

Technical Exhibit

SkyTerra Subsidiary LLC (“SkyTerra”) amends its pending application by submitting a revised, complete Schedule S, which includes beam diagrams (gxt files) for the LE2, LR2, LE5, OmniR, and OmniE beams and link budgets for the Data2, QPSK-V, and MMS carriers (forward and return). Beam contour maps and links budgets for the operation of MSAT-2 at 103.3°W are also provided in this Technical Exhibit.

Table 1- MSAT MMS Carrier EOC Link Budget			
		FORWARD	RETURN
PARAMETER	UNITS	(Hub to User)	(User to Hub)
Noise Bandwidth	kHz	1	1
Boltzmann's constant	dBW/Hz·°K	-228.6	-228.6
UPLINK		Clear	Clear
Frequency	GHz	13	1.64
Earth Station EIRP	dBW	47	4.0
Body Shielding Loss	dB	x	0
Polarization Loss	dB	x	-0.5
Free Space Loss	dB	-206.7	-188.8
Uplink Fade	dB	0	0
Satellite Antenna Gain, EOC	dB _i	29	29
Received Carrier Power	dBW	-130.7	-156.3
Satellite G/T	dB/°K	-1	5
Intersystem Interference Allowance	dB	0.5	1
C/No	dB·Hz	67.4	47.3
C/Imo	dB·Hz	52.0	54.0
Satellite C/(No+Io)	dB·Hz	51.9	46.5
DOWNLINK			
Frequency	GHz	1.55	11
Satellite Active Gain	dB	123.3	122
Satellite Antenna Gain, EOC	dB _i	29	29
Satellite EOC EIRP	dBW	21.6	-5.3
Free Space Loss	dB	-188.5	-205.2
Downlink Fade	dB	x	0
Earth Station G/T	dB/°K	-20	36.5
Interference Allowance	dB	1	0.5
C/No	dB·Hz	40.7	54.1
LINK			
Link C/(No+Io)	dB·Hz	40.4	45.8
Required C/No	dB·Hz	34.2	34.2
Margin	dB	6.2	11.6

Table 2 – MSAT GC-S Carrier EOC Link Budget			
PARAMETER	UNITS	FORWARD (Hub to User)	RETURN (User to Hub)
Noise Bandwidth	kHz	4	4
Boltzmann's constant	dBW/Hz·°K	-228.6	-228.6
UPLINK		Clear	Clear
Frequency	GHz	13	1.64
Earth Station EIRP	dBW	54.5	12
Body Shielding Loss	dB	x	0
Polarization Loss	dB	x	-0.5
Free Space Loss	dB	-206.7	-188.8
Uplink Fade	dB	0	0
Satellite Antenna Gain, EOC	dBi	29	29
Received Carrier Power	dBW	-123.2	-148.3
Satellite G/T	dB/°K	-1	5
Intersystem Interference	dB	0.5	1
Allowance			
C/No	dB·Hz	74.9	55.3
C/Imo	dB·Hz	58.0	60.0
Satellite C/(No+Io)	dB·Hz	57.9	54.0
DOWNLINK			
Frequency	GHz	1.55	11
Satellite Active Gain	dB	123.3	122
Satellite Antenna Gain, EOC	dBi	29	29
Satellite EOC EIRP	dBW	29.1	2.7
Free Space Loss	dB	-188.5	-205.2
Downlink Fade	dB	x	0
Earth Station G/T	dB/°K	-16	36.5
Interference Allowance	dB	1	0.5
C/No	dB·Hz	52.2	62.1
LINK			
Link C/(No+Io)	dB·Hz	51.2	53.4
Required C/No	dB·Hz	45.0	45.0
Margin	dB	6.2	8.4

Table 3 – MSAT DATAF Carrier EOC Link Budget			
		FORWARD	RETURN
PARAMETER	UNITS	(Hub to User)	(User to Hub)
Noise Bandwidth	kHz	300	300
Boltzmann's constant	dBW/Hz·°K	-228.6	-228.6
UPLINK		Clear	Clear
Frequency	GHz	13	1.64
Earth Station EIRP	dBW	65.5	23.9
Body Shielding Loss	dB	x	0
Polarization Loss	dB	x	-0.5
Free Space Loss	dB	-206.7	-188.8
Uplink Fade	dB	0	0
Satellite Antenna Gain, EOC	dB _i	29	29
Received Carrier Power	dBW	-112.2	-136.4
Satellite G/T	dB/°K	-1	5
Intersystem Interference Allowance	dB	0.5	1
C/No	dB·Hz	85.9	67.2
C/Imo	dB·Hz	76.8	78.8
Satellite C/(No+Io)	dB·Hz	76.3	66.9
DOWNLINK			
Frequency	GHz	1.55	11
Satellite Active Gain	dB	123.3	122
Satellite Antenna Gain, EOC	dB _i	29	29
Satellite EOC EIRP	dBW	40.1	14.6
Free Space Loss	dB	-188.5	-205.2
Downlink Fade	dB	x	0
Earth Station G/T	dB/°K	-10	36.5
Interference Allowance	dB	1	0.5
C/No	dB·Hz	69.2	74
LINK			
Link C/(No+Io)	dB·Hz	68.4	66.1
Required C/No	dB·Hz	58.8	58.8
Margin	dB	9.6	7.3

Table 4 - MSAT DATA1 Carrier EOC Link Budget			
		FORWARD	RETURN
PARAMETER	UNITS	(Hub to User)	(User to Hub)
Noise Bandwidth	kHz	168	168
Boltzmann's constant	dBW/Hz·K	-228.6	-228.6
UPLINK		Clear	Clear
Frequency	GHz	13	1.64
Earth Station EIRP	dBW	55.4	6.5
Body Shielding Loss	dB	x	0
Polarization Loss	dB	x	-0.5
Free Space Loss	dB	-206.7	-188.8
Uplink Fade	dB	0	0
Satellite Antenna Gain, EOC	dB _i	29	29
Received Carrier Power	dBW	-122.3	-153.78
Satellite G/T	dB/K	-1	5
Intersystem Interference Allowance	dB	0.5	1
C/No	dB·Hz	75.8	49.82
C/Imo	dB·Hz	74.3	76.3
Satellite C/(No+Io)	dB·Hz	71.9	49.8
DOWNLINK			
Frequency	GHz	1.55	11
Satellite Active Gain	dB	123.3	122
Satellite Antenna Gain, EOC	dB _i	29	29
Satellite EOC EIRP	dBW	30	-2.78
Free Space Loss	dB	-188.5	-205.2
Downlink Fade	dB	x	0
Earth Station G/T	dB/K	-25.3	36.5
Interference Allowance	dB	1	0.5
C/No	dB·Hz	43.8	56.62
LINK			
Link C/(No+Io)	dB·Hz	43.8	49.0
Required C/No	dB·Hz	41.2	41.2
Margin	dB	2.6	7.8

Table 5 - MSAT DATA2 Carrier EOC Link Budget			
		FORWARD	RETURN
PARAMETER	UNITS	(Hub to User)	(User to Hub)
Noise Bandwidth	kHz	42	42
Boltzmann's constant	dBW/Hz·K	-228.6	-228.6
UPLINK			
Frequency	GHz	13	1.64
Earth Station EIRP	dBW	53.4	6.5
Body Shielding Loss	dB	x	0
Polarization Loss	dB	x	-0.5
Free Space Loss	dB	-206.7	-188.8
Uplink Fade	dB	0	0
Satellite Antenna Gain, EOC	dBi	29	29
Received Carrier Power	dBW	-124.3	-153.78
Satellite G/T	dB/K	-1	5
Intersystem Interference Allowance	dB	0.5	1
C/No	dB·Hz	73.8	49.82
C/Imo	dB·Hz	68.2	70.2
Satellite C/(No+Io)	dB·Hz	67.2	49.8
DOWNLINK			
Frequency	GHz	1.55	11
Satellite Active Gain	dB	123.3	122
Satellite Antenna Gain, EOC	dBi	29	29
Satellite EOC EIRP	dBW	28	-2.78
Free Space Loss	dB	-188.5	-205.2
Downlink Fade	dB	x	0
Earth Station G/T	dB/K	-25.3	36.5
Interference Allowance	dB	1	0.5
C/No	dB·Hz	41.8	56.62
LINK			
Link C/(No+Io)	dB·Hz	41.8	49.0
Required C/No	dB·Hz	41.2	41.2
Margin	dB	0.6	7.8

Table 6 - MSAT CW Carrier EOC Link Budget			
		FORWARD	RETURN
PARAMETER	UNITS	(Hub to User)	(User to Hub)
Noise Bandwidth	kHz	1	1
Boltzmann's constant	dBW/Hz·°K	-228.6	-228.6
UPLINK		Clear	Clear
Frequency	GHz	13	1.64
Earth Station EIRP	dBW	52.5	12
Body Shielding Loss	dB	x	0
Polarization Loss	dB	x	-0.5
Free Space Loss	dB	-206.7	-188.8
Uplink Fade	dB	0	0
Satellite Antenna Gain, EOC	dB _i	29	29
Received Carrier Power	dBW	-125.2	-148.3
Satellite G/T	dB/°K	-1	5
Intersystem Interference Allowance	dB	0.5	1
C/No	dB·Hz	72.9	55.3
C/Imo	dB·Hz	52.0	54.0
Satellite C/(No+Io)	dB·Hz	52.0	51.6
DOWNLINK			
Frequency	GHz	1.55	11
Satellite Active Gain	dB	123.3	122
Satellite Antenna Gain, EOC	dB _i	29	29
Satellite EOC EIRP	dBW	27.1	2.7
Free Space Loss	dB	-188.5	-205.2
Downlink Fade	dB	x	0
Earth Station G/T	dB/°K	-16	36.5
Interference Allowance	dB	1	0.5
C/No	dB·Hz	50.2	62.1
LINK			
Link C/(No+Io)	dB·Hz	48.0	51.2
Required C/No	dB·Hz	45.0	45.0
Margin	dB	3.0	6.2

Table 7 - MSAT Beacon Link Budget		
PARAMETER	UNITS	SPOT
Frequency	GHz	10.7
Range	km	39,347
AFC EIRP	dBW	10
Range loss	dB/m ²	-162.9
Rain Fade	dB	-1.2
Scintillation	dB	-0.2
Co-polarization Inclined Orbit Mismatch	dB	-0.1
Tracking Gain	dB	-0.1
Isotropic gain	dB	-42.6
Clear Sky GW Antenna G/T	dB/°K	33.8
G/T Degradation Due to Fade	dB	-1.2
Boltzmann's Constant	dBW/Hz·°K	228.6
Received C/No	dB·Hz	64.1
Received C/Io	dB·Hz	64.1
Received C/(No+Io)	dB·Hz	61.1
Implementation loss	dB	3
Theoretical Eb/No (BER 1E-6)	dB·Hz	10.8
Required C/No	dB·Hz	53.7
Faded Margin	dB	7.4

Table 8 – TELEMETRY (Faded)			
PARAMETER	UNITS	SPOT	OMNI
Frequency	GHz	11.7	11.7
(Worst Case for Tx Ant)			
Range	km	39,347	39,347
Telemetry EIRP	dBW	17.5	7.5
Range loss	dB/m ²	-162.9	-162.9
Rain Fade	dB	-1.2	-1.2
Scintillation	dB	-0.2	-0.2
Co-polarization Inclined Orbit	dB	-0.1	-0.1
Mismatch			
Tracking Gain	dB	-0.1	-0.1
Isotropic gain	dB	-42.6	-42.6
Clear Sky GW Antenna G/T	dB/°K	33.8	33.8
G/T Degradation Due to Fade	dB	-1.2	-1.2
Boltzmann's Constant	dBW/Hz·°K	228.6	228.6
Received C/No	dB·Hz	71.6	61.6
Received C/Io	dB·Hz	71.6	61.6
Received C/(No+Io)	dB·Hz	68.6	58.6
Data Rate	kbps	4	1
TM Mod Index	radians	0.9	0.9
Data Rate	dB·Hz	36	30
Mod loss	dB	3.9	3.9
Implementation loss	dB	3	3
Theoretical Eb/No (BER 1E-6)	dB·Hz	10.8	10.8
Required C/No	dB·Hz	53.7	48
Faded Margin	dB	14.9	10.6
COMMAND (Faded)			
PARAMETER	UNITS	SPOT	OMNI
Frequency (Worst Case)	GHz	14.0	14.5
Range	km	39.347	39.347
Uplink EIRP	dBW	68	83
Range loss	dB/m ²	-162.9	-162.9
Rain Fade	dB	-2	-2
Scintillation	dB	-0.2	-0.2
Co-polarization Inclined Orbit	dB	-0.1	-0.1
Mismatch			
Tracking Gain	dB	-0.3	-0.3
PFD	dBW/m ²	-97.5	-82.5
Required PFD	dBW/m ²	-100	-85
Link Margin	dB	2.5	2.5

Table 9 - MSAT QPSK V Carrier EOC Link Budget			
PARAMETER	UNITS	FORWARD (Hub to User)	RETURN (User to Hub)
Noise Bandwidth	kHz	4	4
Boltzmann's constant	dBW/Hz·°K	-228.6	-228.6
UPLINK		Clear	Clear
Frequency	GHz	13	1.64
Earth Station EIRP	dBW	52.5	12
Body Shielding Loss	dB	x	0
Polarization Loss	dB	x	-0.5
Free Space Loss	dB	-206.7	-188.8
Uplink Fade	dB	0	x
Satellite Antenna Gain, EOC	dBi	27	32
Received Carrier Power	dBW	-127.2	-145.3
Satellite G/T	dB/°K	-1	5
Intersystem Interference Allowance	dB	0.5	1
C/No	dB·Hz	72.9	55.3
C/Imo	dB·Hz	58	60
Frequency Reuse Allowance	dB	1	1
Satellite C/(No+Io)	dB·Hz	56.9	53.0
DOWNLINK			
Frequency	GHz	1.55	11
Satellite Active Gain	dB	123.3	122
Satellite Antenna Gain, EOC	dBi	32	27
Power Loss and Scan Loss	dB	0	x
Satellite EOC EIRP	dBW	28.1	3.7
Free Space Loss	dB	-188.5	-205.2
Downlink Fade	dB	x	0
Earth Station G/T	dB/°K	-16	38
Interference Allowance	dB	1	0.5
C/No	dB·Hz	51.2	64.6
LINK			
Link C/(No+Io)	dB·Hz	50.2	52.7
Required C/No	dB·Hz	45.0	45.0
Margin	dB	5.2	7.7

MSAT-2 L-Band Beam Contours

Figure 1 - MSAT-2 Beam LE1 & LR1 East Beam
Showing beam peak (0 dB) and -2, -4, -6, -8, -10, -15, and -20dB contours
Peak Gain = 34 dBi RHCP

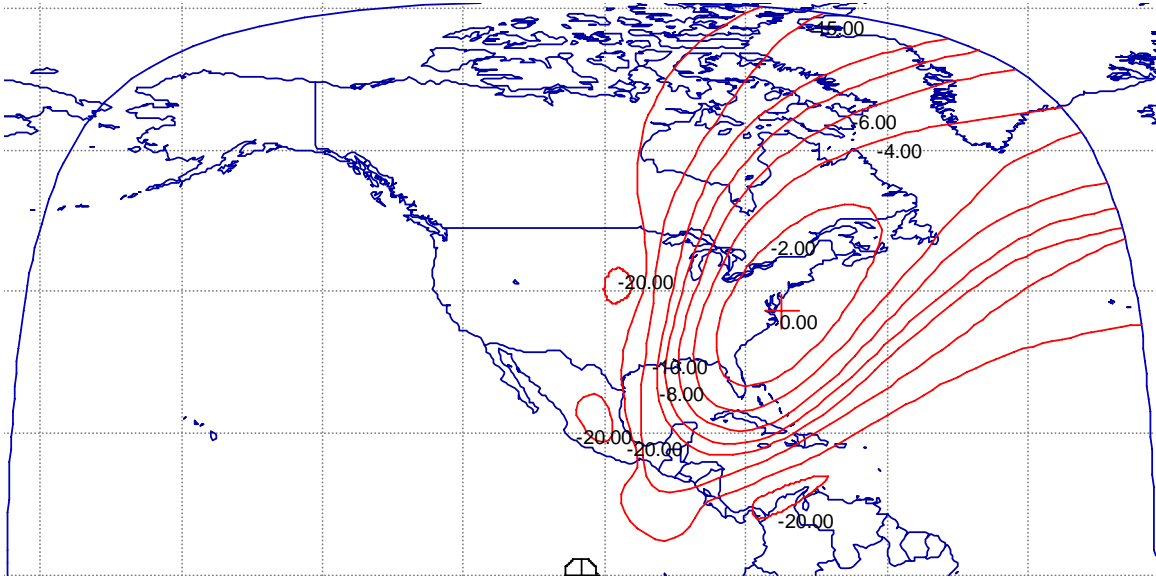


Figure 2 - MSAT-2 Beam LE2 & LR2 Central Beam
Showing beam peak (0 dB) and -2, -4, -6, -8, -10, -15, and -20 dB contours
Peak Gain = 34 dBi RHCP

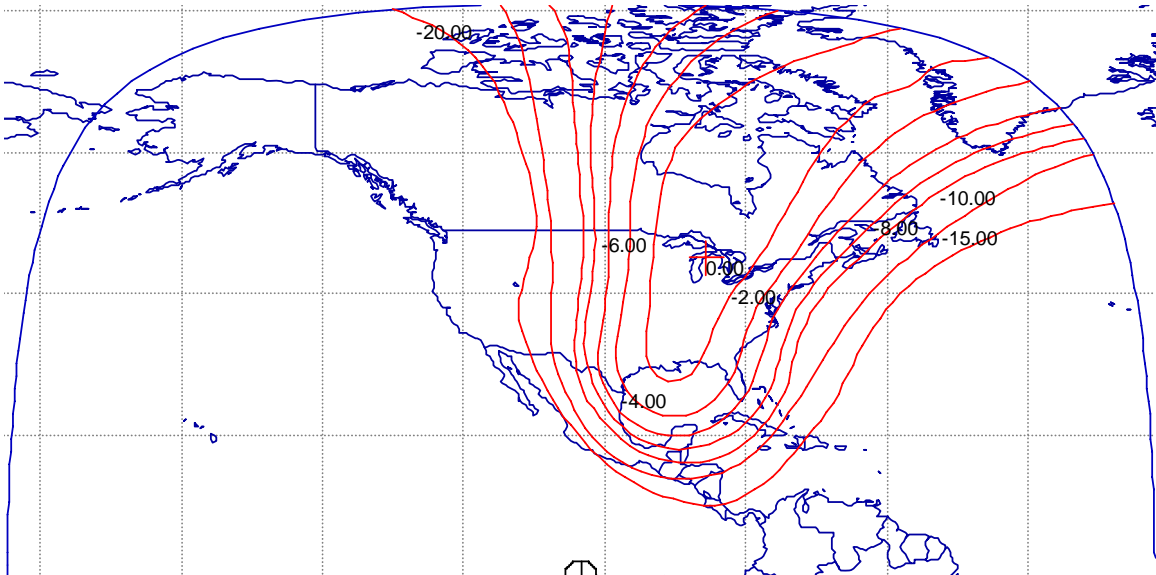


Figure 3 - MSAT-2 Beam LE3 & LR3 Mountain Beam
Showing beam peak (0 dB) and -2, -4, -6, -8, -10, -15, and -20 dB contours
Peak Gain = 34 dBi RHCP

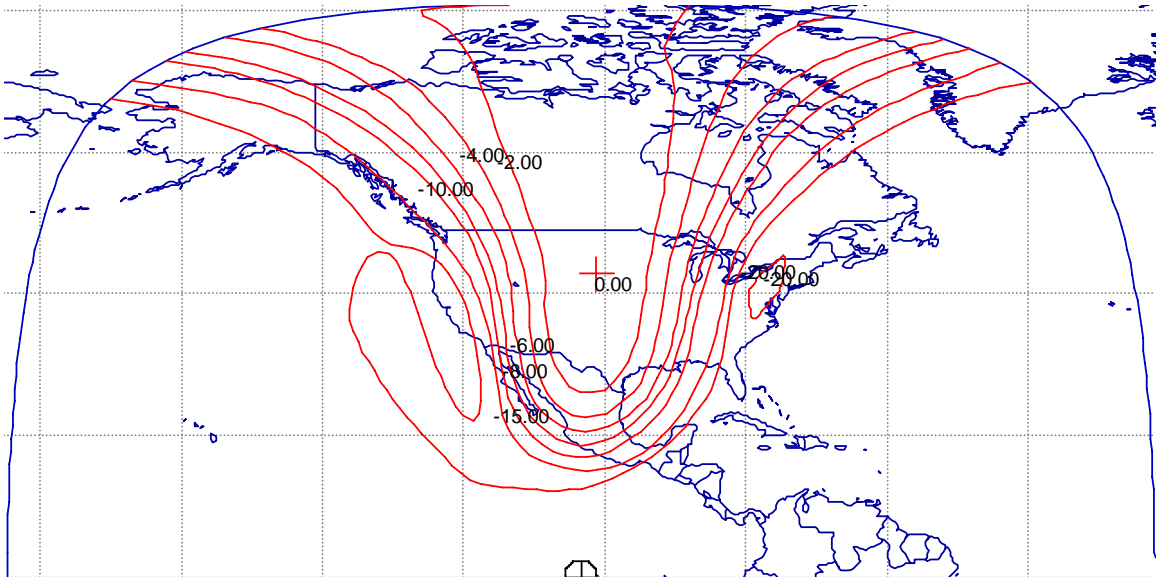


Figure 4 - MSAT-2 Beam LE4 & LR4 West Beam
Showing beam peak (0 dB) and -2, -4, -6, -8, -10, -15, and -20 dB contours
Peak Gain = 34 dBi RHCP

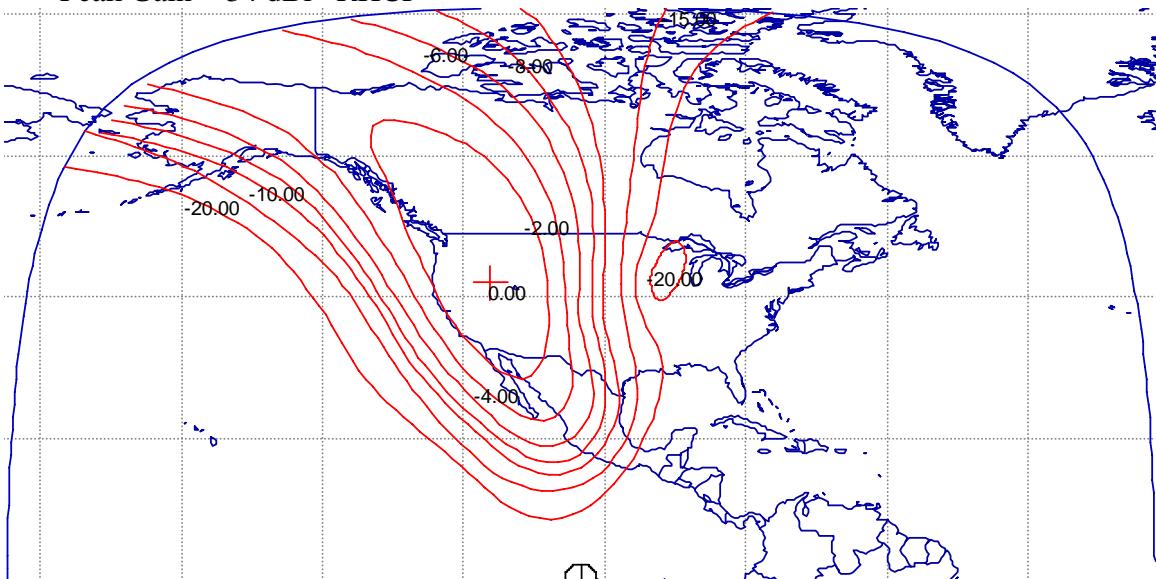


Figure 5 - MSAT-2 BeamLE5 & LR5 South Beam
Showing beam peak (0 dB) and -2, -4, -6, -8, -10, -15, and -20 dB contours
Peak Gain = 30 dBi RHCP

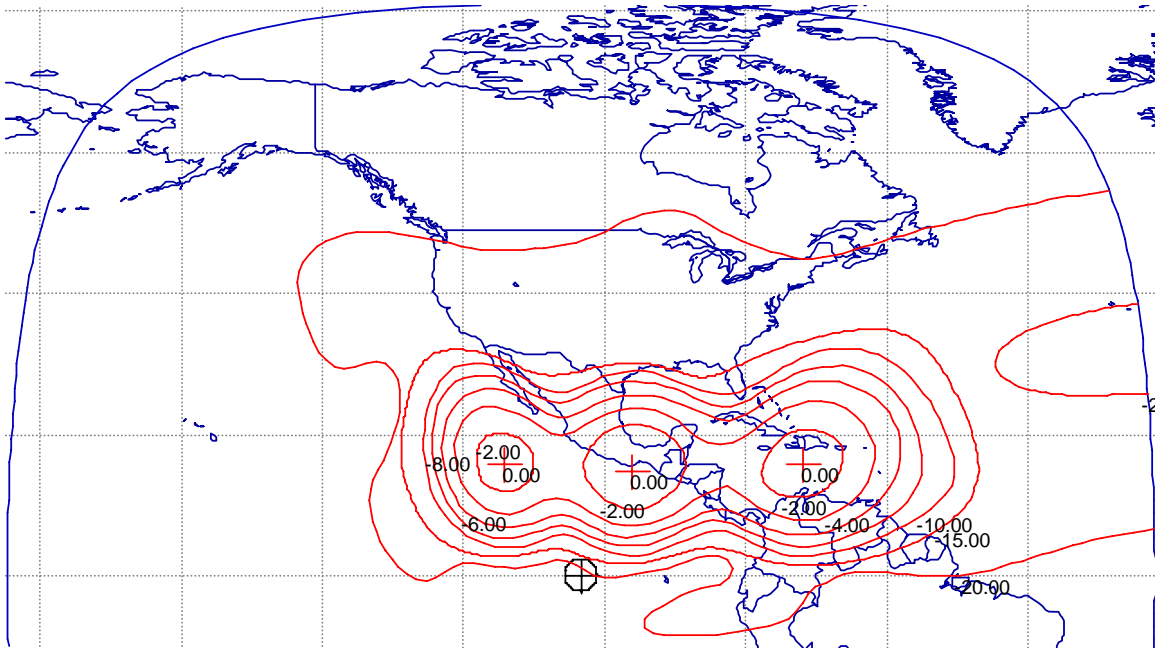


Figure 6 - MSAT-2 LE6 & LR6 Alaska-Hawaii Beam
Showing beam peak (0 dB) and -2, -4, -6, -8, -10, -15, and -20 dB contours
Peak Gain = 30 dBi RHCP

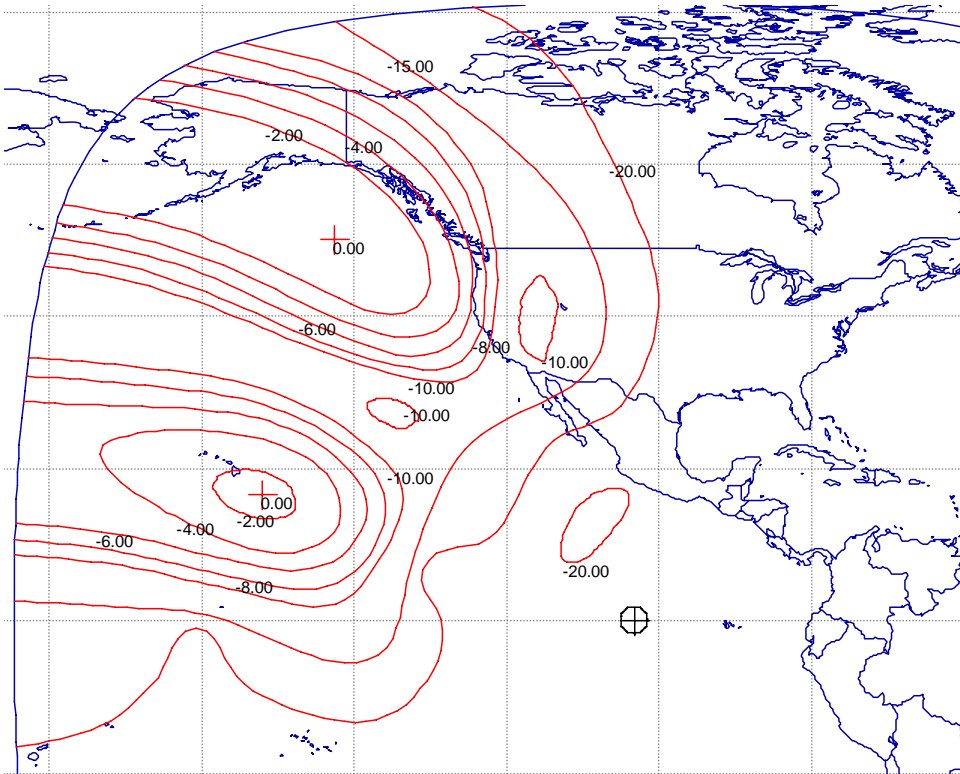


Figure 7 - MSAT-2 Ku-Band Feederlink Beam KU1E & KU1R Beams
Peak Gain = 29.2 dBi -2, -4, -6, -8, -10, -15, and -20 dB Contours

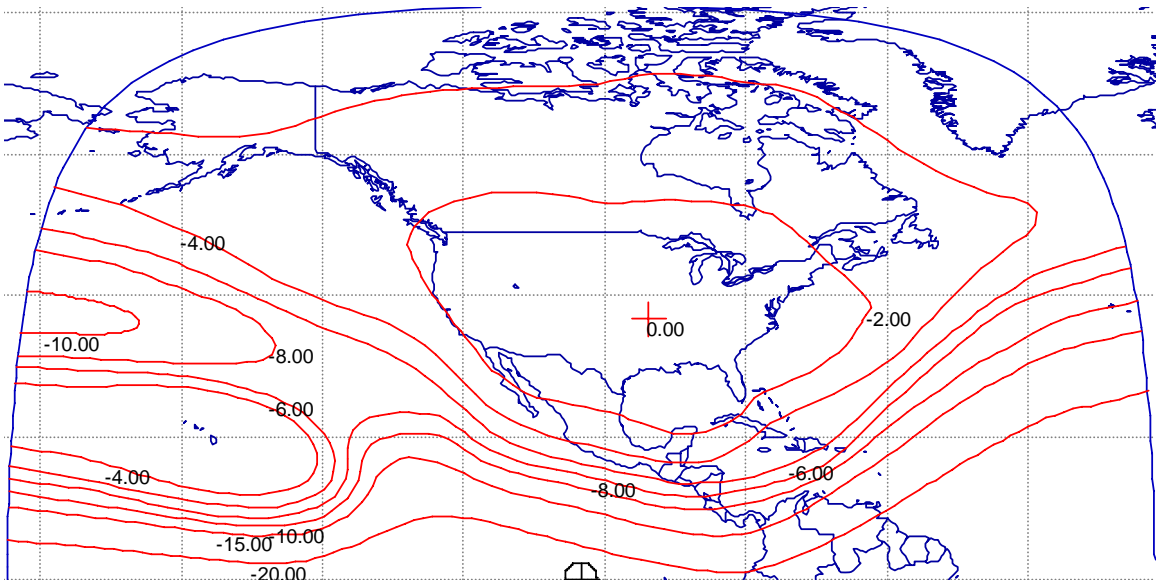


Figure 8 - MSAT-2 TT&C OmniE & OmniR Beam

