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|  | **Radiocommunication Study Groups** |  |
| **INTERNATIONAL TELECOMMUNICATION UNION** |  |
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| Spectrum needs for the amateur service in the frequency band 50-54 MHz in Region 1 and sharing with mobile fixed, radiolocation, and broadcasting services |

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# 1 Introduction

Resolution **658** (Geneva, 2015) invites ITU-R to conduct the following studies to support the deliberations of WRC-19 on agenda item 1.1:

 *1 to study spectrum needs in Region 1 for the amateur service in the frequency band 50‑54 MHz;*

 *2 taking into account the results of the above studies, to study sharing between the amateur service and the mobile, fixed, radiolocation and broadcasting services, in order to ensure protection of these services.*

This Report responds to the invitations of Resolution **658**.

# 2 Use of the frequency band 50-54 MHz by amateur service stations

It is important to note that it is not possible to perform a quantitative analysis of the occupancy of the 50-54 MHz band by amateur service stations using MIFR data, because Administrations do not have amateur service frequency assignments registered by the Bureau.

However, CEPT’s European Table of Frequency Allocations (ECA TABLE) (ERC Report 25) allocates the 50-52 MHz frequency band to the amateur service on a secondary basis. As of October 2016, twenty-four of the forty-eight member administrations of CEPT have notified an allocation to the amateur service in EFIS, the CEPT European Communications Office’s online Frequency Information System. In addition a further twelve CEPT administrations have indicated that amateur usage is an application in this band. This demonstrates that 75% of CEPT’s membership authorise amateur usage within the 50-52 MHz frequency band. The permitted maximum power of such stations is mostly 100 W, in some countries there are territorial limitations with regard to power and frequencies.

Table 1 provides a list of Region 1 Administrations and the conditions for using the 50-54 MHz frequency band, as published in the website of Region 1 of the International Amateur Radio Union (IARU).

*Editor’s note: This information needs to be checked for currency*

Table 1

Conditions for using the 50-52 MHz band, as at October 2016

| Country | Band | Status1 | RR2 | Country | Band | Status1 | RR2 | Country | Band | Status1 | RR2 | Country | Band | Status1 | RR2 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| AFS | 50-54 | P | 5.169 | DNK | 50-52 | S |  | LBR |  | No Info |  | S | 50-52 | S |
| ALB | 50-52 | S |  | E | 50-52 | S |  | LBY |  | No Info |  | SDN |  | No Info |  |
| ALG | 50-52 | S |  | EGY | NO |  |  | LIE | 50-52 | S |  | SEN | 50-51 | P | 5.169 |
| AND | 50-52 | S |  | ERI |  | No Info |  | LSO | 50-54 | P | 5.169 | SEY |  | No Info |  |
| ANG |  | No Info |  | EST | 50-52 | S |  | LTU | 50-52 | S |  | SMR | 50-52 | S |
| ARM | NO |  |  | ETH |  | No Info |  | LUX | 50-52 | S |  | SOM | 50-54 |  |  |
| ARS | NO |  |  | F | 50.2-52 | S |  | LVA | 50-52 | S |  | SRB | 50-51.9 | S |
| AUT | 50-52 | S |  | FIN | 50-52 | S |  | MAU | NO |  |  | SRL |  | No Info |  |
| AZE | NO |  |  | G | 50-51 | P |  | MCO | 50-52 | S |  | SSD |  | No Info |  |
| BEL | 50-52 | S |  | 51-52 | S |  | MDA | NO |  |  | STP |  | No Info |  |
| BEN |  | No Info |  | GAB |  | No Info |  | MDG |  | No Info |  | SUI | 50-52 | S |
| BFA |  | No Info |  | GEO | NO |  |  | MKD | 50-52 | S |  | SVK | 50-52 | S |
| BHR | 50-50.5 | P |  | GHA |  | No Info |  | MLI |  | No Info |  | SVN | 50-52 | S |
| 50.5-52 | S |  | GMB |  | No Info |  | MLT | 50-52 | S |  | SWZ | 50-54 | P | 5.169 |
| BIH | 50-52 | S |  | GNE |  | No Info |  | MNE | 50-52 | S |  | SYR |  | No Info |  |
| BLR | NO |  |  | GNB |  | No Info |  | MNG |  | No Info |  | TAN |  | No Info |  |
| BOT | 50-54 | P | 5.169 | GRC | 50-52 | S |  | MOZ |  | No Info |  | TCD |  | No Info |  |
|  |  |  |  | GUI |  | No info |  |  |  |  |  |  |  |  |  |
| BUL | 50.05-50.2 | S |  | HNG | 50-52 | S |  | MRC |  | No Info |  | TGO |  | No Info |  |
| BUR |  | No Info |  | HOL | 50-52 | S |  | MTN |  | No Info |  | TJK | NO |  |  |
| CAF |  | No Info |  | HRV | 50-51.9 | S |  | MWI | 50-54 | P | 5.169 | TKM | NO |  |  |
| CMR |  | No Info |  | I | 50-52 | S |  | NGR |  | No Info |  | TUN | NO |  |  |
| COD | 50-54 | P | 5.169 | IRL | 50-52 | S |  | NIG | NO |  |  | TUR | NO |  |
| COG |  | No Info |  | IRQ |  | No Info |  | NMB | 50-54 | P | 5.169 | UAE |  | No Info |  |
| COM |  | No Info |  | ISL | 50-52 | S |  | NOR | 50-52 | S |  | UGA |  | No Info |  |
| CPV |  | No Info |  | ISR | 50-52 | S |  | OMA | 50-52 | S |  | UKR |  | No Info |  |
| CTI |  | No Info |  | JOR | 50-51.5 | S |  | POL | 50-52 | S |  | UZB | NO |  |  |
| CVA | 50-52 | S |  | KAZ | NO |  |  | POR | 50-52 | S |  | YEM |  | No Info |  |
| CYP | 50-51 | S |  | KEN | NO |  |  | QAT |  | No Info |  | ZMB | 50-54 | P | 5.169 |
| CZE | 50-52 | S |  | KGZ | NO |  |  | ROU | 50-52 | S |  | ZWE | 50-54 | P | 5.169 |
| D | 50.08-51 | S |  | KWT |  | No Info |  | RUS | NO |  |  |  |  |  |  |
| DJI |  | No Info |  | LBN | NO |  |  | RRW | 50-54 | P | 5.169 |  |  |  |  |
| **5.169** Alternative allocation: in **Botswana**, **Lesotho**, **Malawi**, **Namibia**, **the Dem. Rep. of the Congo,** **Rwanda, South Africa**, **Swaziland**, **Zambia and Zimbabwe**, the band 50-54 MHz is allocated to the amateur service on a primary basis. In Senegal, the band 50-51 MHz is allocated to the amateur service on a primary basis. (WRC-12) |

1 Status: P = primary, S = Secondary, No info = no information available.2 RR is the applicable Radio Regulation Article **5** footnote.

# 3 Spectrum needs for the amateur service in Region 1

The 50-54 MHz frequency band is allocated to the Amateur Service by ITU in Regions 2 and 3. While the Region 1 African countries listed in RR No. **5.169** have an allocation to the amateur service in the 50-54 MHz frequency band on a primary basis, a number of other Region 1 countries have authorised the use of all or parts of the 50-52 MHz frequency band by the amateur service on a mainly secondary (but sometimes national primary) basis in accordance with RR No. **4.4**. The opportunity provided by WRC-19 AI 1.1 to achieve global harmonisation would provide the means to introduce new and innovative communications systems, as well as regularising existing amateur service usage in the 50-54 MHz frequency band, including a reduction in the number of footnotes in RR Article **5**.

The following paragraphs provide the reasons for the creation of a global allocation to the amateur service in the band 50-54 MHz, in response to AI 1.1 of WRC-19.

## 3.1 Background/reason

The frequency range 30-80 MHz marks the transition area between ionospheric and non-ionospheric propagation modes, which makes it particularly interesting for experimentation and study within the amateur service. An allocation with-in this frequency range in Article **5** of the Radio Regulations has not been generally available to the amateur service in Region 1 for over half a century. Alignment with Regions 2 and 3 would therefore facilitate the general understanding and prediction of propagation events as data accumulates and more Region 1 administrations grant their amateur licensees access to spectrum in the 50-54 MHz frequency band.

A number of propagation modes are used by amateurs in the range 50-54 MHz:

– Free-space (line of sight)

– Sporadic-E ‘clouds’

– E and F2 multi-hop and chordal-hop

– Trans-equatorial spread-F

– E-layer Field Aligned Irregularities (FAI)

– Aurora backscatter

– Meteor scatter

– Earth-Moon-Earth (using the moon's surface as a passive reflector)

– Tropospheric super-refraction and ducting

– Tropospheric scatter

– Scatter from aircraft and objects in near Earth orbits (e.g. International Space Station).

In recent years, broadcasting has significantly declined in the 47-68 MHz frequency band and national allocations for the amateur service have already been established in parts of Region 1. For example, the European Common Allocation table (ECA) of CEPT has included an allocation to the amateur service in the 50-52 MHz frequency band for a number of years.

By 2020, TV Broadcasting in other parts of Region 1 within this frequency range is expected to decline further as conversion to digital television broadcasting continues. Sharing between the broadcasting service and amateur service in the 50-54 MHz frequency band in Region 1 should then be minimal.

– A Region 1 allocation would facilitate further worldwide harmonisation.

– Longer term propagation studies would continue and thrive.

The amateur service sees a need to bridge the very wide gap between the existing allocations to the amateur service at 28 MHz and 144 MHz in Region 1 thus avoiding the use of RR No. **4.4** by those administrations in Region 1, not party to RR No. **5.169**, which have provided an allocation to the amateur service within the 50-54 MHz frequency band.

## 3.2 Need/Justification

The amateur service, with more than three million operators worldwide, continues to grow. Radio amateurs utilise allocations to the amateur service to engage in scientific and technical investigation and experimentation, provide communication in the wake of natural disasters, provide non‑commercial public service communications, conduct other activities to advance technical education, develop radio operating technique and enhance international goodwill.

As mentioned previously, a number of Region 1 countries not party to RR No. **5.169** have made all or parts of the 50-52 MHz frequency band available to the amateur service by means of RR No. **4.4**. The lower part of this frequency range is utilised for weak signal communications which would derive great benefit from harmonisation with Regions 2 and 3. The essential need here is for 500 kHz of narrowband applications including propagation beacons.

The frequency range 50.5-52 MHz is currently utilised for voice communications using frequency or phase modulation, Data, Gateways and FM Repeaters. Concerning two frequency repeaters, sufficient separation must be available between input and output frequencies in order to be able to easily engineer the cavity diplexers required for such installations. Digital Voice (DV) and data is already being used for 50 MHz VHF mobile networks in the amateur service incorporating text and simple voice messaging. Such systems have shown to be of considerable value in emergency communications. See RR No. **25.3**.

Additional spectrum above 52 MHz is required in order to give amateur radio room to develop new innovative applications, systems and modes in keeping with 21st century developments and to assist young people in developing new communications skills. Based on current experimentation, in general these will be digital, combining voice, video and data like services encompassing a wide range of appropriate bandwidths. These applications, systems and modes may be used in conjunction with HAMNET, a mainly IP based broadband point-to-point network in the amateur service utilising spectrum mainly in allocations to the amateur service at 2.3 GHz and 5.7 GHz.

In addition, access to the entire 50-54 MHz frequency band in Region 1 would mitigate problems experienced by the amateur service in several ways. The widespread rise in the overall noise floor in MF and HF spectrum increasingly renders lower frequencies allocated to the amateur service subject to disturbance and harmful interference, particularly in urban environments. Furthermore, additional VHF spectrum would help to compensate for possible loss of spectrum identified for IMT in the 2.3 GHz band and the 3.4 GHz bands at recent WRCs. This would apply especially for wideband modes such as data and multimedia which are increasingly being displaced from these bands.

Amateur innovation in the 52-54 MHz frequency band could also pioneer the way for commercial applications in other parts of the low VHF band where many administrations are investigating how such spectrum might be used in an efficient and effective manner. HoT (HAMNET of Things), Machine to Machine and Station to Remote Station are anticipated applications.

Unlike Region 2 and in some cases Region 3, the amateur service in Region 1 does not have allocations elsewhere in the VHF range at 146-148 MHz and 220-225 MHz; harmonising with Regions 2 and 3 in the 50-54 MHz frequency band would therefore seem appropriate, especially if global networks with roaming capabilities are eventually realised.

Current trials show that Reduced Bandwidth digital amateur Television (RB-DATV) could also be implemented above 52 MHz. With leading-edge amateur innovation, currently the lowest data rate achievable for RB-DATV (MPEG-4/DVB-S QPSK) is 333 kb/s requiring a necessary bandwidth of 500 kHz. See for example the Radio Society of Great Britain *RadCom* journal of November 2014 and the British Amateur Television Club *CQ-TV* journal of May 2015 for further details of this experimental work.

When the hardware to support such applications matures, it is expected that there will be greater demands for VHF amateur spectrum to provide some form of one-to-one amateur video communications as well as other data services.

# 4 Characteristics of amateur stations for sharing studies

There is an existing allocation to the amateur service between 50-54 MHz in ITU Regions 2 and 3; therefore, the most recent version of Recommendation ITU-R M.1732, “Characteristics of systems operating in the amateur and amateur-satellite services” for use in sharing studies, contains the current characteristics to be used for the sharing analyses that follow. [Recommendation ITU-R M.1732 is undergoing a revision, which is scheduled for completion by the end of 2016.] Typical transmission modes that may be used in this band are Morse telegraphy, analogue and digital voice, relatively low speed data modes and reduced bandwidth digital television.

# 5 Other services in the 50-54 MHz frequency band

In Regions 2 and 3, and in some countries in Region 1, there is an allocation of 4 MHz (50‑54 MHz) to the amateur service. In addition, there is inter-regional sharing at the borders between Region 1 and Regions 2 and 3.

In accordance with Article **5** of the Radio Regulations, in Region 1 the 50-54 MHz frequency band is allocated to the broadcasting service, however there are some Additional and Alternative allocations:

 5.164*Additional allocation:* in Albania, Algeria, Germany, Austria, Belgium, Bosnia and Herzegovina, Botswana, Bulgaria, Côte d'Ivoire, Croatia, Denmark, Spain, Estonia, Finland, France, Gabon, Greece, Ireland, Israel, Italy, Jordan, Lebanon, Libya, Liechtenstein, Lithuania, Luxembourg, Madagascar, Mali, Malta, Morocco, Mauritania, Monaco, Montenegro, Nigeria, Norway, the Netherlands, Poland, Syrian Arab Republic, Slovakia, Czech Rep., Romania, the United Kingdom, Serbia, Slovenia, Sweden, Switzerland, Swaziland, Chad, Togo, Tunisia and Turkey, the frequency band 47‑68 MHz, in South Africa the frequency band 47-50 MHz, and in Latvia the frequency band 48.5-56.5 MHz, are also allocated to the land mobile service on a primary basis. However, stations of the land mobile service in the countries mentioned in connection with each frequency band referred to in this footnote shall not cause harmful interference to, or claim protection from, existing or planned broadcasting stations of countries other than those mentioned in connection with the frequency band.     (WRC-15)

 5.165 *Additional allocation:*in Angola, Cameroon, Congo (Rep. of the), Madagascar, Mozambique, Niger, Somalia, Sudan, South Sudan, Tanzania and Chad, the band 47‑68 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.       (WRC‑12)

A number of African countries have alternatively allocated 50–54 MHz to the amateur service on a primary basis by RR No. **5.169**:

 5.169 Alternative allocation: in Botswana, Lesotho, Malawi, Namibia, the Dem. Rep. of Congo, Rwanda, South Africa, Swaziland, Zambia and Zimbabwe, the band 50‑54 MHz is allocated to the amateur service on a primary basis. In Senegal, the band 50-51 MHz is allocated to the amateur service on a primary basis.        (WRC‑12)

From the foregoing there is a need to establish sharing criteria with the broadcasting service, fixed service, mobile service and radiolocation service, specifically for wind profiler radars.

# 6 Sharing with the mobile service

According to RR Article 5.164 and the European Table of Frequency Allocations (ECA TABLE), the frequency band 47-68 MHz is allocated to the land mobile service on a primary basis.

However, in the 50-54 MHz frequency band the MIFR contains only 6 frequency assignments to land mobile stations in Region 1 and about 4 assignments to fixed service stations. The information is presented in Table 2 below.

Table 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ADM | Radio service | Frequency assignments number | Radio service | Frequency assignments number |
| D | FB/ML | 3 |  |  |
| I | FB/ML | 3 | FX | 4 |

Following ITU texts are relevant to the sharing analysis:

– Recommendation ITU-R M.1825 – *Guidance on technical parameters and methodologies for sharing studies related to systems in the land mobile service.*

– Recommendation ITU-R M.1634 – *Interference protection of terrestrial mobile service systems using Monte Carlo simulation with application to frequency sharing.*

– Report ITU-R SM.2028-1 – *Monte Carlo simulation methodology for the use in sharing and compatibility studies between different radio services or systems.*

– Recommendation ITU-R SM.1055 – *The use of Spread Spectrum Techniques.*

# 7 Sharing with the fixed Service

In the European Common Allocation table there is no allocation to the fixed service in the 50‑54 MHz frequency band.

# 8 Sharing with the radiolocation Service

In the frequency band 46-68 MHz, RR No. **5.162A** provides an additional allocation to the radiolocation service on a secondary basis in a number of countries and limited to the use of wind profiler radars.

 5.162A *Additional allocation:* in Germany, Austria, Belgium, Bosnia and Herzegovina, China, Vatican, Denmark, Spain, Estonia, the Russian Federation, Finland, France, Ireland, Iceland, Italy, Latvia, The Former Yugoslav Republic of Macedonia, Liechtenstein, Lithuania, Luxembourg, Monaco, Montenegro, Norway, the Netherlands, Poland, Portugal, the Czech Rep., the United Kingdom, Serbia, Slovenia, Sweden and Switzerland the band 46-68 MHz is also allocated to the radiolocation service on a secondary basis. This use is limited to the operation of wind profiler radars in accordance with Resolution **217 (WRC‑97)**.    (WRC‑12)

The relevant Wind profiler radars parameters for sharing studies with amateur service are described in Table 3 below (to be confirmed):

TABLE 3

| System parameter | Range of values |
| --- | --- |
| Pulse peak power (kW) | 5‑60 |
| Average transmitted power (kW) | 0.5‑5 |
| Main beam antenna gain (dBi) | 30‑34 |
| Antenna beamwidth (degrees) | 4‑6 |
| Main pointing elevation angle (degrees) | 90 (zenith) |
| Tilt angle from main pointing (degrees)  | 11‑16 |
| Antenna side-lobe suppression between 0 and 5° compared to horizon (dB) | 33 (minimum) – 40 (Median) |
| Additional shielding at horizon (dB) | TBD |
| Pulse width (µs) | 1‑10 |
| Necessary bandwidth (MHz) | 0.2‑2.2 |
| Occupied bandwidth (MHz) | 0.5‑5 |
| Protection criteria (I/N)(dB) | –6 |
| Noise figure (dB) | 3 (TBC) |
| Maximum interference level in necessary bandwidth (dBW) | –154 (TBC) |

Currently, the MIFR has no information about frequency assignments to wind profilers in the 50‑54 MHz frequency band.

The reference ITU-R documents related to wind profilers are:

– Resolution **217 (WRC-97)** – *Implementation of wind profiler radars*.

– Recommendation ITU-R M.1226 – *Technical and operational characteristics of Wind Profiler Radars in the bands in the vicinity of 50 MHz.*

– Report ITU-R M.2013 – *Wind profiler radars.*

# 9 Sharing with the broadcasting service

The following ITU texts are relevant to the sharing analysis:

– Report ITU-R BT. 2387-0 (07/2015) contains information on responses from administrations on use of various frequency bands, including 50-54 MHz for broadcasting.

– Recommendation ITU-R BT.1368 – *Planning criteria, including protection ratios, for digital terrestrial television services in the VHF/UHF bands.*

– Recommendation ITU-R BT.2033 – *Planning criteria, including protection ratios, for second generation of digital terrestrial television broadcasting systems in the VHF/UHF bands.*

– Recommendation ITU-R SM.851 – *Sharing between the broadcasting service and the fixed and/or mobile services in the VHF and UHF bands.*

– Final Acts of the European Broadcasting Conference (Stockholm, 1961 as revised in Geneva, 2006) (“ST61”) in the European Broadcasting Area.

– Final Acts of the African Broadcasting Conference (Geneva, 1989 as revised in Geneva, 2006) (“GE89”) in the African Broadcasting Area and neighbouring countries.

In addition to the Article **5** allocation to the broadcasting service in Region 1 mentioned in *noting d)*, the band continues to be subject to both the Final Acts of the European Broadcasting Conference (Stockholm, 1961 as revised in Geneva, 2006) (“ST61”) in the European Broadcasting Area and the Final Acts of the African Broadcasting Conference (Geneva, 1989 as revised in Geneva, 2006) (“GE89”) in the African Broadcasting Area and neighbouring countries.

The ITU-R eQry database also shows that there are a total of 353 broadcasting assignments recorded in the ST61 and GE89 plans still using the frequency range 50-54 MHz in 41 administrations. The MIFR contains 555 broadcasting transmitters in that band in Region 1. This information is shown in Table 4 below:

TABLE 4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | IFIC no. | ST61 | GE89 Region 1 | MIFR Region 1 |
| 24/10/2016 | 2831 | 292 | 56 | 555 |
| TV entries falling into or overlapping with frequency range 50 MHz-54 MHz. The information submitted to the BR for recording in the MIFR may not necessarily include all broadcasting stations in operation thus it may not reflect the actual use of the frequency band.  |

## 9.1 The 2016 Situation

In the European Regional Telecommunications Organisation (RTO), CEPT administrations have been urged to remove their unused assignments to the broadcasting service in the band 50-54 MHz in view of agenda item 1.1 of WRC-19. This action will be in line with an earlier decision to protect assignments according to the Stockholm Agreement 1961 Plan.

The CEPT over a number of decades has developed a European Common Allocation (ECA) table, which is reviewed annually. Footnote ECA3 states 'CEPT administrations are urged to take all practical steps to clear the band 47-68 MHz of assignments to the broadcasting service. The broadcasting assignments according to Stockholm Agreement 1961 shall be protected.' At a recent CEPT meeting administrations agreed that it could be useful if the totality of Broadcasting Band 1 could be addressed in accordance with ECA3 and unused assignments listed in the MIFR suppressed. ECA3 will therefore be reviewed at future meetings when the ECA is addressed.

The closure of analogue television in the 47–68 MHz frequency band relates directly to the introduction of digital television. In 2009, the European Commission promoted a coordinated approach to the freeing up and future use of the radio spectrum because it wanted to ensure that EU citizens could enjoy the benefits of digital television. For that to happen, Member States (and other CEPT countries) closed analogue transmissions and moved to digital broadcasting. The switch-off of analogue terrestrial TV transmission was completed by 2009 in Germany, Finland, Luxembourg, Sweden and the Netherlands. The 2012 EU target for switch-off was met by almost all Member States of the European Union.

The MIFR does not reflect this result. The current situation is that in Western Europe the 47‑68 MHz frequency band is no longer used for terrestrial television broadcasting to the general public.

## 9.2 Digital Terrestrial Television Broadcasting in Band 1 – 47–68 MHz

The Chester July 1997 Multilateral Coordination Agreement (MCA) attended by 34 CEPT administrations representing Member countries of the ITU was convened under the terms of Article **6** of the ITU Radio Regulations and dealt with the technical criteria as well as coordination principles and procedures for the introduction of Digital Terrestrial Television Broadcasting (DTTB). Article 4 of the Multilateral Co-ordination Agreement states that coordination procedures only deal with the frequency bands in which DTTB is envisaged, i.e. 174 to 230 MHz and 470 to 862 MHz. In the other bands the procedures of the 1961 Stockholm Agreement (ST61) would apply, without additional procedures.

Furthermore, the joint CEPT ERC/EBU Report on Planning and Introduction of Terrestrial Digital Television (DVB-T) in Europe, Izmir, December 1997 states in Section D2-2 “Due to long distance propagation effects and the high man-made-noise level, Band I is not considered suitable for DVB‑T”.

During consultations carried out by ITU Secretary General in 2000/2001 an overwhelming majority of the countries of the European Broadcasting Area indicated their support for the proposed revision of ST61. In addition, Member States from the planning area of the Regional Agreement for VHF/UHF television broadcasting (GE89) in the African Broadcasting Area (ABA) and neighbouring countries also expressed the wish to convene a Regional Radiocommunication Conference (RRC) for the same purposes.

The ITU Council, at its sessions in 2001 and 2002, adopted Resolutions 1185 and 1180, by which it agreed to the convening of a RRC on the planning of terrestrial broadcasting in the VHF/UHF bands, for the combined planning area covering the European Broadcasting Area (EBA), the African Broadcasting Area, and the countries outside the African Broadcasting Area which are parties to the Regional Broadcasting Agreement, Geneva, 1989.

The Plenipotentiary Conference, Marrakesh, 2002, also considered this issue and decided to extend the planning area to the territories of the following countries that are not or only partially covered by the planning areas of both the ST61 and GE89 Agreements: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Russian Federation (the part of the territory to the west from longitude 170° E), Tajikistan, Turkmenistan and Uzbekistan (see Resolution 117 (Marrakesh, 2002)).

In summary, the planning area comprised those parts of Region 1 that are situated west of the meridian 170° East and north of the parallel 40° South, as well as the whole territory of the Islamic Republic of Iran.

The expectation that the band 47–68 MHz will not be utilised for DTTB in Region 1 continues in the ITU-R documentation, especially Report ITU-R BT.2387-0 (07/2015) which contains information from administrations on the current and future use of various frequency bands, including 50-54 MHz for broadcasting. None of the responding administrations identified VHF1 spectrum for their current or future DTTB services. However it is likely that several countries in Region 2 may adopt or have adopted the ATSC DTTB standard in spectrum allocated to the Broadcasting Service above 54 MHz.

## 9.3 Analogue Television Broadcasting in Band 1 – 47–68 MHz

Report ITU-R BT.2387-0 (07/2015) clearly indicates that low VHF spectrum is not generally considered by administrations to be suitable for DTTB. As national Analogue Switch Off (ASO) programmes are completed, the number of analogue television stations diminishes in those countries where DTTB has been fully implemented. However there are a large number of analogue stations assigned frequencies in the VHF band below 100 MHz which are still in operation, for example 2 091 in Brazil above 54 MHz and 3 683 in the Russian Federation, some of which will be in the 47‑54 MHz frequency band. It therefore appears that analogue television in VHF1 spectrum remains a cost effective means of reaching viewers in remote areas of large countries.

Another important consideration is that many of the remaining analogue broadcasting stations in Region 1 were planned using the criteria and Plan assignments detailed in ST61 and GE89. On the assumption that those countries which have completed their ASO have decommissioned their analogue transmitters that the interference environment for those stations which remain operational has as a result significantly improved and the combined interference potential of several hundred amateur stations spread across the countries of central and western Europe is likely to be significantly less than the situation when the band was utilised solely for television broadcasting.

Nevertheless, it may in some situations be necessary to develop mechanisms to limit the possibility of harmful interference being caused by the amateur service to broadcasting reception in the 50‑54 MHz frequency band in Region 1, until such time that the broadcasting stations cease operations.

## 9.4 Inter-Regional Sharing Situation

The 50–54 MHz frequency band is currently allocated to the amateur service in Region 2 and Region 3 on a primary basis. However in Region 3 the countries specified in numbers **5.167**, **5.167A**, **5.168** and **5.170** of the Radio Regulations have alternative allocations to other radiocommunication services. ITU Region 1 has a border with Regions 2 and 3. Inter-regional sharing between the primary amateur service in Regions 2 and 3 and the primary analogue television broadcasting service in Region 1 seems to have been successful with minimal or no harmful interference occurring to the service areas of analogue television stations.

## 9.5 Sharing between the broadcasting service in Region 1 and the amateur service in Region 3

[The border between the Russian Federation and Japan is of particular interest since in Region 1 the band is used extensively for analogue television broadcasting by the Russian Federation. Japan in Region 3 has authorised the use of band 50–54 MHz by amateur service licensees. The distance between Japan and the Russian Federation at its closest point is 43 km and at its farthest point about 1 000 km, with a considerable amount of territory within 600 to 800 km across the Sea of Japan. In September 2016 there were 435 565 Japanese amateur licensees, about 0.34% of the Japanese population. With a land area of 378 000 km2, on average one should find more than one amateur station per square kilometre. The maximum permitted power at the antenna of an amateur station in Japan is 30 dBW. ]

Another similar case is between Mongolia and the Russian Federation in Region 1 and China in Region 3. These three countries share long territorial borders. Currently there are 5 783 amateur licences in the provinces adjacent to that part of the border in China, together with significant numbers of TV broadcasting stations. No complaints on interference issues between stations of the amateur service and the broadcasting service in that part of China have been received by the administration of China.

*Editor’s note: Need more information about sharing, when, how and where.*

## 9.6 Sharing between the broadcasting service in Region 1 and the amateur service in Region 2

[A similar situation exists between the Russian Federation in Region 1 and the United States in Region 2 where the amateur service has operated for many years on a primary basis in the 50‑54 MHz frequency band. Here the closest distance is 83 km across the Bering Strait. The main difference between Japan and the United States would be a smaller density of amateur service stations per square kilometre in the State of Alaska. As of November 2016 the US regulator has recorded about 3 800 amateur licences in the State of Alaska]

*Editor’s note: Sections 9.5 & 9.6 need additional information for relevance, esp. if there are broadcasting stations in existence or planned near Japan or Alaska.*

# 10 Summary

*Editor’s note: Summary text will change as studies progress*

[An examination has been made of the switchover from analogue to digital terrestrial television broadcasting and concludes that it is highly unlikely that the band 50–54 MHz will be utilised for digital television broadcasting in the future in Region 1. Nevertheless there remain a large number of operational analogue television transmitters in a small number of countries.

Sharing between analogue television and the amateur service is not new in this frequency band and examples have been provided of how sharing currently exists on an inter-regional basis.]