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| Summary:  |
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| Proposal:  |
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DRAFT CEPT BRIEF ON AGENDA ITEM 1.1

1.1 to consider an allocation of the frequency band 50-54 MHz to the amateur service in Region 1, in accordance with Resolution 658 (WRC-15)

# ISSUE

CEPT has identified the following elements, relevant for this agenda item:

* to study spectrum needs for the amateur service in the band 50-54 MHz;
* to study sharing between the amateur service, and the mobile, fixed, radiolocation and broadcasting services, in order to ensure protection of these services

# Preliminary CEPT position

CEPT would support an allocation in the frequency range 50-54 MHz to the amateur service in Region 1, only if studies show that incumbent services, including their future deployment and services in adjacent spectrum are protected.

If potentially the frequency band 50-54 MHz is allocated to the amateur service, this should not cause harmful interference to stations in the broadcasting service to which this frequency band is allocated on a primary basis. The amateur service shall not claim protection from harmful interference caused by broadcasting service stations.

# Background

1. PTD is requested to consider TEXT A when revising TEXT B with the aim to reduce the length of this section and to only provide a summary of existing and on-going studies including compatibility studies with incumbent services.

TEXT A:

This agenda item was developed based on proposals of CEPT and ASMG administrations during WRC-15. According to the Radio Regulations (RR) the band 50-54 MHz is allocated to the amateur service in Regions 2 and 3. Therefore an allocation of this frequency band to the amateur service in Region I could help forward the harmonized use of this band by amateur service in all ITU-R Regions.

According to Article 5 RR in Region 1 the frequency band 50-54 MHz is allocated to broadcasting service on primary basis.

While the Region 1 African countries listed in RR No **5.169** have an alternative allocation to the amateur service in the frequency band 50-54 MHz on a primary basis, a number of other Region 1 countries have authorised the use of all or parts of the band 50-52 MHz by the amateur service on a mainly secondary (but sometimes national primary) basis in accordance with RR No **4.4**.

The frequency band 47-68 MHz or part of it, is also having additional allocation to the land mobile service on a primary basis in a number of countries in Region 1 according to RR No **5.164**. The frequency band 50-54 MHz is also allocated to the land mobile service on a primary basis as shown in the European Table of Frequency Allocations.

RR No **5.1 62A** provides for an additional allocation to the radiolocation service on a secondary basis in a number of countries, limited to the operation of windprofiler radars in accordance with Resolution 217 (**WRC-97**).

lTU-R WP 5A was designated as the responsible group for studies under WRC-19 agenda item 1.1. During its latest meeting (22 May - I June 2017) WP 5A continues work for WRC-19 agenda item 1.1. The preliminary draft CPM text and work plan for this agenda item appear in Annexes 4 and 5 of Doc. 5A/469, respectively. WP 5A developed a working document towards a preliminary draft new Report ITU-R M.[AMATEUR\_50\_MHz] (Annex 14 of Doc. 5A/469*).* This PDNR includes studies on spectrum needs, sharing and compatibility. WP 5A noted the need to continue work on these studies during next meeting, as a lot of issues still need to be clarified (e.g. more explanation of a method determining spectrum needs is required as well as some assumptions for others studies also should be clarified). It was also noted that the preliminary draft. CPM text is in a very early stage and needs further developing.

END OF TEXT A

TEXT B:

The band 50-54 MHz is allocated to the Amateur Service by ITU in Regions 2 and 3.

While the Region 1 African countries listed in No 5.169 have an allocation to the amateur service in the frequency band 50-54 MHz on a primary basis, a number of other Region 1 countries have authorised the use of all or parts of the band 50-52 MHz by the amateur service on a mainly secondary (but sometimes national primary) basis in accordance with RR 4.4.

The frequency band 47-68 MHz or part of it, is also allocated to the land mobile service on a primary basis in a number of countries in Region 1.

No 5.162A provides for an additional allocation to the radiolocation service on a secondary basis in a number of countries, limited to the operation of wind profiler radars in accordance with Resolution 217 (WRC-97);

The frequency band 50-54 MHz is allocated to the land mobile service on a primary basis as shown in the European Table of Frequency Allocations.

## Spectrum needs for the amateur service in Region 1

### General Considerations

Article **1.56** of the Radio Regulations defines the amateur service as

amateur service:a radiocommunication service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is,
by duly authorized persons interested in radio technique solely with a personal aim
and without pecuniary interest.

The 50 MHz band exemplifies all key aspects - communication, technical investigation and self-training. Underpinning this are harmonised allocations to the amateur service on a global basis for which the International Amateur Radio Union develops utilisation plans. The 50 MHz band is also the first band in the frequency spectrum above HF where the full wide range of amateur modes and infrastructure (such as repeaters and gateways) can be used. These range from conventional and emerging terrestrial techniques, all the way to specialist EME (moon-bounce) stations. This part of the spectrum is also where propagation characteristics are highly attractive for amateur investigations In contrast its relatively high noise levels and unwieldy antenna sizes continue to detract from major commercial use, especially for mobile communications.

Regulatory and technical decisions over many years have had a significant impact on the use of broadcasting in both the 50-54MHz range and indeed over all of the frequency band 47–68 MHz (also known as Broadcasting Band-I). In this band as analogue television broadcasting declined and finally ceased in most countries, many CEPT administrations found it possible to allocate all or parts of the band 50-52 MHz to the amateur service under the conditions of number **4.4** of the Radio Regulations on a national primary and/or secondary basis. This has complemented existing primary 50-54 MHz amateur service allocations in Africa under RR **5.169** and the 50-54 MHz primary allocation to the amateur service in Regions 2 and 3.

IARU Region-1 in consultation with IARU Regions 2 and 3 has consequently developed a plan to facilitate intercommunication and technical investigations in the 50 MHz range. The most common applications to date have been the use of relatively narrow bandwidth (less than 25 kHz) analogue and digital modes in the 50-52 MHz range, within which the longest distance weak-signal and propagation beacon applications are globally coordinated within 50.0-50.5 MHz. For Region 1 countries with 52-54 MHz allocations, that range is designated for wideband modes, an area where significant innovation, growth and benefits are forecast, should it become more accessible.

IARU band plans are generally flexible and are regularly reviewed in order to reflect technical developments and user requirements. For example in 2011 the range 50.0-50.5 MHz was the subject of detailed re-planning and beacon upgrades in Region-1 to accommodate demand and technology advances. Such reviews can be expected to continue as technology (and amateur ingenuity) evolves.

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.

### Propagation Issues

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 within 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.

### Current and Future Use

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 category of service utilisations are provided in Table 3.1 below. 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.

### Service Categorisation

Based on a sound background of existing usage and anticipated growth in digital systems, we can address the spectrum needs based on the following service/application categories within the range 50-54 MHz:-

|  |  |
| --- | --- |
| Frequency, MHz | Service Categorisation (SC) |
| 50.0 – 50.5 | Narrowband weak-signal communications, including a subsection for 24/7 propagation beacons |
| 50.5 – 52.0 | Relatively Narrowband (<=25kHz) voice, data, repeaters, gateways  |
| 52.0 – 54.0 | Wider bandwidth predominantly digital applications (See Annex-3) |

Table 1: Service Categories in 50-54 MHz

The first 2 MHz, 50-52 MHz is aligned with and would be utilised to satisfy current and continuing analogue/digital usage and developments on a global basis, whereas 52–54 MHz is needed to satisfy the wider bandwidths and data rates of advanced digital scenarios. The latter includes both IP links/mesh utilisations as well as innovative compressed multimedia (currently based on DVB-S2/MPEG technologies adapted for terrestrial use).

The full 50-54 MHz frequency band is extremely well supported by commercial equipment suppliers and amateur developers, including those employing the latest SDR techniques partly as a consequence of the entire frequency band 50 – 54 MHz being allocated in RR Article 5 in ITU Regions 2 and 3 and part of Region 1. Thus growth in digital modes can be expected to continue in the existing 50-52 MHz range, assisted by 52-54 MHz developments – and vice versa.

### Approach to determining spectrum needs

An application-based approach would seem to be a good choice for the amateur service to assess spectrum needs for the frequency band 50–54 MHz and would focus on the specific applications expected in this frequency band. An example of this approach can be found in Recommendation ITU-R M.1651 “A method for assessing the required spectrum for broadband nomadic wireless access systems including radio local area networks using the 5 GHz band” which provides the methodology for assessing spectrum requirements for RLANs. This Recommendation was developed and utilized in the WRC-07 study cycle, then again as part of RLAN spectrum requirements under WRC-15 agenda item 1.1 and more recently is one of the methods being used for WRC-19 agenda item 1.13. For the amateur service at 50 MHz the input parameters of the applications could reflect different situations for various countries with less complexity than an approach based on traffic forecasts.

In order to calculate the total amount of spectrum needs **R** (Hz) in this approach, the following basic equation is used:

**R**= (*Connection density*, *Application data rate*, *Usage patterns*)
/ (*Service area*, *Spectral efficiency*)

In practice the determination of the above has to be undertaken with appropriate parameters for each of the differing service categorisations in Table 1.

Table 2 shows an example of an estimate of spectrum needs for the different frequency ranges between 50 MHz and 54 MHz using the application-based approach.

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| --- | --- | --- | --- | --- |
| Frequency ranges | 50.0 – 50.5 MHz | 50.5 – 52.0 MHz | 52.0 – 54.0 MHz | Total |
| Spectrum needs | R1 | R2 | R3 | Rtotal |

Table 2: Estimated spectrum needs based on the application based approach

The spectrum need can be calculated for different countries but the overall requirement should be based on at least average use, with sufficient provision to accommodate future development of new modes and growth in the number of amateurs as well as peak traffic when emergencies, special events/contests and favourable anomalous propagation conditions occur.



Table 3: Spectrum Requirement - Average Case



Table 4: Spectrum Requirement – Higher Density Case

As mentioned in the introduction, IARU band plans are generally flexible and are regularly reviewed in order to reflect technical developments and user requirements. Thus if it is the case that the balance is driven by newer digital applications, some adjustments would be made in the middle to upper parts of the available frequency range.

### Application to Sharing Studies

The Service Categories also provide guidance for sharing studies. The overall range of parameters in ITU-R M.1732[[1]](#footnote-1) is quite broad, even for the specific 50-54 MHz range. However based on the various Service Categories Recommendation ITU-R M.1732 can be applied with the following considerations:-

50.0-50.5 MHz: Individual stations are more likely to employ directional antennas, have intermittent usage, but emit relatively high peak erp power as this segment is utilised for long distance communications. This existing usage has been ongoing for many years without any reported problems

50.5-52 MHz has lower-medium power levels associated with mobile equipment, repeaters, FM/Digital voice and moderate data rate links.

Wider bandwidth systems (nominally in the 52-54 MHz range) would have effectively low power spectral density (lower power and wider bandwidth) which may assist in sharing studies.

### Spectrum Needs Summary

An Application-based approach has been developed and has found to be suitable for estimating the spectrum needs for current and envisaged amateur applications in the 50-54 MHz frequency band. A nominal set of frequency sub-ranges have been used to align with the existing and expected categories of applications.

Results show that the average amateur density in the CEPT area requires just over 4 MHz, with some countries having a high population of radio amateurs potentially needing well in excess of that (or necessitating greater re-use or narrower channels with consequential problems).

For sparser areas, the lower densities offer the possibility of greater range, non-line-of sight communications for both standard amateur traffic and for more innovative applications which are expected to have a wider societal benefit.

END OF TEXT B

# List of relevant documents

ITU-Documentation (Recommendations, Reports, other)

* Recommendation ITU-R M.1732-1 Characteristics of systems operating in the amateur and amateur-satellite services for use in sharing studies;
* Amateur and amateur-satellite services Handbook
* Work plan for WRC-19 Agenda item 1.1
* Resolution 658 (WRC-15)
* Working Document Toward Preliminary Draft New report ITU-R M.[AMATEUR\_50\_MHz]
* 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 neighboring countries.

CEPT and/or ECC Documentation (Decisions, Recommendations, Reports)

EU Documentation (Directives, Decisions, Recommendations, other), if applicable

# Actions to be taken

Identify broadcasting stations operating in the band 50-54 MHz, including their switch off / transition plan and to suppress unused broadcasting assignments in the band 50-54 MHz in the MIFR and the 1961 Stockholm Plan (revised 2006);

Specify technical and operational characteristics for future amateur communication systems in the proposed band;

Specify technical and operational characteristics and protection criteria for the broadcasting service systems operating in the band 50-54 MHz;

Specify technical and operational characteristics and protection criteria for land mobile communication systems operating in the band 50-54 MHz;

Conduct compatibility studies based on characteristics, protection criteria and interference scenario’s;

# Relevant information from outside CEPT

## European Union (date of proposal)

## Regional telecommunication organisations

APT (date of proposal)

ATU (date of proposal)

Arab Group (20 April 2017)

* Some administrations support frequency allocation for amateur service within the band 50-54 MHz on a primary basis, with following -up studies on this regard and emphasis on protecting the existing services without imposing new restrictions on them.
* Some administration prefers to wait and follow up the studies at this stage.

CITEL (July 2017)

USA

WRC-19 Agenda Item 1.1 is a Region 1 issue. Any changes made to the Radio Regulations under WRC-19 Agenda Item 1.1 must not impact the existing allocation to the amateur service in 50 – 54 MHz in Region 2, nor subject Region 2 to any changed procedural or regulatory provisions

RCC (14 April 2017)

The RCC Administrations consider that during studies on possible allocation of the frequency band 50-54 MHz to the amateur service in Region 1, spectrum requirements for the amateur service shall be identified.

The RCC Administrations consider that, when identifying technical and regulatory conditions for such allocation, protection shall be ensured to the broadcasting service to which this frequency band is allocated on a primary basis, including stations of the broadcasting service in the frequency band 50-54 MHz, regulated by Stockholm-61 and Geneva-89.

## International organisations

IARU (April 2017)

The IARU supports modification of the Table of Frequency Allocations to allocate the band 50-54 MHz to the Amateur Service on a primary basis in Region 1 and so provide a harmonized allocation across all three Regions.

**IATA (date of proposal)**

ICAO (date of proposal)

IMO (date of proposal)

**NATO (27 June 2017)**

This NATO military assessment summary is a common military assessment of the NATO Nations on the potential impacts and benefits of Agenda Item 1.1. It does not constitute a common position of the NATO Nations.

The whole range 30.005 - 87.5 MHz is essential for NATO military tactical communication. A diminished access to the whole band would reduce the ability to fulfill combined missions.

SFCG (date of proposal)

WMO and EUMETNET (8 February 2017)

WMO does not oppose an allocation to amateur service in the 50-54 MHz provided that:

* appropriate protection of radiolocation service allocated by RR No 5.162A is ensured and
* the status of the new allocation to amateur service provides the radiolocation service equality or precedence relative to the amateur service.

WMO opposes any new allocation to amateur-satellite service in this frequency band

## Regional organisations

ESA (date of proposal)

Eurocontrol (date of proposal)

## OTHER INTERNATIONAL AND REGIONAL ORGANISATIONS

EBU (9 March 2017)

The EBU notes that the Stockholm 1961 Regional Agreement (Rev. Geneva 2006) still applies in the 50-54 MHz band.

This Agreement regulates the use of VHF bands for the broadcasting service by the countries of the European Broadcasting Area which covers almost all CEPT member states.

Many administrations in this area still have broadcasting assignments registered in the ST61 Plan or in the BR IFIC, and the provisions of the Agreement regarding protection of those assignments need to be respected, unless agreed otherwise by the administrations concerned.

As recorded by footnote ECA3 in the ECA Table: 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.

EBU also notes footnote ECA36 in the ECA Table: A frequency band, which has been harmonised by NATO and NATO member nations for military use as defined in the NATO Joint Civil/Military Frequency Agreement (NJFA) 2014. Note: A public version of the NJFA 2014 is expected to be provided by NATO to ECO by the end of 2016.

GSMA (date of proposal)

CRAF (27 June 2017)

The band 50-54 MHz is used by several radio telescopes around the world, in particular for the monitoring of solar activity. In region 1, major facilities such as LOFAR, the Decameter Array in Nancay, and other solar monitoring stations in Europe and Russia make use of that band on a daily basis. Resolution 657 (WRC-15) invites ITU-R to document for WRC-19 the technical and operational characteristics of space weather sensors, to determine for WRC-19 the appropriate radio service designations for space weather sensors, to conduct for WRC-23 the necessary sharing studies for incumbent systems operating in frequency bands used by space weather sensors, with the objective of determining regulatory protection that can be provided while not placing additional constraints on incumbent services. CRAF requests great care in allocating bands to active services, which may block the further development of space weather research.

1. Recommendation ITU-R M.1732-2 (Edition: 01/2017), “Characteristics of systems operating in the amateur and amateur-satellite services for use in sharing studies  the amateur and amateur-satellite services for use in sharing studies” [↑](#footnote-ref-1)