1. Definition of amateur service, amateur satellite service goals and objectives of its activities

1.1 Definition of drugs

According to ITU RR No. 1.57: “amateur service: Service radio communications for self-study, intercom and technical research carried out by amateurs, i.e. by persons who have due permission and radio technicians exclusively from personal interest and without material gain.

1.2 Goals and objectives of the activities of the amateur service in Russian Federation

In the Russian Federation, the activities of the amateur service are recognized socially useful. In particular, the following areas are highlighted activities of the amateur service (decision of the State Committee for Radio Frequencies of July 15, 2010 No. 10-07-01 "On the allocation of radio frequency bands for radio electronic equipment amateur and amateur satellite services "):

- participation of radio amateurs in the organization of communication in the conditions emergency situations and in activities to save people;

- the role of amateur and amateur satellite services in development technical creativity of citizens of the Russian Federation, research and improvement of new technologies in radio communication;

- the importance of radio sports as a means of promoting a healthy lifestyle life of citizens of the Russian Federation.

At present, activities related to preservation of historical memory and patriotic work: in 2020 by application SRR FSUE "GRCHTs" formed 210 call signs of temporary use for memorial radio stations participating in the annual Memorial "Victory".

To carry out the above activities in the Russian Federation by the decision of the SCRF dated July 15, 2010 No. 10-07-01 "On the allocation radio frequency bands for radio electronic means of amateur and amateur satellite services "radio frequency bands are allocated and the conditions for their use are determined.

2 Principles of frequency planning and band use

radio frequencies in the amateur service

The most demanded for the amateur service are conducting long-distance intercontinental radio communications and studying various mechanisms of radio wave propagation. Based on this, in everything the radio spectrum of the amateur service is relatively uniform allocated radio frequency bands from 136 kHz to 250 GHz. Usually, the middle frequencies of adjacent radio frequency bands allocated to the amateur service differ by 1.5 - 2 times.

At the same time, between the upper limit of the 28-29.7 MHz band and the lower at the edge of the 144-146 MHz band, there is a huge, almost fivefold the gap to which the amateur service is closed. This particular the fact determines the need for the distribution of a certain radio frequency bands near 50 MHz.

The use of radio frequency bands in the amateur service occurs uneven. The utilization of a particular radio frequency band depends on conditions of propagation of radio waves, providing the possibility conducting radio communications in accordance with the purposes of their use (see. higher).

Moreover, the situation in which the access of amateur Russian amateur radio stations to the part used by their correspondents the spectrum is closed, has an extremely negative effect on development amateur service in general, and with regard to the participation of Russian athletes in radio sports competitions knowingly puts them in a losing position.

It should be noted that the main activity International Amateur Radio Union (IARU) and the Amateur Radio Union Russia, as a member of IARU, is to work with communications administrations, interregional telecommunications organizations (CEPT, RSS), ITU on harmonization of radio frequency bands not only between countries in within Region 1, but also in all three Regions.

The International Amateur Radio Union (IARU) was established in 1925 and takes an active part in the work of international bodies, responsible for regulating the use of the radio frequency spectrum. IN it currently unites national radio amateur organizations in more than 160 countries of the world and actively participates in the work of ITU-R, ITU-D both directly and through radio amateurs representing their countries at ITU.

The International Amateur Radio Union (IARU) releases guidelines for IARU member organizations on how to use radio frequency bands within bands allocated to the amateur service. The main principle is a flexible approach that allows compensate for uneven use of radio frequency bands. Link on the current option document: https://www.iaru-r1.org/wp-content/uploads/2019/08/Latest-VHF_Handbook.pdf

3 Adjusting the use of the 50 MHz band by amateur service

According to the Frequency Allocation Table of the Regulation radiocommunication, the frequency band 50-54 MHz was allocated before WRC-2019 amateur service on a primary basis in Regions 2 and 3.

According to the European Table of Band Allocations radio frequencies (ECA TABLE), the frequency band 50-52 MHz is allocated amateur service on a secondary basis (and after WRC-2019, part of the some countries - on a primary basis) and is used in almost all European countries by amateur stations in accordance with clause 4.4 of the Radio Regulations.

In the Russian Federation, the use of the radio frequency band 50080-50280 kHz is allowed only for radio amateurs of the city of Sevastopol and Of the Republic of Crimea, which until the spring of 2014 had access to this strip radio frequencies (Decision of the State Committee for Radio Frequencies of 10.02.2015 No. 15-30-02).

The International Amateur Radio Union (IARU) is currently preparing time recommendations for IARU member organizations on the use of radio frequency bands 50-54 MHz, taking into account the decisions taken at WRC-2019.

4 Mechanisms of propagation of radio waves in the range of 50 MHz

The 50 MHz band is characterized by a unique combination of types propagation of radio waves characteristic of both HF and VHF - ranges. The main advantage of the range is the ability to conduct intercontinental radio communications with a minimum level of anthropogenic noise and minimum attenuation on long routes from all ranges, used by radio amateurs. For long-distance radio communications on this range does not require the use of large antennas. An additional advantage is the ability to use broadband types of communication for data transmission of various nature, in including images. For these qualities, the 50 MHz range is unofficial name "Magic band".

Among the mechanisms of propagation of radio waves characteristic of range of 50 MHz, it is necessary to highlight the following:

- spread in free space within a straight line visibility;
- reflection from the sporadic Es layer;
- reflection from the ionospheric layer F2;
- combined reflection from the Es and F2 layers;
- transequatorial distribution;
- scattering on inhomogeneities of the E layer (FAI);
- radio aurora;
- reflection from ionized trails of meteors;
- reflection from the lunar surface (EME);
- normal refraction and super-refraction in the troposphere;
- scattering from aircraft contrails.

In the absence of conditions for long-range propagation of radio waves, for account of tropospheric refraction in the range of 50 MHz is provided conducting stable radio communication at a distance of 150-200 km.

Sports competitions are held in the 50-54 MHz band, including and official, in which the bulk of Russian radio sportsmen are not

can take part.

The listed characteristics of the 50 MHz range make it very demanded for the amateur service around the world and in the Russian Federation including. This range is actually a "laboratory"

on the study of the above mechanisms of distribution radio waves.

The propagation conditions of radio waves in the 50 MHz range are less dependent cycles of solar activity than in the closest HF range 28 MHz. In the years of minimum solar activity, long-distance radio communication on it is possible only in the summer. In the years of maximum long-distance radio communications are possible year-round.

5 Worldwide use of the 50 MHz band by the amateur service currently

The 50 MHz band is used by the amateur service for the following purposes:

- for conducting intercontinental experimental radio communications in all possible classes of radiation;

- to study the propagation of radio waves (radio beacons, including digital);

- for radio sports competitions;

- for the study of weak signal digital modes of communication (with signal-to-noise ratio at the receiving point is less than one);

- for experiments with broadband radio communications, including including, with digital amateur television with reduced bandwidth capability (RB-DATV) with a bandwidth of 300-500 kHz per channel;

- to organize the infrastructure of local communication (analog and digital repeaters and / or access points) used including for the exchange of information in order to minimize the consequences emergencies and natural disasters.

A feature of all amateur technologies, both narrowband and broadband, is not only the declared use of them in non-commercial purposes, but also their technical characteristics, making such technologies fundamentally unsuitable for commercial use. So digital amateur television is downsized bandwidth (RB-DATV) has quality characteristics images significantly inferior to commercial standards. All amateur technologies, both narrowband and broadband, designed for technical research and experimentation, and can be used to organize communication in emergency situations and in activities to save people.

6 Observed trends in amateur service use 50 MHz band in the world

6.1 Growth in the number of repeaters and Internet entry points.

According to the French regulator ANFR **(**https://tinyurl.com/France-AR-Statistics-2018**)** for the period from 2015 to 2018, the number of amateur repeaters and Internet entry points (usually one device combines both of these functions) was one and a half times: from 674 in 2015 to 958 in 2018. A similar picture is observed in all countries at all bands, including 50 MHz. Some of these repeaters are broadband, used for relaying broadband digital data, in including images.

6.2 Increased interest in radio amateurs experimenting with broadband digital modes of operation

Recently, there has been an increase in the interest of radio amateurs, experimenting with broadband digital modes of operation, in including narrowband television images (RB-DATV, band one channel 300-500 kHz) is indirectly confirmed by an increase in the number publications in specialized magazines and on the websites of various clubs and groups such as BATC (https://wiki.batc.org.uk/The_Portsdown_Transmitter)

7 Amateur systems, emission classes, characteristics typical radio electronic equipment used by the amateur service in the 50 MHz range

In the 50 MHz band, the amateur service is currently the systems and emission classes shown in Table 1 are used

Table 1

Name systems	Broadcast Morse code	PSK31, NBDP and systems with weak signals	Analog vote	Data digital los and multimedia
Signal bandwidth and radiation class	150HA1A; 150HJ2A; 1H00A1B; 1H00J2B; 60H0J2B;	250HF1D; 1H00A1D; 1H00F1D	2K70J3E 11K0F3E 16K0F3E 20K0F3E	2K70J2E 5K76G1E 8K10F1E
Permissible frequency deviation	20x10-6	20x10-6	20x10-6	20x10-6
Average power collateral radiation, no more	43 + 10log (P)	43 + 10log (P)	43 + 10log (P)	43+ 10log (P)

Technical characteristics of a typical RES range of 50 MHz (for more details see Recommendation ITU-R M.1732 “Characteristics of systems, operating in the amateur and amateur-satellite services, for the purpose of applications in sharing studies):

Peak output power of the transmitter - 100 W;

Receiver noise figure - 1 dB;

AFU polarization - vertical, horizontal;

The transmitting antenna gain is 0 ... 20 dBi.

8 Needs assessment for the RF amateur service in the band frequencies 50-54 MHz

To assess the needs of the amateur service in the radio frequency band 50-54 MHz (hereinafter referred to as the 50 MHz range), two approach:

- assessment of the use of the 50 MHz band in the CEPT countries based on tools for monitoring the activities of radio amateurs with further extrapolation taking into account the number of amateur radio stations in Russian Federation;

- calculation method.

8.1 Available surveillance tools

To monitor the use of a range of radio frequency bands, distributed to the amateur service, the following tools are available:

- WEB-SDR receivers;

- skimmers;

- DX - clusters;

- base of reports of the participants of the competition;

- storage and processing systems for hardware logs.

8.1.1 WEB-SDR receiver

It is a software defined receiving device, connected to the Internet. It allows multiple users simultaneously and independently of each other listen to the radio broadcast on remote computers, as well as visually observe on spectrograms type "waterfall" marks from operating radio stations in the entire strip radio frequencies blocked by the receiver. WEB-SDR receivers installed on all continents, several WEB-SDR - receivers are located on the territory of the Russian Federation. Site containing links for most WEB-SDR receivers, can be found at the link:

http://www.websdr.org/

WEB-SDR receivers broadcast a large amount of data to the Internet and require a broadband internet connection, so in almost all cases are located in industrial centers, in which are subject to restrictions on the installation of antenna structures large size, which leads to the use of low-efficiency

antennas, as well as high noise levels at the receiving site. Despite the listed disadvantages, the WEB-SDR receiver is the only one a tool for direct monitoring of the use of radio frequency spectrum.

8.1.2 Skimmer

Represents a special kind of WEB-SDR receiver, which is in place reception performs simultaneous decoding of all signals received amateur radio stations, allocation of call signs and publication of these callsigns on the Internet in real time. Simultaneously with decoding, the level is measured the signal of each radio station. Skimmers are located on each continent, they are also available on the territory of the Russian Federation.

Skimmers allow you to indirectly assess the increase or decrease in activity amateur radio stations on a particular band. Disadvantage skimmers is a limitation on the class of emission decoded signals. Decoding is only possible for stations working with amplitude telegraphy Morse code, relative phase telegraphy (PSK), as well as some other digital modes. The uneven distribution of receivers across the globe is not gives objective information about operating radio stations due to presence of "dead zones" between correspondents. Site containing links for most skimmers, can be found here: http://www.reversebeacon.net/

8.1.3 DX - cluster

It is an open warning network designed for exchange between amateur radio stations in real time information about the work of distant or rare radio stations (DX-stations). TO to the DX server - computers of a large number of amateur radio stations exchanging information together. DX recording (spot) - the cluster usually consists of the following fields: the call sign of the amateur radio station making recording, callsign of the observed DX station, frequency of the DX station, observation time, note.

By the spots in the DX cluster, one can indirectly judge the activity of the DX stations, their radio frequency bands and classes of emission, but

it is impossible to get a complete picture of the use of a particular range, since records of nearby radio stations in the DX cluster are not published. Based on data obtained by comparing several complete hardware amateur radio logs uploaded to the storage server and processing hardware logs http://HAMLOG.RU one spot falls on an average of 200 contacts of a monitored DX radio station. Most popular DX cluster cluster http://www.dxsummit.fi , where the spots stored since January 31, 1995.

To assess the uniformity of loading the 50 MHz range, consider data obtained from several sources.

First, let's look at the table obtained from the DX cluster site dxwatch.com, on which some radio amateurs are users of this cluster, exchange information (spots) about work with each other rare and distant radio stations (DX-stations) they observe, including number and from Regions 2 and 3. Appendix 2 provides information on the number of DX stations seen by DX cluster users dxwatch.com in the 50-54 MHz band (wavelength 6 m), from 05/12/2018 to 05/14/2018.

As can be seen from the presented sample, distant stations are observed, mainly at one nominal radio frequency 50.313 MHz digital FT-8 operating mode (emission class F7D), and less often - in the radio frequency band 50.090-50.260 MHz amplitude telegraphy. The listed types radio communications have maximum energy efficiency. Data on number of DX stations watched by DX cluster users dxwatch.com in the 50-54 MHz band at other times during the spring 2018, do not differ significantly from those specified in Appendix 2.

Let us compare the results obtained with the sample of spots obtained from cluster www.dxsummit.fi for the same period from 13:50 UTC 07/30/2012 at 16:51 UTC 08/01/2012. For 27 hours, 924 spots were published that indicates the level of activity of amateur radio stations on the 50 MHz range, which is 19 times higher than observed in May 2018. At the same time, radio communications were carried out in the radio frequency band 50011 - 53,800 kHz. In the 50,000 - 50,010 kHz band, the operation of radio beacons was recorded, used to monitor the propagation of radio waves. Of the obtained results, it can be concluded that, depending on the place occupied by the year in the solar cycle, loading the range 50 MHz changes tenfold, while using the radio frequency band 50-53.8 MHz.

8.1.4 The databases of the participants' reports contain a complete information on the number of participants in the competition, the total number of radio communications held by them for a certain limited time. Report database data allow you to assess the load of a particular range during the competition. The lack of databases of participants' reports as a tool for RF spectrum load estimate is a relatively short the time during which the competition takes place, usually a day or two days, as well as the lack of information about radio communications conducted between

amateur radio stations not involved in competitions. IARU competition server containing report bases participants of IARU competitions, located at the link https://iaru.oevsv.at/v_upld/prg_list.php?start=1

8.1.5 Storage and processing systems for hardware logs

allow radio amateurs to upload their hardware logs and handle them. Downloaded logs contain information about all radio communications carried out by a radio amateur for a certain significant period of time - from several months to several years.

Lack of storage and processing hardware logs is the low percentage of radio amateurs who use them. So by data from the most popular Russian storage and processing server hardware logs http://HAMLOG.RU only 8000 Russian radio amateurs out of 36,300 radio amateurs admitted to the amateur service (22%) download hardware logs to the specified server.

8.1.6 Results of analysis of data obtained using monitoring tools for radio amateurs

Analyze data from surveillance tools activities of radio amateurs allows us to draw the following conclusions:

- use of radio frequency bands by amateur radio stations occurs unevenly and depends on a number of factors, the main ones which is solar activity and the associated attenuation by long-distance routes, as well as the level of anthropogenic noise and requirements for the geometric dimensions of the antenna;

- the above tools to monitor the download radio frequency bands allow for qualitative comparison of levels

downloads of amateur bands at different time periods, but do not give quantifying the load;

- to identify the need for additional bandwidth allocation radio frequencies 50-54 MHz amateur service must use calculation methods.

8.2 Assessment of the need for the radio frequency band in the 50 MHz range for RES of the amateur service by the calculation method

8.2.1 Determining the total number of radio amateurs

The number of radio amateurs in the constituent entities of the Russian Federation with valid admission to amateur service at the beginning of 2020, presented in Table 2 (information obtained by analysis by the method enumeration of the call signs of the page of the site of the FSUE "GRCHTs" http://www.grfc.ru/grfc/service/amateur_service/search_pozivnoy/).

table 2

Region	Number of radio amateurs
Altai region	520
Amur region	110
Arhangelsk region	160

Astrakhan region	110
Belgorod region	920
Bryansk region	290
Vladimir region	280
Volgograd region	600
Vologodskaya Oblast	110
Voronezh region	1400
Jewish Autonomous Region	thirty
Transbaikal region	120
Ivanovo region	230
Irkutsk region	370
Kabardino-Balkar Republic	140
Kaliningrad region	280
Kaluga region	250
Kamchatka Krai	140
Karachay-Cherkess Republic	one hundred
Kemerovo region	880
Kirov region	190
Kostroma region	140
Krasnodar region	2640
Krasnoyarsk region	790

Kurgan region	120
Kursk region	360
Leningrad region	240
Lipetsk region	500
Magadan Region	20
Moscow	2330
Moscow region	2170
Murmansk region	170
Nenets Autonomous Okrug	ten
Nizhny Novgorod Region	520
Novgorod region	120
Novosibirsk region	500
Omsk region	350
Orenburg region	550
Oryol Region	290
Penza region	460
Perm region	460
Primorsky Krai	460
Pskov region	110
Republic of Adygea (Adygea)	250
Altai Republic	40
Republic of Bashkortostan	840
The Republic of Buryatia	60
The Republic of Dagestan	one hundred
The Republic of Ingushetia	20
Republic of Kalmykia	thirty
Republic of Karelia	one hundred
Komi Republic	160
Republic of Crimea	600
Mari El Republic	130
The Republic of Mordovia	130
The Republic of Sakha (Yakutia)	120
Republic of North Ossetia-Alania	130
Republic of Tatarstan (Tatarstan)	690
Tyva Republic	20

The Republic of Khakassia	190
Rostov region	1750
Ryazan Oblast	300
Samara Region	890
St. Petersburg	940
Saratov region	870
Sakhalin Region	130
Sverdlovsk region	1060

Sevastopol	160
Smolensk region	290
Stavropol region	1470
Tambov Region	640
Tver region	220
Tomsk region	270
Tula region	520
Tyumen region	250
Udmurt republic	310
Ulyanovsk region	220
Khabarovsk region	240
Khanty-Mansi Autonomous Okrug - Ugra	330
Chelyabinsk region	780
Chechen Republic	70
Chuvash Republic - Chuvashia	160
Chukotka Autonomous District	ten
Yamalo-Nenets Autonomous District	70
Yaroslavl region	270
The overall result	36370

8.2.2 Determination of the percentage of radio amateurs ready use 50 MHz band

One of the sources of data on the possible loading of the 50 MHz band is a questionnaire. In the period from January 20 to February 4, 2019 the Union Russian radio amateurs spent on the site http://vhfdx.ru questionnaire Russian radio amateurs in order to find out the degree of readiness for work on the 50 MHz range in case they receive the necessary permits documents. The results of the answer to the question “When can you start working on 50 MHz? " the following:

As soon as I get permission - 72.4%

I need time to prepare - 15.3%

I'm not interested in this range - 12.3%

Thus, the 50 MHz range in the long-range period radio waves can be used by up to 87.7% of Russian radio amateurs.

K1 = 0.877

8.2.3 Determination of the amateur utilization rate radio stations

A survey of regional branches of the SRP showed that on average a radio amateur uses his radio station to transmit 1.5 hours a day.

Thus, the utilization rate of an amateur radio station is:

$K_2 = 1.5 / 24 = 0.06$.

9 Calculation of the need for spectrum for different variants of its use by the amateur service in the Russian Federation

9.1 Description of the calculation method

Based on information about the technologies used and planned and classes of emission (clause 6 of Table 1), calculate the average radio frequency band, necessary for radio communication between two amateur radio service by averaging the values of the radio frequency bands given in the table in the case of using the most narrowband, maximum

broadband technologies, as well as in the case of taking into account promising types communication.

9.1.1 Using narrowband communication modes

$F_1 = (0.001 + 0.150 + 2.7 + 2.7) / 4 = 1.35$ kHz,

Where:

0.001 kHz - minimum signal bandwidth when transmitting in Morse code;

0.001 kHz - minimum transmission bandwidth when using weak signals;

2.7 kHz - minimum bandwidth for voice analog communication;

2.7 kHz - minimum digital voice bandwidth and multimedia.

9.1.2 Using broadband communications

$F_2 = (0.15 + 0.25 + 20 + 8.1) / 4 = 7.125$ kHz,

Where:

0.15 kHz - maximum signal bandwidth when transmitting in Morse code;

0.25 kHz - maximum transmission bandwidth when using weak signals;

20 kHz - maximum voice bandwidth;

8.1 kHz - maximum digital voice communication bandwidth and multimedia.

9.1.3 Leveraging promising broadband communications

Assessment of the possible use of promising broadband types of communication were carried out by the method of direct observation via the Internet WEB-

SDR receiver broadcasting commercial relay bandwidth the Es'Hail-2 spacecraft located on the geostationary orbit, on board of which an amateur repeater QO-100 is installed. Direct link to the WEB-SDR site of the receiver receiving QO-100: http://websdr.is0grb.it:8901/

The peculiarity of this WEB-SDR receiver is that it accepts all signals without dead zones and you can assess the demand broadband image transmission channels.

When the repeater is fully loaded with digital and analog signals, on average, two image transmission channels were observed. So Thus, we can assume that in the case of using the range 50 MHz there will also be two such channels:

T = 2.

9.2 Calculation of the number of operating RES

Let's calculate the number of RES of the amateur service at the same time working in the "transfer" mode from the territory of the Russian Federation. When this, we assume that all RES that have the technical capability

transmit in the 50 MHz range and are located in an area not
served by 1 TVK, will work on transmission evenly in ten
radio frequency bands between 1810 kHz and 440 MHz allocated to the amateur
service. Thus, we get:

$R = N * K_1 * K_2 /6 = 36370 * 0.877 * 0.06 / 10 = 191,$

Where:

N = 36370 - the number of registered amateur radio electronic equipment;

$K_1 = 0.877$ - the number of radio amateurs ready to use the range
50 MHz;

$K_2 = 0.06$ - coefficient of use of an amateur radio station;

$K_3 = 10$ - ten used radio amateur bands.

9.3 Calculating spectrum requirements

We calculate the spectrum requirements for the case of establishing
radio communications between the RES of the amateur service of the Russian Federation and
Amateur service RES located in the rest of the Area
1 using the mechanism of propagation of radio waves Es (paragraph 2, clause 5
tab. 1). At the same time, we will take into account that the number of radio electronic devices of amateur

services in the rest of Region 1 obviously exceed the number of RES
amateur service located on the territory of the Russian Federation:

**9.3.1 Calculating the spectrum requirement in use
narrowband communication modes**

When using narrowband modes of communication, the need for spectrum
will be:

$F_1 * R = 1.35$ kHz * 191 = 258 kHz

**2.3.2 Calculating the spectrum requirement in use
broadband communications**

When using broadband communications, the need for
spectrum will be:

$F_2 * R = 7.125$ kHz * 191 = 1364 kHz

**9.3.3 Calculation of spectrum requirement in use
promising broadband radio communications**

When using promising broadband radio communications
(using broadband communication modes plus two transmission channels
narrowband television images (RB-DATV, bandwidth $F_4 = 300$ kHz at
channel) the need for the spectrum will be:

$F_3 * R + T * F_4 = 7.125$ kHz * 191+ 2 * 300 kHz = 1964 kHz

10 Conclusions

10.1 Allocation of the radio frequency band 50080 to the amateur service
50280 kHz at WRC-2019 is a critical positive step towards opening
for the amateur service in the Russian Federation
use of the 50 MHz range and should be implemented in regulatory
acts of the Russian Federation in the field of spectrum regulation in
in the prescribed manner as soon as possible.

Moreover, this distribution does not cover the needs
amateur service.

10.2 When taking further steps to clarify
use of the radio frequency band 50-54 MHz of the Russian Communications Administration
it is suggested to proceed from the above calculation of the need
amateur service in the specified radio frequency band, taking into account
the use of promising broadband radio communications. Wherein
the required bandwidth will be approximately 2 MHz: (50-52 MHz).

Appendix 1

1 List of the main regulatory acts of the Russian Federation, regulating the activities of the amateur service, as well as internal acts of the Union of radio amateurs of Russia

1.1 Order of the Ministry of Telecom and Mass Communications of the Russian Federation of 12.01.2012 No. 4 "On approva The procedure for the formation of call signs for the identification of radio electronic civilian equipment "(as amended);

1.2 Order of the Ministry of Telecom and Mass Communications of the Russian Federation of July 26, 2012 No. 184 "On app requirements for the use of the radio frequency spectrum by amateur service and amateur satellite service in the Russian Federation ";

1.3 The decision of the State Committee for Radio Frequencies of July 15, 2010 No. 10-07-01 "On the allocation of bands radio frequencies for radio electronic means of amateur and amateur satellite services "(as amended bymeeting of the State Committee for Radio Frequencies on April 16 2018 (minutes No. 18-45)...

1.4 Order of the Ministry of Telecom and Mass Communications of the Russian Federation dated January 13, 2015 No. 2 "O list of technical characteristics and radiation parameters radio-electronic means and high-frequency devices, information about which are attached to the application for registration of these means and devices, forms of certificates of registration of radio electronic means and high-frequency devices and forms of certificates of formation of callsigns identification signals "

1.5 Order of the Ministry of Telecom and Mass Communications of the Russian Federation of June 30, 2011 No. 164 "On ap Methods for calculating the size of a one-time fee and an annual fee for use in the Russian Federation of the radio frequency spectrum "(in current edition)

1.6 Order of FSUE "RFC CFD" dated 01.10.2015 No. 224 "On approval Checklist for checking compliance with operational and technical readiness minimum requirements for radio operators of the amateur service " (Appendix to the Order - Checklist for checking compliance with operational and technical readiness minimum requirements for amateur radio operators)

2 **List of main international normative acts**

2.1 CEPT documents related to the amateur service

The Communications Administration of the Russian Federation joined the following CEPT recommendations:

2.1.1 Recommendation T / R 61-01 CEPT Radio Amateur License
2.1.2 Recommendation T / R 61-02 Harmonized amateur radio examination

certificates
2.1.3 ECC Recommendation (05) 06 CEPT Novice Radio Amateur License
2.1.4 ERC Report 32 Amateur radio novice examination syllabus and amateur radio novice examination certificate within CEPT and non-CEPT countries
2.1.5 ECC Report 89 A radio amateur entry level examination and license
2.1.6 ECC Recommendation (14) 05 Amateur Radio License Examinations for Persons with Disabilities

2.2 ITU documents related to the amateur service:

No.	Designation	Name, summary
1	RR ITU. Article 1	*amateur service:* A radiocommunication service for goals of self-study, communication and technical research carried out amateurs, that is, persons who have due permission and practicing radio engineering solely out of personal interest and without extracting material benefits (RR 1.56) *amateur-satellite service:* Radiocommunication service using space stations installed on earth satellites for those same goals as amateur service (RR 1.57)
2	RR ITU. Article 5	Allocation of frequencies
3	RR ITU. Article 19	Identification of stations
4	RR ITU. Article 25	Amateur services
five	RR ITU. Appendix 42	International Series Allocation Table callsigns
6	Resolution 641 (Rev. VCHRV-87)	Use of the 7000-7100 kHz band
7	Resolution 642	With regard to the commissioning of earth stations amateur satellite service

8	Resolution 644 (Rev. WRC-2000)	Using telecommunication resources to mitigate consequences of disasters and for rescue operations
9	Rec. ITU-R M.1172	Various abbreviations and signals that should be used for radio communication in the maritime mobile Service (QRA-QUZ Section I and Section II)
10	Rec. ITU-R M.1041	Future amateur radio systems
11	Rec. ITU-R M.1042	Disaster communication in the amateur and amateur satellite services
12	Rec. ITU-R M.1043	Amateur and amateur use satellite services in developing countries
13	Rec. ITU-R M.1044	Sharing criteria in amateur and amateur-satellite services
14	Rec. ITU-R M.1544	Minimum qualifications for radio amateurs
15	Rec. ITU-R M.1677	International Morse Code
		Characteristics of systems operating in amateur and amateur satellite

16 Rec. ITU-R M.1732	services for use in research on frequency sharing
17 Rec. ITU-R M.1740	Guidance on the application of ITU-R texts, amateur and amateur satellite services
18 R-HDB-52-2014	A guide to the amateur and amateur satellite services. Revision 2014

All documents are available for download from official ITU website...

2.3 IARU and IARU-R1 documents related to amateur service:

2.3.1 IARU Constitution

2.3.2 Minutes of IARU Governing Body Meetings

2.3.3 IARU Governing Body Resolutions

2.3.4 IARU RF spectrum allocation policy
amateur service

Frequency plan IARU-R1:

- VHF
- HF
- LF / MF
- UHF
- The the SHF
- The the EHF

2.3.5 IARU Region 1 VHF Managers Handbook ver. 7.51

2.3.6 IARU Region 1 HF Managers Handbook v8.2

2.3.7 IARU Region 1 HF band plan 2016

Appendix 2

DX Cluster dxwatch.com spots on 50 MHz
in the period from 05/12/2018 to 05/14/2018

Station observing DX-station - author spot	LS,	Observable DX - station	Frequency, kHz	Recording time spot
IK5GQK (Italy)		CT2HPM (Portugal)	50313	1349z 14 May
IK5GQK (Italy)		CT1ANO (Portugal)	50313	1346z 14 May
AC2PB (USA)		AE7KI (USA)	50313	1337z 14 May
AC2PB (USA)		W8OI (USA)	50313	1330z 14 May
IK6DTB (Italy)		4U1ITU (ITU)	50096	1326z 14 May
HA8VA (Hungary)		HA8QRP (Hungary)	50091	1319z 14 May
EA5CI (Spain)		4U1ITU (ITU)	50096	1316z 14 May
4U1ITU (ITU)		4U1ITU (ITU)	50096	1314z 14 May
KK4XO (USA)		AC2PB (USA)	50313	1256z 14 May
KK4XO (USA)		KD9VV (USA)	50313	1255z 14 May
DK5EW (Germany)		OY9JD (Denmark, Faroe Islands)	50130	1255z 14 May
PC4N (Netherlands)		PE1RF (Netherlands)	50314	1251z 14 May
M0CGL (UK)		OY9JD (Denmark, Faroe Islands)	50130	1251z 14 May
VE1SKY (Canada)		VE1PZ (Canada)	50313	1247z 14 May
DF4PL (Germany)		LX0SIX (Luxembourg)	50022	1246z 14 May
KT4FW (USA)		NF3R (USA)	50313	1235z 14 May
VE1SKY (Canada)		K8LEE (USA)	50313	1234z 14 May
DK5EW (Germany)		GS3PYE (UK)	50313	1231z 14 May
VO1VCE (Canada)		VO1FU / B (work from China)	50073	1229z 14 May
F1YJ (France)		OY9JD (Denmark,	50130	1228z 14 May

	Faroe Islands)		
GM4FDM (UK)	OY9JD (Denmark, Faroe Islands)	50130	1227z 14 May
M0TLI (UK)	OY9JD (Denmark, Faroe Islands)	50130	1223z 14 May
K1TOL (USA)	EUVIDEO (Belarus)	50,000	1221z 14 May
EI7HBB (Ireland)	DF3XZ (Germany)	50099	1220z 14 May
VE1SKY (Canada)	K1TOL (USA)	50313	1219z 14 May
VE1SKY (Canada)	WA2GSX (USA)	50313	1219z 14 May
F4AZF (France)	OY9JD (Denmark, Faroe Islands)	50130	1218z 14 May
VE1SKY (Canada)	N3RG (USA)	50313	1218z 14 May
PA1MR (Netherlands)	OY9JD (Denmark, Faroe Islands)	50130	1216z 14 May
LA4LN (Norway)	EI4DQ (Ireland)	50313	1215z 14 May
PC2J (Netherlands)	OY9JD (Denmark, Faroe Islands)	50130	1210z 14 May
UN7TW (Kazakhstan)	JE1BMJ (Japan)	50313	0558z 14 May
VU2NKS (India)	VU2NKS (India)	50313	0542z 14 May
K7XC (USA)	K7XC (USA)	50260	1744z 13 May
4Z4DP (Israel)	4Z70IARC (Israel)	50099.8	1616z 13 May
LZ3BS (Bulgaria)	5B4AIF (Cyprus)	50314	1014z 13 May
SV1QFF (Greece)	F6HLC (France)	50133.2	0829z 13 May
HA1VG (Hungary)	G2KF (England)	50140	0759z 13 May
HA1VG (Hungary)	G2KF (England)	50140	0753z 13 May
HA1VG (Hungary)	G7RAV (England)	50092	0752z 13 May
2E0XXO (UK)	IW1JTQ (Italy)	50170	0729z 13 May
W9BWR (USA)	AA0MZ (USA)	50313	1747z 12 May
4Z4DP (Israel)	IW9GDC / B (Italy)	50006	1727z 12 May
4Z4DP (Israel)	SV1SIX (Greece)	50040.1	1723z 12 May

SV9CVY (Greece)	K1TOL (USA)	50313	1518z 12 May
SV9CVY (Greece)	K1TOL (USA)	50313	1458z 12 May
WB4JPG (USA)	W1AIN (USA)	50125	1434z 12 May
PU5BOY (Brazil)	PU5BOY (Brazil)	50160	1344z 12 May
SV9CVY (Greece)	BD0AAI (PRC)	50313	1337z 12 May

F1OOG (France)	EA9ACD (Spain)	50160	1012z 12 Mau