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AGÊNCIA NACIONAL DE TELECOMUNICAÇÕES
SUPERINTENDÊNCIA DE SERVIÇOS PRIVADOS

CONSULTA PÚBLICA Nº 61, DE 16 DE NOVEMBRO DE 2011.

Proposta de Norma das Condições de Operação de Satélite Geoestacionários em Banda Ka com Cobertura Sobre o Território Brasileiro
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Response to Anatel Public Consultation No. 61 "Proposal for the Rule of the Conditions for the Operation of Geostationary Satellites in Ka band with Coverage over the Brazilian Territory"

Dear Sir or Madam,

The Satellite Industry Association ("SIA")[1] wishes to thank Anatel for the opportunity to provide comments on the "Proposal for the Rule of the Conditions for the Operation of Geostationary Satellites in Ka band with Coverage over the Brazilian Territory"

SIA is a U.S.-based trade association providing worldwide representation of the leading satellite operators, service providers, manufacturers, launch services providers, and ground equipment suppliers. Since its creation fifteen years ago, SIA has become the unified voice of the U.S. satellite industry on policy, regulatory, and legislative issues affecting the satellite business.
SIA supports the development of regulations to allow for the efficient use of the Ka-band spectrum and orbital resources. There has been a major increase in the development of Ka-band satellite systems in the last few years and several new systems are planned to be launched in the near future. Where possible, the regulations for Ka-band satellite systems should be harmonised

[1] SIA Executive Members include: Artel, Inc.; The Boeing Company; The DIRECTV Group; DBSD North America, Inc.; EchoStar Satellite Services L.L.C.; Harris CapRock Communications; Hughes Network Systems, LLC; Integral Systems, Inc.; Intelsat S.A.; Iridium Communications Inc.; LightSquared; Lockheed Martin Corporation.; Loral Space & Communications, Inc.; Northrop Grumman Corporation; Rockwell Collins Government Systems; SES S.A.; and TerreStar Networks, Inc. SIA Associate Members include: Arqiva Satellite and Media; ATK Inc.; Cisco; Cobham SATCOM Land Systems; Comtech EF Data Corp.; DRS Technologies, Inc.; Eutelsat, Inc.; GE Satellite; Globecomm Systems, Inc.; Glowlink Communications Technology, Inc.; iDirect Government Technologies; Inmarsat, Inc.; Marshall Communications Corporation.; Orbital Sciences Corporation; Panasonic Avionics Corporation; Segovia, Inc.; Spacecom, Ltd.; Spacenet Inc.; Stratos Global Corporation; TeleCommunication Systems, Inc.; Telesat Canada; Trace Systems, Inc.; UltiSat; and ViaSat, Inc. Additional information about SIA can be found at http://www.sia.org.

internationally. This is particularly important for fixed Ka-band user terminals which operate in many different countries on the same satellite network, and also for mobile and transportable terminals which could be transported from one country to another.

We have reviewed the new regulations proposed by Anatel.

In general, we note that some of the limits proposed by Anatel are more stringent than the equivalent limits applied by the FCC in the United States, and those applied in Europe through the ETSI harmonised standards and CEPT ECC Decisions. Some of the limits proposed by Anatel may be unnecessary altogether, and some of the limits should be reviewed and modified. In the latter case, we recommend that they are brought in line with existing FCC or ETSI ones, or with the ITU-R Recommended values.

We identify specific areas of concern and proposed modifications below, and ask Anatel to consider these comments in developing the new regulations.

Specific Comments:

Item 4.2.1, Line I

Anatel has proposed that uplink power control may be used, provided that the power received at the space station remains at the "clear sky value".

It is certainly understood that automatic uplink power control (ULPC) facility needs to be used carefully so as not to create excess interference to the adjacent satellites. However, the nature of ULPC algorithm is that it does require additional margin above the measured excess in attenuation due to precipitation. ULPC measures the excess attenuation caused by precipitation and compensates for it by increasing the earth station transmit level. It sustains this increased transmit level until the precipitation attenuation drops by a certain amount, typically equal to 15% of the ULPC range. During this period, the signal power density at the input of the space station antenna may in fact be slightly higher (by 15%) than the clear sky values. Taking into account the accuracy of measurement and the nature of the ULPC algorithm, it may simply be impossible to implement an exact one-for-one precipitation mitigation system.

In view of this, we kindly request that Anatel consider allowing the power density to exceed clear sky conditions by no more than 1.5 dB. In other words, for earth stations employing uplink power control, under conditions of uplink fading due to precipitation, the amount of increase in excess of the actual amount of monitored attenuation over clear sky propagation conditions shall not exceed 1.5 dB.

Item 4.2.1, Line III

Certain equations are specified to be used for the C/I calculation. The equations are taken from Section 3 of Annex 3 of Appendix 7 of the Radio Regulations. In the Radio Regulations, these equations are proposed as examples for the antenna gain to be used in coordination between terrestrial stations and earth stations. The purpose of the C/I calculation and hence the purpose of these equations is not clear, however it should be noted that the equations will not be an accurate reflection of performance for all Ka-band antennas, particularly for smaller antennas. Hence, depending on the purpose of this proposal, it may be necessary to use alternative antenna patterns.

Item 4.2.1, Line IV

It is proposed to limit the off-axis gain of the transmitting earth station antennas to certain specified equations. It is noted that Item 4.2.1, Line III contains a different antenna pattern. The need for this limitation is not clear, bearing in mind that off-axis eirp limits are also proposed (which we comment on below). Anatel has proposed that the off-axis gain limit may be exceeded provided the earth station complies with the off-axis eirp limits or is coordinated. (Item 4.2.1, Line VI). Given that the proposed off-axis eirp limits may themselves be exceeded subject to coordination, it is not apparent what purpose is served by applying this limit on the antenna gain in addition to the off-axis eirp limits.

Item 4.2.1, Line VII, Letter b)

Certain off-axis eirp limits are proposed for the user earth stations. It is understood that these values are not absolute limits, but that Ka-band earth stations which exceed these values are subject to coordination with adjacent satellite networks. However, there should be a presumption that provided earth stations comply with these off-axis eirp limits, authorisation would be granted.

The values are expressed in a reference bandwidth of 1 Hz but converting the limits to the more usual bandwidth of 40 kHz and comparing with other limits shows that the proposed limits are lower than those contained in Recommendation ITU-R S.524, the FCC Rules (Part 25.138), and the ETSI standards applicable to user earth stations in the band 27.5-30 GHz (ETSI EN 301 360 and ETSI EN 301 459). For off-axis angles greater that 48°, the proposed values are about 12 dB lower than those contained in the FSS Rules and the ETSI standards.

Many user terminals planned to operate in the Ka-band frequencies will not be able to comply with these Anatel proposed e.i.r.p. density values, and hence will require coordination with adjacent satellite networks. It is recommended to adopt alternative values, such as those in the ETSI standards, as shown below:

$d_{e.i.r.p.tx}$ =	$19 - 25 \log \varphi - 10 \log N$	dBW	for $1.8° \leq \varphi \leq 7.0°$;
	$-2 - 10 \log N$	dBW	for $7.0° < \varphi \leq 9.2°$;
	$22 - 25 \log \varphi - 10 \log N$	dBW	for $9.2° < \varphi \leq 48°$;
	$-10 - 10 \log N$	dBW	for $\varphi > 48°$.

These values are in the reference bandwidth of 40 kHz. For systems in which more than one terminal is expected to transmit simultaneously in the same 40 kHz band, e.g. for systems employing CDMA, the maximum e.i.r.p. values above are decreased by 10 log N dB, where N is the number of terminals in the receive beam of the satellite to which these terminals are communicating and which are expected to transmit simultaneously in the same 40 kHz band within that beam.

The values adopted by the FCC are more stringent by 0.5 dB.

Item 4.2.1, Line VIII

Limits are proposed limits for the cross-polarisation gain for an earth station antenna. Similar to the equivalent limit for the main polarisation case (Item 4.2.1, Line IV), it is not clear why this limit is necessary, considering that off-axis eirp density limits are also proposed for the cross polarisation emissions. Whereas in the case of co-polarisation emissions it is permissible for earth stations to exceed the limits, subject to meeting the off-axis eirp limits, there is no exception identified for the cross-polarisation emissions.

The limits proposed by Anatel are 7 dB more stringent than those proposed for the main-polarization gain and are more stringent than those contained in Recommendation ITU-R S.731-1, which are as follows:

$G_x(\varphi) = 23 - 20 \log \varphi$	dBi	for $\varphi_r \leq \varphi \leq 7°$
$G_x(\varphi) = 20.2 - 16.7 \log \varphi$	dBi	for $7° < \varphi \leq 26.3°$
$G_x(\varphi) = 32 - 25 \log \varphi$	dBi	for $26.3° < \varphi \leq 48°$
$G_x(\varphi) = -10$	dBi	for $48° < \varphi \leq 180°$

φ_r is equal to 1° or 100 λ/D, whichever is greater;

Particularly for the far sidelobe angles, many earth stations will not be able to comply with the limit proposed by Anatel, which are 7 dB lower than those in the ITU-R Recommendation. If a limit on the cross-polarisation gain is considered necessary, it is suggested to include the limit in Recommendation ITU-R S.731-1 shown above.

Item 4.2.1, Line IX

Limits are proposed for the off-axis e.i.r.p. density of the transmitting earth station. Unlike the case for the main polarisation, it appears that the proposed values may not be exceeded, even if higher values were agreed in coordination. While the values proposed by Anatel are similar to those applicable in the ETSI standards, the ETSI limits extend only to 9.2° off-axis angle, whereas those proposed by Anatel extend to 180° off-axis angle. Some user earth stations may not be able to comply with the limits proposed by Anatel for large off-axis angles. It is

suggested that Anatel adopt the limits in the ETSI standards for Ka-band user terminals, which are as follows:

$$d_{e.i.r.p.tx} = \begin{cases} 9 - 25 \log \varphi - 10 \log N & \text{dBW} \quad \text{for } 1.8° \leq \varphi \leq 7.0°; \\ -12 - 10 \log N & \text{dBW} \quad \text{for } 7.0° < \varphi \leq 9.2°. \end{cases}$$

These values are in the reference bandwidth of 40 kHz. For systems in which more than one terminal is expected to transmit simultaneously in the same 40 kHz band, (e.g. for systems employing CDMA) the maximum e.i.r.p. values above are decreased by 10 log N dB, where N is the number of terminals in the receive beam of the satellite to which these terminals are communicating and which are expected to transmit simultaneously in the same 40 kHz band within that beam.

The values adopted by the FCC are more stringent by about 0.5 dB.

Item 4.2.1, Line X

The on-axis cross polarisation is proposed to be limited to a minimum value of 20 dB. It should be noted that this limit does not affect potential interference to or from other satellite networks, and is hence a matter for the operators themselves. Some Ka-band terminals are specified with a minimum axial ration of 2 dB, which corresponds to a minimum cross-polarisation discrimination of 18.8 dB.

If a limit is required, we would propose this value.

Item 6 of the Conditions for Block Licensing of the Earth Stations

We welcome the adoption of a light licensing regime based on block licensing of Ka-band Earth station. Not only is this approach in line with the existing international regulatory practice for the use of Earth Stations on Vessels (ESVs) and VSAT terminals operating in Ku-band in general, but also it facilitates the introduction of Ka-band service through the simple registration of common technical characteristics of the terminal. In this respect, we would recommend a single registration approach per terminal type, irrespective of the number of in-country service providers or users.

For Ka-band terminals whose use is to a large extent trans-border, for example Ka-band aero terminals operating across multiple airspaces in an international arena, we recommend that Anatel should implement a policy of mutual recognition of authorisations applicable to terminals licensed abroad.

Item 6.1, Line II

As a condition for the block licensing of earth stations, it is proposed that the earth stations must comply with the requirements in item 4. As is indicated in the comments above, the current Anatel proposal would leave some earth stations unable to comply with the limits proposed in item 4. We have suggested above alternative limits that could be adopted by Anatel. If these proposals are not accepted, there should be a route to allow the block licensing of earth stations that are not fully compliant with item 4, on the condition that satisfactory coordination with other satellite operators is completed.

SIA thanks Anatel for being able to comment on this Consultation. I can be reached via telephone at +1 202-503-1561 or e-mail at pcooper@sia.org should Anatel require additional information on these issues. SIA agrees to its comments being available for public viewing on the Anatel website.

Very Best Regards,

Patricia Cooper
President, SIA