other stakeholders understanding we have included a substantial information annex to our response to illustrate the world class, highly innovative, educational, spectrally efficient and harmonised use that includes regular contacts ranges of 100s of kilometres, global distances via moonbounce (EME) and future Amateur Satellite downlinks - largely in the 3400-3410MHz range.

Extension of RSA to the 3400 to 3600 MHz band

Question 1: *do you agree that we should introduce RSA in the 3400 to 3600 MHz?*

Whilst certainly not enthusiastic regarding the concept we recognise that the MoD has embarked on the process. Our prime interest is in maximum protection and our own development in the 3400-3410MHz subsection of the Amateur 3400-3475MHz allocation. This allocation though on a Secondary basis is based on an ITU RR footnote and is also subject to CEPT ECA allocation footnote EU17¹

Question 2: *do you agree that we should extend the relevant regulations to allow Crown bodies to be granted and to trade RSA in the 3400 – 3480 MHz and 3500 – 3580 MHz blocks?
If not, which frequency ranges do you think the RSA regulations should cover and why?*

The 3400 to 3410MHz section is an international defence band that is most unlikely to change, so we are not convinced that much will be gained in extending RSA into that bottom section. Furthermore throughout Europe (as per a graph in the UK Broadband response) this same section is being excluded, so we request Ofcom to specifically consider this

Terms and conditions of the RSA grant and the WT licences

Question 3: *do you agree that there should be no minimum trading unit for the RSA grant and the WT licences arising from trade in the band?*

This is not a PMR style VHF band and is inappropriate for narrow fixed channelling. It would be sensible for all current and future users to have a minimum convenient block size of say 5-10MHz to act as a counter against uncertainty and fragmentation of the band

Question 4: *are there specific conditions that you consider should be included in RSA grants and WT licences arising from trading in the band?*

The document does not appear to consider any specific measures to protect Defence and Amateur use of the lower 3410-3480 block edge (as opposed to other block boundaries)

In addition there is no significant detail of potential geographic restrictions in the consultation. For information we would highlight we currently contend with restrictions in Schedule-2 of the Ofcom Amateur Licence on Unattended Beacons in 3420-3430 & 3450-3455MHz which have 50km exclusion zones around

- NGR SO916223 Cheltenham
- NGR SS206127 Bude, Cornwall
- NGR SE202577 nr Harrogate, North Yorkshire

Any further information on the future of such geographic restrictions would be welcomed

¹ European Common Frequency Allocation Table Footnote EU17: **“In the sub-bands 3400-3410MHz, 5660-5670MHz, 10.36-10.37GHz, 10.45-10.46GHz the amateur service operates on a secondary basis. In making assignments to other services, CEPT administrations are requested wherever possible to maintain these sub-bands in such a way as to facilitate the reception of amateur emissions with minimal power flux densities.”**

In effect, EU17 allocates and encourages administrations to afford consideration to amateur weak-signal operations in the sub-band 3400 – 3410 MHz, amongst others.

Technical limits for base stations in the 3500 – 3580 MHz block

Question 5: do you agree with the proposed in block emissions limit for base stations in the 3500 – 3580 MHz block?

Question 6: do you agree with the proposed out of block emissions mask at the 3500 MHz and 3580 MHz boundaries for base stations?

Question 7: do you agree that less stringent technical parameters should be permitted if agreed between neighbouring operators?

Question 8: should we align UK Broadband licence conditions for base stations at 3500 MHz and 3580 MHz with those in the RSA grants if and when UK Broadband requests us to do so?

No comment on Qs5-8 as they are outside of the amateur allocation

Technical limits for terminal stations in the 3500 – 3580 MHz block

Question 9: do you agree with the proposed in block emissions limits for terminal stations?

Question 10: do you agree that the block edge mask should be based on the spectrum emissions mask from ETSI EN 302 623?

Question 11: do you agree with our derivation of regulatory out of block limits for terminals and, if so, which of the proposed four alternative regulatory conditions do you think most appropriate?

Question 12: should out of block limits for fixed, nomadic and mobile terminals be different?

For Qs9-12:-

It is important that outdoor terminal equipment be full specified so that out-of-band emissions are at acceptable limits for adjacent existing users, especially ourselves with sensitive weak-signal receivers.

Question 13: should we align UK Broadband licence conditions for terminal stations at 3500 MHz and 3580 MHz with those in the RSA grants if and when UK Broadband requests us to do so?

No comment

Technical limits at 3580 MHz

Question 14: do you agree that the technical limits at 3480 MHz should copy those at 3580 MHz when the use immediately below 3480 MHz is broadband wireless?

Question 15: do you agree with the proposed technical limits at 3480 MHz for the scenario where the upper edge of the emergency services block does not change from the current allocation at 3475 MHz?

Question 16: do you agree with the proposed technical limits at 3480 MHz for the scenario where the upper edge of the emergency services block is moved to 3480 MHz?

For Qs14-16:-

We believe there is considerable merit in Government applications in conjunction with Amateurs and PMSE-use in coalescing at the bottom of the 3400 band (perhaps in the 3400-3440 range) following a trade as per Para 8.62, to give one contiguous area for existing users and freeing the rest of the band for mobile/broadband services. This will result in maximum spectrum efficiency, but only if Ofcom and other users reconsider the need for symmetric duplex operation as more spectrum will be free above 3500 than below. Such a move will have significant implications for both the 3440 MHz (or wherever) block edge, as well as the lower UK-Broadband block edge.

Technical limits inside the RSA blocks after a partial trade

Question 17: do you agree that the technical conditions of the RSA grant at the 3500MHz and 3580 MHz boundaries are the best option for the boundaries that will appear inside the 3500 – 3580 MHz block if the block is partitioned and traded into several smaller sub-blocks?

No comment

Question 18: do you think that the out of block limits for broadband wireless base stations in Figure 8.2 are sufficient to protect air-to-ground videolink receivers in an adjacent block?

Question 19: what are your views on the requirements for protection of air-to-ground videolink receivers from interference from broadband wireless terminals?

Question 20: do you think that an out of block requirement for airborne videolink transmitters of -25dBm/MHz EIRP is sufficient to protect broadband wireless receivers?

For Qs18-20:-

With the exception of amateur receiver operations close to certain dockyards, we have had few reported problems with existing Primary User and look forward to continuing our successful sharing with such video/data links.

Summary of Position

As indicated in this document and previous inputs and discussions with MoD and Ofcom, the UK Amateur Service has been prepared for this eventuality some time and is focussed on further developing its activities in the 'protected' 3400-3410MHz military/EU17 sub-band where we have successfully shared with the Primary User. As the annex shows amateurs have excelled in achieving international long range communications, sensitive receivers in this most precious part of the band.

With regard to 3410-3475 MHz we are keen to retain some access to that for those activities that do need additional bandwidth, such as ATV (which itself is evolving into Digital Multimedia/DATV) and would not fit in the lower section; but believe this could be coordinated with retained sub-bands for Helicopter links etc outside of the new commercial sections.

RSGB, Amsat-UK, UKuG & BATC, November 2009

**See Overleaf for Additional Information on
UK Amateur Radio in the 3400 MHz Band**

UK Amateur Radio Activities in the 3400-3475MHz Band

The majority of UK Amateur activity in the 3400MHz band is of the narrowband long-range variety. This was based originally on CW & SSB modes, and is now supplemented by advanced Digital Techniques (known as MGM) such as JT65 and JT4G which can be detected below 0dB SNR. Operations include:-

- Beacon spotting and Propagation research
- Long range Terrestrial DX, particularly on Contest weekends or Activity Nights
- International./Intercontinental traffic via Moonbounce (aka EME, or Earth-Moon-Earth)
- Embryonic developments in Amateur TV and TV Repeaters
- Support for Amateur Satellite Downlinks and allocations in other countries

UK 3400 MHz Amateur Bandplan

The bandplan for amateur operation for the UK is closely modelled on International Amateur Radio Union (IARU Region-1) guidance. Historically UK and German amateurs were centred on 3456MHz (in common with the US). However in recent years as more European countries have gained access to the band under EU17 (which is 3400-3410MHz), a migration has occurred so in the UK all narrowband traffic and beacons are now around 3400 MHz; with limited data, ATV and legacy EME further up the band. The current RSGB bandplan reflects this including a footnote re geographic restrictions

3.4 GHz (9cm)	UK Usage	
IARU Recommendation		
3,400.000-3,402.000 MHz	3,400.100 MHz	Centre of activity (Note 1)
Narrow band		
CW/EME/SSB	3,400.750-3,400.800 MHz	Local Beacons, 10W erp max
3,400.800-3,400.995	3,400.800-3,400.995 MHz	Propagation Beacons only
Propagation Beacons		
3,402.000-3,410.000	3,401.000-3,402.000 MHz	Remote control
All modes (Notes 2, 3)		
3,410.000-3,475.000	3,456.000 MHz	(Note 1)
All modes		
Note 1: EME has migrated from 3456 MHz to 3400 MHz promote harmonised usage and activity Note 2: Stations in many European countries have access to 3400-3410 MHz as permitted by ECA Table Footnote EU17 Note 3: Amateur Satellite downlinks planned LICENCE NOTES: Amateur Service - Secondary User. Unattended operation is permitted for remote control, digital modes and beacons, except in the sub-bands 3,420-3,430 MHz and 3,450-3,455 MHz within 50 km of SO916223 (Cheltenham), SS206127 (Bude) and SE202577 (Harrogate). <i>ISM = Industrial, scientific and medical</i>		

Figure 1: RSGB 2009 Bandplan for the 3400 MHz Band

Operating Characteristics & Station Ranges

The ready availability of modern LNAs and solid state Power amplifiers, including surplus from former Ionica equipment (typically in the 10-35W range) enables useful ERPs to be achieved. Dish antennas are the norm for home and portable stations (though there are a few based on yagi arrays)

Current UK Records for confirmed unassisted two-way QSOs:

UK Terrestrial - 1137km: GM4OGI Scotland (IO85DX) to SM7GEP Sweden(JO77IP), CW, 21-Sep-2006

UK Moonbounce -16969km: G3LTF Andover(IO91GG) to VK3NX Australia(QF21EX), CW, 16-Jul-2007

Contest & Activity Days

In 2009 the UK Microwave Group Contest calendar had the 3.4GHz band grouped with 1.3 and 2.3GHz use for four weekends. This was supplemented by seven other activity weekends and sessions on Monday evenings. The Moonbounce community is an international one and organises its own events as well

Beacon Network and Propagation Monitoring/Research

At microwave frequencies a fundamental tool for amateurs is the propagation beacon network which consists of a chain of precision transmitters running 24/7 for equipment test and propagation research. For some years the 3400MHz band had been relatively underserved, but this has improved in recent times with a combination of precision frequency sources, (some of which are GPS-locked DDS based with digital modulation for ultra-weak signal reception) and some key ones with substantial power outputs (up 80Werp at GB3ZME at Telford). The latest plans extend this to collaboration with Science & Educational Establishments at Bath University & RAL

	<p>Current UK 3400MHz Beacons</p> <p>GB3CSB Kilsyth (new), Scotland GB3MHS Martlesham, Suffolk GB3SCF Bell Hill, Dorset GB3OHM Birmingham GB3LEF Leicester GB3ZME Telford</p> <p>Planned</p> <p>GB3RAL - Rutherford Appleton Labs GB3UOB - Bath University</p> <p>All beacons are lie within 3400.800-3400.995MHz</p>
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To complement the beacons, reception reporting networks such as the DX Cluster and most recently <http://www.BeaconSpot.eu/> enable amateurs to log and plot beacon signal strengths and have a real-time picture of propagation conditions, paths, atmospheric ducts, etc. Plots of recent reception ranges for some of these demonstrate the extent of propagation and sensitivity of amateur receivers:-

<p>Beacon spots map for GB3MHS (JO02PB53) on 3400.8300MHz</p> <p>You may View OR Update data for GB3MHS, OR List spots for this Beacon, OR List all spots for this Band.</p>	<p>Beacon spots map for GB3SCF (IO80UU59) on 3400.9050MHz</p> <p>You may View OR Update data for GB3SCF, OR List spots for this Beacon, OR List all spots for this Band.</p>
<p>Beacon spots map for GB3ZME (IO82RP78) on 3400.9100MHz</p> <p>You may View OR Update data for GB3ZME, OR List spots for this Beacon, OR List all spots for this Band.</p>	<p>Reception Distances are automatically plotted by the Beaconspot database based on daily reports from amateur home or portable stations. Examples:-</p> <p>Upper Left: GB3MHS Upper Right: GB3SCF Lower left: GB3ZME</p> <p>Beaconspot has over 600 registered users from 40 countries and gets 70 users a day, with the GPS-locked GB3SCF as one of its most popular requests</p>

Examples of Amateur Equipment

Whilst the beacons are omnidirectional, usually based on 10dB gain slotted waveguide antennas, individual amateurs are almost entirely based on dish antennas. These may range from 60cm to as large as 7m diameter for the largest EME stations.

Commercial equipment and kits are widely available including ready-built DB6NT transverters, converted Ionica equipment and home developed LNAs and PAs. This has been complemented with continuing advances in precision frequency sources and use of SDR techniques for receivers.

It is interesting to note that the re-awakening of commercial activity in the band in the guise of Wimax/LTE etc will undoubtedly benefit the supply of suitable devices and modules into the amateur community

Some typical stations are shown below. Links to these and more can be found on the UK Microwave groups 3400MHz webpage <http://www.microwavers.org/3400mhz.htm>



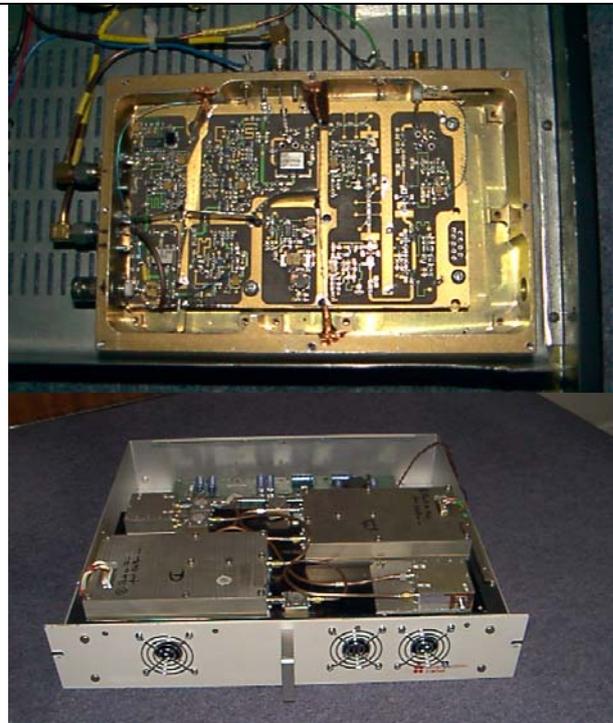
Mobile/Hilltop operation



Portable Dish on Contest with VHF talkback



3400 MHz EME Moonbounce
– with remote control computerised mount



3400MHz Transverter and Combined PAs

IARU Region-1 VHF/Microwave Spectrum Managers Handbook

4.8 3400 -3475 MHz BANDPLAN	
IARU Region 1 bandplan	Usage
3400.000 <div style="text-align: center;">NARROW-BAND MODES</div>	<div style="text-align: center; color: blue;">3400.100 Center of activity and EME</div> <div style="text-align: center;">3400.750-3400.800 Local Beacon (e)</div>
3400.800 3400.800 <div style="text-align: center;">BEACONS ONLY d)</div>	
3400.995 3401.000 <div style="text-align: center;">NARROW-BAND MODES</div>	
3402.000 3402.000 <div style="text-align: center;">SATELLITE DOWNLINKS a)c) ALL MODES</div>	
3410.000 3410.000 <div style="text-align: center;">ALL MODES</div>	<div style="text-align: center;">3420.000-3430.000 Digital Communications</div> <div style="text-align: center;">3450.000-3455.000 Digital Communications</div>
3475.000	

NOTES ON THE 3400 – 3475 MHz BANDPLAN

a) CEPT Footnote EU17 permits Amateur Service in 3400-3410MHz

b) EME Centre of Activity has migrated from 3456 to 3400.1MHz to promote harmonised usage and activity

c) Amateur Satellite Service is allocated in 3400-3410MHz in Regions 2&3 and in some countries of Region-1.

d) 3400.750-3400.800MHz may be designated for Local Beacon use (10W ERP max) by National Societies.

e) Refer to Beacons Chapter for coordination of beacons in the beacon sub-band

References
 Vienna-2007 C5 Paper-B13: Allocations at 3400MHz
 Cavtat-2008 Paper CT08_C5_17: 3400MHz Amateur Satellite Allocation
 Cavtat-2008 Paper CT08_C5_18: 3400MHz EME developments
 Cavtat-2008 Paper CT08_C5_25: Microwave Beacon Bands

IARU Region 1 VHF managers handbook	page 54/148	Version 5.40
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Figure 2: Extract from the IARU Region-1 VHF/Microwave Manger Handbook

This and the IARU Cavtat conference papers are available from <http://www.iaru-r1.org/>