

SECTION 25.114 (d) TECHNICAL INFORMATION

SECTION 25.114 (d) INFORMATION FOR AMAZONAS-3 SPACE STATION

(1) General description of overall system facilities, operations and services;

AMAZONAS-3 is a multi-mission system with payloads in C-band, Ku-Band and Ka-Band. AMAZONAS-3 will be a replacement of AMAZONAS-1 in C and Ku bands and will add extra-capacity in Ka band. This system will be used to satisfy the needs of communications by satellite in Europe and in the Americas. HISPAMAR will operate AMAZONAS-3 satellite system at 61° W.L. to provide a wide range of telecommunications services, including routing and DTH delivery of video and audio programs, satellite news gathering, VSAT applications, internet backbone services, broadband links, multimedia and interactive services, capacity for both public and private networks, etc.

Once AMAZONAS-3 will be fully in operation, Amazonas-1 is planned to be relocated into another orbital slot yet to be decided or utilized as a back-up satellite for Amazonas-3. The definitive plan will be informed to the Commission as soon as the decision is made concerning this matter.

(2) If applicable, the feeder link and inter-satellite service frequencies requested for the satellite, together with any demonstration otherwise required by this chapter for use of those frequencies (see, e.g., §§25.203(j) and (k));

N/A

(3) Predicted space station antenna gain contour(s) for each transmit and each receive antenna beam and nominal orbital location requested. These contour(s) should be plotted on an area map at 2 dB intervals down to 10 dB below the peak value of the parameter and at 5 dB intervals between 10 dB and 20 dB below the peak values, with the peak value and sense of polarization clearly specified on each plotted contour. For applications for geostationary orbit satellites, this information must be provided in the .gxt format.

C Band

The station antenna gain contour in copolar and crosspolar for the AMERICA beam are contained electronically in .gxt format in the files named:

- *VUPCBRAh.GXT (AMERICA receive beam horizontal polarization, copolar),*
- *VUPCBRhX.GXT (AMERICA receive beam horizontal polarization, crosspolar),*
- *VUPCBRAv.GXT (AMERICA receive beam vertical polarization, copolar),*
- *VUPCBRvX.GXT (AMERICA receive beam vertical polarization, crosspolar),*
- *VDWCBRhC.GXT (AMERICA transmit beam horizontal polarization, copolar),*
- *VDWCBRhX.GXT (AMERICA transmit beam horizontal polarization, crosspolar),*
- *VDWCBRvC.GXT (AMERICA transmit beam vertical polarization, copolar)*
and

- *VDWCBRvX.GXT (AMERICA transmit beam vertical polarization, crosspolar)*

attached to this application.

For the AMERICA beam, the gain peak for receiving antenna is 25.5 dBi and for the transmitting antenna 25.3 dBi, for both polarizations.

Annex-1 contains the copolar antenna gain contours for the AMERICA beam.

Ku Band

The station antenna gain contour in copolar and crosspolar for the NORTH AMERICA beam are contained electronically in .gxt format in the files named:

- *vupkunach.GXT (NORTH AMERICA receive beam horizontal polarization, copolar),*
- *VUPKUNAXh.GXT (NORTH AMERICA receive beam horizontal polarization, crosspolar),*
- *vupkunacv.GXT (NORTH AMERICA receive beam vertical polarization, copolar),*
- *VUPKUNAXv.GXT (NORTH AMERICA receive beam vertical polarization, crosspolar),*
- *vdwkunach.GXT (NORTH AMERICA transmit beam horizontal polarization, copolar),*
- *VDWKUNAXh.GXT (NORTH AMERICA transmit beam horizontal polarization, crosspolar),*
- *vdwkunacv.GXT (NORTH AMERICA transmit beam vertical polarization, copolar) and*
- *VDWKUNAXv.GXT (NORTH AMERICA transmit beam vertical polarization, crosspolar)*

attached to this application.

For the NORTH AMERICA beam, the gain peak for receiving antenna is 31 dBi and for the transmitting antenna 29.9 dBi, for both polarizations.

Annex-2 contains the copolar antenna gain contours for the NORTH AMERICA beam.

Ka Band

The station antenna gain contours in copolar and crosspolar for those SPOT beams connecting USA territories are contained electronically in .gxt format in the files named:

- SAO PAULO:
 - *RT1U_C.GXT (SAO PAULO receive beam left hand polarization, copolar),*
 - *RT1U_X.GXT (SAO PAULO receive beam left hand polarization, crosspolar),*
 - *FW1D_C.GXT (SAO PAULO transmit beam right hand polarization, copolar),*

- *FW1D_X.GXT* (SAO PAULO transmit beam right hand polarization, crosspolar)

attached to this application.

Annex 3 section 1 contains the copolar antenna gain contours for the SPOT beams from/to SAO PAULO.

- SANTIAGO:

- *RT6U_C.GXT* (SANTIAGO receive beam right hand polarization, copolar),
- *RT6U_X.GXT* (SANTIAGO receive beam right hand polarization, crosspolar),
- *FW6D_C.GXT* (SANTIAGO transmit beam left hand polarization, copolar),
- *FW6D_X.GXT* (SANTIAGO transmit beam left hand polarization, crosspolar)

attached to this application.

Annex 3 section 2 contains the copolar antenna gain contours for the SPOT beams from/to SANTIAGO.

- RIO:

- *RT9U_C.GXT* (RIO receive beam right hand polarization, copolar),
- *RT9U_X.GXT* (RIO receive beam right hand polarization, crosspolar),
- *FW9D_C.GXT* (RIO transmit beam left hand polarization, copolar),
- *FW9D_X.GXT* (RIO transmit beam left hand polarization, crosspolar)

attached to this application.

Annex 3 section 3 contains the copolar antenna gain contours for the SPOT beams from/to RIO.

- MEXICO:

- *RT3U_C.GXT* (MEXICO receive beam left hand polarization, copolar),
- *RT3U_X.GXT* (MEXICO receive beam left hand polarization, crosspolar),
- *RT5U_C.GXT* (MEXICO receive beam right hand polarization, copolar),
- *RT5U_X.GXT* (MEXICO receive beam right hand polarization, crosspolar),
- *FW5D_C.GXT* (MEXICO transmit beam left hand polarization, copolar),
- *FW5D_X.GXT* (MEXICO transmit beam left hand polarization, crosspolar),
- *FW3D_C.GXT* (MEXICO transmit beam right hand polarization, copolar),
- *FW3D_X.GXT* (MEXICO transmit beam right hand polarization, crosspolar)

attached to this application.

Annex 3 section 4 contains the copolar antenna gain contours for the SPOT beams from/to MEXICO.

- LIMA:
 - *RT8U_C.GXT (LIMA receive beam left hand polarization, copolar),*
 - *RT8U_X.GXT (LIMA receive beam left hand polarization, crosspolar),*
 - *FW8D_C.GXT (LIMA transmit beam right hand polarization, copolar),*
 - *FW8D_X.GXT (LIMA transmit beam right hand polarization, crosspolar)*

attached to this application.

Annex 3 section 5 contains the copolar antenna gain contours for the SPOT beams from/to LIMA.

- BUENOS AIRES:
 - *RT2U_C.GXT (BUENOS AIRES receive beam left hand polarization, copolar),*
 - *RT2U_X.GXT (BUENOS AIRES receive beam left hand polarization, crosspolar),*
 - *FW2D_C.GXT (BUENOS AIRES transmit beam right hand polarization, copolar),*
 - *FW2D_X.GXT (BUENOS AIRES transmit beam right hand polarization, crosspolar)*

attached to this application.

Annex 3 section 6 contains the copolar antenna gain contours for the SPOT beams from/to BUENOS AIRES.

- BOGOTA:
 - *RT7U_C.GXT (BOGOTA receive beam left hand polarization, copolar),*
 - *RT7U_X.GXT (BOGOTA receive beam left hand polarization, crosspolar),*
 - *FW7D_C.GXT (BOGOTA transmit beam right hand polarization, copolar),*
 - *FW7D_X.GXT (BOGOTA transmit beam right hand polarization, crosspolar)*

attached to this application.

Annex 3 section 7 contains the copolar antenna gain contours for the SPOT beams from/to BOGOTA.

- LAREDO:
 - *FW5U_C.GXT (LAREDO receive beam left hand polarization, copolar, frequency band 28.1 – 28.6 GHz),*
 - *FW5U_X.GXT (LAREDO receive beam left hand polarization, crosspolar, frequency band 28.1 – 28.6 GHz),*
 - *FW3U_C.GXT (LAREDO receive beam right hand polarization, copolar, frequency band 28.1 – 28.6 GHz),*

- *FW3U_X.GXT* (LAREDO receive beam right hand polarization, crosspolar, frequency band 28.1 – 28.6 GHz),
- *RT3D_C.GXT* (LAREDO transmit beam left hand polarization, copolar, frequency band 18.3 – 18.8 GHz),
- *RT3D_X.GXT* (LAREDO transmit beam left hand polarization, crosspolar, frequency band 18.3 – 18.8 GHz),
- *RT5D_C.GXT* (LAREDO transmit beam right hand polarization, copolar, frequency band 18.3 – 18.8 GHz),
- *RT5D_X.GXT* (LAREDO transmit beam right hand polarization, crosspolar, frequency band 18.3 – 18.8 GHz),
- *FW9U_C.GXT* (LAREDO receive beam left hand polarization, copolar, frequency band 29.5 – 30 GHz),
- *FW9U_X.GXT* (LAREDO receive beam left hand polarization, crosspolar, frequency band 29.5 – 30 GHz),
- *FW2U_C.GXT* (LAREDO receive beam right hand polarization, copolar, frequency band 29.5 – 30 GHz),
- *FW2U_X.GXT* (LAREDO receive beam right hand polarization, crosspolar, frequency band 29.5 – 30 GHz),
- *RT2D_C.GXT* (LAREDO transmit beam left hand polarization, copolar, frequency band 19.7 – 20.2 GHz),
- *RT2D_X.GXT* (LAREDO transmit beam left hand polarization, crosspolar, frequency band 19.7 – 20.2 GHz),
- *RT9D_C.GXT* (LAREDO transmit beam right hand polarization, copolar, frequency band 19.7 – 20.2 GHz),
- *RT9D_X.GXT* (LAREDO transmit beam right hand polarization, crosspolar, frequency band 19.7 – 20.2 GHz)

attached to this application.

Annex 3 section 8 contains the copolar antenna gain contours for the SPOT beams from/to LAREDO.

- TUCSON:
 - *FW6U_C.GXT* (TUCSON receive beam left hand polarization, copolar, frequency band 28.1 – 28.6 GHz),
 - *FW6U_X.GXT* (TUCSON receive beam left hand polarization, crosspolar, frequency band 28.1 – 28.6 GHz),
 - *FW1U_C.GXT* (TUCSON receive beam right hand polarization, copolar, frequency band 28.1 – 28.6 GHz),
 - *FW1U_X.GXT* (TUCSON receive beam right hand polarization, crosspolar, frequency band 28.1 – 28.6 GHz),
 - *RT1D_C.GXT* (TUCSON transmit beam left hand polarization, copola, frequency band 18.3 – 18.8 GHz r),
 - *RT1D_X.GXT* (TUCSON transmit beam left hand polarization, crosspolar, frequency band 18.3 – 18.8 GHz),
 - *RT6D_C.GXT* (TUCSON transmit beam right hand polarization, copolar, frequency band 18.3 – 18.8 GHz),
 - *RT6D_X.GXT* (TUCSON transmit beam right hand polarization, crosspolar, frequency band 18.3 – 18.8 GHz),
 - *FW8U_C.GXT* (TUCSON receive beam left hand polarization, copolar, frequency band 29.5 – 30 GHz),
 - *FW8U_X.GXT* (TUCSON receive beam left hand polarization, crosspolar, frequency band 29.5 – 30 GHz),
 - *FW7U_C.GXT* (TUCSON receive beam right hand polarization, copolar, frequency band 29.5 – 30 GHz),

- *FW7U_X.GXT* (TUCSON receive beam right hand polarization, crosspolar, frequency band 29.5 – 30 GHz),
- *RT7D_C.GXT* (TUCSON transmit beam left hand polarization, copolar, frequency band 19.7 – 20.2 GHz),
- *RT7D_X.GXT* (TUCSON transmit beam left hand polarization, crosspolar, frequency band 19.7 – 20.2 GHz),
- *RT8D_C.GXT* (TUCSON transmit beam right hand polarization, copolar, frequency band 19.7 – 20.2 GHz),
- *RT8D_X.GXT* (TUCSON transmit beam right hand polarization, crosspolar, frequency band 19.7 – 20.2 GHz)

attached to this application.

Annex 3 section 9 contains the representation of copolar antenna gain contours for the SPOT beams from/to TUCSON.

For all the beams, the gain peak for receiving antenna is 52 dBi and for the transmitting antenna 48 dBi, for both polarizations.

- (4) A description of the types of services to be provided, and the areas to be served, including a description of the transmission characteristics and performance objectives for each type of proposed service, details of the link noise budget, typical or baseline earth station parameters, modulation parameters, and overall link performance analysis (including an analysis of the effects of each contributing noise and interference source);**

The AMAZONAS-3 satellite will be used for digital communications services, including video and internet applications, with bit rates ranging from 64 Kbit/s, possibly less, to 1 Gbit/s.

The AMAZONAS-3 satellite serves from the North of USA to the South of Argentina and Europe.

The files called *LINK_BUDGET_1.pfd* to *LINK_BUDGET_11.pfd* (for C and Ku bands) and *Forward Ka-band 1.pfd* to *Forward Ka-band 4.pfd*, *return ka 1.pdf* to *return ka 5.pdf* and *Ka-band 9.pdf* (for Ka band) attached to this application, contain several examples of link noise budgets.

- (5) Calculation of power flux density levels within each coverage area and of the energy dispersal, if any, needed for compliance with §25.208; Calculation of power flux density levels within each coverage area and of the energy dispersal, if any, needed for compliance with §25.208, for angles of arrival other than 5°, 10°, 15°, 20°, and 25° above the horizontal.**

C Band

In all the C downlink frequency range, the power flux density at the Earth's surface produced by emissions from a space station for all conditions and for all methods will not exceed -159.7 dBW/m^2 4 KHz over the US territory and all the Americas:

-59.0 dBW/Hz max psd + 25.3 (max gain dBi) - 162 spreading losses (dB) (worst case).

Ku Band

In all the Ku downlink frequency range, the power flux density at the Earth's surface produced by emissions from a space station for all conditions and for all methods will not exceed -132.5 dBW/m^2 1 MHz over the US territory and all the Americas:

$$-60.4 \text{ dBW/Hz max psd} + 29.9 \text{ (max gain dBi)} - 162 \text{ spreading losses (dB) (worst case).}$$

Ka Band

In all the Ka downlink frequency range, the power flux density at the Earth's surface produced by emissions from a space station for all conditions and for all methods will not exceed -123.5 dBW/m^2 1 MHz over the US territory and all the Americas:

$$-69.5 \text{ dBW/Hz max psd} + 48 \text{ (max gain dBi)} - 162 \text{ spreading losses (dB) (worst case).}$$

(6) Public interest considerations in support of grant;

The AMAZONAS-3 satellite will ensure digital transmission services between the United States, South America and Europe at the 61° W longitude orbital location.

The entry of the AMAZONAS-3 satellite into the market to meet US customers' demand for such services will enhance competition in that market. Accordingly, the grant of this application is in the public interest.

(7) Applications for authorizations for fixed-satellite space stations shall also include the information specified in §25.140 (b)(1) and (2) of this part. Applicants for authorizations for space stations in the 17/24 GHz broadcasting-satellite service must also include the information specified in Sec. Sec. 25.140(b)(1) and (3) of this part.

C band

There is currently no satellite operating in the C-band frequencies located within two degrees from 61° W, where AMAZONAS-3 will operate.

Hispamar has no plans at present to use AMAZONAS-3 for FM/TV transmissions. Any analog TV carriers used by adjacent satellite operators will be coordinated on a case-by case basis, as required. For this reason, the C band interference analysis provided in the following tables only includes interference caused by AMAZONAS-3 digital transmissions into the digital transmissions of a potential adjacent satellite.

The results of the two-degree interference analysis shown below assumes that a future C-band satellite, operated at 63° W or 59° W, will have transmission parameters similar to those of AMAZONAS-3 (see Table 1). Table 2 provides a summary of the overall link C/I margins using the transmissions of AMAZONAS-3 as both the wanted and interfering carriers.

The interference calculations assumed a 1dB advantage for topocentric-to-geocentric conversion, all wanted and interfering transmission are co-polarized and all earth station antennas conform to a sidelobe pattern of 29-25 log (theta).

	Design. Emission	Mod. Type	Diam TX (m)	TX Ant. Gain (dBi)	Diam RX (m)	RX Ant. Gain (dBi)	U/L Power (dBW)	U/L Power Dens. (dBW/Hz)	D/L EIRP (dBW)	D/L EIRP Dens. (dBW/Hz)	C/N Req. (dB)	C/I Criterion (dB)
Wanted Carrier	70K0G7W	8-PSK	4.5	47	4.5	43.3	2	-46.5	9.5	-39	8	20.2
	1M70G7W	8-PSK	4.5	47	4.5	43.3	16.2	-46.1	23.9	-38.4	8	20.2
	7M50G7W	QPSK	4.5	47	4.5	43.3	24	-44.8	31.6	-37.2	9	21.2
	36M0G7W	QPSK	4.5	47	8.6	48.8	27	-48.6	34.7	-40.9	7.4	19.6

Table 1.- Assumed C-band transmission parameters of an adjacent satellite.

		Interfering carrier			
		70K0G7W	1M70G7W	7M50G7W	36M0G7W
Wanted carrier	DESIGN EMISSION				
	70K0G7W	1.1	0.6	-0.7	3.1
	1M70G7W	15.4	1.1	-0.2	3.5
	7M50G7W	22.2	7.8	0.1	3.8
	36M0G7W	29.8	15.5	7.8	4.7

Table 2.- Summary of the overall link C/I margins (dB)

It can be seen in Table 2 that mostly all C/I margins are positive. The worst case is represented for Wanted Carrier 1 with respect to Interfering Carrier 3. The deficit with respect to the 6% C/I criterion is 0.7 dB, which is equivalent to an increase of 7.1% of victim noise temperature (instead of the normal criteria of 6%). It is expected that such a C/I level can be coordinated between satellite operators.

Ku band

The results of the two-degree interference analysis shown below assumes a satellite, operated at 63° W or 59° W, having transmission parameters similar to those of AMAZONAS-3 (see Table 3). Table 4 provides a summary of the overall link C/I margins using the transmissions of AMAZONAS-3 as both the wanted and interfering carriers.

The interference calculations assumed a 1dB advantage for topocentric-to-geocentric conversion, all wanted and interfering transmission are co-polarized and all earth station antennas conform to a sidelobe pattern of 29-25 log (theta).

	Design. Emission	Mod. Type	Diam TX (m)	TX Ant. Gain (dBi)	Diam RX (m)	RX Ant. Gain (dBi)	U/L Power (dBW)	U/L Power Dens. (dBW/Hz)	D/L EIRP (dBW)	D/L EIRP Dens. (dBW/Hz)	C/N Req. (dB)	C/I Criterion (dB)
Wanted Carrier	14K0G7W	QPSK	1.2	43	2.9	49.7	-8	-49.5	5.6	-35.9	6.8	19
	14K0G7W	QPSK	2.4	49.2	1.7	44.9	-9.4	-50.9	10.4	-31.1	6.8	19
	1M80G7W	QPSK	3.7	53	2.6	48.7	9.5	-53.1	32.1	-30.5	9	17.7
	9M00G7W	8-PSK	3.7	53	2.6	48.7	15.1	-54.4	37.7	-31.8	8	20.2
	36M0G7W	QPSK	3.7	53	1.7	44.9	23	-52.6	45.1	-30.5	6.1	18.3

Table 3.- Assumed Ku-band transmission parameters of an adjacent satellite.

DESIGN EMISSION		Interfering carrier				
		14K0G7W	14K0G7W	1M80G7W	9M00G7W	36M0G7W
Wanted carrier	14K0G7W	2.7	4.4	4.6	6.0	4.5
	14K0G7W	1.5	4.1	4.5	5.9	4.4
	1M80G7W	22.2	27.9	9.2	10.5	9.0
	9M00G7W	25.3	31.0	12.3	6.7	5.1
	36M0G7W	34.8	38.7	18.6	13.0	5.5

Table 4.- Summary of the overall link C/I margins (dB)

It can be seen in Table 4 that all C/I margins are positive.

Ka Band

Compliance with the FCC two-degree spacing policy is assured provided:

1. The maximum PFD levels in the Ka band are lower than the PFD values given in §25.138 (a)(6) of the Rules for blanket licensing of small user terminals;
2. The uplink off-axis EIRP density limits of §25.138 (a)(1) of the Rules are not exceeded.

Section (5) above showed the maximum PFD that can be transmitted by the Amazonas-3 in the Ka band satellite at any angle of arrival is -123.5 dBW/m²/MHz. This value is lower than the PFD value given in §25.138 (a)(6) of the Rules for blanket licensing of small user terminals.

The clear sky uplink input power density in the Ka band will be always lower than -56.5 dBW/Hz, according to the value given in §25.138 (a)(1). Table 5 compares the uplink input power densities derived from the link budget contained in the Schedule S with the clear sky limits of §25.138 (a)(1) (dBW/Hz) of the Rules. It can be seen that in all cases the clear sky uplink power limits are met. No authorized uplink transmissions to the Amazonas-3 satellite will exceed an input power density value of -56.5 dBW/Hz in the Ka band.

Uplink Antenna Size	Emission	Maximum Clear Sky Uplink Input Power Density (dBW/Hz)	Clear Sky Uplink Input Power Density Limit of §25.138 (a)(1) (dBW/Hz)	Excess Margin (dB)
6 m	450MG7W	-66.1	-56.5	9.6
6 m	45M0G7W	-61.9	-56.5	5.4
0.75 m	5M00G7W	-61.9	-56.5	5.4
0.75 m	1M00G7W	-58.0	-56.5	1.5

Table 5.- Examples of demonstration of compliance with the Uplink Power limits of §25.138 (a)(1)

Moreover, currently there is no satellite operating in the Ka-band frequencies located within two degrees from AMAZONAS-3 however, a C/I analysis has been performed. The results of the two-degree interference analysis below assumes that a future Ka-band satellite, operated at 63° W or 59° W, will have transmission parameters similar to those of AMAZONAS-3 (see Table 6). Table 7 provides a summary of the overall link C/I margins using the transmissions of AMAZONAS-3 as both the wanted and interfering carriers.

The interference calculations assumed a 1dB advantage for topocentric-to-geocentric conversion, all wanted and interfering transmission are co-polarized and all earth station antennas conform to a sidelobe pattern of 29-25 log(theta).

	Design. Emission	Mod. Type	Diam TX (m)	TX Ant. Gain (dBi)	Diam RX (m)	RX Ant. Gain (dBi)	U/L Power (dBW)	U/L Power Dens. (dBW/Hz)	D/L EIRP (dBW)	D/L EIRP Dens. (dBW/Hz)	C/N Req. (dB)	C/I Criterion (dB)
Wanted Carrier	450MG7W	16APSK	6,0	63,0	1,2	45,9	19,6	-66,9	64,0	-22,5	10,7	22,9
	450MG7W	8-PSK	6,0	63,0	0,75	42,1	20,4	-66,1	64,5	-22,0	8,3	20,5
	45M0G7W	16APSK	6,0	63,0	1,2	45,9	14,6	-61,9	52,5	-24,0	10,7	22,9
	45M0G7W	8-PSK	6,0	63,0	0,75	42,1	9,6	-66,9	52,5	-24,0	8,3	20,5
	5M60G7W	QPSK	0,75	44,9	6,0	59,5	5,6	-61,9	32,2	-35,3	7,5	19,7
	4M00G7W	8-PSK	0,9	46,6	6,0	59,5	8,0	-58,0	37,0	-29,0	11,6	23,8
	1M40G7W	QPSK	0,75	38,9	6,0	59,5	-0,4	-61,9	26,2	-35,3	7,5	19,7
	1M00G7W	8-PSK	0,75	44,9	6,0	59,5	2,0	-58,0	31,0	-29,0	11,6	23,8

Table 6.- Assumed Ka-band Transmission parameters of an adjacent satellite.

	Design. Emission	Interfering Carrier							
		450MG7W	450MG7W	45M0G7W	45M0G7W	5M60G7W	4M00G7W	1M40G7W	1M00G7W
Wanted carrier	450MG7W	2.4	1.9	13.7	13.9	31.0	27.3	37.0	33.3
	450MG7W	1.6	1.1	13.0	13.1	31.8	27.6	37.8	33.6
	45M0G7W	1.0	0.5	2.4	2.5	21.8	17.4	27.8	23.4
	45M0G7W	-0.4	-0.9	1.0	1.1	20.1	15.8	26.1	21.8
	5M60G7W	4.9	4.3	3.1	5.8	4.6	2.1	10.6	8.1
	4M00G7W	6.8	6.2	4.8	7.7	6.1	2.1	10.6	8.1
	1M40G7W	4.9	4.3	3.1	5.9	4.6	0.6	4.6	2.1
	1M00G7W	6.1	5.5	3.5	6.9	4.4	0.5	4.4	0.5

Table 7.- Summary of the overall link C/I margins (dB).

It can be seen in Table 7 that all C/I margins are positive, except for two cases. The worst case is represented for Wanted Carrier 4 with respect to Interfering Carrier 2. The deficit with respect to the 6% C/I criterion is 0.9 dB, which is equivalent to an increase of 7.3% of victim noise temperature (instead of the normal criteria of 6%). It is expected that such a C/I level can be coordinated between satellite operators.

Two-degree compatibility demonstration for the 28.1-28.35 GHz band

Currently there are no operational GSO Ka-band satellites that use the 28.1-28.35 GHz band within two-degrees of the 61° W.L. location, nor are there any pending applications before the Commission for use of the 28.1-28.35 GHz

band by a GSO satellite within this arc. In order to demonstrate two-degree compatibility, the 450 MHz carrier contained in Table 6 has been assumed as both the wanted and victim carriers. Since the assumed uplink input power densities for both the wanted and victim carriers are therefore identical, the uplink C/I is simply the difference between the on-axis gain and the off-axis gain. The uplink C/I margin is calculated as follows:

$$\begin{aligned} (C/I)_{\text{Marg_up}} &= G_{\text{max}} - (29 - 25 \cdot \log(\theta)) - C/N - 12.2 \\ &= 63 - (29 - 25 \cdot \log(2)) - 10.3 - 12.2 = 19 \text{ dB} \end{aligned}$$

The calculated margin is quite large and clearly demonstrates two-degree compatibility. The large margin is not surprising given the size of the gateway antenna. Note the above calculation did not take into account any advantage for topocentric-to-geocentric conversion.

Sharing with LMDS in the 28.1-28.35 GHz band

The 28.1-28.35 GHz band is allocated to LMDS on a primary basis and it is allocated to the FSS on a secondary basis. §2.105(c)(2) states, in part, that stations of a secondary service:

- (i) Shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date;
- (ii) Cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date;

Regarding §2.105(c)(2)(i), uplinks from gateway earth stations that are located in the United States must be operated in a manner such that they do not cause harmful interference to any current or future licensed LMDS station. Technical compatibility will be accomplished primarily through geographic separation between the gateway antennas and the LMDS stations. Shielding may also be used, if necessary. Regarding §2.105(c)(2)(ii), transmitting LMDS stations cannot cause harmful interference into a gateway since the gateway does not receive transmissions in the 28.1-28.35 GHz band. Harmful interference occurring from the aggregation of transmitting LMDS stations into a receiving spot beam of the satellite is considered to be unlikely, however Hispamar undertakes to accept this risk and will not seek protection from such interference in the event it occurs.

The applications for the gateway earth stations will need to include a technical analysis to demonstrate that the proposed operations will not cause harmful interference into any licensed LMDS station. The earth station licensee will need to take appropriate actions to protect any future licensed LMDS station that has the potential to receive harmful interference from its gateways, including ceasing transmissions if necessary.

- (8) **Applications for authorizations in the Mobile-Satellite Service in the 1545–1559/1646.5–1660.5 MHz frequency bands shall also provide all information necessary to comply with the policies and procedures set forth in Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service, 2 FCC Rcd 485 (1987) (Available at address in §0.445 of this chapter.);**

N/A

- (9) Applications to license multiple space station systems in the non-voice, non-geostationary mobile-satellite service under blanket operating authority shall also provide all information specified in §25.142; and

N/A

- (10) Applications for authorizations in the 1.6/2.4 GHz Mobile-Satellite Service shall also provide all information specified in §25.143.

N/A

- (11) In addition to a statement of whether the space station is to be operated on a common carrier basis, or whether non-common carrier transactions are proposed, as specified in paragraph (c)(11) of this section, satellite applications in the Direct Broadcast Satellite service must provide a clear and detailed statement of whether the space station is to be operated on a broadcast or non-broadcast basis.

N/A

- (12) Applications for authorizations in the non-geostationary satellite orbit fixed-satellite service (NGSO FSS) in the bands 10.7 GHz to 14.5 GHz shall also provide all information specified in §25.146.

N/A

- (13) For satellite applications in the Direct Broadcast Satellite service, if the proposed system's technical characteristics differ from those specified in the Appendix 30 BSS Plans, the Appendix 30A feeder link Plans, Annex 5 to Appendix 30 or Annex 3 to Appendix 30A, each applicant shall provide:

- (i) The information requested in Appendix 4 of the ITU's Radio Regulations. Further, applicants shall provide sufficient technical showing that the proposed system could operate satisfactorily if all assignments in the BSS and feeder link Plans were implemented.
- (ii) Analyses of the proposed system with respect to the limits in Annex 1 to Appendices 30 and 30A.

N/A

- (14) A description of the design and operational strategies that will be used to mitigate orbital debris including the following information:

- (i) A statement that the space station operator has assessed and limited the amount of debris released in a planned manner during normal operations, and has assessed and limited the probability of the space station becoming a source of debris by collisions with small debris or meteoroids that could cause loss of control and prevent post-mission disposal;

The spacecraft is designed such that no debris will be released during normal operations. As part of the daily routine operations, an analysis

using a public catalogue of orbital objects is conducted to avoid any collision, preventing the spacecraft to become a source of debris.

- (ii) A statement that the space station operator has assessed and limited the probability of accidental explosions during and after completion of mission operations. This statement must include a demonstration that debris generation will not result from the conversion of energy sources on board the spacecraft into energy that fragments the spacecraft. Energy sources include chemical, pressure, and kinetic energy. This demonstration should address whether stored energy will be removed at the spacecraft's end of life, by depleting residual fuel and leaving all fuel line valves open, venting any pressurized system, leaving all batteries in a permanent discharge state, and removing any remaining source of stored energy, or through other equivalent procedures specifically disclosed in the application;**

Please, see Attachment A.

- (iii) A statement that the space station operator has assessed and limited the probability of the space station becoming a source of debris by collisions with large debris or other operational space stations. Where a space station will be launched into a low-Earth orbit that is identical, or very similar, to an orbit used by other space stations, the statement must include an analysis of the potential risk of collision and a description of what measures the space station operator plans to take to avoid in-orbit collisions. If the space station operator is relying on coordination with another system, the statement must indicate what steps have been taken to contact, and ascertain the likelihood of successful coordination of physical operations with, the other system. The statement must disclose the accuracy--if any--with which orbital parameters of non-geostationary satellite orbit space stations will be maintained, including apogee, perigee, inclination, and the right ascension of the ascending node(s). In the event that a system is not able to maintain orbital tolerances, i.e., it lacks a propulsion system for orbital maintenance, that fact should be included in the debris mitigation disclosure. Such systems must also indicate the anticipated evolution over time of the orbit of the proposed satellite or satellites. Where a space station requests the assignment of a geostationary-Earth orbit location, it must assess whether there are any known satellites located at, or reasonably expected to be located at, the requested orbital location, or assigned in the vicinity of that location, such that the station keeping volumes of the respective satellites might overlap. If so, the statement must include a statement as to the identities of those parties and the measures that will be taken to prevent collisions;**

HISPAMAR has assessed and limited the probability of the space station becoming a source of debris as a result of collisions with large debris or other operational space stations. As part of the daily routine operations, an analysis using a public catalogue of orbital objects is conducted to avoid any collision, preventing the spacecraft to become a source of debris.

The proposed orbital location for AMAZONAS-3 is 61° W.L. same as AMAZONAS-1 and AMAZONAS-2. AMAZONAS-3 will be maintained on the geostationary orbit within a window of less than +/-0.07° in North-South and less than +/- 0.05° East-West. It will be co-located with the other two satellites. The co-location strategy is coordinated for all the satellites in the cluster and will be based on separation in eccentricity and inclination method assuring no collisions between the satellites.

- (iv) **A statement detailing the post-mission disposal plans for the space station at end of life, including the quantity of fuel--if any--that will be reserved for post-mission disposal maneuvers. For geostationary-Earth orbit space stations, the statement must disclose the altitude selected for a post-mission disposal orbit and the calculations that are used in deriving the disposal altitude. The statement must also include a casualty risk assessment if planned post-mission disposal involves atmospheric re-entry of the space station. In general, an assessment should include an estimate as to whether portions of the spacecraft will survive re-entry and reach the surface of the Earth, as well as an estimate of the resulting probability of human casualty.**

At the end of the mission, HISPAMAR will dispose of the spacecraft by moving it to a minimum altitude of 414 kilometers above the geostationary arc. This exceeds the minimum altitude established by the IADC formula.

HISPAMAR has reserved 16.2 kilograms of fuel for this purpose. This fuel figure was determined by the spacecraft manufacturer and provided for in the propellant budget. To calculate this figure, the "rocket equation" was used, taking into account the expected mass of the satellite at the end of life and the required delta-velocity to achieve the desired orbit. The fuel gauging uncertainty has been taken into account in these calculations.

In calculating the disposal orbit, HISPAMAR has used simplifying assumptions as permitted under the Commission's Orbital Debris Report and Order. For reference, this calculation results in a minimum perigee disposal altitude under the IADC formula of at most 271.2 kilometers above the geostationary arc, which is lower than the 414 kilometers above geostationary disposal altitude specified by HISPAMAR.

The post-mission disposal orbital altitude is based on the following calculation according to section 25.283:

$$36,021 \text{ km} + (1000 \times C_R \times A / m)$$

where:

" $C_R \times A$ " = Solar Pressure Radiation Coefficient x Total Solar Pressure Area = 97.53 m²

"m" = Dry Mass of Satellite = 2694 kg

then

$$= 36,021 \text{ km} + (1000 \times C_R \times A / m)$$

$$= 36,021 \text{ km} + 1000 \times 97.53 / 2694$$

= 36,057.2 km
= 271.2 km above GSO (35,786 km)

For additional information, please see Attachment A.

- (15) Each applicant for a space station license in the 17/24 GHz BSS shall include the following information as an attachment to its application:
- (i) Except as set forth in paragraph (d)(15)(ii) of this section, an applicant proposing to operate in the 17.3-17.7 GHz frequency band, must provide a demonstration that the proposed space station will comply with the power flux density limits set forth in Sec. 25.208(w) of this part.
 - (ii) In cases where the proposed space station will not comply with the power flux density limits set forth in Sec. 25.208(w) of this part, the applicant will be required to provide a certification that all potentially affected parties acknowledge and do not object to the use of the applicant's higher power flux densities. The affected parties with whom the applicant must coordinate are those GSO 17/24 GHz BSS satellite networks located up to 6 away for excesses of up to 3 dB above the power flux-density levels specified in Sec. 25.208(w) of this part, and up to 10 away greater for excesses greater than 3 dB above those levels.
 - (iii) In cases where the proposed 17/24 GHz BSS space station will be operated in the 17.3-17.7 GHz band, or operated to provide international service in the 17.7-17.8 GHz band, and cannot be located precisely at one of the nominal 17/24 GHz BSS orbital locations specified in Appendix F of the Report and Order, adopted May 2, 2007, IB Docket No. 06-123, FCC 07-76, the applicant must provide a demonstration that the proposed space station will not cause more interference to other 17/24 GHz BSS satellite networks operating in compliance with the rules for this service than if it were located at the precise 17/24 GHz BSS orbital location from which its proposed location is offset.
 - (iv) An applicant proposing to provide international service in the 17.7-17.8 GHz band must demonstrate that it will meet the power flux density limits set forth in Sec. 25.208(c) of this part.

N/A

- (16) In addition to the requirements of paragraph (d)(15) of this section, each applicant for a license to operate a 17/24 GHz BSS space station that will be used to provide video programming directly to consumers in the United States, that will not meet the requirements of Sec. 25.225 of this part, must include as an attachment to its application a technical analysis demonstrating that providing video programming service to consumers in Alaska and Hawaii that is comparable to the video programming service provided to consumers in the 48 contiguous United States (CONUS) is not feasible as a technical matter or that, while technically feasible, such service would require so many compromises in satellite design and operation as to make it economically unreasonable.

N/A

ATTACHMENT A



SS/L Proprietary

1/3

AMZ3 End of Life Disposal Plan

The plan for disposing of the AMZ3 satellite at end of life ensures that all stored energy sources on board the satellite are discharged to the maximum extent practicable, by venting excess propellant, discharging batteries, relieving pressure vessels, and all other appropriate measures.

A) The following sequence describes the process flow, rather than detail, with emphasis on what we are achieving and the main considerations.

1. Starting point

All payload ground station Uplink traffic is off.

Bus systems are normal (Attitude Control / Data Handling / Power / Propulsion).

Satellite is at or near Geosynch orbit.

2. Deactivate Payload

Turn off all payload units including TWTA's, LCAMP's, LNA's, Downconverters, Beacons, MLO's & MRO's. This will ensure no Payload RF radiation will interfere with other spacecraft.

3. Configure Attitude Control Safety System Monitors

Configure Attitude Control Safety System per Satellite On-orbit Operating Handbook for Sun Acquisition Mode. This is the final control mode which provides stability of spacecraft spinning in Pitch axis and is the default mode of the S/C processor which will eventually be powering up/down whenever the solar arrays are either illuminated or shadowed, respectively, until the arrays degrade to a point such that no current to the 100V bus can be produced.

]

4. Configure TT&C

Establish High Power Wide Angle Telemetry and Command mode by command.

HPWA is established prior to the first de-orbit maneuver to obtain a wider FOV as the orbit is raised.

5. Perform Transfer Orbit Maneuver

Transfer vehicle from operational orbit to parking orbit. (See details on page 3)

6. Make Satellite Safe

Fire Unused Pyro's

Fire all unfired pyros (Solar Array and Reflector hold downs, propellant system, etc.)

Depressurize Bi Propulsion System & He Pressurant

Activate earth deck thrusters until all six thrusters indicate fuel and ox depletion (sputtering). Earth deck thrusters are used to raise orbit as much as possible to reach disposal orbit.

Slew Solar Arrays to Sun pointing and perform Sun Acquisition.

Activate anti-earth deck thrusters to purge remaining fuel/ox from lines and complete propulsion subsystem depressurization. The impact of this purge into the disposal orbit altitude is negligible; in any case, this altitude will remain above the 271.2 km derived from the IADC formula.

After AMZ3 reaches its final disposal orbit all propellant line valves, located downstream the propellant tanks, will be left open and all pressure vessels will be vented.

Once it has been determined that only one propellant is remaining, repressurize the Ox and Fuel tanks to depressurize He from Pressurant tank to lowest practicable pressure. After repressurizing the propellant tanks, the He isolation valve, located upstream the propellant tanks, is closed to preclude any possibility of residual bipropellants from leaching into the pressurant system and causing a hypergolic reaction.

Following these operations, the remaining He will be less than 0.01 kg in the pressurant tanks (2 tanks of 65.5 liters and 1 tank of 49.1 liters) and 0 kg in the propellant tanks; the remaining Oxidizer (NTO) and Fuel (MMH) in the corresponding tanks is considered negligible. As indicated before, the propellant line valves downstream the propellant tanks will remain open.

7. Spin Down Momentum Wheels

Remaining ACS is not shut down so that the satellite will remain in Sun Acquisition mode when power from the S/A activates the bus. The momentum wheels are spun down to reduce the spacecraft "stiffness", thus, minimizing the pressurant required to transition the spacecraft to Sun Acquisition mode.

8. Deactivate Electrical Power System

Turn OFF all the Battery Chargers to keep the batteries from recharging.
Open Battery Relays to further preclude the ability to recharge the batteries.
Turn OFF all Battery Power Control Unit Dischargers to ensure no battery power is applied to the bus.
Deplete charge from all batteries.

As long as the solar arrays can produce enough power when illuminated by the sun, the S/C processors will attempt to reboot in Sun Acq mode whenever 100V power is available from the arrays; when the array power goes away, and with the batteries depleted, everything will turn off again.

9. Disable Telemetry and Tracking System

Command Off Telemetry transmitter 1 and 2 to ensure no RF radiation will interfere with other spacecraft.

10. End of Satellite Life

B) End-of-Life Deorbit

The End-of-Life (EOL) deorbit maneuver consists of two ΔV s (one at each apsis) in the direction of motion which raise the satellite into a circular orbit above synchronous radius (as shown in Figure 1. Total ΔV s of approximately 15 m/s raise the EOL circular orbit radius greater than 400 km above synchronous. To reduce the bipropellant requirement, the helium pressurant in the propellant tank can be used for part of the EOL deorbit maneuver.

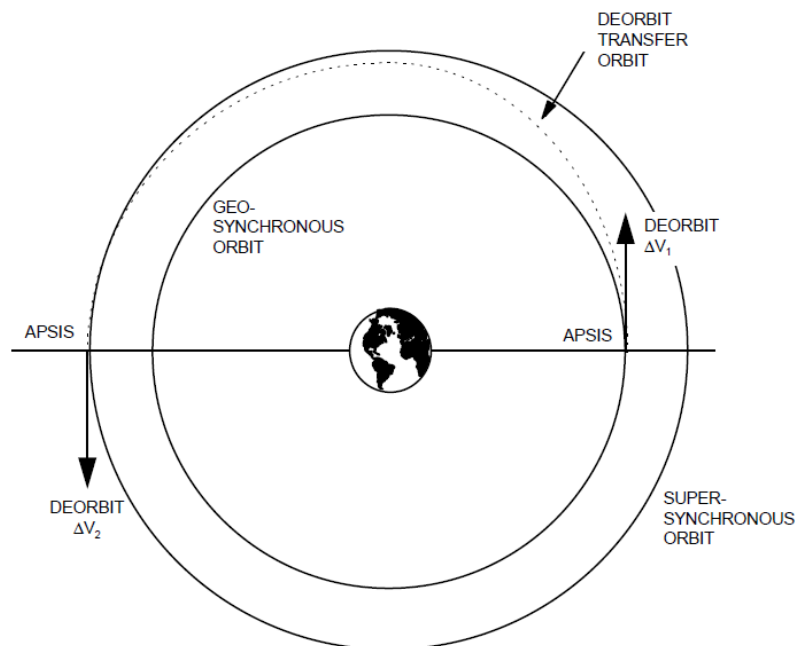


Figure 1. End-of-Life Deorbit Geometry

ANNEX 1

C BAND

COPOLAR ANTENNA GAIN CONTOURS FOR THE AMERICA BEAM

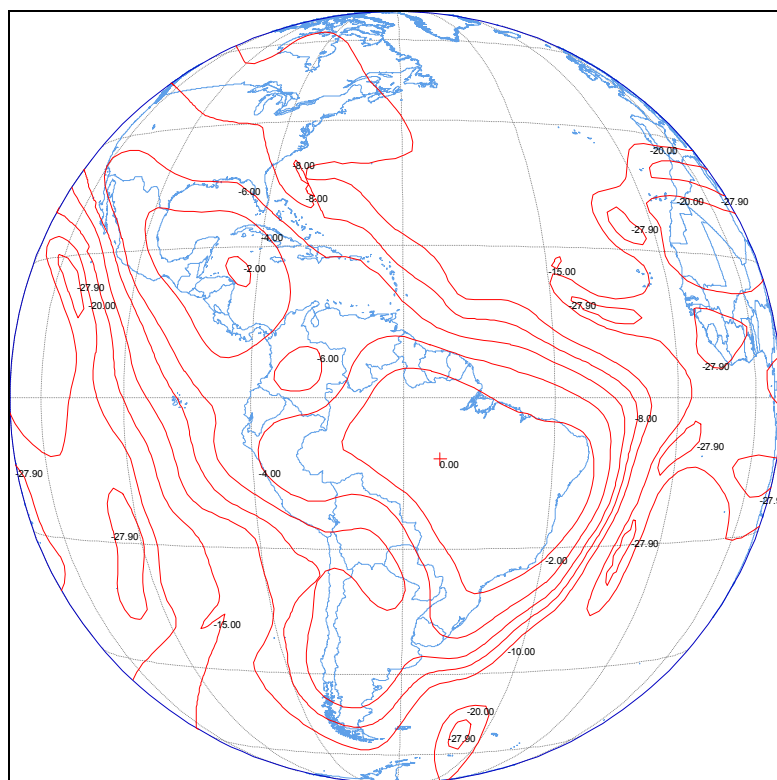


Figure-1: Antenna gain contours contained in VUPCBRAh.GXT (AMERICA receive beam horizontal polarization, copolar)

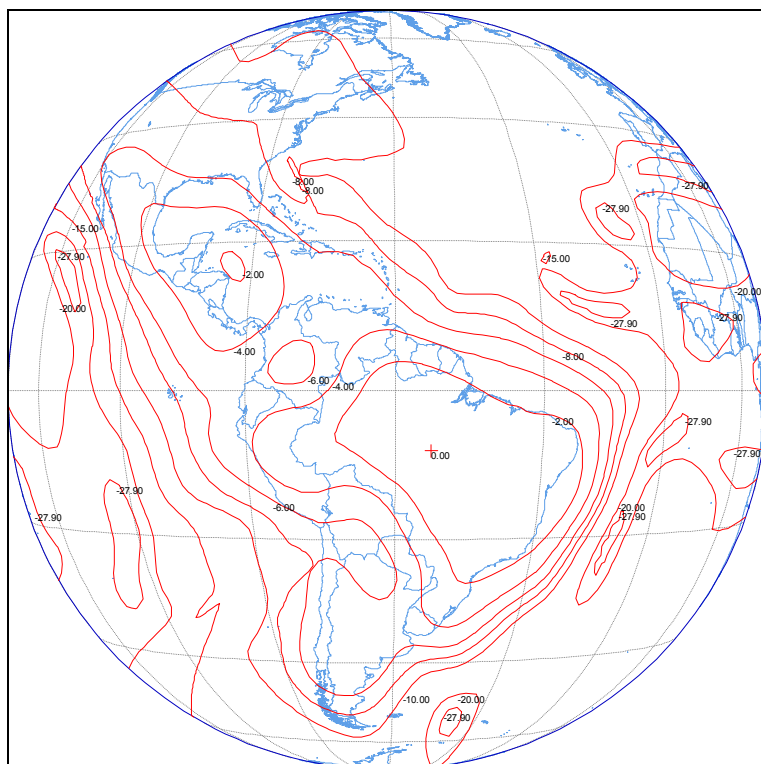


Figure-2: Antenna gain contours contained in VUPCBRAv.GXT (AMERICA receive beam vertical polarization, copolar)

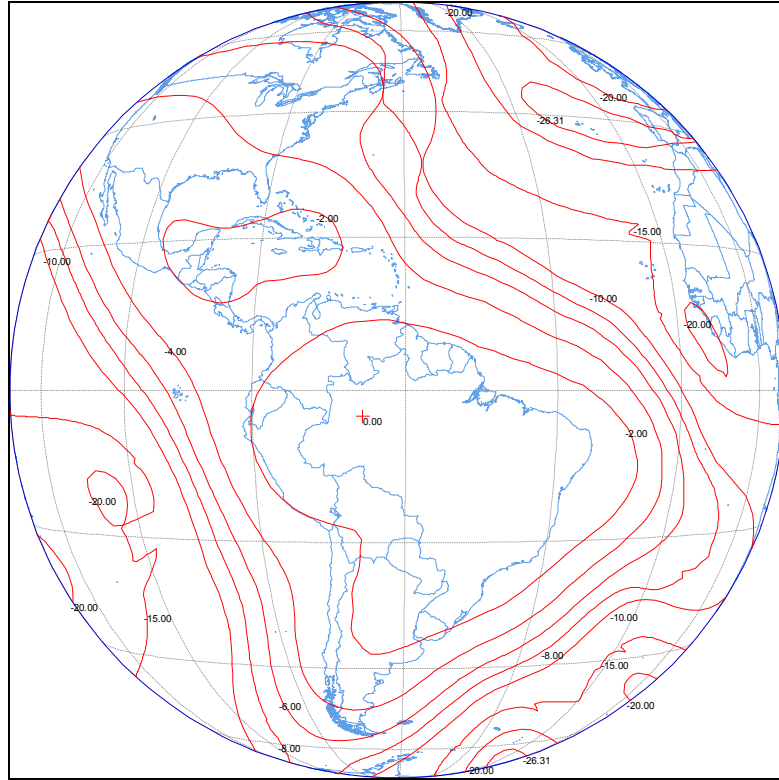


Figure-3: Antenna gain contours contained in VDWCBRhC.GXT (AMERICA transmit beam horizontal polarization, copolar)

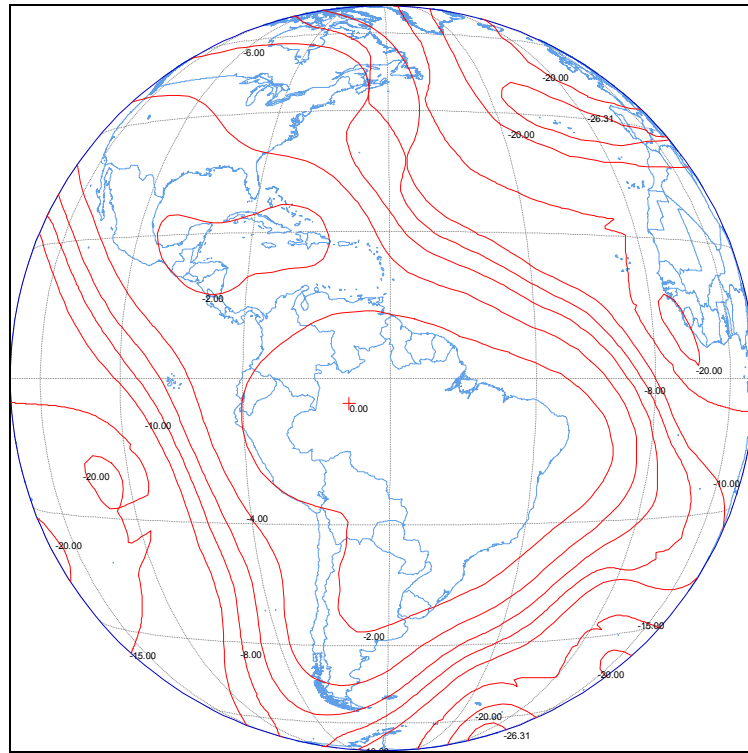


Figure-4: Antenna gain contours contained in VDWCBRvC.GXT (AMERICA transmit beam vertical polarization, copolar)

ANNEX 2

KU BAND COPOLAR ANTENNA GAIN CONTOURS FOR THE NORTH AMERICA BEAM

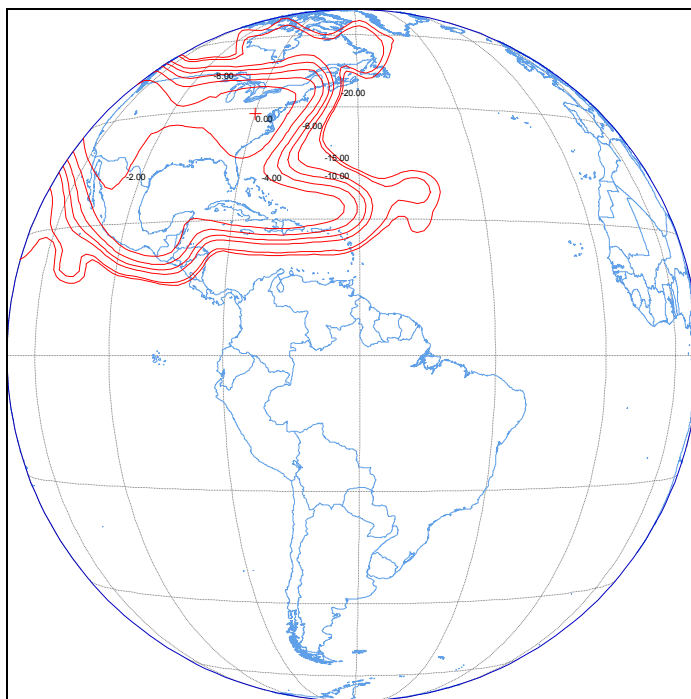


Figure-5: Antenna gain contours contained in *vupkunach.GXT* (NORTH AMERICA receive beam horizontal polarization, copolar).

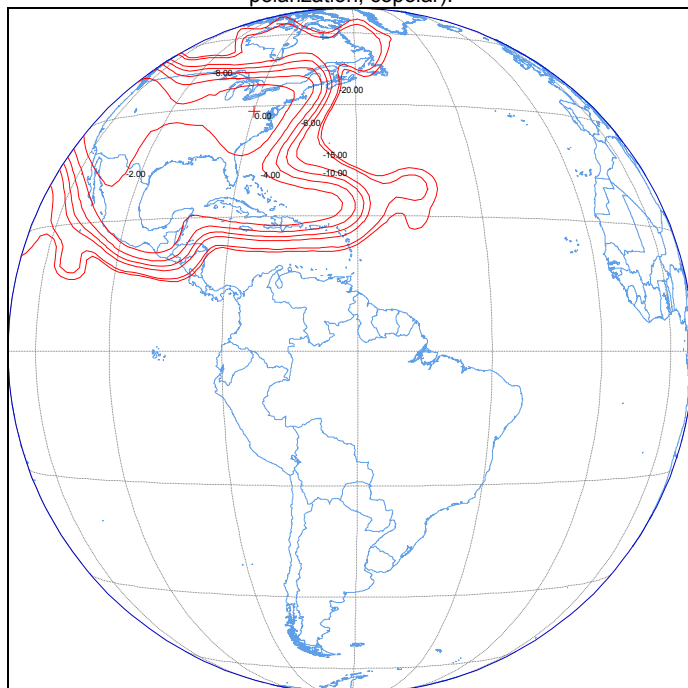


Figure-6: Antenna gain contours contained in *vupkunacv.GXT* (NORTH AMERICA receive beam vertical polarization, copolar).

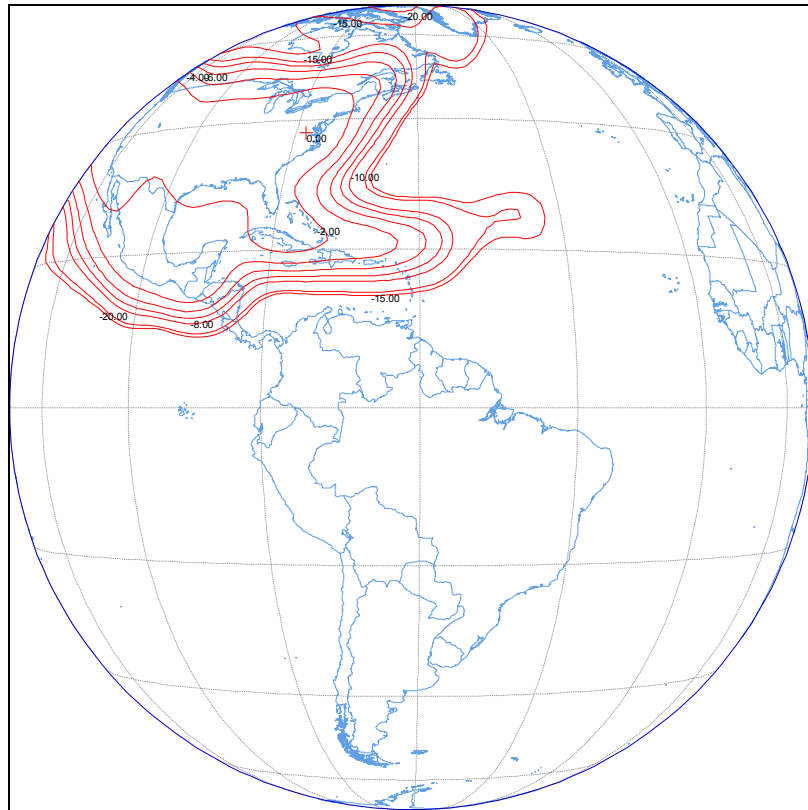


Figure-7: Antenna gain contours contained in *vdwkunach.GXT* (NORTH AMERICA transmit beam horizontal polarization, copolar).

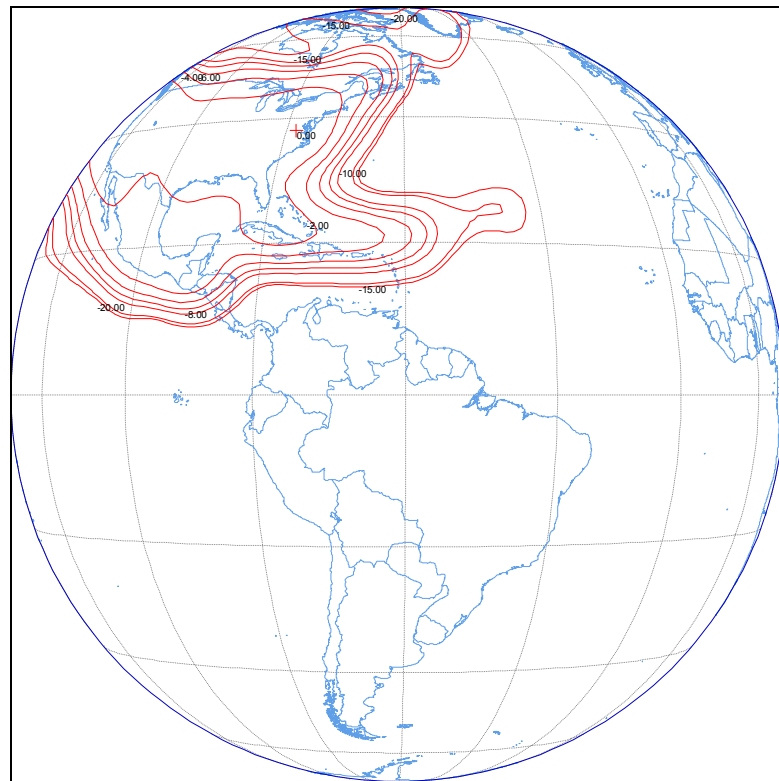


Figure-8: Antenna gain contours contained in *vdwkunacv.GXT* (NORTH AMERICA transmit beam vertical polarization, copolar).

ANNEX 3

KA BAND COPOLAR ANTENNA GAIN CONTOURS

ANNEX 3 SECTION-1: SAO PAULO

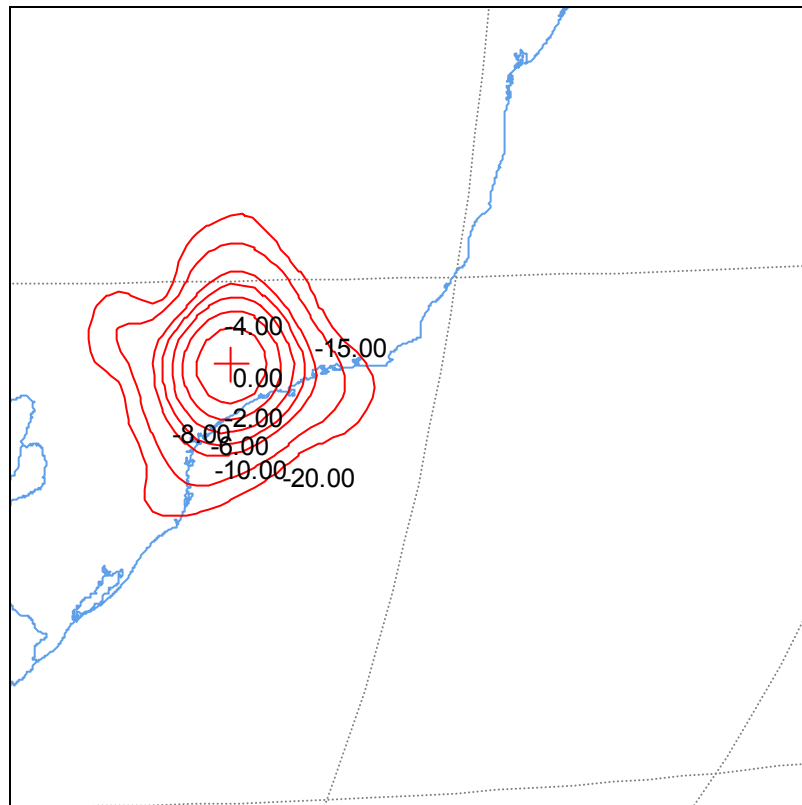


Figure-9: Antenna gain contours contained in RT1U_C.GXT (SAO PAULO receive beam left hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

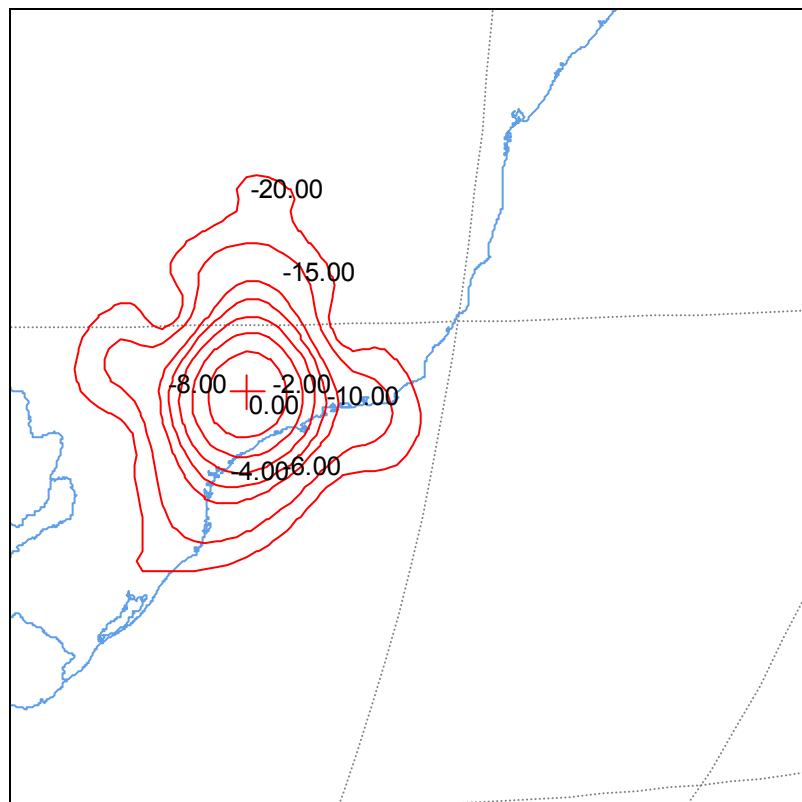


Figure-10: Antenna gain contours contained in FW1D_C.GXT (SAO PAULO transmit beam right hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

ANNEX 3 SECTION-2: SANTIAGO

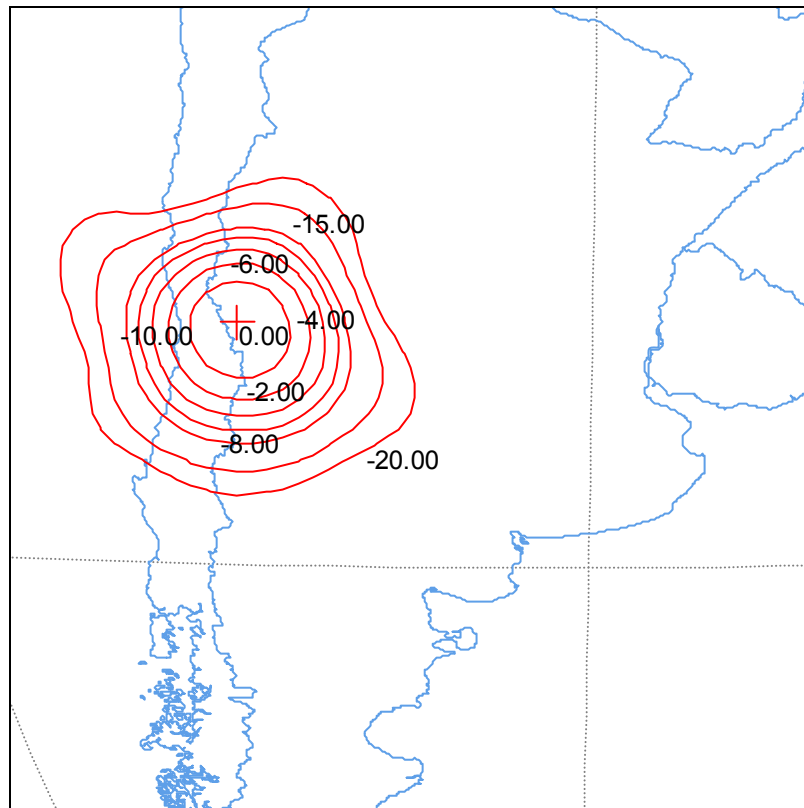


Figure-11: Antenna gain contours contained in RT6U_C.GXT (SANTIAGO receive beam right hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

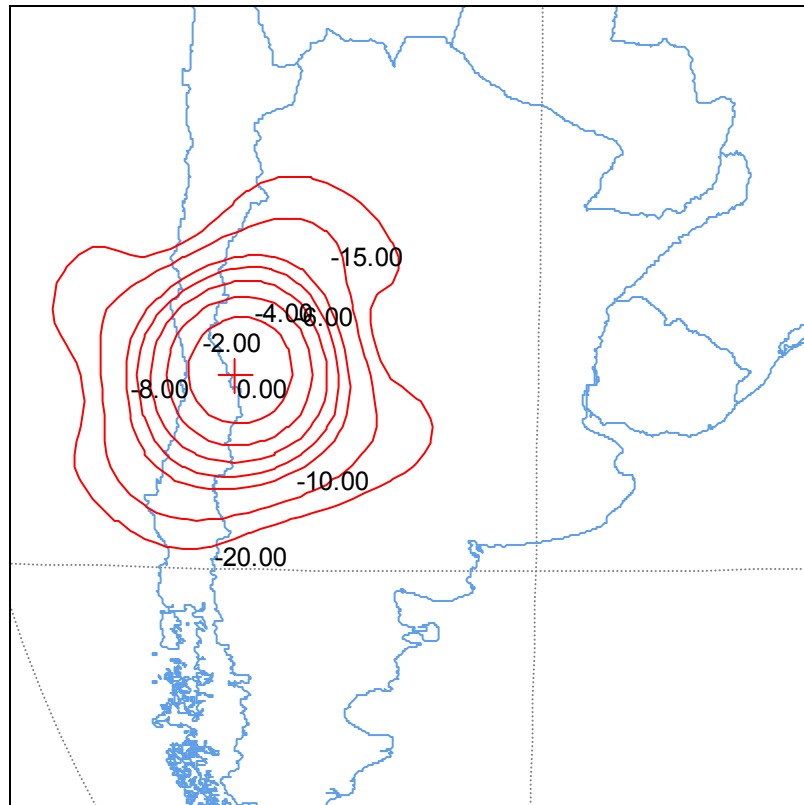


Figure-12: Antenna gain contours contained in FW6D_C.GXT (SANTIAGO transmit beam left hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

ANNEX 3 SECTION-3: RIO

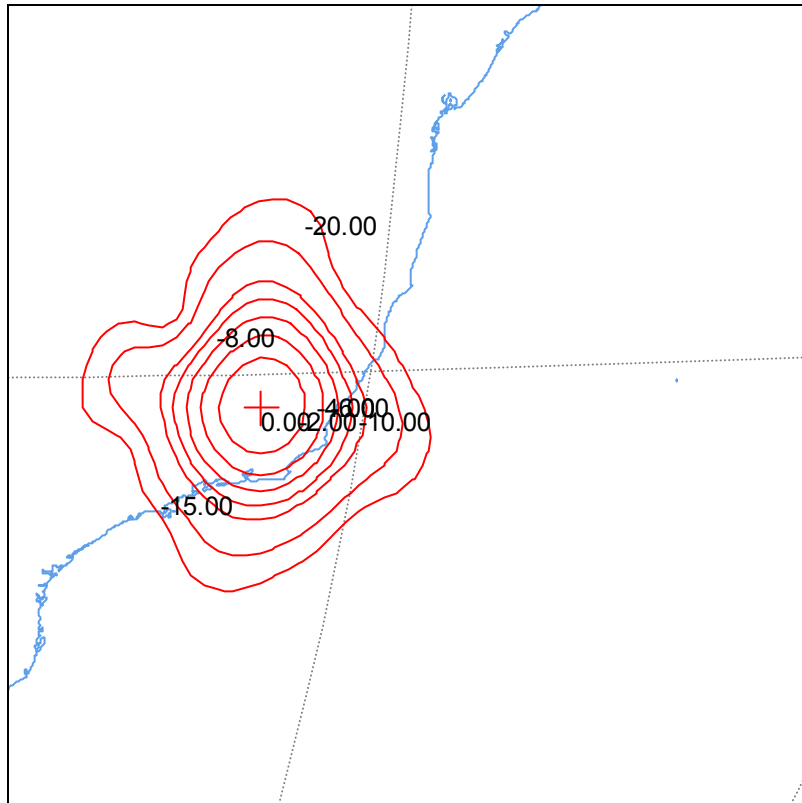


Figure-13: Antenna gain contours contained in RT9U_C.GXT (RIO receive beam right hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

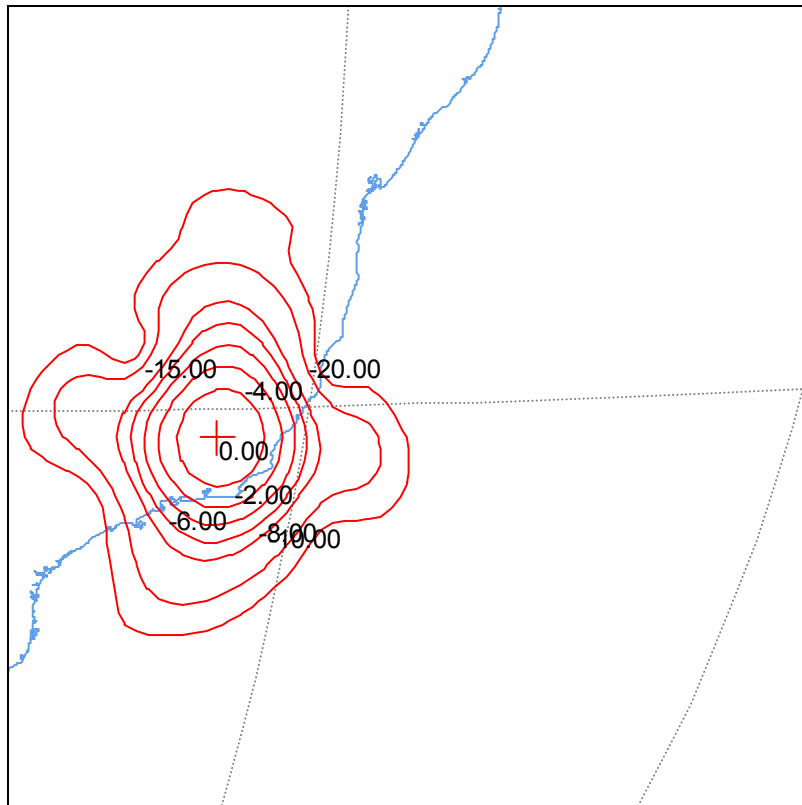


Figure-14: Antenna gain contours contained in FW9D_C.GXT (RIO transmit beam left hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

ANNEX 3 SECTION-4: MEXICO

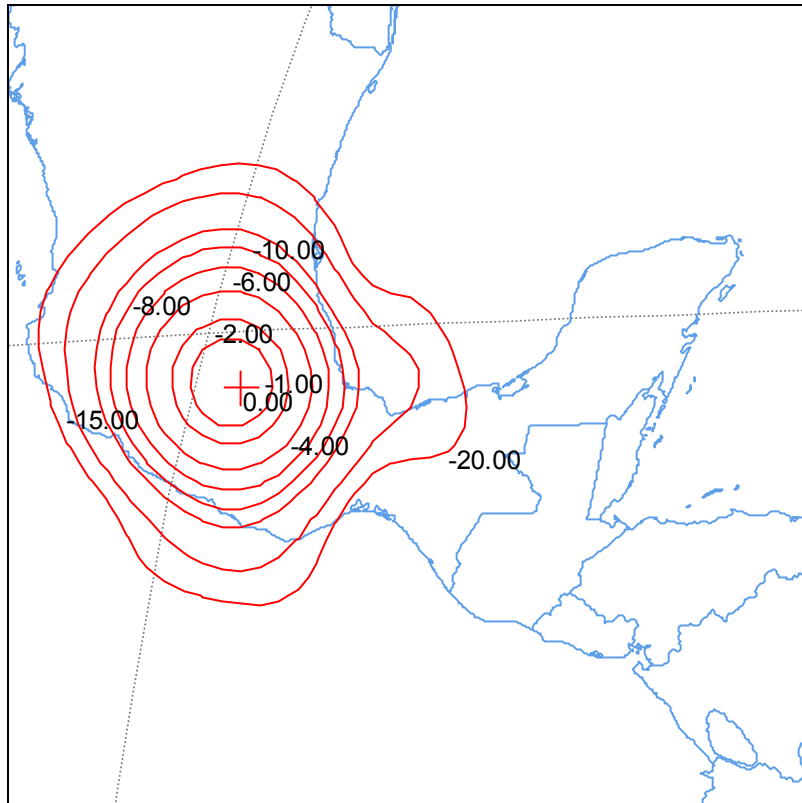


Figure-15: Antenna gain contours contained in RT3U_C.GXT (MEXICO receive beam left hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

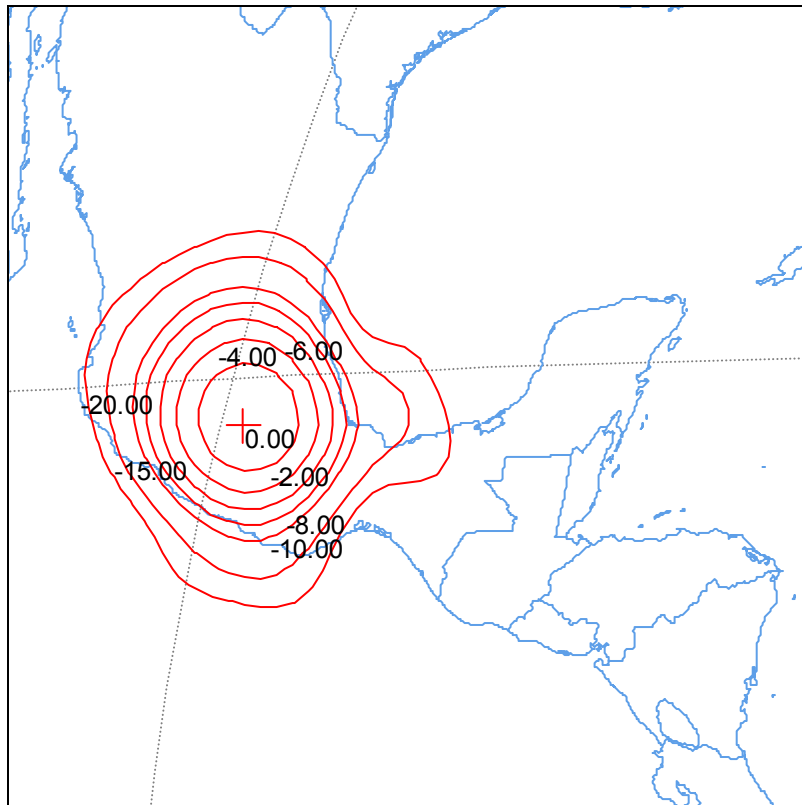


Figure-16: Antenna gain contours contained in RT5U_C.GXT (MEXICO receive beam right hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

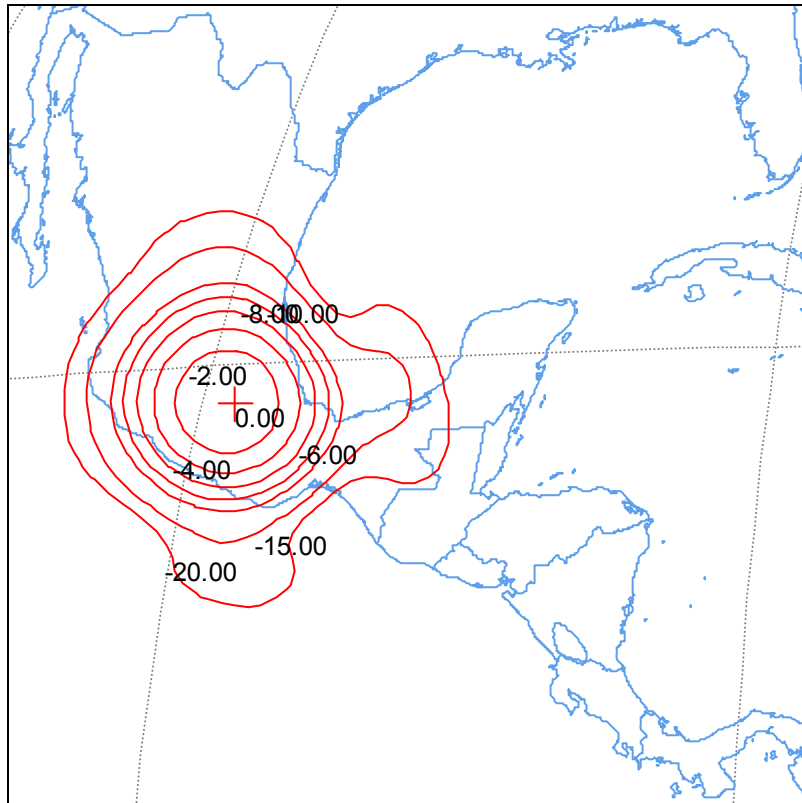


Figure-17: Antenna gain contours contained in FW5D_C.GXT (MEXICO transmit beam left hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

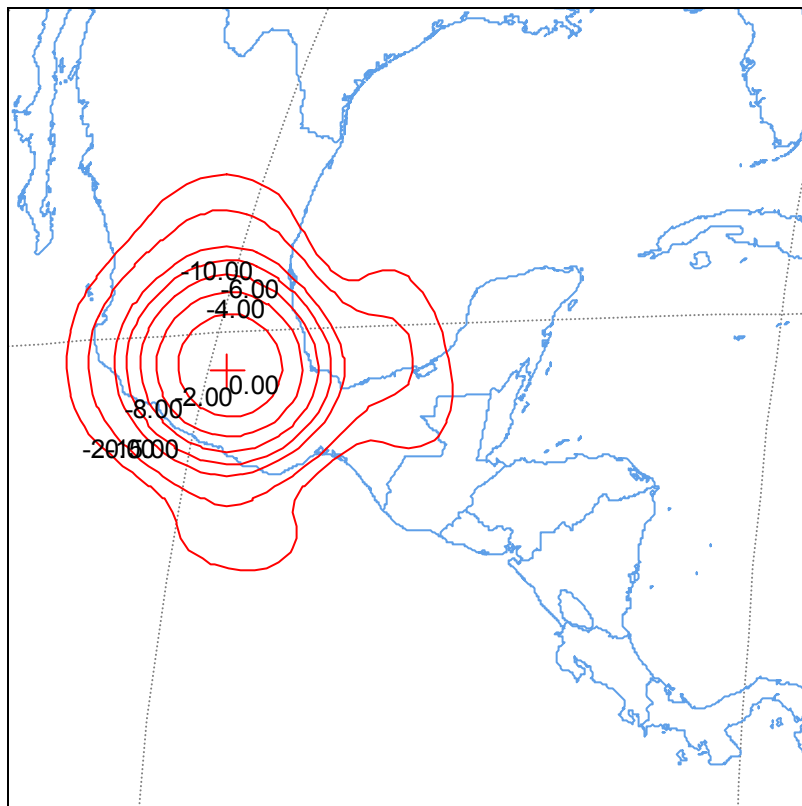


Figure-18: Antenna gain contours contained in FW3D_C.GXT (MEXICO transmit beam right hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

ANNEX 3 SECTION-5: LIMA

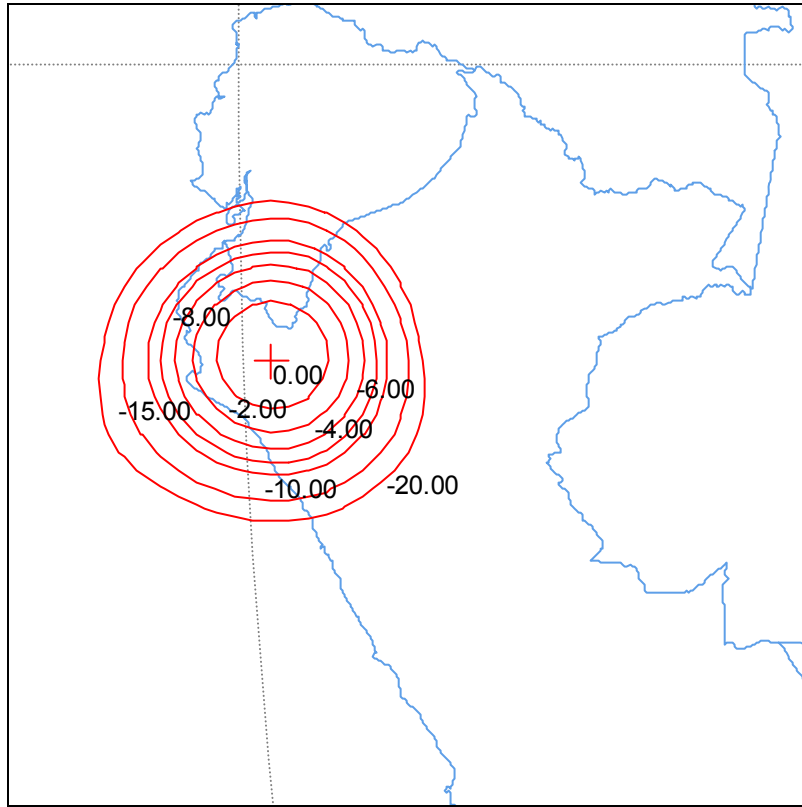


Figure-19: Antenna gain contours contained in RT8U_C.GXT (LIMA receive beam left hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

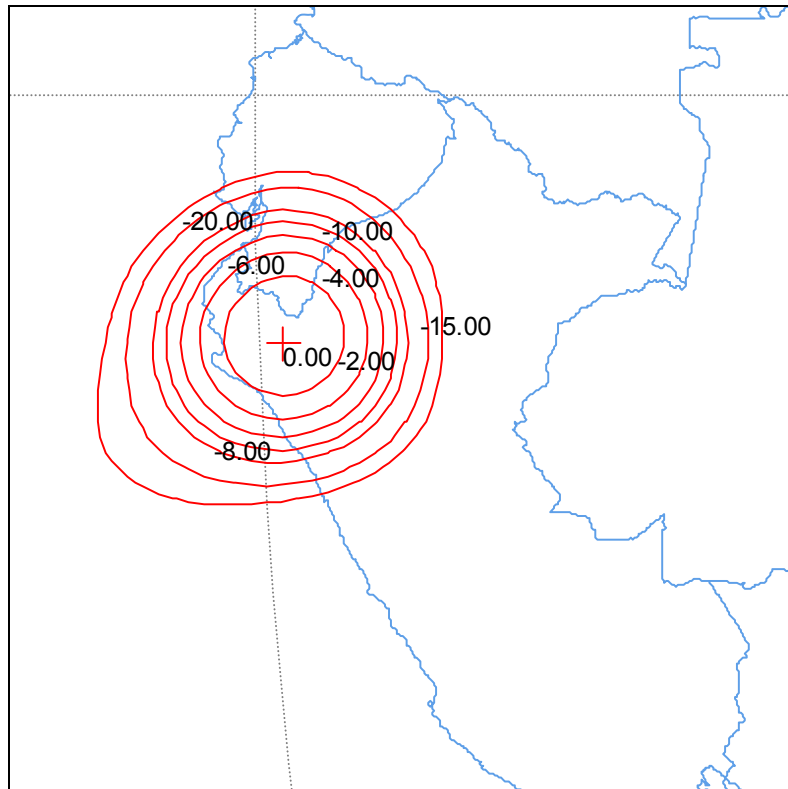


Figure-20: Antenna gain contours contained in FW8D_C.GXT (LIMA transmit beam right hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

ANNEX 3 SECTION-6: BUENOS AIRES

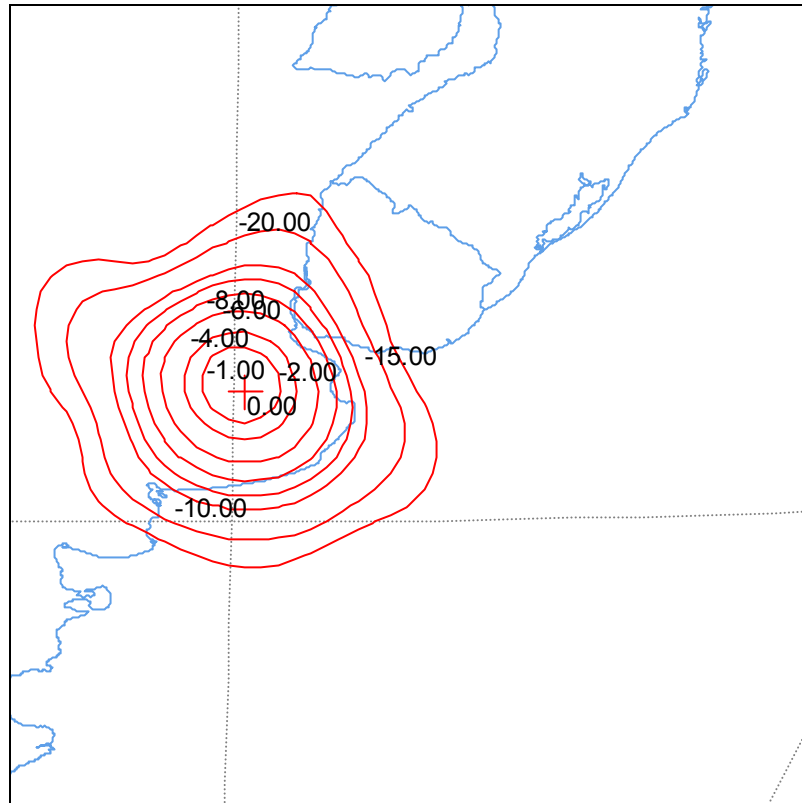


Figure-21: Antenna gain contours contained in RT2U_C.GXT (BUENOS AIRES receive beam left hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

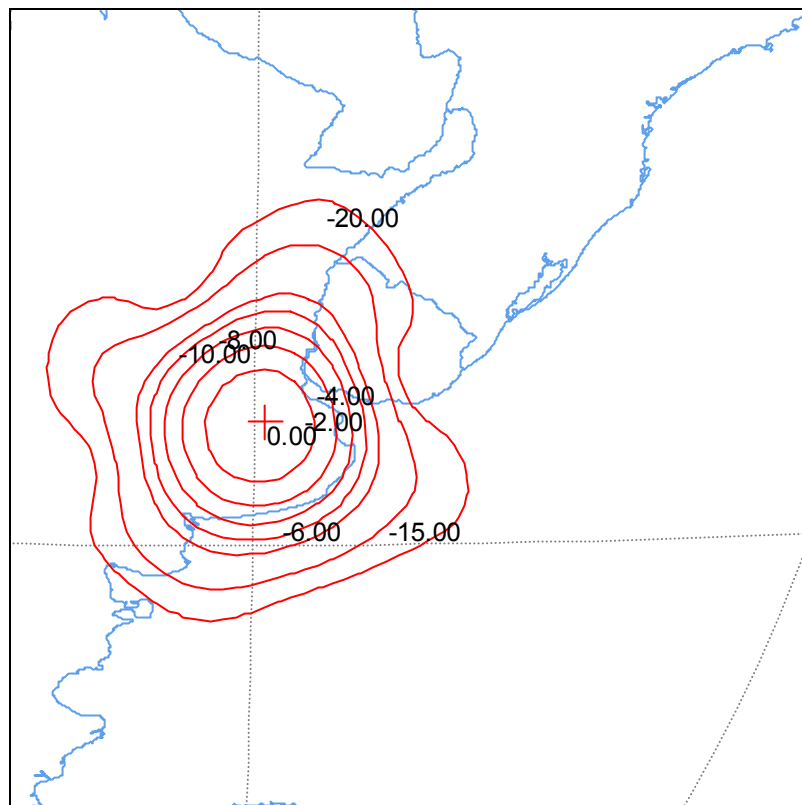


Figure-22: Antenna gain contours contained in FW2D_C.GXT (BUENOS AIRES transmit beam right hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

ANNEX 3 SECTION-7: BOGOTA

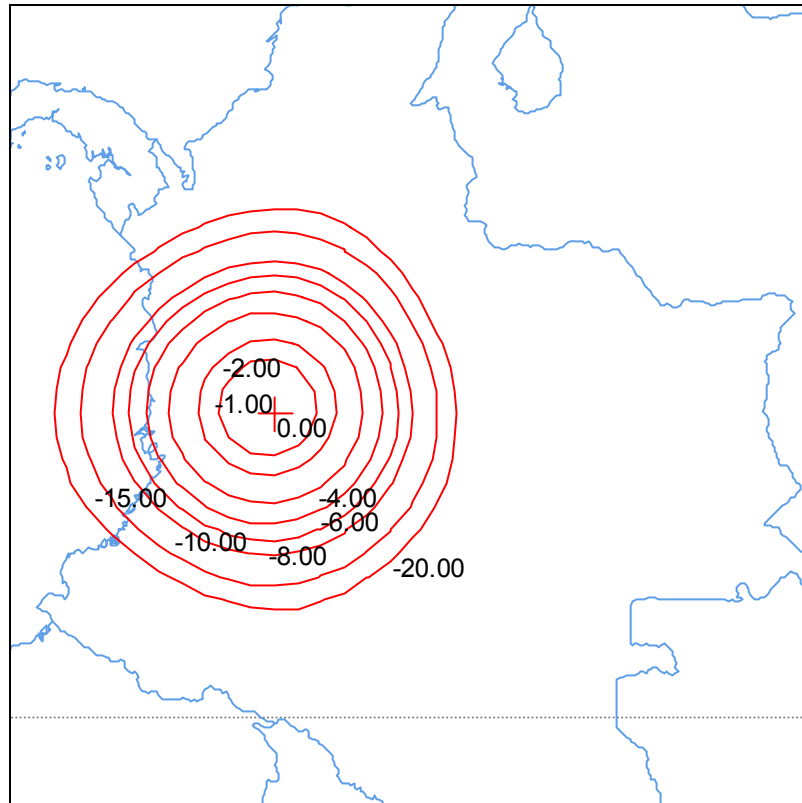


Figure-23: Antenna gain contours contained in RT7U_C.GXT (BOGOTA receive beam left hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

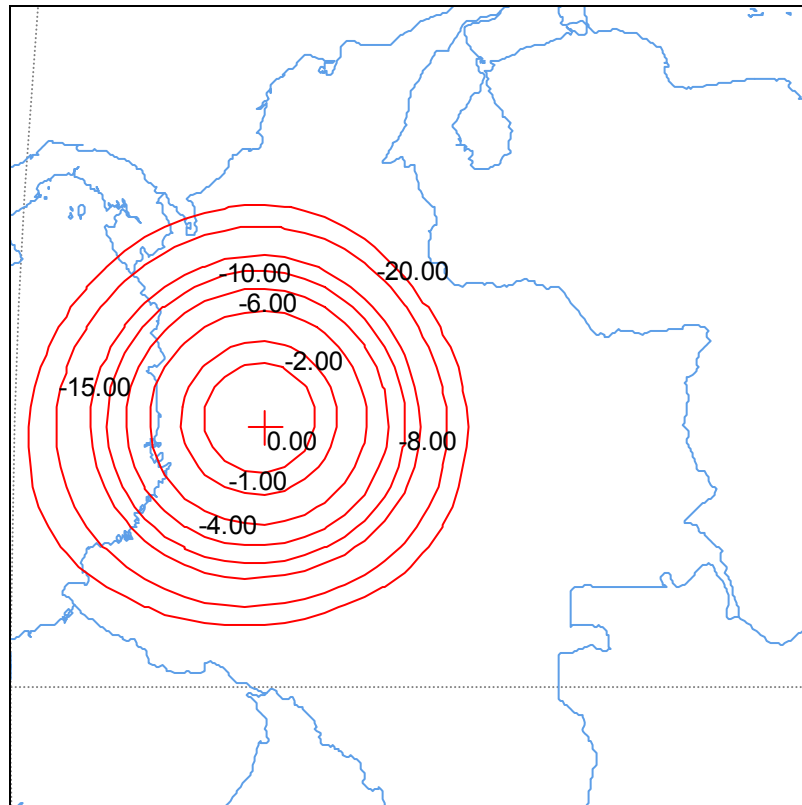


Figure-24: Antenna gain contours contained in FW7D_C.GXT (BOGOTA transmit beam right hand polarization, copolar). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

ANNEX 3 SECTION-8: LAREDO

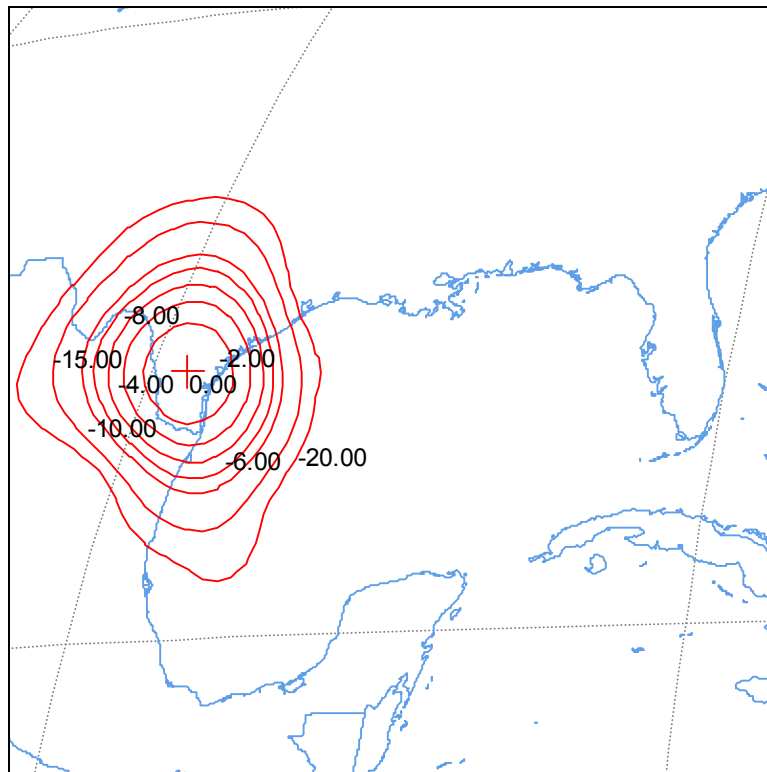


Figure-25: Antenna gain contours contained in FW5U_C.GXT (LAREDO receive beam left hand polarization, copolar, frequency band 28.1 – 28.6 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

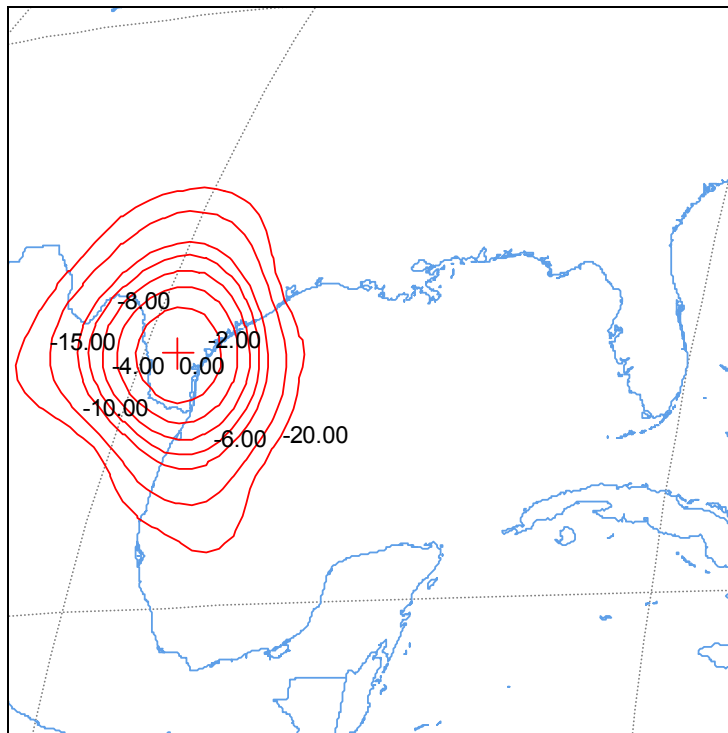


Figure-26: Antenna gain contours contained in FW3U_C.GXT (LAREDO receive beam right hand polarization, copolar, frequency band 28.1 – 28.6 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

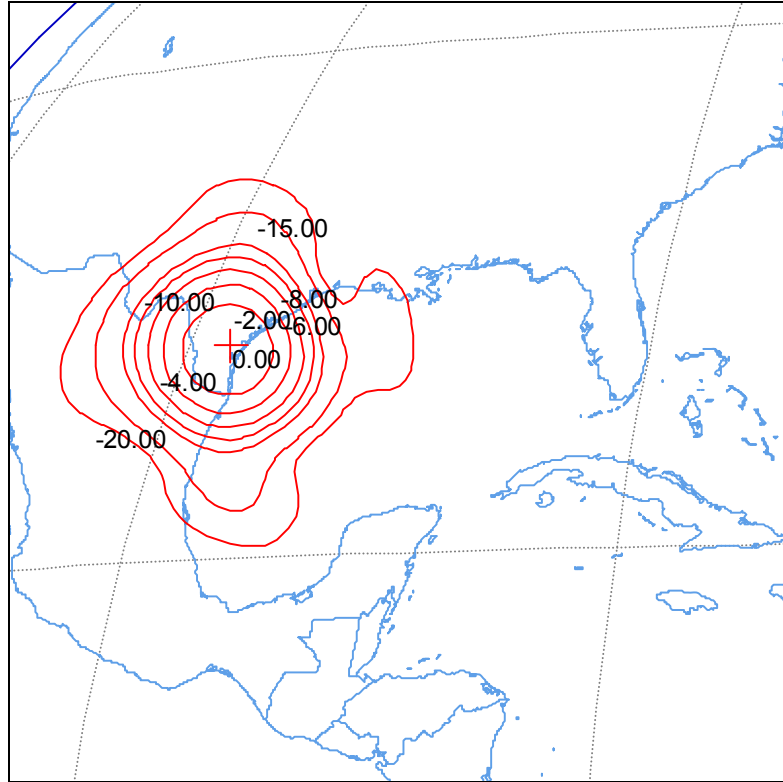


Figure-27: Antenna gain contours contained in RT3D_C.GXT (LAREDO transmit beam left hand polarization, copolar, frequency band 18.3 – 18.8 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

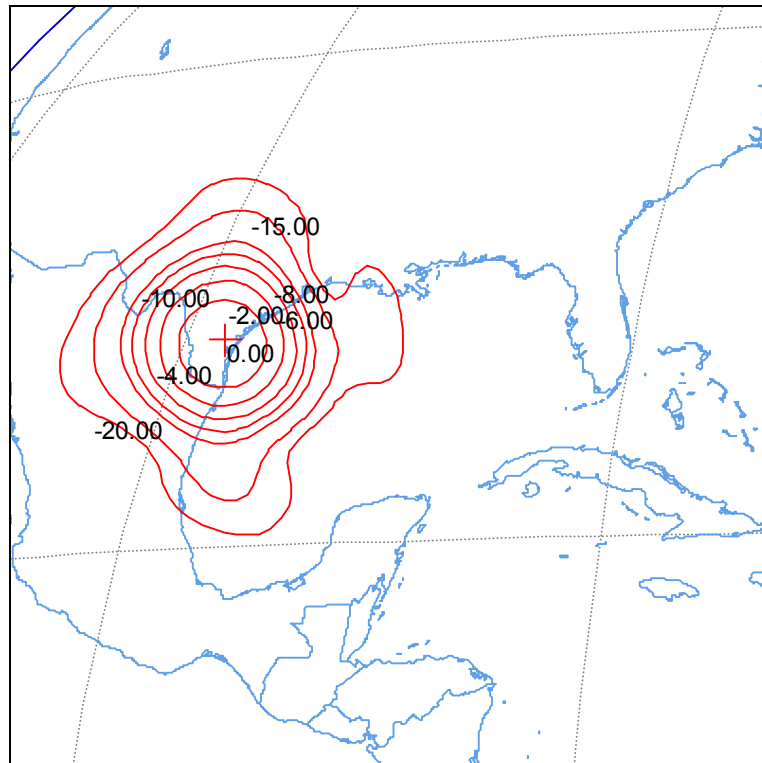


Figure-28: Antenna gain contours contained in RT5D_C.GXT (LAREDO transmit beam right hand polarization, copolar, frequency band 18.3 – 18.8 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

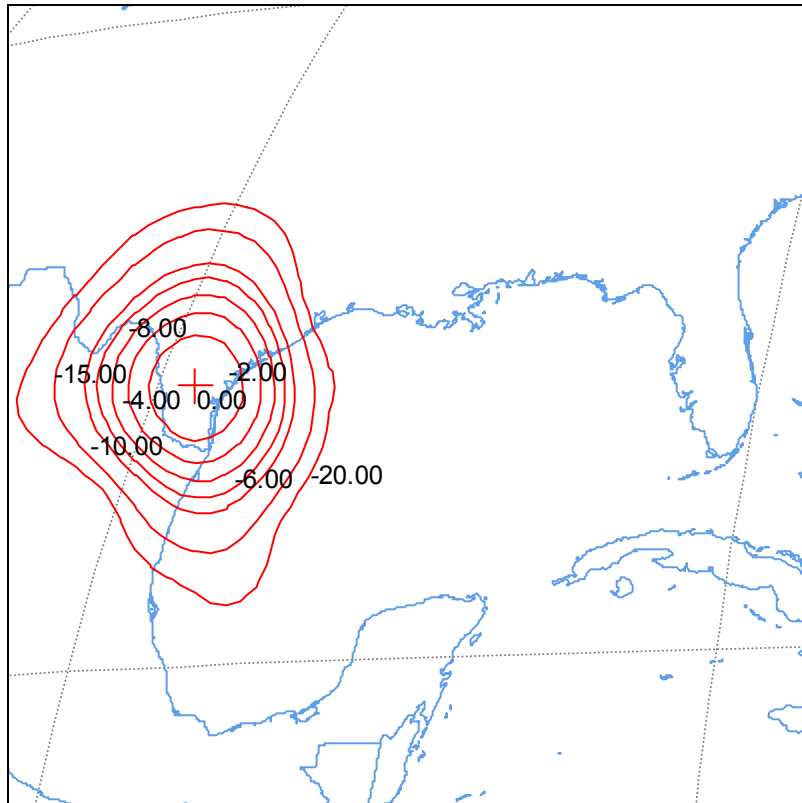


Figure-29: Antenna gain contours contained in FW9U_C.GXT (LAREDO receive beam left hand polarization, copolar, frequency band 29.5 – 30 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

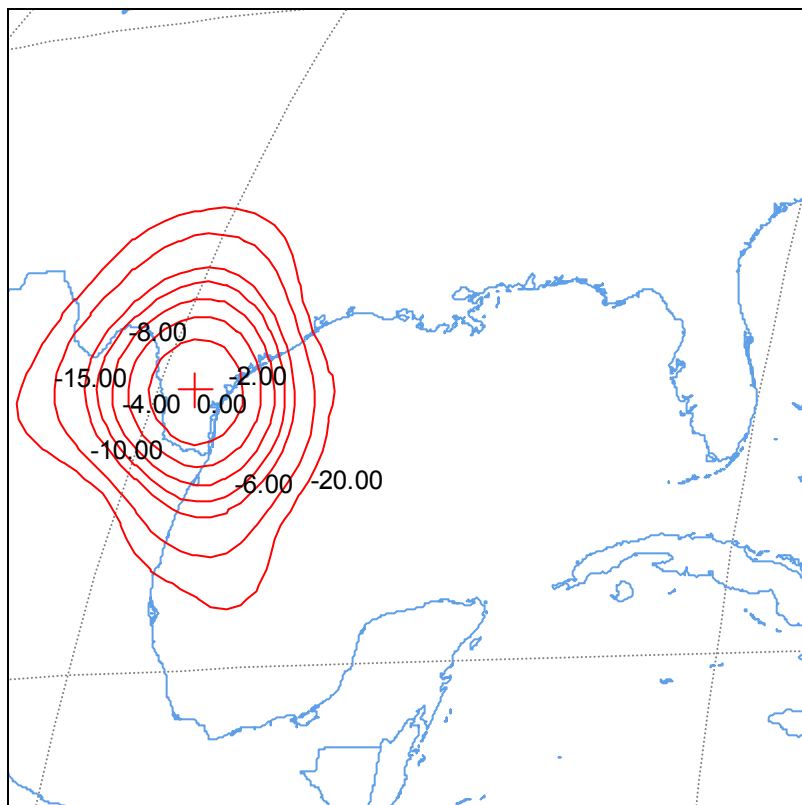


Figure-30: Antenna gain contours contained in FW2U_C.GXT (LAREDO receive beam right hand polarization, copolar, frequency band 29.5 – 30 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

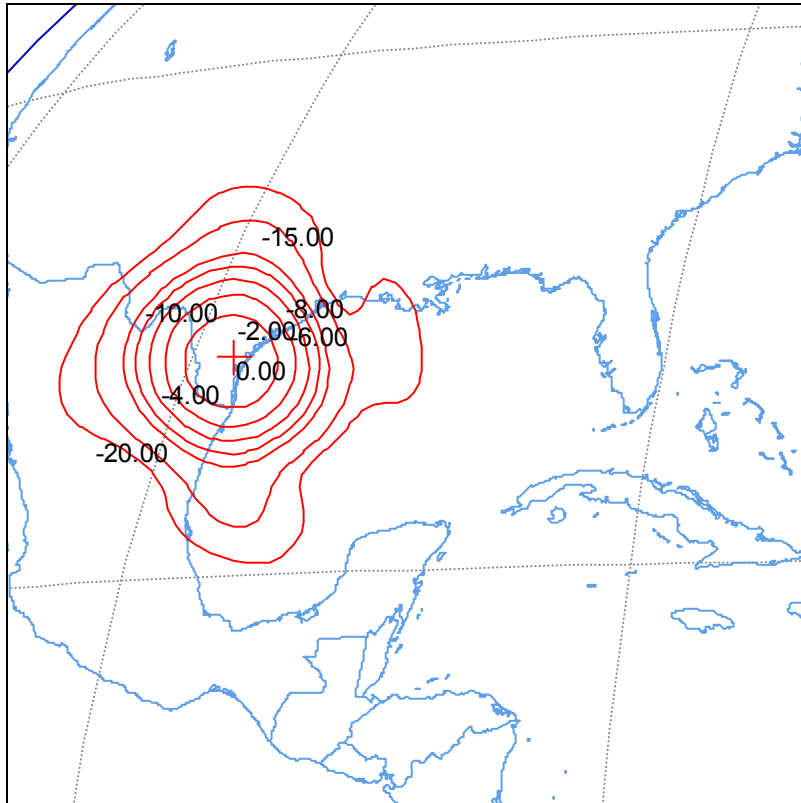


Figure-31: Antenna gain contours contained in RT2D_C.GXT (LAREDO transmit beam left hand polarization, copolar, frequency band 19.7 – 20.2 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

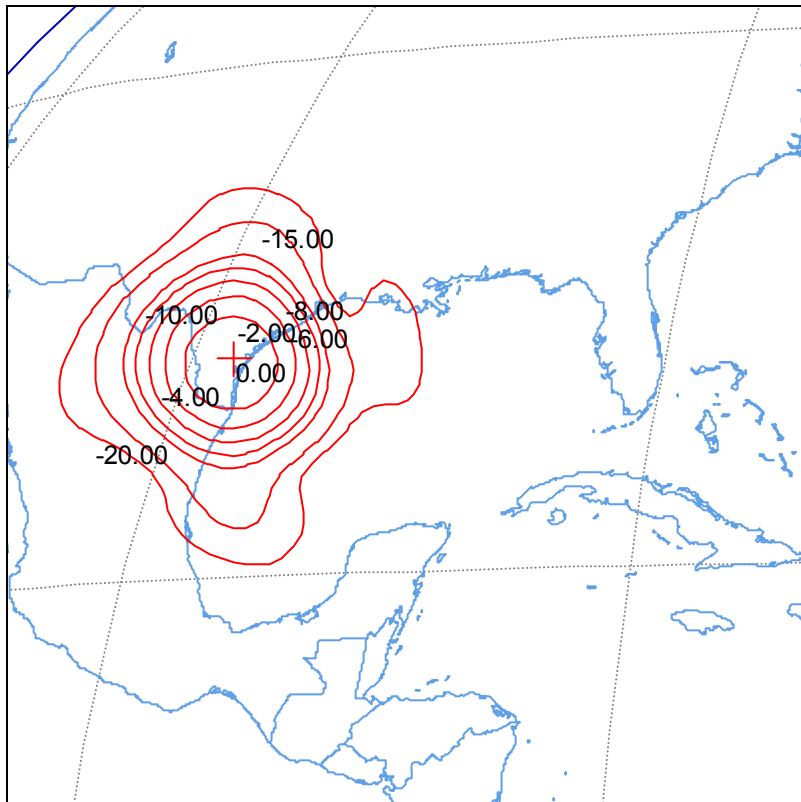


Figure-32: Antenna gain contours contained in RT9D_C.GXT (LAREDO transmit beam right hand polarization, copolar, frequency band 19.7 – 20.2 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

ANNEX 3 SECTION-9: TUCSON

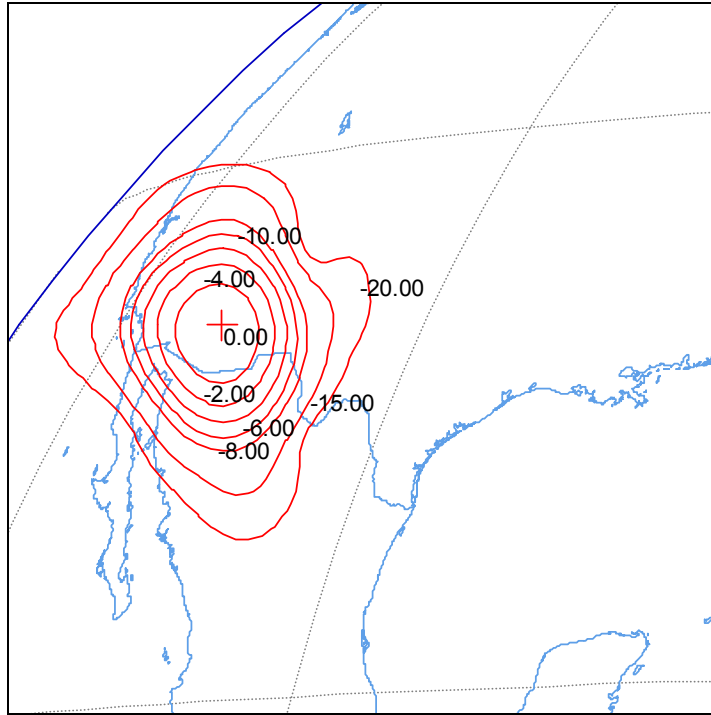


Figure-33: Antenna gain contours contained in FW6U_C.GXT (TUCSON receive beam left hand polarization, copolar, frequency band 28.1 – 28.6 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

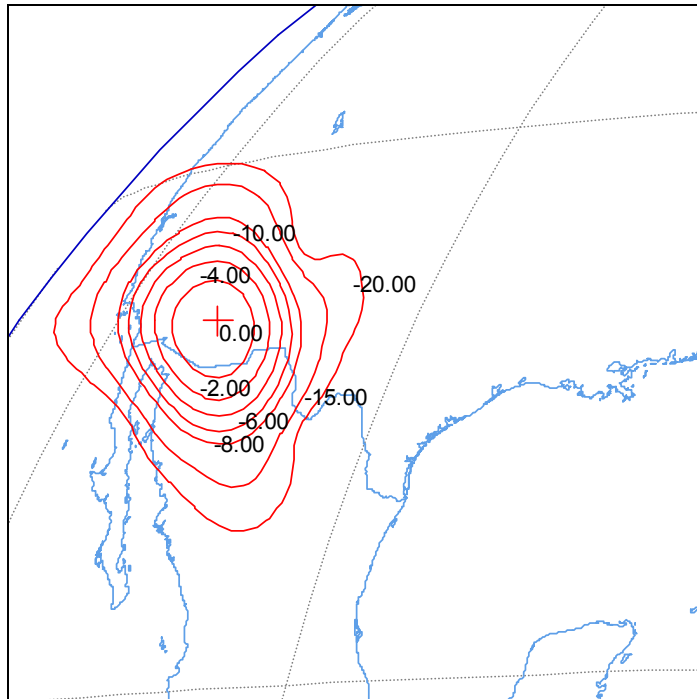


Figure-34: Antenna gain contours contained in FW1U_C.GXT (TUCSON receive beam right hand polarization, copolar, frequency band 28.1 – 28.6 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

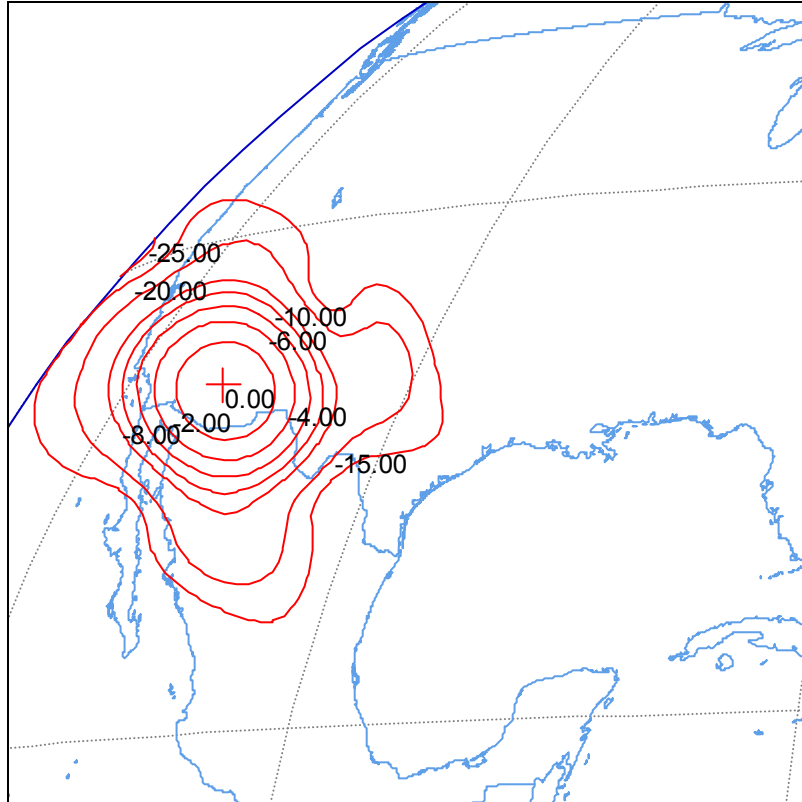


Figure-35: Antenna gain contours contained in RT1D_C.GXT (TUCSON transmit beam left hand polarization, copolar, frequency band 18.3 – 18.8 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

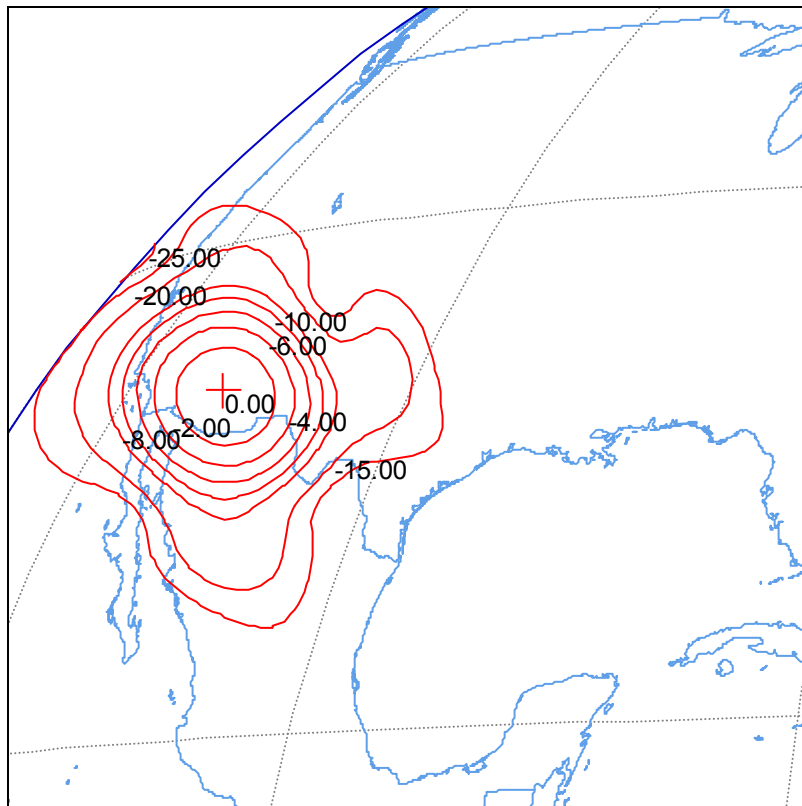


Figure-36: Antenna gain contours contained in RT6D_C.GXT (TUCSON transmit beam right hand polarization, copolar, frequency band 18.3 – 18.8 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

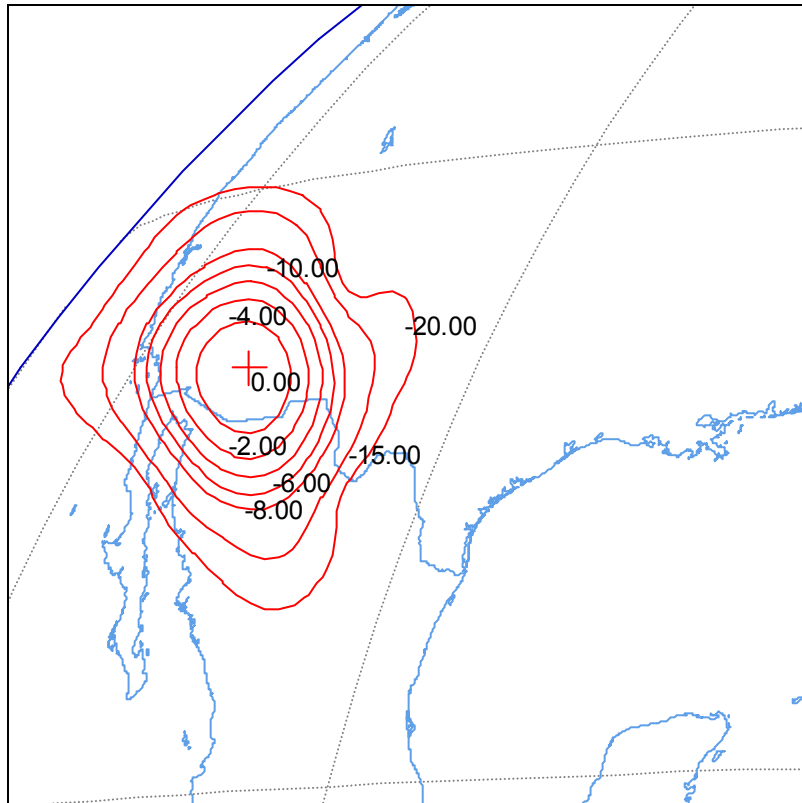


Figure-37: Antenna gain contours contained in FW8U_C.GXT (TUCSON receive beam left hand polarization, copolar, frequency band 29.5 – 30 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

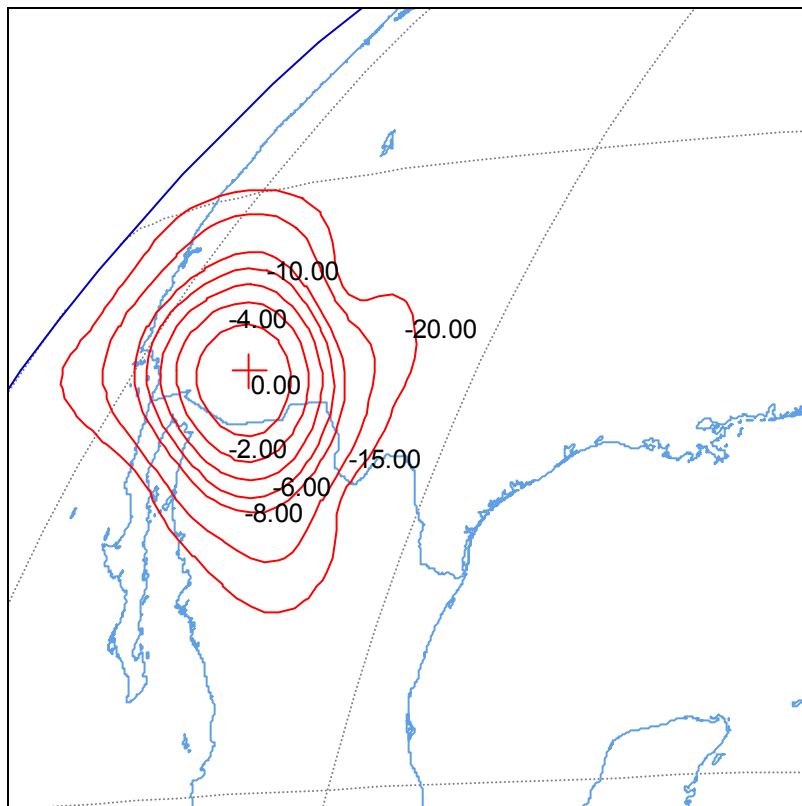


Figure-38: Antenna gain contours contained in FW7U_C.GXT (TUCSON receive beam right hand polarization, copolar, frequency band 29.5 – 30 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

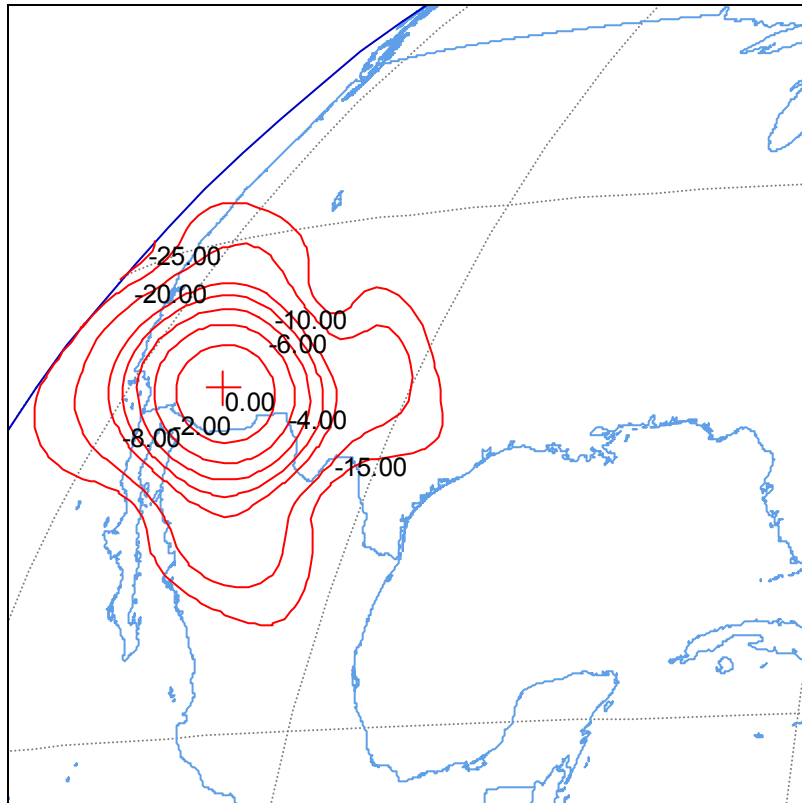


Figure-39: Antenna gain contours contained in RT7D_C.GXT (TUCSON transmit beam left hand polarization, copolar, frequency band 19.7 – 20.2 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.

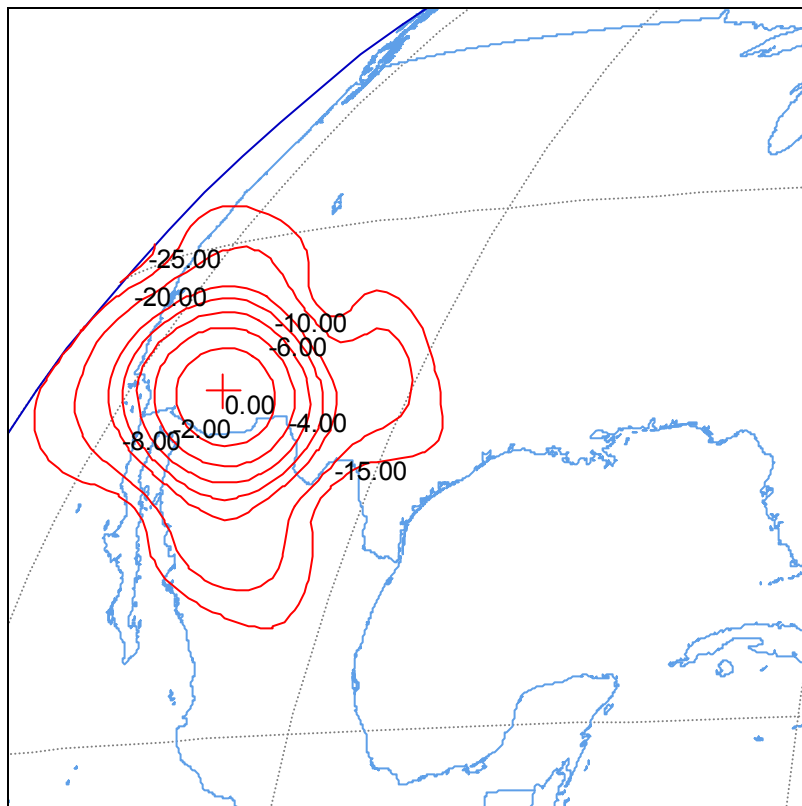


Figure-40: Antenna gain contours contained in RT8D_C.GXT (TUCSON transmit beam right hand polarization, copolar, frequency band 19.7 – 20.2 GHz). Contours represented: -2, -4, -6, -8, -10, -15, -20 dB.