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

SAUS, Quadra 6, Bloco F, Térreo - Biblioteca

70070-940 - Brasília – DF

E-mail: biblioteca@anatel.gov.br

Avanti 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,

Avanti Communications Group Plc ("Avanti") 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"

Avanti (LON:AVN) is a UK headquartered satellite operator.

Avanti procures and operates Ka-band satellite systems and sells Ka-band broadband services to telecoms companies to supply residential, enterprise, government and institutional users.

Avanti's first satellite called HYLAS-1, was launched on 26 November 2010 and was the first superfast Ka-band broadband satellite operated in Europe. HYLAS-1 uses the latest Ka-band technology to deliver high speed, two-way data services across Europe.

Avanti's second satellite called HYLAS-2 is fully funded and will launch in Q2 2012. It will extend Avanti's coverage to Africa and the Middle East.

HYLAS-3 is currently in design.

We have considered the new regulations for Ka-band proposed by Anatel.

We applaud Anatel for its clear policy orientations:

- to promote efficient orbit / spectrum use in Ka-band by establishing clear technical and other regulations to enable 2 degree orbit spacing use by Ka-band GEO satellite systems serving Brazil;

- to permit competitive entry of Ka-band satellite systems by both Brazilian and foreign satellite operators to the Brazilian market.

We therefore generally support Anatel's detailed proposals.

We cordially request Anatel to consider Avanti's comments as below in developing the new regulations.

Thanks in advance for your consideration.

Sincerely,

Kumar Singarajah

Director, Regulatory

Avanti Communications Group plc

74 Rivington Street

London EC2A 3AY

Tel: +44-2077 498 198

www.avantiplc.com

Annex
PUBLIC CONSULTATION ANNEX No. 61 OF 16 NOVEMBER 2011

PROPOSAL FOR A STANDARD OF OPERATING CONDITIONS geostationary satellite Ka WITH COVER BAND IN THE TERRITORY OF BRAZILIAN
http://sistemas.anatel.gov.br/SACP/Contribuicoes/TextoConsulta.asp?CodProcesso=C1545&Tipo=1&Opcao=andamento

Item	ANATEL PROPOSAL	Avanti Comment
1	**GENERAL PROVISIONS**	
1.1	This standard sets conditions for the operation of geostationary satellites with orbital separation of two degrees or more in Ka band, with coverage of the Brazilian territory, establishing the technical parameters and criteria for this purpose.	We support fully.
1.2	The use of Brazilian and foreign satellites are subject to the provisions of this Standard, when the provision of space capabilities over the Brazilian territory.	**We support Anatel's overall policy orientation to enable Ka-band satellites to serve the Brazilian market. However, this should not prejudice or unduly constrain the rights of satellite operators who rely on non-Brazilian satellite network filings of other Administrations to the ITU to offer service to other countries and their rights which may have been derived through the proper application of the ITU Article 9 / Article 11 regulatory procedures.**

2	**DEFINITIONS**	
2.1	I - Ka Band: the name corresponding to the frequency bands from 17.7 to 20.2 GHz and 27-30 GHz; II -Clear Sky: propagation condition in which a carrier is not considered the effect of fading caused by rain and clouds;# III - Downlink: radio link between the satellite and the receiving earth station; IV - uplink: radio link between the transmitting earth station and the satellite; V - Carrier Digital: wave, usually sinusoidal signal modulated by digital information; VI - Analog Carrier: wave, usually sinusoidal, modulated analog signal information; VII - Equivalent isotropic radiated power (eirp): product of the power supplied to an antenna by its gain in a given direction relative to an isotropic antenna; VIII - earth station access: ground station that enables telecommunications traffic between the space station and telecommunication networks, integrated by means of power links.	

3	**ON FREQUENCY BANDS**	
3.1	The provisions of this Standard apply to the following frequency bands: Uplink from 27.0 to 30.0 GHz Downlink from 17.7 to 20.2 GHz I - The use of the frequency band from 17.7 to 17.8 GHz for the down link, the satellite network for the Fixed Satellite Service must also comply with the provisions of the 5.517 Radio Regulations of the ITU . II - In the case of unmodulated carriers used in the satellite to Earth direction in the frequency bands from 27.5 to 27.501 GHz and 29.999 to 30 GHz for enabling automatic control of power in the uplink, one must meet the provisions of the Radio Regulations 5.538 of the ITU.	We support these provisions. **We also propose that Anatel include the band 17.3 – 17.7 GHz which is allocated for BSS in Region 2 to be within the scope of these proposed Anatel regulations.**

4	**TECHNICAL PARAMETERS AND CRITERIA**	
4.1	The earth and space stations should use antennas with circular polarization.	We support this for all communications and TT&C carriers. We propose for Ka-band TT&C functions, linear polarization be accepted, subject to coordination and agreement with other satellite operators.
4.2	Characteristics of Earth Stations Of Transmitters	
4.2.1	The characteristics of the transmitting earth stations must comply with the following conditions:	
	I - During the fading period for rain and clouds can be used for automatic control of power in the uplink to increase the eirp density, since the value of power density of the signal at the input of the antenna does not exceed the space station the value for clear sky, which must be in accordance with the criteria for off-axis eirp emissions, as specified in section VI;	We support in principle. We suggest a small margin (e.g. 0.6 dB) to be defined to be permitted to enable practical uplink power control systems to be implemented.
	II - The frequency of each carrier at the transmitter output earth station can vary up to 0.001% over the nominal value of the transaction;	We support in principle.
	III - To estimate the off-axis emission in the calculation of the carrier / interference ratio (C / I) or other related calculations, the gain of earth station antenna, taken from Annex 3 of Appendix 7 of the ITU Radio Regulations, must satisfy the following equation: $G(\theta) = G_{max} - 0.0025\,[(D/\lambda)\theta]^2$ dBi, $0 < \theta < \theta_m$ $= G_1$ dBi $\theta_m \leq \theta < \theta_r$ $= 29 - 25 \log(\theta)$ dBi $\theta_r \leq \theta < 36°$ $= -10$ dBi, $36° \leq \theta < 180°$ where: θ = off-axis angle, in degrees, which defines any space direction with respect of the direction of maximum gain of the antenna for the main polarization of the radiated wave; D = larger dimension, transversal to the direction of antenna propagation, expressed in meters;	We support in principle. We support the use of the equations in this section III to assess interference to or from licensed co-primary terrestrial services in some segments of the Ka-band frequency band. **However, we recommend the equations in Section IV below to be used for the specific purpose of assessing interference between satellite networks.**

	λ = wavelength, expressed in meters; $G_1 = -1 + 15 \log (D/\lambda)$ dBi $\quad D/\lambda \geq 100$; $= -21 + 25 \log (D/\lambda)$ dBi $\quad D/\lambda < 100$; $\theta_m = (20\ \lambda/D)\ (G_{max} - G_1)^{0.5}$, degrees; $\theta_r = 15.85\ (D/\lambda)^{-0.6}$ degrees $\quad D/\lambda \geq 100$; $= 100\ (\lambda/D)$ degrees $\quad D/\lambda < 100$; $= G_{max}$ = maximum gain of the antenna main lobe.	
	IV - The off-axis gain of the transmit earth station antennas in the main polarization shall not exceed the following value: $G(\theta) = 29 - 25 \log (\theta)$ dBi, for $2.17^o \leq \theta < 36^o$ $= -10$ dBi, for $36^o \leq \theta < 180^o$ Where $\theta = 2.17°$ is the topocentric angle corresponding to the geocentric angle $\theta = 1.9°$ multiplied by the constant 1.14, which represents the typical value for Erath stations located in Brazil.	**We fully support this Anatel proposal. We strongly believe it is important to establish off-axis antenna gain standards as given in Section IV herein for Ka-band earth stations to promote efficient use of the spectrum / orbit resource. The establishment of such a standard will also promote good practice in the design and manufacture of Ka-band earth stations.** **If operators propose to use earth stations which do not comply with this off-axis antenna gain, specific agreement from Anatel and specific agreements from other satellite operators should be obtained prior to operation of such non-compliant earth stations.**
	V - requirement must be met for any off-axis direction within ±3 ° of the equatorial plane of the geostationary orbit	We support.
	VI - The antenna that does not meet the specifications of section IV can be used in the uplink only if:	We support.
	a) the antenna input power is reduced so that the issue for off-axis angles greater than 2.17 · Comply with value specified in section VII, or	We support.
	b) its use is coordinated with adjacent satellite networks, in accordance with paragraph 5;	We support it with the clarification that the adjacent satellite network operator needs to provide its agreement to such non-compliant use.
	VII - No need for coordination with adjacent satellite networks, if the eirp density off-axis transmitting earth station antenna, the main bias in a reference bandwidth of 1 Hz, within the bandwidth of a digital carrier equivalent to its rate of transmission of symbols does	We support in principle.

	not exceed the following limits:	
	a) in the case of the earth station access: $d_{e.i.r.p.\ tx} = -64 + 29 - 25 \log(\theta)$ dBW/Hz, for $2.17° \le \theta < 36°$ $= -74$ dBW/Hz, for $36° \le \theta < 180°$ b) it is an earth station user: $d_{e.i.r.p.\ tx} = -58 + 29 - 25 \log(\theta)$ dBW/Hz, for $2.17° \le \theta < 36°$ $= -68$ dBW/Hz, for $36° \le \theta < 180°$	We note certain off-axis eirp density limits are proposed by Anatel for the user earth stations. We understand that those Ka-band earth stations which exceed these values are subject to coordination and agreement 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). 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 and agreement with adjacent satellite networks. **We therefore recommend to adopt alternative values, such as those in the ETSI standards, as shown below:** $d_{e.i.r.p.tx} = 19 - 25 \log \varphi - 10 \log$ dBW $1.8° \le \varphi \le 7.0°$ $= -2 - 10 \log N$ dBW $7.0° < \varphi \le 9.2°$ $= 22 - 25 \log \varphi - 10 \log N$ dBW $9.2° < \varphi \le 48°$ $= -10 - 10 \log N$ dBW $\varphi > 48°$ 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.
	c) The use of digital carriers with densities greater than the limit	We support.

	established in subparagraphs a) or b) should be coordinated with the explorers of adjacent satellites in accordance with paragraph 5;	
	VIII - The gain cross-polarization off-axis should not exceed the following value: $G(\theta) = 22 - 25 \log(\theta)$ dBi for $2.17^o \leq \theta < 36^o$ $= -17$ dBi, for $36^o \leq \theta < 180^o$	**We fully support limits being established for the cross-polarisation gain for an earth station antenna.** We note that 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: $G_x(\theta) = 23 - 20 \log \quad \varphi_r \leq \varphi \leq 7°$ $G_x(\theta) = 20.2 - 16.7 \log \theta \quad 7° < \varphi \leq 26.3°$ $G_x(\theta) = 32 - 25 \log \theta \quad 26.3° < \varphi \leq 48°$ $G_x(\theta) = -10 \quad 48° < \varphi \leq 180°$ θ_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. **We therefore propose to include the cross-polarization limits in Recommendation ITU-R S.731-1 shown above.**
	IX - The e.i.r.p. density off-axis antenna earth station transmitting in the cross-polarization, in a reference bandwidth of 1 Hz, within the bandwidth of a digital equivalent to its carrier transmission symbol rate must not exceed the following limits: a) in the case of the earth station access: $d_{e.i.r.p.\ tx} = -71 + 29 - 25 \log(\theta)$ dBW/Hz, $2.17° \leq \theta < 36°$ $= -81$ dBW/Hz, $36° \leq \theta < 180°$	We note 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 can be agreed in coordination. We note also that the proposed limits are more stringent than those contained in the FCC Rules and in the ETSI standards mentioned above, and some user earth stations will not be able to comply. We suggest that Anatel adopted the limits in the ETSI standards for

	b) it is an earth station user: $d_{e.i.r.p.\ tx} = -65 + 29 - 25 \log(\theta)$ dBW/Hz, $2.17° \le \theta < 36°$ $= -75$ dBW/Hz, $36° \le \theta < 180°$	Ka-band user terminals, which are as follows: $d_{e.i.r.p.tx} = 9 - 25 \log \varphi - 10 \log N$ $1.8° \le \varphi \le 7.0°$ $= -12$ dBW $- 10 \log N$ $7.0° < \varphi \le 9.2°$ 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.
	X - The cross-polarization discrimination on axis, the gain ratio between the polarization and the gain on the main cross-polarization, must be at least 20 dB.	We support this in principle, subject to obtaining waivers from Anatel in case of non-compliance.
4.3	Characteristics of Receiving Earth Stations	
4.3.1	The characteristics of the receiving earth stations must comply with the following conditions:	
	I - The off-axis gain, polarization key, the receiving earth station antenna shall not exceed the following value: $G(\theta) = 29 - 25 \log(\theta)$ dBi, for $2.17^o \le \theta < 36^o$ $= -10$ dBi, for $36^o \le \theta < 180^o$	**We fully support this Anatel proposal. We strongly believe it is important to establish off-axis antenna gain standards as given in Section IV herein for Ka-band earth stations to promote efficient use of the spectrum / orbit resource. The establishment of such a standard will also promote good practice in the design and manufacture of Ka-band earth stations.** **If operators propose to use earth stations which do not comply with this off-axis antenna gain, specific agreement from Anatel and specific agreements from other satellite operators should be obtained prior to operation of such non-compliant earth stations. In addition, operators who plan to use earth station which do not meet this off-axis antenna gain requirements should be required to accept interference from all adjacent satellites which meet the**

		satellite eirp density limits given below in Section 4.4.1 II.
	a) This requirement must be met for any off-axis direction within ± 3 ° of the equatorial plane of the geostationary orbit;	We support.
	b) Earth stations whose antennas meet the provisions of this subsection, are protected from interference caused by other space stations	We support it
4.4	Characteristics of Space Stations	
4.4.1	The characteristics of the space station should be in accordance with the following	
	I - The power flux density on the surface of the Earth, in the frequency range from 17.7 to 19.7 GHz, must meet the limits set out in Article 21 of the ITU Radio Regulations;	We support it
	II - The density of e.i.r.p. link in the descent, in a reference bandwidth of 1 Hz, within the bandwidth of a digital equivalent to its carrier transmission symbol rate must not exceed the limit of -16.5 dBW / Hz, both in the direction of access and earth station earth station in the direction of the user;	**We fully support the proposed satellite eirp density of -16.5 dBW/Hz.** We do not believe a higher satellite eirp density should be permitted, since it will make inter-satellite-frequency coordination more challenging and it will likely lead to greater orbit spacing than 2 degrees for Ka-band satellite systems serving Brazil.
	III - The use of digital carriers with densities greater than the limit established in paragraph II shall be coordinated with the operators of adjacent satellites in accordance with paragraph 5;	We support.
	IV - The frequency of each carrier at the transmitter output space stations can vary up to 0.002% over the nominal value of the transaction; V - The cross-polarization discrimination on axis, the gain ratio between the polarization and the gain on the main cross-	We support.

	polarization, must be at least 25 dB within the outline of -4 dB relative to maximum gain;	
	VI - All space stations must have a minimum capacity of switching the saturation flux density of the transponder through the command sent from Earth, in steps of 1 dB at an interval of at least 18 dB; a) It is recommended that, operationally, this is dBW/m2 of -88 ± 2 dB at the center of the beam; b) If the saturation flux density of the transponder is off the tour recommended in point a, there is potential for interference in its own space station or stations in adjacent space, caused by transmitting earth stations that meet the limits in this standard, and in this events be held in coordination with the operators of adjacent satellites in accordance with paragraph 5.	We support in principle this requirement, but we would recommend further consideration to the proposed 18 dB dynamic range.
	VII - The satellite must be maintained with a station-keeping accuracy of ±0.05 ° relative to the nominal orbital position	We support in principle, although operation of GEO satellite networks with +/- 0.1 degree East/West station-keeping should be permissible, subject to coordination and agreement with other satellite operators.

5	**COORDINATION OF SATELLITE NETWORKS**	
5.1	The operators must coordinate their satellite networks imbued with good faith and mutual cooperation.	We support.
5.2	The coordination process can be initiated by exploiting satellite or the National Telecommunications Agency - Anatel.	We support.
5.2.1	Each satellite operator must determine the levels of interference caused by adjacent satellites, particularly those located in the orbital arc of ± 4 ° from its orbital position.	We support.
5.3	After 90 (ninety) days from the date of your request coordination, if it has not completed any of exploiting satellite may request the intervention of Anatel, which determines the actions and deadlines to be met.	We support.
5.4	A copy of the agreement to coordinate with the operators of adjacent satellites should be sent to the FCC within 30 (thirty) days before the entry into operation of the satellite or, where appropriate, specific carrier	We support.
5.5	Coordination among others may require the implementation of one or more of the following measures:	We support in principle, provided these measures listed below are technically and operationally feasible and viable to implement and also do not pose unacceptable constraints on other satellite operators operating in compliance with the provisions of these regulations.
	I - increase the power densities of the carriers interfered with;	
	II - to reduce the power densities of interfering carriers;	
	III - the carriers move to different transponders;	
	IV - change carrier frequencies;	
	V - changing the polarization of the carriers.	
5.6	For coverage of the Brazilian territory, using any satellite carrier with power spectral density outside the limits set forth in paragraph 4 must use those carriers only after completed successfully, coordination with adjacent satellites.	**We fully support this provision.**
5.7	The operation of the transponder with a saturation flux density of the tour was recommended in subparagraph a, item VI, item 4.4.1 must first be coordinated with the operators to avoid adjacent	We support.

	satellite interference between adjacent satellite networks.	
5.8	In the case of exploiting of Brazilian satellites to the coverages that are contained in their respective methodologies for implementation, bilateral coordination is conducted under the same conditions as by other exploiters.	We support it
6.	**Licensing conditions for earth stations of the block**	
6.1	The ground stations, transmitters and receivers, belonging to the same satellite network, can be licensed as a block, provided that:	We welcome the adoption of a light licensing regime based on block licensing of Ka-band Earth station, especially in bands which are exclusively allocated by the ITU for satellite services such as 29.5 – 30.0 GHz and 19.7- 20.2 GHz. Not only is this approach in line with the existing international regulatory practice for the use of 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.
	I - part of a set of earth stations with similar technical characteristics, and	We support.
	II - comply with the provisions of section 4.	We support.
6.1.1	Together with the registration of the technical block in the licensing of earth stations, if applicable, should be presented the coordination arrangements of exploiting satellite potentially affected, making sure that coordination has been completed.	We support.
6.2	The operation of ground stations depends on the license for operation, as provided in regulation.	We support.

7	**SANCTIONS**	
7.1	Failure to comply with the provisions of this standard subject to the satellite operator to penalties provided in specific regulations, subject to the sanctions of civil and criminal matters.	We support.
8	**FINAL PROVISIONS**	
8.1	The radio equipment, including the radiating systems shall meet the requirements of the Rules for Certification and Approval of Telecommunications Products by Anatel.	**We strongly support. See above.**
8.2	It is not allowed to use analog carriers.	We support.
8.3	Exceptionally, and subject to coordination according to item 5, the ground stations can use linear polarization.	We support.
8.4	The earth and space stations operating in non-compliance with this standard shall be adjusted to be in accordance to technical parameters and criteria in this standard, within a period to be defined by Anatel.	We support.