

**NATIONAL TELECOMMUNICATIONS AGENCY**

ACT Nº 1477, OF MARCH 5, 2021

**THE SUPERINTENDENT OF GRANTING AND RESOURCES TO THE PROVISION OF THE NATIONAL TELECOMMUNICATIONS AGENCY - ANATEL**, in the use of his powers, according to the provisions of art. 156 and items, of Anatel's Internal Regulations, approved by [Resolution No. 612, of April 29, 2013](#), and;

WHEREAS the provision in item VIII of art. 19 of Law No. 9,472, of 1997, Anatel is responsible for managing the radio frequency spectrum, issuing the respective rules;

CONSIDERING the provisions of art. 161 of Law No. 9,472, of 1997, which determines that the allocation of radiofrequencies or bands may be modified at any time, as well as changes in powers or other technical characteristics, as long as the public interest or compliance with conventions or treaties international organizations so determine;

CONSIDERING Anatel's competence to regulate the efficient and adequate use of the spectrum, restricting employment, or modifying the destination of certain radio frequencies or bands;

CONSIDERING the fact that the radio spectrum is a public and scarce asset, administered by the Agency;

CONSIDERING the need to optimize the use of radio frequency bands;

CONSIDERING technological developments, which may facilitate the use of an active antenna system (AAS - *Active Antenna System*), including MIMO ( *Multiple Input Multiple Output* ) and beam forming techniques ( *beamforming* ), to support broadband applications with the use spectrum more efficiently;

CONSIDERING the provisions of §§ 1 and 2, of art. 4 of the Attached Regulation to Resolution No. 711, of May 28, 2019, which provides that the power limits of stations operating in the 3.3 - 3.7 GHz band will be established by means of Technical Requirements approved by the Superintendence Act responsible for managing the use of the radio spectrum;

WHEREAS the Proposal for Regulatory Actions (SEI nº 3077101), approved by Judgment nº 651 (SEI nº 3434164), in the records of Process nº 53500.014958 / 2016-89;

CONSIDERING the contributions received as a result of Public Consultation No. 50, of October 14, 2019, published in the Official Gazette of October 16, 2019; and,

WHEREAS the case file of process no. 53500.011701 / 2020-51;

**RESOLVES:**

Article 1 To approve the technical and operational requirements for the conditions of use of the sub-range 3,300 MHz and 3,700 MHz, by stations in the Personal Mobile Service - SMP, in the Multimedia Communication Service - SCM, in the Fixed Switched Telephone Service - STFC and in the Private Limited Service - SLP, in the form of the Attachment to this Act.

Art. 2 This Act enters into force on April 1, 2021.



Document electronically signed by **Vinicius Oliveira Caram Guimarães**, **Superintendent of Granting and Provisioning Resources**, on 03/09/2021, at 15:12, according to official Brasília time, based on art. 23, item II, of [Ordinance No. 912/2017](#) of Anatel.



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**ATTACHMENT****TECHNICAL AND OPERATIONAL REQUIREMENTS FOR USE OF THE 3,300 MHZ TO 3,700 MHZ RANGE****1. OBJECTIVE**

1.1. Establish the technical and operational requirements for the use of the spectrum by stations operating in the frequency range from 3,300 MHz to 3,700 MHz and, in accordance with the Regulation on Conditions of Use for the 3.5 GHz Radio Frequency Band, associated with the Personal Mobile Service - SMP, Multimedia Communication Service - SCM, Fixed Switched Telephone Service - STFC or Limited Private Service - SLP.

## 2. REFERENCES

- 2.1. Regulation Attached to Resolution No. 711, of May 28, 2019.
- 2.2. 3GPP TS 38.101 V16.3.0 (2020-03): *User Equipment (UE) radio transmission and reception (Release 16)* .
- 2.3. 3GPP TS 38.104 V16.3.0 (2020-03): *Base Station (BS) radio transmission and reception (Release 16)* .
- 2.4. 3GPP TS 38.141 V16.4.0 (2019-12): *Base Station (BS) conformance testing* .
- 2.5. ECC Report 281 (2018-06): *Analysis of the suitability of the regulatory technical conditions for 5G MFCN operation in the 3400-3800 MHz band* .
- 2.6. ITU-R SM Recommendation. 1541-6: *Unwanted emissions in the out-of-band domain* .
- 2.7. ITU-R SM Recommendation. 328-11: *Spectra and bandwidth of emissions* .
- 2.8. ITU-R SM Recommendation. 329-12: *Unwanted emissions in the spurious domain* .

## 3. DEFINITIONS

- 3.1. AAS (English, Active Antenna System): antenna system integrated with the active elements of the transceiver (transmitter, receiver).
- 3.2. ACLR (Adjacent Channel Leakage Ratio): measures the performance of a transmitter in terms of the energy suppression capacity in the adjacent channel, it is defined as the ratio, expressed in dB, between the average power in the operating channel and the average power emitted in the adjacent channel.
- 3.3. eirp: equivalent isotropically radiated power.
- 3.4. Spurious emissions: emissions caused by unwanted effects from the transmitter, such as harmonic emission, parasitic emission, intermodulation products and frequency conversion products, excluding out-of-range emissions.
- 3.5. Out-of-band emissions: these are undesirable emissions immediately outside the channel's bandwidth, resulting from the modulation process and non-linearity in the transmitter, excluding spurious emissions.
- 3.6. Undesirable emissions: consist of out-of-band emissions and spurious emissions.
- 3.7. OBUE (from English, Operating Band Unwanted Emissions): consists of undesirable emissions within the system's operating range plus a frequency shift ( $f_{\text{offset}}$ ) below and above the lower and upper ends of the operating range, respectively.
- 3.8. TRP (Total Radiated Power): it is defined as the integral of the power transmitted in different directions throughout the radiation sphere.

## 4. OPERATING POWER

- 4.1. The power used must be the minimum necessary to perform the service with good quality and adequate reliability.
- 4.2. Base, nodal and repeater stations must operate at maximum eirp according to Table I.

Table I - Maximum power transmitted by the base station, nodal or repeater.

Frequency range	Maximum power
3,300 - 3,700 MHz	65 dBm / 10 MHz eirp per polarization

- 4.3. Mobile stations or terminals must operate with maximum eirp in accordance with Table II and must implement automatic power control.

Table II - Maximum power transmitted by the mobile station or terminal.

Station type	Maximum power
Portable Mobile	26 dBm at transmitter output
Mobile vehicle	43 dBm eirp
Terminal	43 dBm eirp

## 5. UNDESIRABLE EMISSIONS

- 5.1. The power limits in this section refer to TRP values for AAS antennas (integrated antenna) and conductive power values for non-AAS antennas (non-integrated antenna).
- 5.2. Emissions out of range:
  - 5.2.1. Out-of-band emissions are specified in terms of ACLR and in terms of OBUE.
  - 5.2.2. For a mobile station or terminal operating in the frequency range from 3,300 MHz to 3,700 MHz, the ACLR must be at least 30 dB.
  - 5.2.3. For base station, nodal or repeater operating in the frequency range from 3,300 MHz to 3,700 MHz the ACLR must be in accordance with Table III.

Table III - Minimum ACLR for base station, nodal or <sup>note 1</sup> repeater

BW Channel [MHz]	Displacement of the transmitted carrier's central frequency in relation to the central frequency of	Adjacent Channel	Type of filter in the adjacent channel and respective	Minimum ACLR

	the upper or lower adjacent channel		bandwidth	
5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100	$BW_{Channel}$	Same width as $BW_{Config}$	Square Filter ( $BW_{Config}$ )	45 dB
	$2 \times BW_{Channel}$	Same width as $BW_{Config}$	Square Filter ( $BW_{Config}$ )	45 dB
	$BW_{Channel} / 2 + 2.5 \text{ MHz}$	5 MHz BW	Square Filter (4.5 MHz)	45 dB
	$BW_{Channel} / 2 + 7.5 \text{ MHz}$	5 MHz BW	Square Filter (4.5 MHz)	45 dB

Where:

- a)  $BW_{Channel}$  is the bandwidth of the channel;
- b)  $BW_{Config}$  is the configuration of the transmission bandwidth (in MHz) in the assigned frequency channel, that is,  $BW_{Config}$  (in MHz) = NRB (number of resource blocks) x spacing of subcarriers x 12; and,
- c) BW is the bandwidth.

note 1:

The absolute value limit for ACLR is:

- For non-AAS system -15 dBm / MHz per port;
- For AAS TRP -6 dBm / MHz system;
- If there is an AAS system that allows measurements carried out by transmission ports, the limit value per port will be equal to the

TRP-10 \* log10 value (Transmission ports).

In the event of a conflict between the absolute value and the relative value, the least restrictive of them applies as a final limit.

5.2.4. For base station, nodal or repeater with non-AAS antenna (non-integrated antenna), undesirable emissions per port in the frequency range 3,260 MHz to 3,740 MHz (OBUE) must be in accordance with Table IV.

Table IV - OBUE limits per base station, nodal or repeater port with non-integrated antenna.

Frequency range (f)	Maximum power level	Resolution range for measurement
$3,260 \text{ MHz} \leq f < 3,290 \text{ MHz}$	-15 dBm	1 MHz
$3,290 \text{ MHz} \leq f < 3,295 \text{ MHz}$	-14 dBm	100 kHz
$3,295 \text{ MHz} \leq f < 3,300 \text{ MHz}$	$-7\text{dBm} - (7/5) * (f / \text{MHz} - 0.05) \text{ dB}$	100 kHz
$3,700 \text{ MHz} < f \leq 3,705 \text{ MHz}$	$-7\text{dBm} - (7/5) * (f / \text{MHz} - 0.05) \text{ dB}$	100 kHz
$3,705 \text{ MHz} < f \leq 3,710 \text{ MHz}$	-14 dBm	100 kHz
$3,710 \text{ MHz} < f \leq 3,720 \text{ MHz}$	-15 dBm	1 MHz
$3,720 \text{ MHz} < f \leq 3,740 \text{ MHz}$	-40 dBm	1 MHz

5.2.5. For base station, nodal or repeater with AAS antenna (integrated antenna), undesirable emissions in the frequency range 3,260 MHz to 3,740 MHz (OBUE) must be in accordance with Table V.

Table V - TRUE limits of base station, nodal or repeater with <sup>note 2</sup> AAS antenna

Frequency range (f)	Maximum power level	Resolution range for measurement
$3,260 \text{ MHz} \leq f < 3,300 \text{ MHz}$	-6 dBm	1 MHz
$3,290 \text{ MHz} \leq f < 3,295 \text{ MHz}$	-5 dBm	100 kHz
$3,295 \text{ MHz} \leq f < 3,300 \text{ MHz}$	$2 \text{ dBm} - (7/5) * (f / \text{MHz} - 0.05) \text{ dB}$	100 kHz
$3,700 \text{ MHz} < f \leq 3,705 \text{ MHz}$	$2 \text{ dBm} - (7/5) * (f / \text{MHz} - 0.05) \text{ dB}$	100 kHz
$3,705 \text{ MHz} < f \leq 3,710 \text{ MHz}$	-5 dBm	100 kHz
$3,710 \text{ MHz} < f \leq 3,720 \text{ MHz}$	-6 dBm	1 MHz
$3,720 \text{ MHz} < f \leq 3,740 \text{ MHz}$	-31 dBm	1 MHz

note 2: If there is an AAS system that allows measurements carried out by transmission ports, the limit value per port will be equal to the TRP-10 \* log10 value (Transmission ports).

5.3. Spurious emissions:

5.3.1. For stations with non-AAS antenna (non-integrated antenna) or with AAS antenna (integrated antenna), spurious emissions are considered at frequencies below 3,260 MHz and above 3,740 MHz (displacement of 40 MHz below and above the lower and upper ends of the operation, respectively).

5.3.2. For base station, nodal or repeater with non-AAS antenna (non-integrated antenna) they must be a maximum of -30 dBm / MHz per port in the frequency range from 1 GHz to 18.5 GHz, except in the frequency ranges of 3.74 GHz to 4.2 GHz and 4.5 GHz to 4.8 GHz which should be a maximum of -52 dBm / MHz per port.

note 3,

5.3.3. For base station, nodal or repeater with AAS antenna (integrated antenna) spurious emissions must be a maximum of -21 dBm / MHz TRP (in English, Total Radiated Power) in the frequency range from 1 GHz to 18.5 GHz, except in the frequency ranges of 3.74 GHz to 4.2 GHz and 4.5 GHz to 4.8 GHz, which must be a maximum of -43 dBm / MHz TRP.

note 3: If there is a system with AAS antenna that allows measurements carried out by transmission ports, the limit value per port will be equal to the TRP-10 \* log10 value (Transmission ports).

5.3.4. For mobile station or terminal, spurious emissions must be a maximum of -30 dBm / MHz in the frequency range from 1 GHz to 18.5 GHz.

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Reference: Process No. 53500.011701 / 2020-51

SEI nº 6628779