



# International Amateur Radio Union Region 1 2017 General Conference – Landshut, Germany



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Subject:	Future Spectrum work above 148 MHz		
Society	VHF Manger	Country:	IARU Region 1
Committee	C5	Paper Number:	LA17_C5_53
Author:	Jacques Verleijen ON4AVJ		

## Introduction

We received a question from IARU to update a document about the use of spectrum above 148 MHz

## Background

Amateur and amateur-satellite service allocations are subject to an unprecedented level of pressure from competing services, as well as a deterioration in the noise floor. At UHF and above many of the allocations we have today are secondary, not all are harmonised, and cumulatively preserving or enhancing amateur access is a significant challenge.

To assist the AC, the IARU officers and IARU Expert Consultants in their constant strategical and tactical work to protect our amateur privileges and allocations especially at UHF and higher, the AC in 2011 set up a Future Spectrum Committee (FSC). The Committee reported back to the AC in 2013.

In order to keep this important document up to date on amateur use of our UHF and microwave bands, I am now requesting each region to update their user part of this report to ***show as detailed as possible the various amateur uses of all these bands and in which segments of the bands this activity is concentrated.***

To assist your work, I have attached an excerpt of the current report containing the actual part that needs updating for your region.

Could you please send the updates to the IARU Vice President ([ole.garpestad@gmail.com](mailto:ole.garpestad@gmail.com)) or the IARU Secretary ([dsumner@iaru.org](mailto:dsumner@iaru.org)) by the end of 2017?

## Key points and proposal

To do this properly we need to do a survey in a short term to see the use of the allocated spectrum in our different MS in Region 1

See reference in annex

## Recommendations

To make a task group who will make a survey in a short time. The task will be to make a survey, see that it is filled in by the MS and send the conclusions to IARU.

## Excerpt of the “Current Use” of our amateur bands above 148 MHz Region 1

### 430 MHz Band

#### Region 1

Most countries have some access to (most of) 430 - 440 MHz though with various limitations. Whilst the ITU Region 1 and EU allocations are nominally primary, in practice it is secondary on the vast majority of countries relative to Radiolocation

Frequencies around 430, 433 and 438 MHz (and in the United States, above 440 MHz) are used for FM repeaters and links.

Region 1 which has a narrower allocation now has some very encouraging experiments on narrowband colour digital ATV (using QPSK modulation and ~1,5 - 2 MHz bandwidth at 437 MHz). This gives excellent results and transmission ranges and is one example of how amateurs can exploit and demonstrate modern technology in smaller bandwidths.

The 435 MHz ISM-section in the middle of the band is already making this part less usable for amateur radio purposes as more and more administrations allow for non-licensed operation of various data and voice applications here. As some of these exempt applications will become valuable to the public and hence get a higher priority at national level, this segment may become useless for amateur radio use within a matter of a few years.

### The Lower Microwave Bands: 1,2 – 3,4GHz

The lower microwaves band coincide with intense commercial pressure for wireless broadband spectrum, notably in the 2,3 and 3,4 GHz band, as well as new GNSS (Galileo and Glonass) developments in the 1,2 GHz band which traditionally has been Radiolocation.

### 1,2 GHz Band

#### Region 1 Allocation Summary

Band	Amateur Service, MHz	Amateur Satellite service, MHz	Comments
1,3 GHz	1 240 - 1 300	1 260 – 1 270 (E->S only)	UK also has 1 300 - 1 325 in use for ATV. New 2012 RSGB band plan might a model for the rest of the Region Some ATV access below 1 240 in France

#### General R1 Usage Comments

#### Narrowband

In Region 1 all three bands have well-coordinated narrowband DX activity centres including ad hoc, contests, propagation beacons and EME. In Region 1 these are at 1 296, 2 320 and 3 400 MHz.

Region 1 have also established a narrowband reserve at 1 240 MHz to mitigate L-Band Radars and Galileo

## EME

All three bands have EME enthusiasts within the narrowband segments. In addition to 2 320 MHz, for EME 2 304 MHz is in use by some for USA QSOs. A Region 1 initiative has led to global harmonisation of EME at 3 400 MHz (as 3 456 had poor access).

## Voice

Commercial equipment availability means that FM Voice is in use in 23 cm (including repeaters) but rarely in bands above, where narrowband SSB dominates. Digital Voice is low usage at present, but in band plan.

## Data

Traditional data usage such as packet has died off. There are small patches of revived activity based on D-Star in 23 cm and Wi-Fi (or conversions of Wi-Fi components) in 2,3 GHz.

## ATV

Some countries such as the UK, France and Germany have very active communities, networks of TV repeaters, etc. Innovation is leading to a migration to 'spectrum friendly' DATV based on DVB-S/QPSK or GMSK in 70, 23 and 13 cm. (2 MHz BW in 70 cm, 4 – 6 MHz BW in higher bands). DATV gives us a novel and attractive proposition to demonstrate amateur radio.

Region 1 is seeing early signs of problems as national authorities seek to protect GNSS reception and seek restrictions on amateur activity. In addition, some aviation authorities are concerned that GNSS transmissions also cause noise floor issues for their radars (despite them having Primary priority).

## **2,3 GHz Band**

The band 2 300 – 2 450 MHz is allocated to the Amateur Service on a secondary basis in all three Regions. However, actions by certain administrations in their domestic allocations have reduced the amount of spectrum within this band available to the Amateur Service.

The upper band 2 400 – 2 500 MHz is used for ISM applications and is increasingly congested by (unlicensed) low-power devices such as radio local area networks (Wi-Fi, etc) creating significant interference levels, most notably for the Amateur-Satellite service that cannot access the lower allocation

Above 70 cm, this is the most frequent band used by Amateur Satellites (usually for uplinks)

## Region 1

Band	Amateur Service, MHz	Amateur-Satellite service, MHz	Comments
2,3 GHz	2 300 – 2 450	2 400 - 2 450	<p>Full band widely allocated to Amateurs and originally excluded from EU Wireless Access (WAPECS) due to government and other use.</p> <p>Not all have access to 2 300 - 2 310 (e.g. UK)</p> <p>However, IMT spectrum pressure now increasing</p> <p>- process underway based on ECC Report-172!</p> <p>Civil satellite radio not allocated (e.g. Sirius-XM)</p>

General features in Region 1 are:

The full bands are widely allocated to Amateurs and were originally excluded from EU Wireless Access (WAPECS) due to government (e.g. military air telemetry) and other use such as PMSE (Broadcasting)

Not all amateurs have access to 2 300 – 2 310 (e.g. UK)

However, IMT spectrum pressure now increasing and is expected to displace most government use. Designation to wireless broadband is now underway based on the EU-RSPP and ECC Report-172. CEPT is formulating a decision (Project Team 52) led by Sweden, who have already de-allocated the entire 2300-2400 band from amateurs.

Satellite radio not allocated (e.g. Sirius-XM) and is unlikely to be once the Mobile service is entrenched

Narrowband usage is quite common at the Region 1 preference of 2 320 MHz, although some 2 302 / 2 304 MHz activity does occur for EME. Further up the band a variety of adhoc data (e.g. Hamnet) and ATV activity occurs.

Newer losses:

UK: April 2015

- 2,3 GHz: Loss of 40 MHz from 2 310 – 2 400 band: has left 2 310 – 2 350 and 2 390 – 2 400 MHz
- 3,4 GHz: Loss of 65 MHz from 3 400 - 3 475 band: has left 3 400 – 3 410 MHz

Sweden:

2,3 GHz: Loss of all 2 300 – 2 400 (Oct 2012) and 2 400 – 2 450 limited to only 100 mW

Further restriction/losses are expected after WRC-15 in France, the Netherlands, Denmark and Sweden.

### **3,4 GHz Band**

The 3,4 GHz band has a relatively large ITU secondary allocations of 3 300 – 3 500 MHz to the Amateur Service in Regions 2 and 3 and 3 400 – 3 410 MHz for the Amateur-Satellite service

However, in Region 1 with the exception of a few national footnotes there are no ITU allocations. Instead at sub-regional level there has been a coordinated gradual expansion of national allocations at 3 400 - 3 410 MHz based on CEPT ECA footnote EU17.

The band, particularly above 3 400 MHz, lies in the so-called 'sweet spot' for mobile communications along with the 2,3 GHz band.

One impact of the lack of global harmonisation is that it so far has not been possible to utilise the band for amateur satellites

Region 1 allocations are a combination of a small number of original 3 400 – 3 475 MHz countries and a gradually increasing number of EU17 allocations at 3 400 – 3 410 MHz

In line with WRC decisions, the 3 400 - 3 600 MHz band has been designated for mobile/fixed wireless networks though mainly above 3 410 MHz due to the presence of airborne radars.

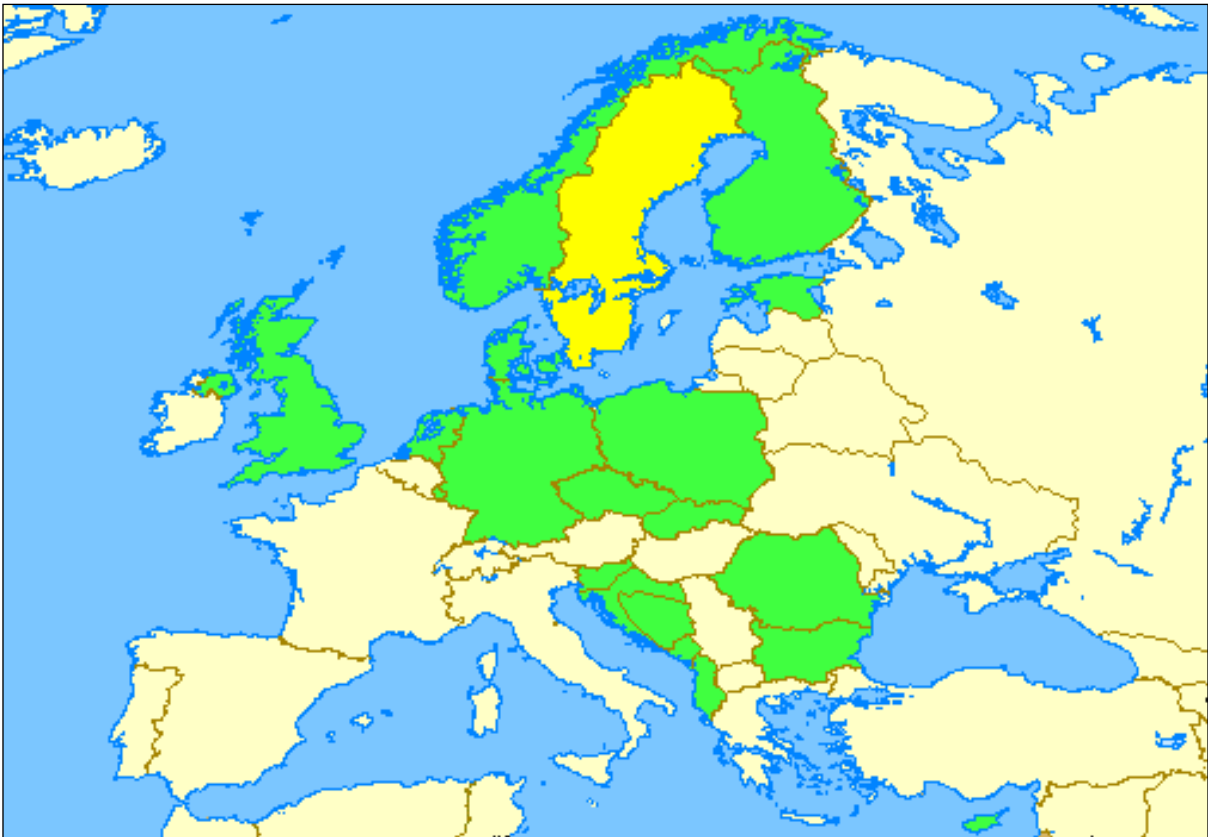
Band	Amateur Service, MHz	Amateur Satellite service, MHz	Comments
3,4 GHz	UK, Germany, Israel: 3 400 - 3 475 Bulgaria: 3 400 - 3 500 CEPT EU17 3 400 - 3 410	ITU: n/a Denmark: 3 400 - 3 410	IMT: Based on ECC DEC(11)06, Dec 2011, which partly avoids 3 400 - 3 410 MHz No ITU Region 1 Allocation but implementation of CEPT EU17 allocations gradually growing A useful summary/map of CEPT allocations is at <a href="http://www.microwavers.org/?3400mhz.htm">www.microwavers.org/?3400mhz.htm</a>

In April 2012 Poland became the latest country to implement EU17 (and a EU9 70 MHz) allocation), making ~20 countries in Region 1

The current list is:

Albania, Bosnia Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Germany, Great Britain, Israel, Luxembourg, Montenegro, Netherlands, Norway, Poland, Romania, Slovak Republic, Slovenia, Sweden (annual permits), and Somalia.

This is illustrated in the map below where the trend is that most regulatory gains have been amongst newer European nations such as Montenegro 2006, Albania 2009, Estonia 2010, Poland 2012



European 3 400 MHz Amateur Allocations, April-2012

With the approval of CEPT decision ECC DEC(11)06, the regulatory situation in the 3 400-3 410 segment is now relatively stable with respect to the mobile wireless sector and a further push should achieve additional gains, assisted in part by avoiding any ambition above 3 410 MHz.

### **Mid-Microwave Bands: 5,7 and 10GHz**

#### **5,7 GHz Band**

5 650 – 5 725 MHz: Primary services Radiolocation and Mobile; secondary services Amateur and Space Research (deep space).

Footnote 5.282 permits the use of 5 650 – 5 670 MHz by the Amateur-Satellite service (earth to space) on a non-interference basis.

5 725 – 5 830 MHz: Primary service Radiolocation; secondary service Amateur.

5 830 – 5 850 MHz: Primary service Radiolocation; secondary services Amateur and Amateur-Satellite (space to earth).

Narrowband working including EME at 5 760 is well established in the CEPT area supported by around 60 propagation beacons. Some countries have small groups experimenting with data links. There are also a few attempts to utilise the S-E Satellite allocation at ~5 840 MHz

but nothing has yet been launched. For that matter, there is little enthusiasm to support narrowband alternatives such as 5 668 MHz (although RSGB has a beacon clearance to investigate this).

### **10 GHz Band**

Above 23 cm, the 10 GHz band is probably the most popular. Narrowband activity dominates at 10368, but there is additional activity from ATV, and legacy wideband-FM

Commercial use of the band includes low density usage by video and point-point fixed links. Whilst most countries have the band allocated, several have gaps in their national allocations in either the lower half of the band or at the upper section of the Amateur-Satellite service

CEPT recognise amateur weak signal activities by allocation footnotes EU17 and EU23

### **The Millimetre Wave Bands: 24 GHz and up**

Unlike the lower bands, the millimetre bands tend to have fewer pressures on amateur usage apart from Car Radar at ~77 GHz. Some of the bands have significant amounts of secondary spectrum adjacent to primary allocations. Some of the features of these bands are:-

Higher atmospheric attenuation

Greater regional harmonisation of ITU allocations

Adjacent Secondary and Primary allocations

Excess amount of secondary spectrum

ISM at 60 and 122 GHz based on Oxygen resonances

WRC12 AI-1.6 increased access opportunities for bands above 275 GHz

WRC-15 AI-1.18 threat at 77,5 - 78 GHz

For CEPT Countries, EU35 permits continued access to 75,5 - 76 as a result of car radar

Almost all activity is narrowband which, along with the allocations, is summarised in the table below:

Frequency Band		BW, GHz	Amateur Service	Amateur-Satellite service	Narrowband/EME		
Low	High				R1	R2	R3
24,00	24,05	0,05	PRIMARY	PRIMARY	24,048	24,048 EME	24,048
24,05	24,25	0,20	Secondary	n/a	-	24,192	
47,00	47,20	0,20	PRIMARY	PRIMARY	47,088	47,088	47,088
76,00	77,50	1,50	Secondary	Secondary	76,032		
77,50	78,00	0,50	PRIMARY	PRIMARY	77,501	?	
78,00	79,00	1,00	Secondary	Secondary	-	78,192	

Frequency Band		BW, GHz	Amateur Service	Amateur-Satellite service	Narrowband/EME		
79,00	81,00	2,00	Secondary	Secondary	-	139?	
81,00	81,50	0,50	Secondary	Secondary	-		
122,25	123,00	0,75	Secondary	n/a	122,251		
134,00	136,00	2,00	PRIMARY	PRIMARY	134,928		
136,00	141,00	5,00	Secondary	Secondary	-		
241,00	248,00	7,00	Secondary	Secondary	-		
248,00	250,00	2,00	PRIMARY	PRIMARY	248,001		
>275,00	1000,00		not allocated	not allocated	DE/AT	USA	
1000,00	3000,00		available	available			

### **24 GHz Band**

The 24 GHz band possesses the first harmonised Primary allocation above 145 MHz in all three ITU regions:

24,00 - 24,05 GHz: Amateur and Amateur-Satellite (Primary)

24,05 - 24,25 GHz: Amateur (secondary), Radiolocation (Primary), Earth Exploration Satellite (secondary).

The band (especially the secondary segment) is also used by SRDs/ISM such as Car Radar

Region 1 countries generally have good access to the full band from 24,0-24,25 GHz. One notable characteristic is that some years ago, Region 1 harmonised all its operations to within the 24 – 24,05 Primary Segment, leaving the secondary 24,05 - 24,25 section empty (and thus available to trade) apart from a small amount of legacy equipment. The Region 1 Handbook is explicit in stating that the secondary segment is not preferred and should only be used if the Primary allocation is not available.

Usage is predominantly narrowband including beacons and EME centred at 24,048 GHz. The move to 24 048 was partly inspired by both regional policy and Oscar 40 and was based on a delta of 144 MHz away from the original 24,192 centre for easy conversion

### **47 GHz Band**

The ITU Region allocations for the 47 GHz band are globally harmonised for both amateur services.

47,0 - 47,2 GHz: Amateur and Amateur-Satellite (Primary Exclusive).



Whilst there are no immediate threats, it is important to encourage higher profile usage (perhaps coupled with 24 GHz users) in order to guard against future losses.

## Region 1

The band is widely allocated. Like 24 GHz, usage is almost entirely weak signal narrow-band/FM activity, in this case centred at 47 088 MHz. The wavelengths facilitate small portable stations, although a modest number of fixed beacons do exist in Europe. Current operations are limited by the availability of power sources and LNAs although there is an interest in 47 GHz EME based on US experiments

### **76 GHz Band**

Until WRC-2000, the Amateur Services were allocated 75,5-76 GHz on a Primary basis. At WRC-2000 this access was time limited to 2006 and a series of new allocations below were made. The original band has however stayed in use on a largely secondary basis in some countries, most notably in Europe where CEPT footnote EU35 permits Amateur use of 75,5-76 GHz on an ongoing basis

The current ITU Allocations are:

76,0 - 77,5 GHz: Amateur and Amateur-Satellite (secondary) Radio Astronomy and Radiolocation (Primary) and Space Research (secondary),

77,5 - 78,0 GHz: Amateur and Amateur-Satellite (Primary)\* Radio Astronomy and Space Research (secondary),

78,0 - 79,0 GHz: Amateur and Amateur-Satellite (secondary) Radiolocation (Primary); Radio Astronomy and Space Research (secondary)

79,0 - 81,0 GHz: Amateur and Amateur-Satellite (secondary) Radio Astronomy and Radiolocation (Primary); Space Research (secondary)

81,0 – 81,5 GHz: ITU Footnote 5.561A also allocates Amateur and Amateur-Satellite (secondary)\*\*

\* 77,5-78,0 GHz is the subject of WRC-15 AI-1.18 to consider a Primary Allocation for Radiolocation

\*\* 81,0-81,5 GHz is believed to have a low national allocation rate on account of it only being by footnote

Whilst the ITU allocations are on a globally harmonised basis there is evidence that implementation is more fragmented at national/regional level.

All usage so far has been by terrestrial use with no amateur satellite activity

An increasingly significant feature of the bands has been the rise in automotive radars. These are in two distinct categories.

76 -77 GHz Automatic Cruise Control

77 – 81 GHz Short Range Radar (SRR79) for automatic safety and crash avoidance

The newer SRR category is a result of EU eSafety legislation and as such is the long-term band for such wideband radars – thus the new WRC-15 item which aims to facilitate their global deployment.

The 24 GHz band was temporarily allocated for SRR but proved especially unpopular in Europe and will be phased out in favour of 77 - 81. In 2004 CEPT ECC Report 056 found that 79 GHz SRR was not compatible with Amateurs in the worst-case scenario and created EU35 as a result. Compatibility was demonstrated for the case of amateurs on mountaintops above cars on average terrain, although this analysis is under review.

#### Region 1

Region 1 usage is entirely terrestrial narrowband (CW/SSB/FM) with either 75,976 or 76,032 in use (usually by portable stations) depending on availability of the original 75 GHz segment. There is negligible use of the 77,5 GHz Primary allocation although it is recognised in the Region 1 handbook availability for outside the CEPT area

The Region 1 VHF Handbook specifies that 78 – 81,5 GHz is not preferred for any use

Adjacent to the bands are fixed and mobile allocations with multi-gigabit links at 71 - 76 paired with 81 – 86

The UK was able to show that courtesy of guard bands in the links, and in exchange traded away its entitlement to 81 – 81,5 GHz

#### **122 GHz Band**

The ITU Region allocation is 122,25 - 123,00 GHz: Amateur (secondary). (No Satellite allocation)

The primary services are Fixed, Mobile and Inter-Satellite.

#### Region 1

The band is widely allocated in the CEPT area. Rarely used at present other than Germany

#### **134 GHz Band**

134 - 136 GHz: Amateur and Amateur-Satellite - Primary, Radio Astronomy secondary.

136 - 141 GHz: Amateur and Amateur-Satellite - Secondary, Radio Astronomy and Radiolocation primary.

#### Region 1

Region 1 use, though modest, was the topic of two papers at Sun City where the band and 134,928 GHz in particular (i.e. the Primary section) was promoted as being preferred compared to 122 GHz. This has spurred experimentation in the UK and Germany based on 47 and 76 GHz portable equipment, despite the lack of LNAs and PAs. The re-plan to 134,928 was partly intended to enable release of 136 - 141 if necessary

#### **241 - 248 GHz Band**

241 - 248 GHz: Amateur and Amateur-Satellite (secondary), Radio Astronomy and Radiolocation (Primary).

248 - 250 GHz: Amateur and Amateur-Satellite (Primary), Radio Astronomy (secondary).

#### Region 1

Region 1 activity is negligible (and is largely confined to a few enthusiasts in Germany, although a renewed construction effort is underway in the UK. Like 134 GHz, the view is that the excess amount of secondary allocation will never be used.

#### **Bands above 275 GHz**

There are no formal ITU allocations above 275 GHz. However, the USA, Germany, Austria and New Zealand have national allocations for amateurs in this range.

At WRC-12 the potential use of these frequencies by active services was acknowledged for the first time. Short range amateur QSOs of a few kilometres have been recorded on 322 and 403/411 GHz. Region 1 discussed this frequency range at its interim meeting at Vienna 2007 (Paper B02 by RSGB).

It should now be possible to extend access to others for low power experiments – either by allocation or license exemption