International Amateur Radio Union Region1
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SUBJECT	Microwave Spectrum Requirements		
Society	RSGB	Country:	UK
Committee:	C5	Paper number:	CT08_C5_26
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Introduction

A series of revisions to IARU microwave spectrum requirements are proposed - a separate paper by RSGB considers the VHF-UHF range. All interested parties are invited to discuss these in further detail, prior to the Conference in November.

Background

At the 2005 IARU Region-1 General Conference in Davos, Paper-10 by EDR [1] called for "Common Narrowband-Segments, in the Secondary Microwave Bands" - 23cms to 10GHz. Subsequently, RSGB examined and discussed options that were aligned with CEPT allocation table footnotes EU17 and EU23 [2,3]. These footnotes however only cover certain bands.

At the IARU-R1 Interim conference at Vienna in February-2007, member societies were actioned in the C5 VHF/Microwave Committee to submit inputs regarding the current IARU Spectrum Requirements document on the Internet at http://www.iaru.org/ac-spec06.html [4]. This had not had any significant changes to the microwave bands for several years. At the Vienna conference, RSGB also presented Paper-B16 [5] in respect of Amateur Satellite allocations. Although B16 was approved in C5, it did not receive a sufficient majority to satisfy a later meeting of the Region-1 Executive Committee. At Vienna, RSGB also presented a broad discussion document [6] on Bands above 275GHz, a topic that will be an agenda item for WRC-11.

In November 2007, WRC-07 agreed to designate the 2.3GHz and most of the 3.4GHz bands for future mobile radio, known as 'IMT'. This was one of many examples of the commercial pressures and values being placed on spectrum. In parallel there are also many examples of innovation and development occurring in the Amateur Services at microwave frequencies. It would therefore be sad if we did not make a serious effort to ensure that spectrum is left for them.

We firmly believe that it is time to make a concerted effort to thoroughly modernise the IARU microwave spectrum requirements and consider all possible means of achieving them.

Key Points and Proposals

- Microwave spectrum is highly valued by and under pressure from commercial users, particularly in the 1-11GHz range.
- The present IARU web document is ~18 pages of A4 and, as such, would benefit from better structuring into separate sections/webpages. For example: LF-HF, VHF/UHF, Microwave
- The microwave sections need modernisation in a manner that provides a useful framework, which reflects the current reality.

- For any change, good bandplanning principles require that weak-signal long distance cross-border modes should be a priority – Narrowband DX, Beacons, EME and Amateur Satellites.

- The Amateur Satellite Service is also faced with more restricted allocations than the Amateur Service and is further restricted in some bands by being Earth-Space or Space-Earth only.

Recommendations

The annexe includes our proposed revised wording for the IARU webpage. This is explained below:-

1) **Structure:** It is requested that LF-HF, VHF/UHF and Microwave requirements be clearly separated on the IARU website. For microwave requirements these categories should be used:-
- Microwave - 1-20GHz
- Millimetre-Wave - 24-250GHz
- Bands above 275GHz

2) **Internet:** The IARU Spectrum Requirements web pages should be reviewed on a variety of web browsers and screen resolutions to guard against html/formatting issues.

3) **23cms:** It is unrealistic to target 1260-1300MHz for Amateur Primary in a Primary safety-of-life radar band, which is also expected to have the Primary Galileo service. Whilst clearly recognising the importance of 1260-70 Satellite uplinks and the 1296 narrowband area, other sections of the band may be easier to focus on in future. New text is proposed with a more generic aim for a 10MHz slot. This might be in the lower 1240-1250 area outside of the 'Galileo zone'. We also believe that an opportunity may have arisen for the Amateur Satellite Service to gain Space-Earth downlinks on a non-interference basis – Currently E-S uplinks only.

4) **13cms:** Allocations in this band are very fragmented around the world. Updated wording is proposed to reflect the situation and possible alternative satellite spectrum

5) **9cms:** Reduce the Region-1 requirement to be far more realistic - 3400-3410MHz only *(See separate RSGB paper on 3.4GHz)*

6) **5GHz:** Modified requirement so that 5650-5670 is the priority for Primary status instead of 5830-5850, making it better aligned with EU17/23. Removal of the E-S only restriction is added.

7) **10GHz:** Updated text and slight realignment of terrestrial requirements in line with EU17/23 and extension of Amateur Satellite Service to align with current narrowband section at 10.36GHz

8) **24GHz:** Updated text and reduced emphasis on the Secondary allocation

9) **71-250GHz:** Clarify the table to show current allocations only – for example delete the former 119GHz and 142-149GHz entries, but add a note regarding CEPT footnote EU35.

10) **New Beacon Bands:** Seek small allocations for propagation beacons at ~20 and 30GHz, either side of the 24GHz Primary allocation water absorption band. Harmonised slots of a few megahertz should be sufficient. These would enable an expansion of propagation research in the large frequency gaps between 10, 24 and 47GHz bands.

11) **Bands above 275GHz:** A more realistic view for WRC-11 discussions based on the data in the Vienna paper [6] that targets low attenuation bands, and is more compatible with spaceborne Earth sensors (Earth Exploration-Satellite Service-passive).

12) **Implementation:** IARU & National Societies should also:-

- Increase attention and resources to this part of the spectrum.
- Enhance engagement with regulators and other stakeholders to achieve national changes and regional footnotes, to underpin any future effort at a WRC conference
- Consider creating a special IARU task group
- Explore all possible avenues to achieve success in a timely manner. For example, consider opportunities for exchanging some secondary spectrum for enhanced privileges or more suitable allocations - in line with the principle of common narrowband segments.

References

[1] "Common Narrowband-Segments, in the Secondary Microwave Bands", Ivan G. Stauning OZ7IS, EDR, Paper-10, IARU Region-1 Conference, Davos, Sept-2005

[2] **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.

[3] **EU23:** In the sub-bands 5660-5670MHz (earth to space), 5830-5850 MHz (space to earth) and 10.45-10.50GHz the amateur-satellite service additionally operates on a secondary and non-interference basis to other services. In making assignments to other services, CEPT administrations are requested wherever possible to maintain these allocations in such a way as to facilitate the reception of amateur emissions with minimal power flux densities.

[4] IARU Spectrum Requirements: http://www.iaru.org/ac-spec06.html.

[5] "Amateur Satellite Service Spectrum", Murray Niman G6JYB, RSGB, Paper-B16, IARU Region-1 Interim Conference, VHF/Microwaves Committee, Vienna, February-2007

[6] "Bands above 275GHz", Murray Niman G6JYB, RSGB, Paper-B02, IARU Region-1 Interim Conference, VHF/Microwaves Committee, Vienna, February-2007

Annex – Proposed New Text for IARU Webpage **http://www.iaru.org/ac-spec06.html**

Note:- Items in italics are explanatory only

1.2GHz-20GHz – The Microwave Bands *(new category and introduction)*

All ITU allocations to the amateur services in this range are on a Secondary non-interference basis with a number of additional restrictions on the Amateur Satellite Service.

Although radio amateurs have access to this portion of the spectrum, the International Table of Frequency Allocations does not automatically provide for common worldwide allocations for amateur uses, unlike the frequencies below and above this range. For narrowband communications, ranges are frequently higher than VHF/UHF due to the high antenna gains available, which also facilitate EME moonbounce contacts.

The range 1-6GHz is also known as the 'sweet-spot' for commercial services. This places severe pressure on the shared amateur allocations in this range. A policy of **'common narrowband segments'** is pursued to maximise harmonisation and protection.

1215-1300MHz *(Change first paragraph to)*

The Amateur Service seeks retention of the band 1240-1300 MHz and upgrading a 10MHz portion of this to primary status. The Amateur Satellite Service seeks retention of the band 1260-1270MHz or equivalent new spectrum (preferably at 1240-1250MHz) and deletion of the "Earth-to-Space only" restriction.

2300-2450MHz *(new requirements and rewording as follows)*

Amateur Service allocations around the world are fragmented in the 2300-2400 range preventing harmonised operation, whilst operation in the 2400-2450 range, shared with ISM, is increasingly hindered by the rising level of interference from licence-exempt devices such WLANS, cordless phones, video senders etc. In addition part of the band is shared with Broadcast Radio Satellites.

The Amateur Satellite Service is currently restricted to the 2400-2450MHz allocation where it suffers from ISM. **Accordingly, both the Amateur Services seek interference-free allocations at 2300-2330MHz**
and 2390-2400MHz whilst retaining access to sufficient secondary spectrum

WRC-07 Agenda Item 1.4 designated the band 2300-2400 MHz for IMT mobile communications in all three ITU regions.

3300-3500 MHz *(modified requirements/emphasis and rewording as follows)*

The Amateur and Amateur Satellite Service seeks to consolidate various secondary/regional allocations in this band into a globally harmonised allocation centred on 3400-3410 MHz

The Amateur Service in Regions 2 and 3 have a broad but fragmented range of secondary allocations across 3300-3500MHz which are increasingly shared with commercial services. There are no full ITU amateur allocations in Region-1. However, in CEPT countries, footnote EU17 allocates 3400-3410 to the Amateur Service although this is not yet implemented in all states

The Amateur Satellite Service seeks to retain its bi-directional 3400-3410MHz allocation in Regions 2 and 3 and to extend this to Region-1. Without the latter it the use of this allocation is substantially restricted.

Establishment of a globally harmonised allocation at 3400-3410 for both the Amateur and Amateur Satellite Services would promote a harmonised DX, EME and Satellite operation whilst also improving coordination with commercial services

There is a major effort to promote Wimax, FWA and other commercial applications in the 3400-3600MHz bands. WRC-07 Agenda Item 1.4 designated the band 3400-3600MHz for IMT mobile communications systems in several regions, with full effect from November 2010.

5650-5850GHz *(modified requirements and rewording as follows)*

The Amateur Services seek to upgrade the sub-band 5650-5670 to Primary status *(not 5830-5850)*

The 5760-5762MHz sub-band is currently preferred for terrestrial weak-signal working and propagation research beacons, with 5668-5670MHz nominated in reserve.

The Amateur Satellite Service also seeks to upgrade the band 5650-5670MHz from Earth-to-Space only to bi-directional status. CEPT footnotes EU17/23 apply to the 5660-5670MHz range.

Parts of the 5GHz band are subject to sharing with FWA applications and 802.11 systems. The band 5850-5925MHz is also allocated to the Amateur Service in Region-2, but is subject to Intelligent Transport Systems links, which are being globally harmonised.

10-10.5GHz *(modified requirements and rewording as follows)*

The 10GHz band is a popular band for amateur microwave activity. Propagation research beacons, terrestrial long distance and EME activity are all centred on 10.368MHz. Long range propagation can occur via ducting and rainscatter phenomena. The band is also popular for ATV applications. **The Amateur Service seeks to upgrade the sub-band 10.36-10.46GHz to Primary Status** with a particular priority on 10.36-10.37GHz. *(changed from 10.35-10.45 to improve alignment with EU footnotes)*

The Amateur Satellite Service seeks to upgrade the sub-band 10.45-10.46 to Primary status and additionally seeks wider access to 10.36-10.45 permitting closer alignment to terrestrial activities and CEPT footnotes EU17 and EU23, compared to its present 10.45-10.5 allocation.

17-20GHz *(New Requirement)*

The Amateur Service seeks an allocation of around 10MHz bandwidth on a Secondary basis within this range for propagation research beacons that would provide data in the substantial gap between the 10GHz band and the higher attenuation 24GHz band. This would also complement the beacon requirement at ~30GHz.

24GHz-250GHz - The Millimetre-Wave Bands *(change title and new introduction)*

In the range 24-275GHz, the general pattern is for a narrow, exclusive allocation to the Amateur Services to be adjacent to a wider allocation shared with other services. This pattern allows amateurs worldwide to pursue their experimental activities within a common frequency allocation, while providing administrations with the flexibility to tailor the width of the amateur allocation and the conditions of sharing in the light of national requirements.

(Remove other unnecessary references to spectral lines and radio astronomy etc)

24-24.05GHz

The Amateur Services seek to retain their Primary allocations in the band 24-24.05GHz. Despite the atmospheric moisture absorption peak, recent years has seen significant progress by narrowband-DX operators in low humidity conditions

In Europe the band is subject to the 'temporary' presence of Car Radar as per CEPT decision ECC/DEC/(04)10 and European Commission Decision 2005/50/EC

24.05-24.25GHz

The Amateur Service shares a secondary allocation in the band 24.05-24.25GHz with increasing amounts of ISM and automotive radar

(Modified wording - This Secondary allocation is no longer preferred in Region-1)

30GHz *(New Requirement)*

A modest allocation of around 10MHz bandwidth on a Secondary non-interference basis in the vicinity of 30GHz is sought for propagation research beacons. At frequencies above 24GHz, atmospheric attenuation due to moisture declines to a minimum close to 30GHz, before rising at higher frequencies. Anecdotal evidence suggests ranges equivalent to 10GHz can be achieved. A small allocation would be compatible with some of the large guardbands of fallow spectrum that are common at these frequencies.

47GHz – *no change to current wording*

71-250GHz

The table should be simplified to display just current post-WRC-2000 allocations. Therefore references to the former 119 and 142-149GHz allocations should be deleted. In addition the 75.5-76GHz entry need to be modified and a note below adding:-

In CEPT countries Allocation Footnote EU35 permits continued use of this allocation by the Amateur and Amateur Satellite Service beyond 2006. Region-1 Societies are urged to avail themselves of this allocation to enable harmonised use.

(Comment: The Secondary 81-81.5GHz band is not widely allocated, and is not preferred)

Frequencies Above 275GHz *(replace the current section with the following)*

ITU Radio Regulations cover the range 275-1000GHz but do not make specific allocations. Radio Regulation 5.565 permits the use of the 275-1000GHz frequency range by administrations for experimentation with and development of active and passive services. However RR5.565 does include a request to protect certain passive bands until the date that formal allocations are made. This frequency range has more numerous spectral lines than lower bands which are an important factor in determining suitable choices for long range communications, short range sensing/imaging, radio astronomy or earth observation.

In order to continue their pioneering experimental activities, the Amateur and Amateur Satellite Services will require globally harmonised low attenuation allocations spaced through this frequency range. Some administrations currently permit experimentation by amateurs, either throughout the frequency range, or in high attenuation windows that are not designated for use by passive services.

WRC-07 set the agenda for reviewing spectrum use in this frequency range at WRC-11. Amateur Services requirements are currently being studied in preparation for this.

Bands with low attenuation below 500GHz are the most ideal. Primary allocations for both the Amateur and Amateur Satellite Service are sought in a manner that would be compatible with other services. In order to foster experimental developments, the Amateur Services attach particular importance to the long-term stability of an allocation and seek to avoid changes such as those that disrupted some millimetre-wave band allocations at WRC-2000.

Recent studies by IARU Region-1 of atmospheric attenuation and molecular absorption lines have identified that the following frequency ranges are good choices to seek allocations within for the Amateur Services:-

Preferred Band, GHz	Bandwidth
280-294	14
334-342	8
400-410	10
455-470	15
670-680	10
855-870	15

It should be noted that there is also an increasing preference by some administrations to consider licence-exemption as the default position for the 275-1000GHz range. This may also facilitate amateur access for experimental purposes as the available transmitter powers are quite modest.