Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
SES AMERICOM, INC.	)	File No. SAT-MOD-___________
	)	Call Sign S2134
Application for Modification of AMC-2	)	
Fixed-Satellite Space Station License	)	

APPLICATION OF SES AMERICOM, INC.

SES Americom, Inc. ("SES Americom," doing business as "SES WORLD SKIES"),[1] hereby respectfully requests a modification of its license for the AMC-2 fixed-satellite space station to reassign the spacecraft to the 78.95º W.L. orbital location. Specifically, SES WORLD SKIES requests authority to perform Tracking, Telemetry, Command, and Monitoring ("TTC&M") in order to relocate AMC-2 from 101º W.L. to 78.95º W.L. and authority to operate both the TTC&M and communications payloads on AMC-2 after it has arrived at 78.95º W.L. Grant of the requested authority will serve the public interest by allowing SES WORLD SKIES to use AMC-2 to provide service continuity at the nominal 79º W.L. orbital location, where the satellite will replace AMC-5 and Satcom C-3.

A completed FCC Form 312 is attached, and SES WORLD SKIES incorporates by reference the technical information previously provided in support of AMC-2.[2] In addition, SES WORLD SKIES is providing here technical information relating to the proposed

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1 On September 7, 2009, SES S.A. announced that the newly integrated operations of its two indirect subsidiaries, New Skies Satellites B.V. and SES Americom would be conducted under a single brand name, SES WORLD SKIES. The new brand name does not affect the underlying legal entities that hold Commission authorizations or U.S. market access rights.

2 *See* File Nos. SAT-LOA-19940310-00008; SAT-AMD-19941114-00065; SAT-MOD-20050527-00110; SAT-MOD-20080124-00030; & SAT-AMD-20080311-00070.

modification to the AMC-2 license on Schedule S and in narrative form pursuant to Section 25.114 of the Commission's Rules.

MODIFICATION

SES WORLD SKIES currently operates the AMC-2 C/Ku-band hybrid satellite at 101º W.L.[3] The satellite was relocated to that position in late 2006 when another C/Ku-band hybrid satellite operating at 101º W.L., AMC-4, began to experience solar array circuit failures that affected the total power available to the spacecraft. To ensure service continuity, SES WORLD SKIES requested and received authority to move AMC-2 to 101º W.L. and collocate it with AMC-4.[4] SES WORLD SKIES also expedited the replacement of AMC-4. An application to launch and operate SES-1, the designated replacement satellite for AMC-4, is pending before the Commission,[5] and launch of the spacecraft is currently scheduled for on or about April 24, 2010.

SES WORLD SKIES currently operates two spacecraft at the nominal 79º W.L. orbital location: Satcom C-3 is licensed to operate in the conventional C-band frequencies at 79.05º W.L., and AMC-5 is licensed to operate in the conventional Ku-band frequencies at 78.95º W.L. Satcom C-3 is in inclined orbit, and SES WORLD SKIES intends to deorbit the satellite once AMC-2 begins operations at 78.95° W.L. AMC-5 is near the end of its North-South station-kept life, and SES WORLD SKIES intends to commence inclined orbit operations

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[3] AMC-2 operates in the conventional C-band (3700-4200 MHz and 5925-6425 MHz) and conventional Ku-band (11.7-12.2 GHz and 14.0-14.5 GHz) frequencies.

[4] *See* File Nos. SAT-MOD-20080314-00072, SAT-MOD-20080124-00030, and SAT-AMD-20080311-00070, all grant-stamped May 19, 2008.

[5] *See* File Nos. SAT-RPL-20100120-00014; SAT-AMD-20100309-00040 (Call Sign S2807).

for the satellite within the next few months[6] Subject to receipt of Commission authority, SES WORLD SKIES intends to move AMC-5 to 79.05° W.L. once AMC-2 begins operations at 78.95° W.L. and Satcom C-3 has been de-orbited. At 79.05° W.L., AMC-5 will serve as an in-orbit backup for AMC-2.

Grant of the requested modification will serve the public interest. The Commission has consistently recognized that continuity of service is an important public interest objective.[7] Modification of the AMC-2 license will serve the public interest by allowing SES WORLD SKIES to continue providing station-kept service to customers using AMC-2 at 78.95° W.L. Grant of the requested modification also will not adversely affect services provided at 101º W.L. SES WORLD SKIES intends to relocate AMC-2 after SES-1 has been successfully launched to 101° W.L. and after all traffic on AMC-2 has been transferred to the new SES-1 satellite.

Operation of AMC-2 at 78.95° W.L. as proposed herein will not harm adjacent satellite operators. AMC-2 will be operated consistent with existing and future coordination agreements applicable to its operations at the nominal 79° W.L. orbital location. SES WORLD SKIES notes that the Venesat-1 satellite operates at 78° W.L. under a Uruguayan ITU network

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[6] SES WORLD SKIES will notify the Commission as required under Section 25.280 within 30 days after performing the last North-South stationkeeping maneuver on AMC-5.

[7] *See, e.g., DIRECTV Enterprises, LLC, Request for Special Temporary Authority to Conduct Telemetry, Tracking and Control During the Relocation of DIRECTV 1 to the 72.5º W.L. Orbital Location*, Order and Authorization, DA 05-1890 (Sat. Div. rel. July 14, 2005) at ¶ 18 (granting STA to relocate spacecraft to a location where it will replace a satellite with failing solar panels "will enable DIRECTV to maintain continuity of DBS service to its customers"); *DIRECTV Enterprises, LLC, Application for Authorization to Operate DIRECTV 5, a Direct Broadcast Satellite, at the 109.8º W.L. Orbital Location*, Order and Authorization, DA 05-2654 (Sat. Div. rel. Oct. 5, 2005) at ¶ 8 ("DIRECTV's proposal to provide DBS service from this location will serve the public interest, convenience and necessity in that it will ensure continuity of service to DIRECTV subscribers").

filing that is lower in priority than the U.S. ITU filing at the nominal 79° W.L. location. Coordination discussions with the Venesat-1 operator are in progress to ensure that operations at 78° W.L. will not negatively impact the co-frequency operations of AMC-2 at 78.95° W.L.

WAIVER REQUEST

SES WORLD SKIES requests a limited waiver of the Commission's requirements in connection with the instant modification application. Grant of the waiver is consistent with Commission policy:

> The Commission may waive a rule for good cause shown. Waiver is appropriate if special circumstances warrant a deviation from the general rule and such deviation would better serve the public interest than would strict adherence to the general rule. Generally, the Commission may grant a waiver of its rules in a particular case if the relief requested would not undermine the policy objective of the rule in question and would otherwise serve the public interest.[8]

SES WORLD SKIES requests a limited waiver of Section 25.114(d)(3) of the Commission's rules. That provision requires submission of predicted antenna gain contours for each transmit and receive antenna beam and specifies that for geostationary orbit satellites, the information must be provided in a .gxt format. As discussed in Section 4.0 of the Technical Appendix, SES WORLD SKIES has provided antenna gain information in the format specified with one exception. The gain characteristics for the global horn antenna are not provided as a .gxt file because the .gxt data is not available from the spacecraft manufacturer. Instead, gain versus off-set angle information is provided as a figure in Annex 1 to the Technical Appendix.

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8 *PanAmSat Licensee Corp*., 17 FCC Rcd 10483, 10492 (Sat. Div. 2002) (footnotes omitted).

The Commission has previously waived the requirements of Section 25.114(d)(3) in similar factual circumstances.[9] In acting on these requests, the Commission recognized that the purpose of the rule is to ensure that adequate information is available to allow evaluation of the potential for harmful interference.[10] Here, in lieu of the single .gxt file that cannot be provided, SES WORLD SKIES has submitted alternative data sufficient to permit the Commission and any interested party to evaluate the antenna's interference potential. Accordingly, SES WORLD SKIES requests that the Commission grant a limited waiver of Section 25.114(d)(3).

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[9] *See, e.g.*, Application of PanAmSat Licensee Corp., File No. SAT-RPL-20061219-00155, Call Sign S2715, grant stamp dated April 24, 2007 ("*Galaxy 17 Grant*") at ¶ 5 (waiving Section 25.114(d)(3) to allow submission of gain information for omni antenna in non-.gxt format where manufacturer did not provide .gxt data); *see also Spectrum Five, LLC, Petition for Declaratory Ruling to Serve the U.S. Market Using Broadcast Satellite Service (BSS) Spectrum from the 114.5° W.L. Orbital Location*, Order and Authorization, DA 06-2439, File Nos. SAT-LOI-20050312-00062/00063 at ¶ 17 (IB rel. Nov. 29, 2006) (conditionally accepting antenna gain information not filed in .gxt format).

[10] *Galaxy 17 Grant* at n.5.

CONCLUSION

For the foregoing reasons, SES WORLD SKIES seeks a modification of the AMC-2 license to reassign the spacecraft from 101º W.L. to 78.95º W.L. for operations in the conventional C- and Ku-bands, as described in the attached materials.

Respectfully submitted,

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ATTACHMENT A

TECHNICAL APPENDIX

IN SUPPORT OF AMC-2 AT 78.95°W.L.

TECHNICAL APPENDIX

1.0 Overall Description (§25.114(d)(1))

This technical appendix is submitted is support of the modification application of SES Americom, Inc. ("SES Americom," doing business as SES WORLD SKIES) seeking reassignment of AMC-2 to 78.95°W.L. from its current orbital position of 101°W.L. SES WORLD SKIES hereby incorporates by reference the technical information it has already provided with respect to AMC-2,[1] and provides here technical information relating to operation of AMC-2 at 78.95°W.L. consistent with the proposed modification.

AMC-2 is equipped with twenty-four 36 MHz C-band transponders, and twenty-four 36 MHz Ku-band transponders. From the orbital location 78.95°W.L., the Ku-band transponders will provide coverage of the contiguous U.S. ("CONUS") and parts of the Caribbean region. The service area of the C-band transponders is CONUS and the Caribbean region.

2.0 Schedule S (§25.114(c))

The Schedule S database is included with this filing. This section describes changes in the Schedule S relating to the proposed operation of AMC-2 at 78.95°W.L. and addresses some items not covered in the Schedule S.

1. *Transponder frequency plan.* No changes, except polarizations of C-band and Ku-band transponders are changed from H to V and V to H.
2. *Telemetry and Telecommand (TT&C) frequencies and beams.* The TT&C carrier frequencies are the same as those at 101°W.L., but using the opposite polarization. The TT&C link budgets are included in the Schedule S.

   A global horn antenna ("GBLR") is used for receiving telecommand carriers. The communication antennas ("KTV" and "KTH") are used for transmitting telemetry carriers. The TT&C frequencies shown in Schedule S are nominal, and are subject to change based on coordination with neighboring satellites.
3. *PFD limits in C-band.* The C-band PFD values are provided in Section S8 of Schedule S, and Section 3.0 below (Table 1) demonstrates that these values comply with §25.208.

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[1] *See* File Nos.-SAT-LOA-19940310-00008; SAT-AMD-19941114-00065; SAT-MOD-20050527-00110; SAT-MOD-20080124-00030; & SAT-AMD-20080311-00070.

4. *Conversion of G/T values to Saturation Flux Density values.* Same as at 101°W.L.[2]
5. *Transponder frequency response of C- and Ku-transponder*. Same as at 101°W.L.[3]

3.0 PFD limits in C-band (§25.114(d)(5) and §25.208)

Table 1 demonstrates that the PFD values in C-band from AMC-2 at 78.95°W.L. comply with §25.208.

Table 1 Maximum PFD values and margins relative to permissible limits of §25.208 (Max. PFD computed in a carrier bandwidth of 2 MHz representing TV/FM)

	Elevation angle (degrees)	Max. EIRP (dBW)	MAX. PFD (dBW/m2/4KHz)	Permissible max PFD (dBW/m2/4KHz) from §25.208)	Margin (dB)
DL:V-Pol	5	37.8	-155.51	-152	3.5
	10	38.5	-154.81	-149.5	5.3
	15	39	-154.31	-147	7.3
	20	39.5	-153.81	-144.5	9.3
	25	39.75	-153.56	-142	11.6
DL:H-Pol	5	39.7	-153.61	-152	1.6
	10	39.9	-153.41	-149.5	3.9
	15	40.3	-153.01	-147	6.0
	20	40.8	-152.51	-144.5	8.0
	25	41.2	-152.11	-142	10.1

4.0 Satellite Antenna Gain Contours (§25.114(d)(3))

Annex 1 shows the typical antenna gain contours for 8 different cases: transmit and receive beams, H- and V-polarizations, and C-and Ku-beams. The peak EIRP and G/T values in different beams are shown in Table 2.

1. CRV.gxt (V-pol, receive beam)
2. CTV.gxt (V-pol, transmit beam)
3. KRH.gxt (H-pol, receive beam)
4. KTH.gxt (H-pol, transmit beam)
5. CRH.gxt (H-pol, receive beam)
6. CTH.gxt (H-pol, transmit beam)
7. KRV.gxt (V-pol, receive beam)
8. KTV.gxt (V-pol, transmit beam)

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[2] File No. SAT-MOD-20080124-00030, Technical Appendix at Page 3.
[3] *Id*.

Table 2 Maximum EIRP and G/T values

Beam	File name in Schedule S	Max. EIRP, dBW	Max. G/T, dB/K
CRV (C-band, V-pol, receive beam)	CRV.gxt		4.48
CTV (C-band, V-pol, transmit beam)	CTV.gxt	41.69	
KRH (Ku-band, H-pol, receive beam)	KRH.gxt		5.93
KTH (Ku-band, H-pol, transmit beam)	KTH.gxt	49.68	
CRH (C-band, H-pol, receive beam)	CRH.gxt		5.56
CTH (C-band, H-pol, transmit beam)	CTH.gxt	41.98	
KRV (Ku-band, V-pol, receive beam)	KRV.gxt		3.46
KTV (Ku-band, V-pol, transmit beam)	KTV.gxt	49.2	

The gain characteristics for the global horn antenna ("GBLR") are not provided as a GXT file because the GXT data is not available from the spacecraft manufacturer. Instead, gain vs. off-set angle information is provided as a figure in Annex 1. SES WORLD SKIES requests a waiver to permit this substitution. As discussed in the narrative section of this modification application, grant of the requested waiver is consistent with Commission precedent.

5.0 Emission Designators and Link Budgets (§25.114(d)(4))

Tables 3 to 6 show the Emission designators and typical link budgets. The TT&C link budgets are included in the Schedule S, Page S13.

Table 3 Link budgets for 7 typical Ku-band carriers

Parameter	Digital TV MCPC 40 MBPS QPSK ¾ RS	Digital TV MCPC 40 MBPS QPSK ¾ RS	Digital TV SCPC QPSK ¾ RS	Digital TV SCPC QPSK ¾ RS	56Kbps QPSK ¾ RS	1.544 MBPS QPSK 3/4	Digital TV MCPC 50 MBPS 8PSK 2/3 RS
Digital MOD ID	A_Ku	B_Ku	C_Ku	D_Ku	E_Ku	F_Ku	G_Ku
Carrier designation	36M0G7W	27M0G7W	6M95G1W	5M00G1W	100KG1W	1M60G1W	36M0G7W
Throughput rate, Mbps	40	32	8	6	0.0562	1.5440	50
Symbol rate, MHz	28.8	22.9	5.7	4.2	0.0407	1.1	27.1
Uplinks:							
Transmit Power (dBW)	20	20	8.9	8.9	-5	8	20
Transmit Loss (dB)	-1	-1	-1	-1	-1	-1	-1
Antenna diameter	6.1	6.1	3.7	3.7	1.8	1.8	6.1
Antenna Gain (dBi)	57.2	57.2	52.9	52.9	46.6	46.6	57.2
Ground Station EIRP (dBW)	76.2	76.2	60.8	60.8	40.6	53.6	76.2
Uplink Rain Loss (dB)	-2	-2	-2	-2	-2	-2	-2
Free Space Loss (dB)	-207.5	-207.5	-207.5	-207.5	-207.5	-207.5	-207.5
Satellite G/T (dB/K)	3	3	3	3	3	3	3
Data Rate (dB-Hz)	76	75	69	67.6	47.5	61.9	76
Boltzmann's Constant (dBW/K-Hz)	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6
Eb/No (dB)	22.3	23.3	13.9	15.3	15.2	13.8	21.3
Eb/Io (dB)	18	18	16	16	16	16	18
Total Eb/(No + Io) (dB) For 10-7	16.6	16.9	11.8	12.6	12.6	11.8	16.3
Downlinks:							
Satellite Carrier EIRP (dBW)	48.7	48.7	35.7	34.3	18.5	28.5	48.7
Downlink Rain Loss (dB)	-3	-3	-3	-3	-3	-3	-3
Free Space Loss (dB)	-206.3	-206.3	-206.3	-206.3	-206.3	-206.3	-206.3
Ground station antenna dia, m	0.9	0.9	2.4	2.4	1.2	2.4	2.4
Ground Station G/T (dB/K)	17.1	17.1	25.6	25.6	19.6	25.6	25.6
Eb/No (dB)	9.1	10.1	11.6	11.6	9.9	11.5	16.6
C/IM			18	18	18	18	
Eb/IModB)			16.6	16.6	16.6	16.6	
C/I(dB)	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Eb/Io(ASI)	13.6	13.6	13.6	13.6	13.6	13.6	12.3
Eb/Io (dB)	13.6	13.6	11.8	11.8	11.8	11.8	12.3
Eb/(No + Io) (dB)	7.8	8.5	8.7	8.7	7.7	8.7	11.0
Total UP/DOWN Eb/(No+Io)(dB)	7.2	7.9	7.0	7.2	6.5	6.9	9.9
Required (dB)	5.4	5.4	5.4	5.4	5.4	5.4	7.2
Margin (dB)	1.8	2.5	1.6	1.8	1.1	1.5	2.7

Table 4 Link budgets for TV/FM in Ku-band

Parameter	Typical TV/FM link
Carrier designation	36M0F3F
Uplinks:	
Transmit Power (dBW)	22
Transmit Loss (dB)	-1
Antenna diameter	6.1
Antenna Gain (dBi)	57.2
Ground Station EIRP (dBW)	78.2
Uplink Rain Loss (dB)	-2
Free Space Loss (dB)	-207.5
Satellite G/T (dB/K)	3
Bandwidth (dB-Hz)	75.6
Boltzmann's Constant (dBW/K-Hz)	-228.6
C/N, uplink(dB)	24.7
Downlinks:	
Satellite Carrier EIRP (dBW)	48.7
Downlink Rain Loss (dB)	-3
Free Space Loss (dB)	-206.3
Ground station antenna dia, m	1.2
Ground Station G/T (dB/K)	19.6
C/N, DL (dB)	12.0
C/I ASI (dB)	18.0
C/Ntot, dB	10.9
Required(dB)	10.5
Margin(dB)	0.4

Table 5 Link budgets for 7 typical C-band carriers

	H_C	I_C	J_C	K_C	L_C	M_C
Parameter	Digital TV MCPC, 40 MBPS, QPSK, ¾ RS	Digital TV SCPC, 8 MBPS, QPSK ¾ RS	Digital TV MCPC, 60 MBPS, 8PSK, 2/3 RS	Digital TV, MCPC, 110 MBPS, 16QAM, 7/8 RS	56 Kbps, SCPC, QPSK, ¾ RS	1.544 Mbps, SCPC, QPSK, ¾ RS
Carrier designation	36M0G7W	6M95G1W	36M0G7W	36M0G7W	100KG1D	1M60G1D
Throughput rate, Mbps	40	8	60	110	0.056	2
Symbol rate, MHz	28.8	5.8	32.6	34.1	0.037	1.0
FEC rate	0.69	0.69	0.61	0.81	0.75	0.75
Uplinks:						
Transmit Power (dBW)	17.1	9.6	25.1	25.1	-3.4	11.8
Transmit Loss (dB)	0.5	0.5	0.5	0.5	0.5	0.5
Antenna diameter(m)	10	10	10	10	4.5	4.5
Antenna Gain (dBi)	54.4	54.4	54.4	54.4	47.4	47.4
Ground Station EIRP (dBW)	71.0	63.5	79.0	79.0	43.5	58.7
Uplink Rain Loss (dB)	1	1	1	1	1	1
Free Space Loss (dB)	200.1	200.1	200.1	200.1	200.1	200.1
Satellite G/T (dB/K)	0	0	0	0	0	0
Data Rate (dB-Hz)	76	69.0	77.8	80.4	47.5	61.9
Boltzmann's Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Eb/No (dB)	22.5	22.0	28.7	26.1	23.5	24.3
Eb/Io (dB)	18	18	18	18	18	18
Total Eb/(No + Io) (dB) For 10-7	16.7	16.5	17.6	17.4	16.9	17.1

(Table continued on the next page)

Table 5 Link budgets for 7 typical C-band carriers (contd.)

	H_C	I_C	J_C	K_C	L_C	M_C
Parameter	Digital TV MCPC, 40 MBPS, QPSK, ¾ RS	Digital TV SCPC, 8 MBPS, QPSK ¾ RS	Digital TV MCPC, 60 MBPS, 8PSK, 2/3 RS	Digital TV, MCPC, 110 MBPS, 16QAM, 7/8 RS	56 Kbps, SCPC, QPSK, ¾ RS	1.544 Mbps, SCPC, QPSK, ¾ RS
Carrier designation	36M0G7W	6M95G1W	36M0G7W	36M0G7W	100KG1D	1M60G1D
Downlinks:						
Satellite Carrier EIRP (dBW)	38	28	38	40	8	25.2
Downlink Rain Loss (dB)	0.5	0.5	0.5	0.5	0.5	0.5
Free Space Loss (dB)	196.3	196.3	196.3	196.3	196.3	196.3
Ground station antenna dia, m	3.8	6	10	10	6	6
Ground Station G/T (dB/K)	21.8	25.2	33.2	33.2	23.0	23.0
Eb/No (dB)	15.6	16.0	25.2	24.6	15.3	18.1
C/IM		18			18	18
Eb/IMo(dB)		16.6			16.2	16.2
C/I	16.0	16.0	20.0	22.0	16.0	16.0
Eb/Io(ASI)	14.6	14.6	17.3	16.9	14.2	14.2
Eb/Io (dB)	14.6	12.5	17.3	16.9	12.1	12.1
Eb/(No + Io) (dB)	12.1	10.9	16.7	16.2	10.4	11.1
Total UP/DOWN C/(N+I)(dB)	13.5	12.3	19.3	21.3	12.2	12.9
Total UP/DOWN Eb/(No+Io)(dB)	10.8	9.8	14.1	13.8	9.5	10.2
Required Eb/No(dB)	5.4	5.4	7.2	11.5	5.4	5.4
Required C/N(dB)	6.8	6.8	9.9	16.6	7.2	7.2
Margin(dB)	5.4	4.4	6.9	2.3	4.1	4.8

Table 6. Link budgets for TV/FM in C-band

Parameter	Typical TV/FM link
Carrier designation	36M0F3F
Noise bandwidth (MHz)	36.0
Uplinks:	
Transmit Power (dBW)	20.7
Transmit Loss (dB)	0.5
Antenna diameter	6.1
Antenna Gain (dBi)	49.8
Ground Station EIRP (dBW)	70.0
Uplink Rain Loss (dB)	1
Free Space Loss (dB)	200.1
Satellite G/T (dB/K)	0
Boltzmann's Constant (dBW/K-Hz)	228.6
C/N(dB)	21.9
C/I ASI (dB)	22.0
C/(N+I), dB	19.0
Downlinks:	
Satellite Carrier EIRP (dBW)	38
Downlink Rain Loss (dB)	0.5
Free Space Loss (dB)	196.3
Ground station antenna dia (m)	6
Ground Station G/T (dB/K)	23.0
C/N(dB)	17.2
C/I(dB)	18.0
C/(N+I) (dB)	14.6
C/(N+I), Up & DL, dB	13.2
C/(N+I) required(dB)	11
Margin(dB)	2.2

6.0 Two Degree Spacing Analysis (§25.114(d)(7) and §25.140(b)(2))

Annexes 2 and 3 to this Technical Appendix provide analyses demonstrating the compatibility of AMC-2 at 78.95°W.L. 1.95 degrees away from other spacecraft. Annex 2 addresses Ku-band and Annex 3 addresses C-band.

7.0 Mitigation of Orbital Debris (§25.114(d)(14)

This section provides the information required under Section 25.114(d)(14) of the Commission's Rules.

§25.114(d)(14)(i): SES WORLD SKIES has assessed and limited the amount of debris released in a planned manner during normal operations of AMC-2. No debris is generated during normal on-station operations, and the spacecraft will be in a stable configuration. Onstation operations require stationkeeping within the +/- 0.05 degree E-W control box.

SES WORLD SKIES has also assessed and limited the probability of the space station becoming a source of orbital debris by collisions with small debris or meteoroids that could cause loss of control and prevent post-mission disposal. SES WORLD SKIES requires that spacecraft manufacturers assess the probability of micrometeorite damage that can cause any loss of functionality. This probability is then factored into the ultimate spacecraft probability of success. Any significant probability of damage would need to be mitigated in order for the spacecraft design to meet SES WORLD SKIES' required probability of success of the mission. The design of AMC-2 locates all sources of stored energy within the body of the structure, which provides protection from small orbital debris. SES WORLD SKIES has taken steps to limit the effects of any collisions through shielding, the placement of components, and the use of redundant systems.

§25.114(d)(14)(ii): SES WORLD SKIES has assessed and limited the probability of accidental explosions during and after completion of mission operations. As part of the Safety Data Package submission for SES WORLD SKIES spacecraft, an extensive analysis is completed by the spacecraft manufacturer, reviewing each potential hazard relating to accidental explosions. A matrix is generated indicating the worst-case effect, the hazard cause, and the hazard controls available to minimize the severity and the probability of occurrence. Each subsystem is analyzed for potential hazards, and the Safety Design Package is provided for each phase of the program running from design phase, qualification, manufacturing and operational phase of the spacecraft. Also, the spacecraft manufacturer generates a Failure Mode Effects and Criticality Analysis for the spacecraft to identify all potential mission failures. The risk of accidental explosion is included as part of this analysis. This analysis indicates failure modes, possible causes, methods of detection, and compensating features of the spacecraft design.

The design of the AMC-2 spacecraft is such that the risk of explosion is minimized both during and after mission operations. In designing and building the spacecraft, the manufacturer took steps to ensure that debris generation will not result from the conversion of energy sources on board the satellite into energy that fragments the satellite. All propulsion subsystem pressure vessels, which have high margins of safety at launch, have even higher margins in orbit, since use of propellants and pressurants during launch decreases the propulsion system pressure. Burst tests were performed on all pressure vessels during qualification testing to demonstrate a margin of safety against burst. Bipropellant mixing is prevented by the use of valves that prevent backwards flow in propellant and pressurization lines. All pressures, including those of the batteries, are monitored by telemetry.

At the end of operational life, after the satellite has reached its final disposal orbit, onboard sources of stored energy will be depleted or secured, and the batteries will be discharged. However, at the end of AMC-2's operational life, there will be oxidizer remaining in the tank that cannot be vented. Following insertion of the spacecraft into orbit, the spacecraft manufacturer permanently sealed the oxidizer tank by firing pyrotechnic valves. At a later date prior to commencing maneuvers to put AMC-2 in a disposal orbit, SES WORLD SKIES will seek any necessary waiver of Section 25.283(c) in connection with the residual oxidizer that will remain in the tank at end of life.

§25.114(d)(14)(iii): SES WORLD SKIES 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. Specifically, SES WORLD SKIES has assessed the possibility of collision with satellites located at, or reasonably expected to be located at, the requested orbital location or assigned in the vicinity of that location.

Regarding avoidance of collisions with controlled objects, in general, if a geosynchronous satellite is controlled within its specified longitude and latitude stationkeeping limits, collision with another controlled object (excluding where the satellite is collocated with another object) is the direct result of that object entering the allocated space.

The instant application seeks authority for operation of AMC-2 at the 78.95° W.L. orbital location. SES WORLD SKIES operates AMC-5 in the Ku-band at 78.95° W.L. and Satcom C-3 in the C-band at 79.05º W.L. Satcom C-3 is in inclined orbit and SES WORLD SKIES intends to deorbit the satellite once AMC-2 begins operations at 78.95° W.L. Subject to receipt of Commission authority, SES WORLD SKIES intends to move AMC-5 to 79.05° W.L. once AMC-2 begins operations at 78.95° W.L. and Satcom C-3 has been de-orbited. SES WORLD SKIES is not aware of any other FCC- or non-FCC licensed spacecraft that are operational or planned to be deployed at 78.95° W.L. or to nearby orbital locations such that there would be an overlap with the requested stationkeeping volume of AMC-2.

SES WORLD SKIES uses the SOCRATES system offered by the Center for Space Standards and Innovation to monitor the risk of close approach of its satellites with other objects. Any close encounters (separation of less than 5 km) are flagged and investigated in more detail. If required, avoidance maneuvers are performed to eliminate the possibility of collisions.

During any relocation, the moving spacecraft is maneuvered such that it is at least 30 km away from the synchronous radius at all times. In most cases, much larger deviation from the synchronous radius is used. In addition, the SOCRATES system is used to ensure no close encounter occurs during the move. When de-orbit of a spacecraft is required, the initial phase is treated as a satellite move, and the same precautions are used to ensure collision avoidance.

§25.114(d)(14)(iv): Post-mission disposal of the satellite from operational orbit will be accomplished by carrying out maneuvers to a higher orbit. The upper stage engine remains part of the satellite, and there is no re-entry phase for either component. The fuel budget for elevating the satellite to a disposal orbit is included in the satellite design. SES WORLD SKIES plans to maneuver AMC-2 to a disposal orbit at end of life and has selected a target minimum perigee of 150 km above the normal operational altitude. Fuel gauging uncertainty has been taken into account in these calculations, as discussed below. However, as the Commission is aware, there is no mechanism that allows precise calculations of the amount of fuel left on a spacecraft once it is in-orbit, and therefore it is possible that the AMC-2 spacecraft will not reach the targeted minimum de-orbit altitude.

AMC-2 is not subject to the minimum perigee requirement of Section 25.283(a) of the Commission’s Rules because the satellite was launched prior to March 18, 2002. SES WORLD SKIES intends to reserve 1.5 kg of fuel in order to account for postmission disposal of AMC-2. SES WORLD SKIES has assessed fuel gauging uncertainty and has provided an adequate margin of fuel reserve to address the assessed uncertainty.

As noted above, AMC-2 is not subject to application of the IADC formula for determining a minimum disposal orbit perigee, but for the Commission's information, the disposal orbit altitude resulting from the IADC formula would be 287 km based on the following calculation:

Area of the satellite (average aspect area): 39.04 m^2

Mass of the spacecraft: 1309 kg

CR (solar radiation pressure coefficient): 1.75

Therefore the disposal altitude as calculated under the IADC formula is:

36,021 km + (1000 x CR x A/m) = 36,073 km, or 287 km above the GSO arc (35,786 km)

ANNEX 1

COVERAGE MAPS

Fig 1. Transmit beam CTH
C-band, H-pol, Antenna peak gain: 31.48 dB, peak EIRP: 41.98 dBW

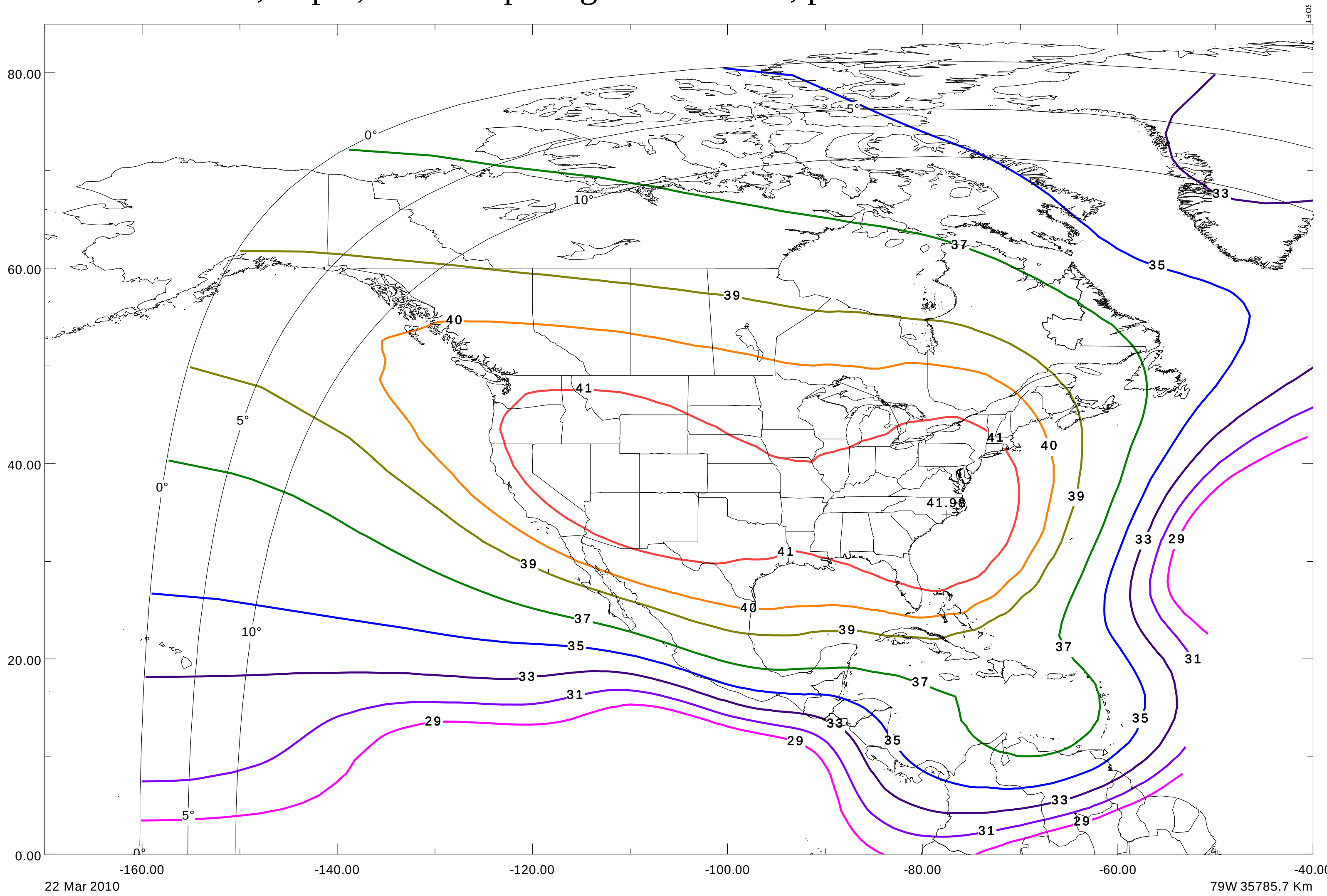

Fig 2. Receive beam CRV

C-band, V-pol, Antenna peak gain: 32.38 dB, peak G/T: 4.48 dB/K

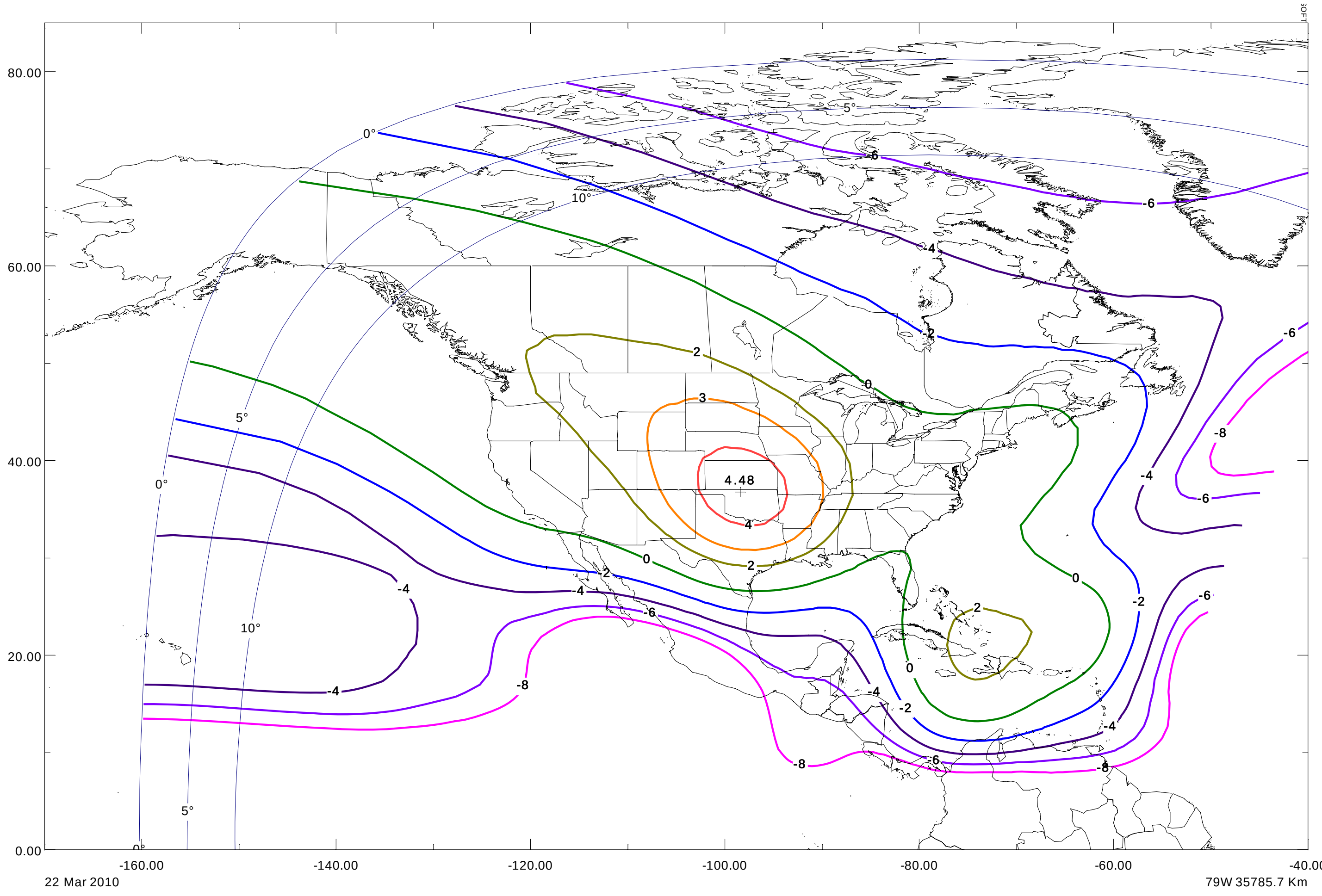

Fig 3. Transmit beam CTV
C-band, V-pol, Antenna peak gain: 30.58 dB, peak EIRP: 41.69 dBW

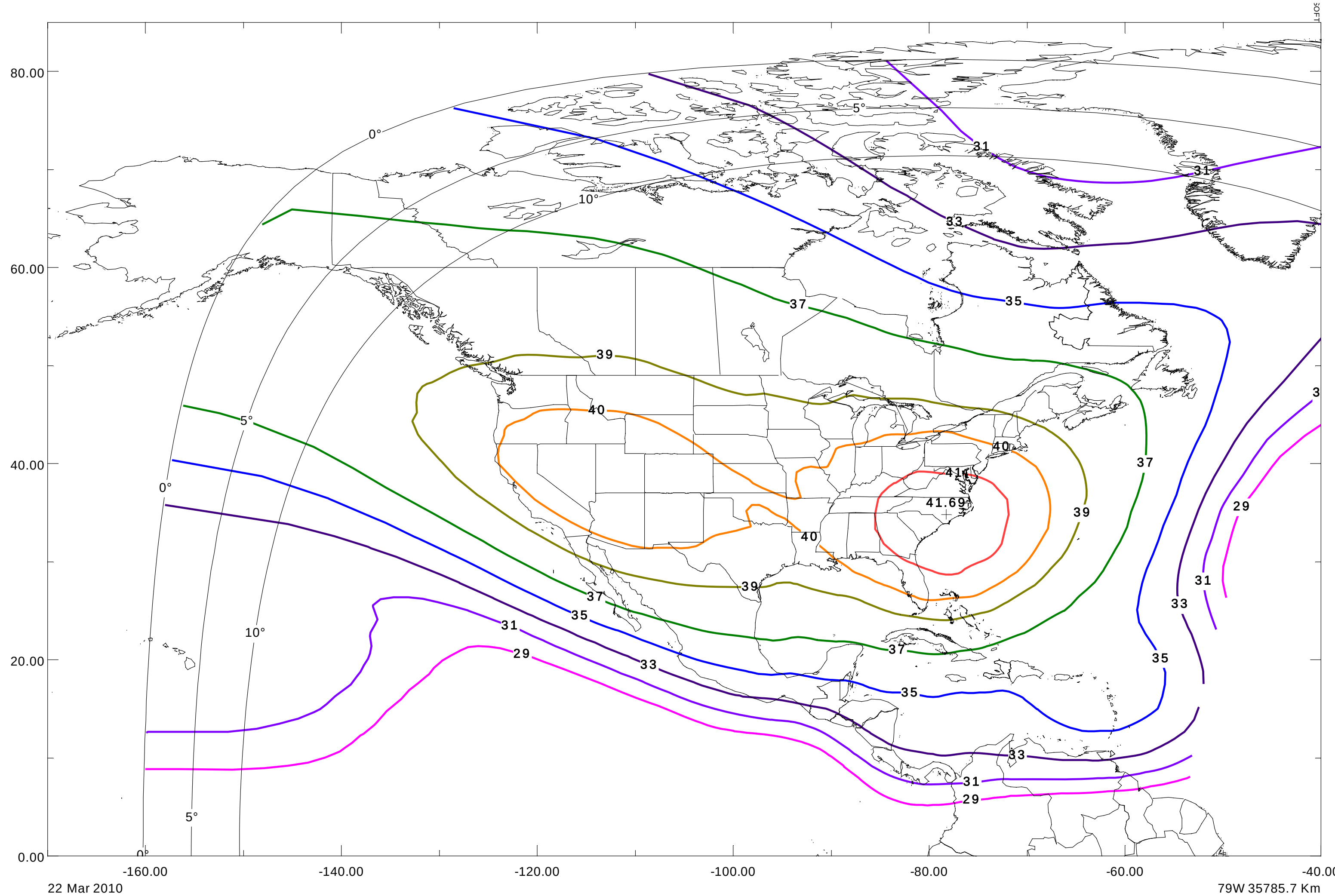

Fig 4. Receive beam CRH
C-band, H-pol, Antenna peak gain: 32.86 dB, peak G/T: 5.56 dB/K

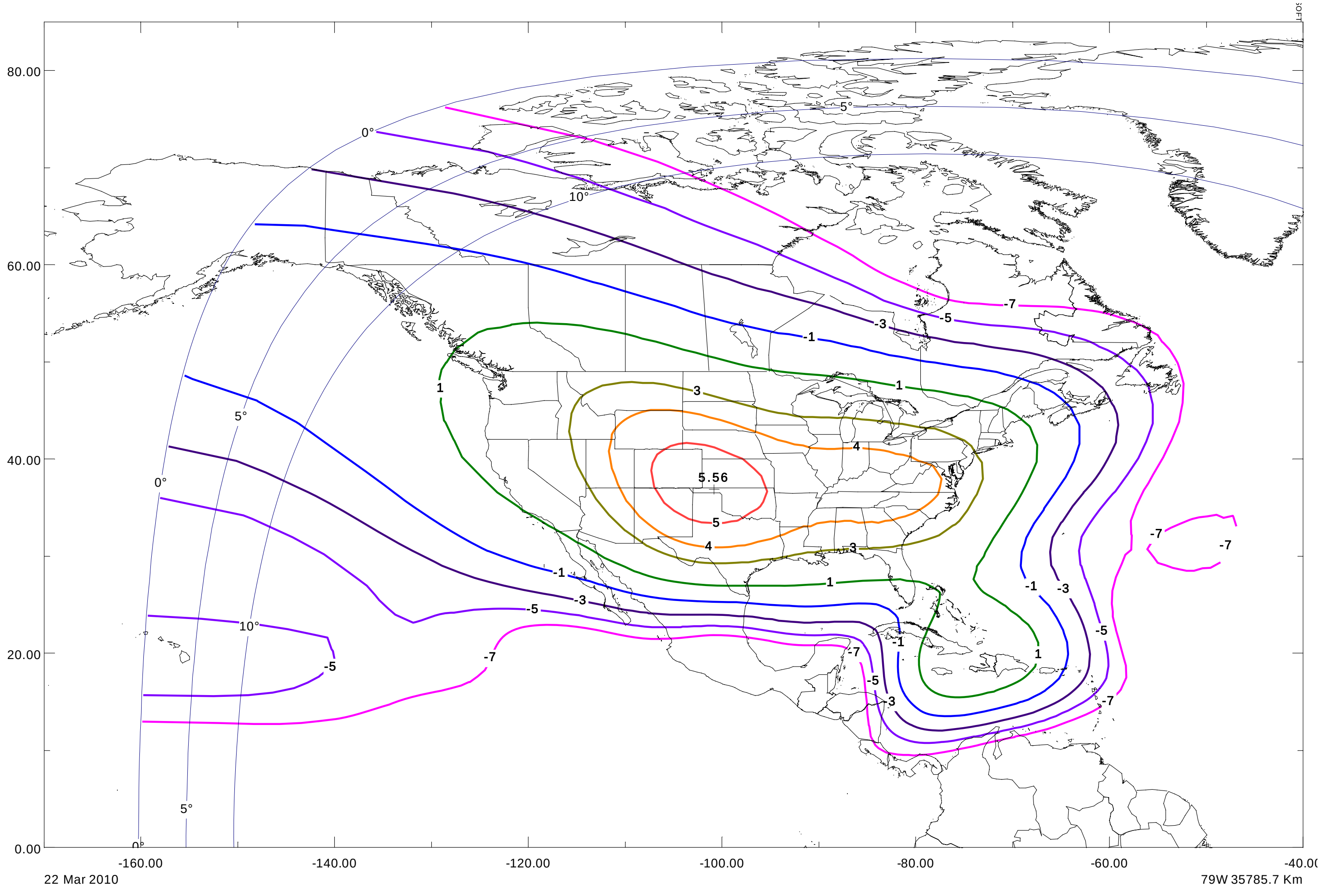

Fig 5. Transmit beam KTH

Ku-band, H-pol, Antenna peak gain: 33.27 dB, peak EIRP: 49.68 dBW

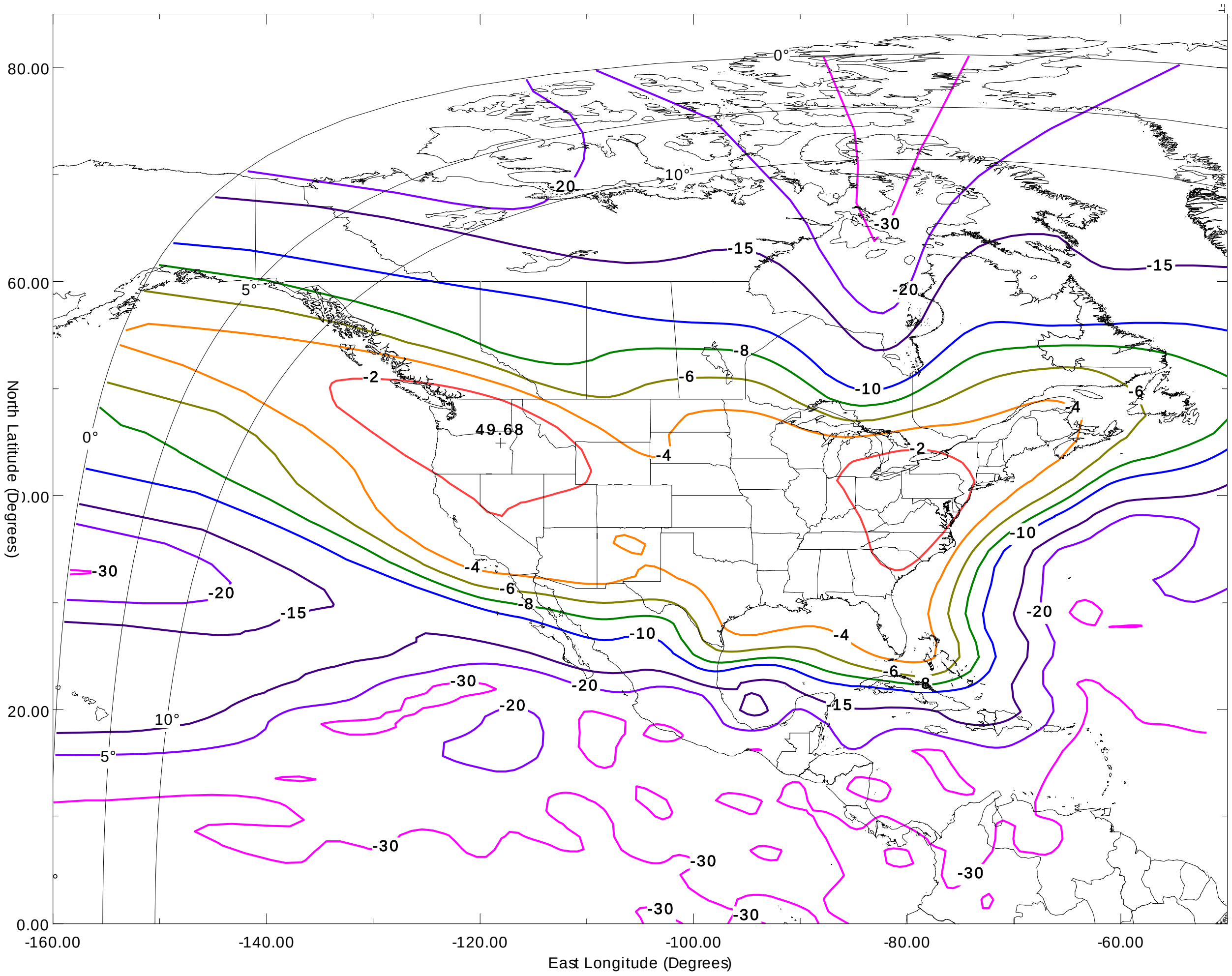

Fig 6. Receive beam KRV

Ku-band, V-pol, Antenna peak gain: 30.86 dB, peak G/T: 3.46 dB/K

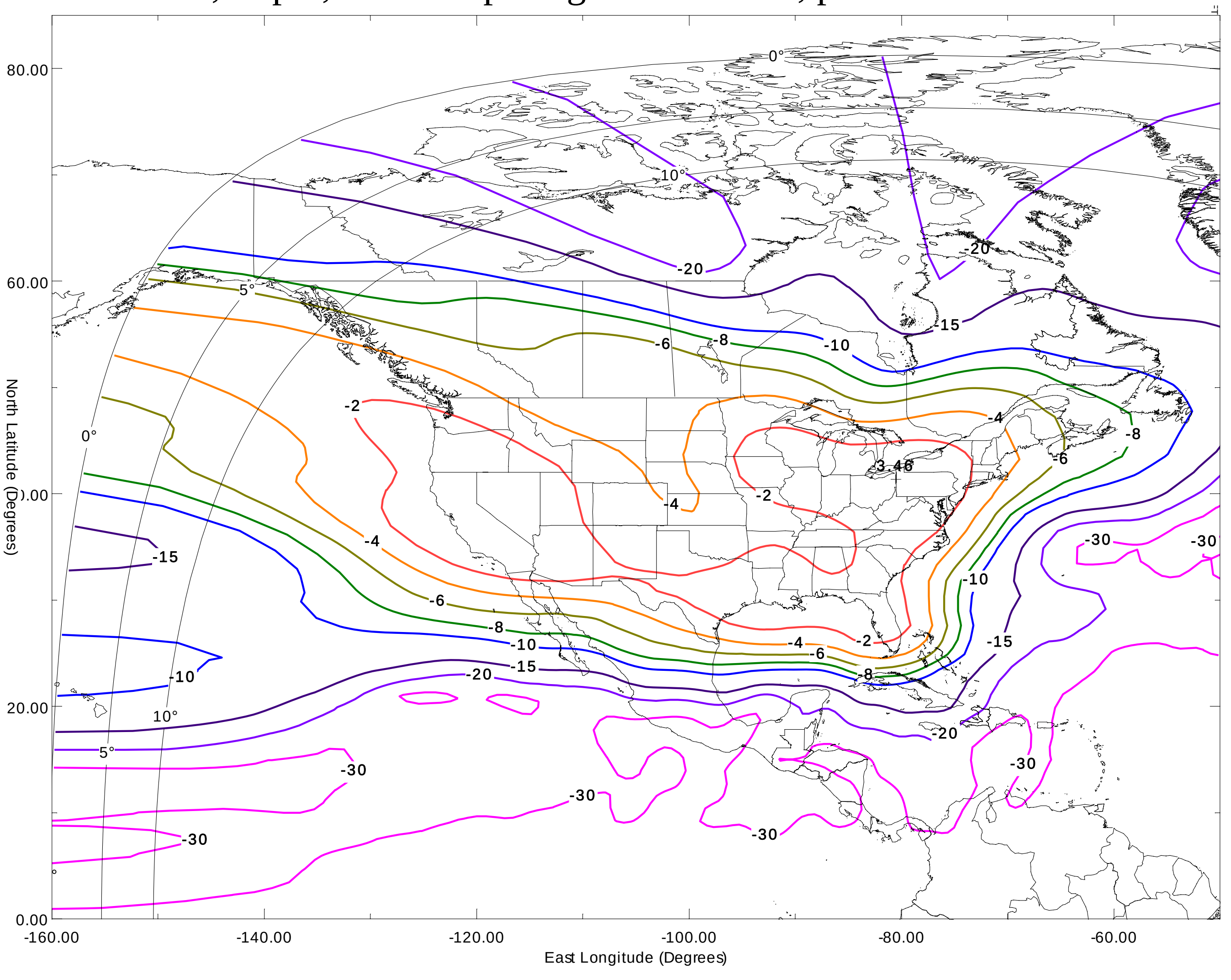

Fig 7. Transmit beam KTV
Ku-band, V-pol, Antenna peak gain: 33.0 dB, peak EIRP: 50.3 dBW

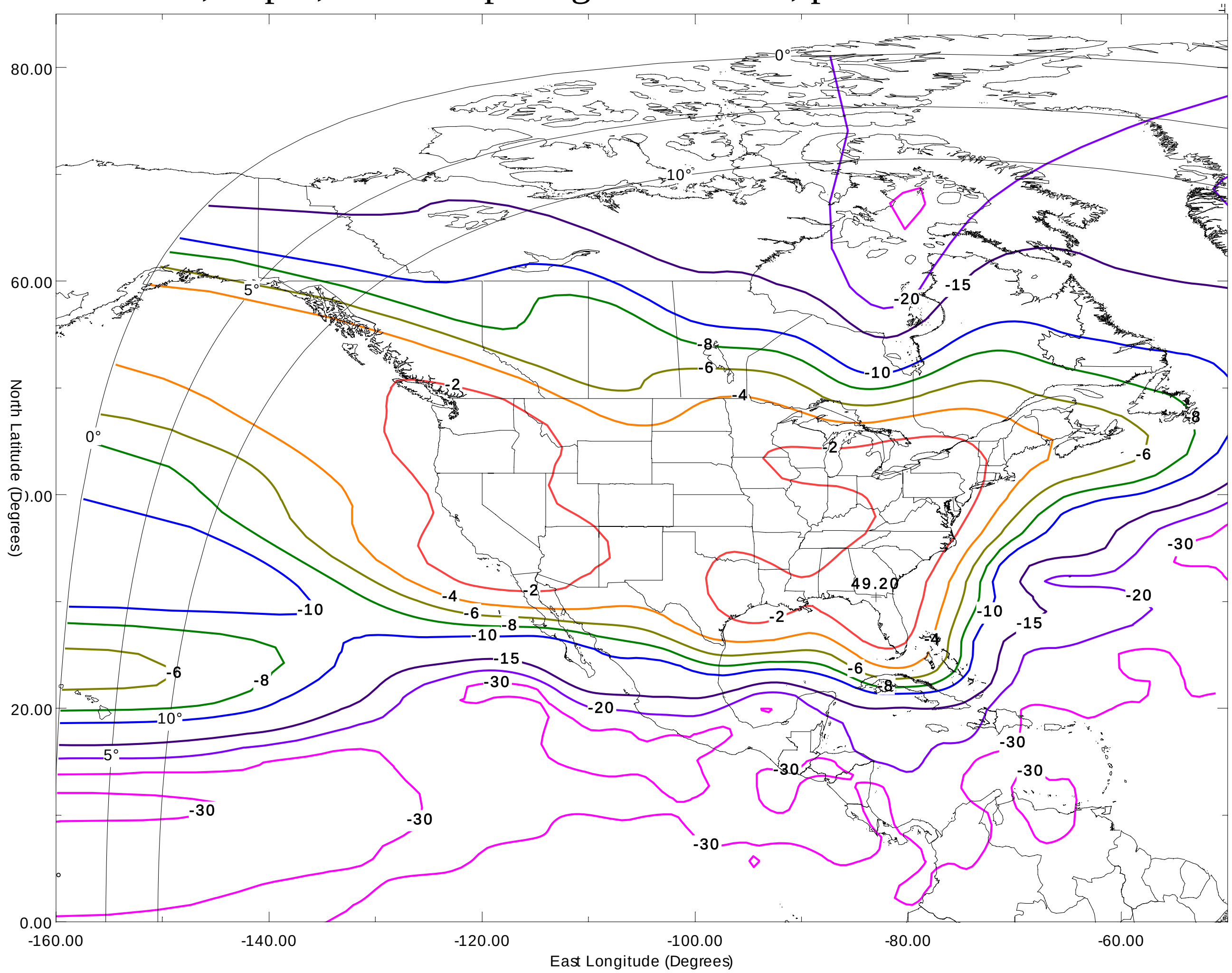

Fig 8. Receive beam KRH
Ku-band, H-pol, Antenna peak gain: 33.63 dB, peak G/T: 5.93 dB/K

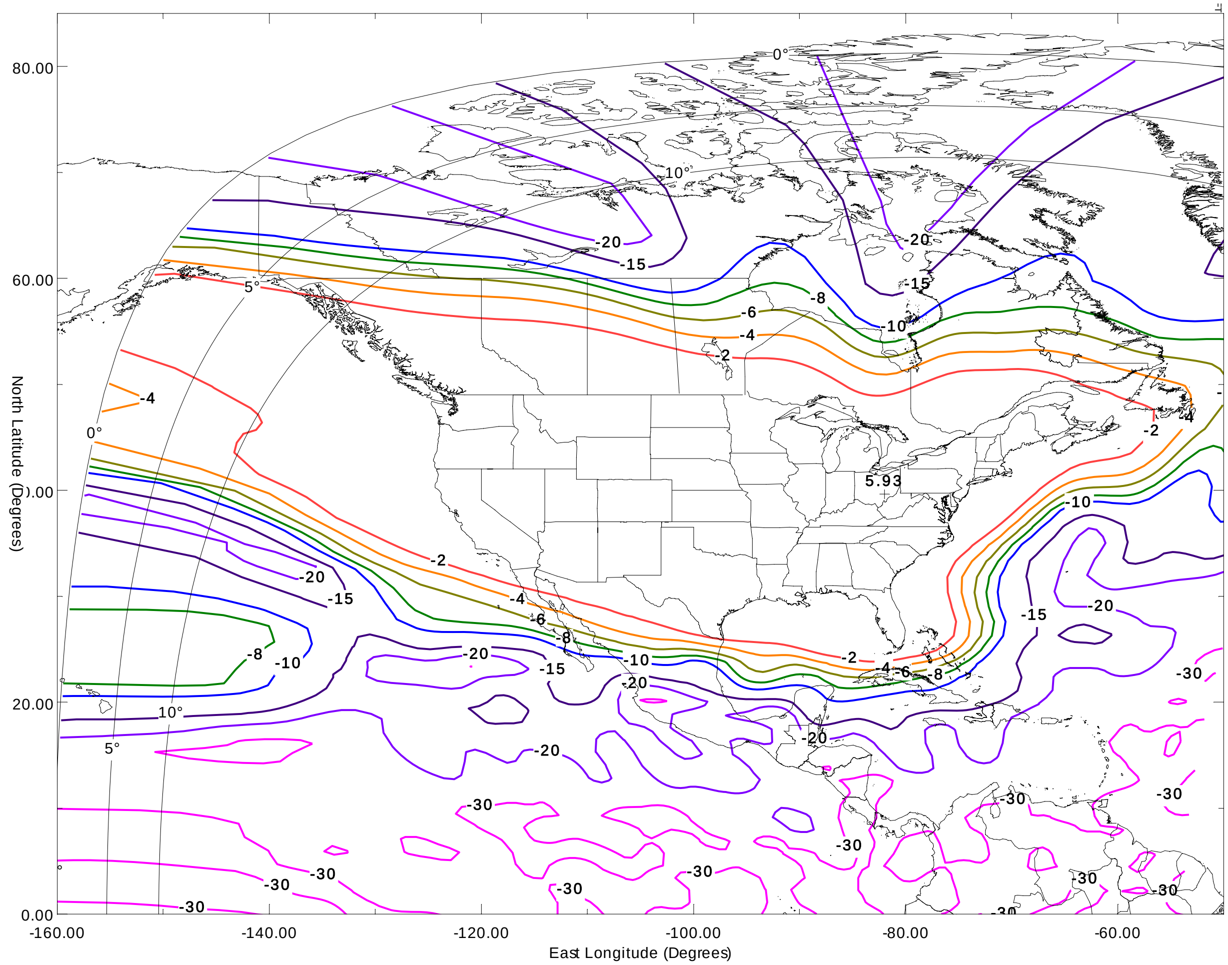

Fig 9. Global Horn Characteristics

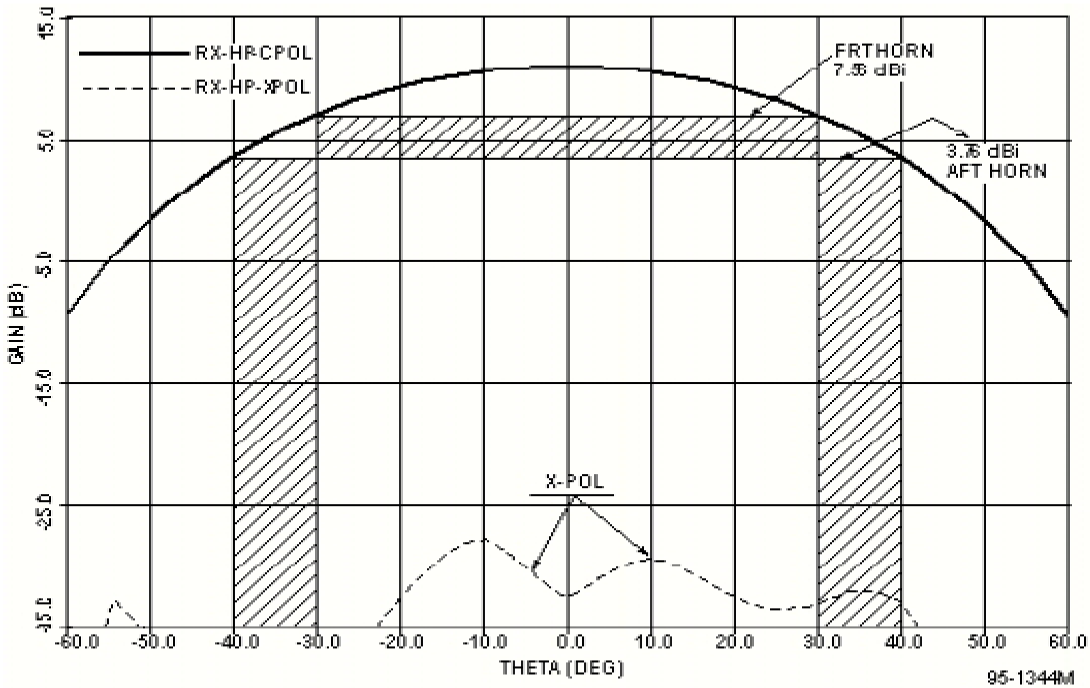

Figure 2.3-4. Measured Performance of Command Horn

ANNEX 2

INTERFERENCE ANALYSIS
IN SUPPORT OF AMC-2
(KU-BAND)

Two-degree spacing analysis

The following analysis will demonstrate that the AMC-2 network is compatible with a co-coverage, co-frequency satellite, spaced 1.95º away.[4] This analysis has been performed for digital signals in both networks. Analog TV/FM signals are coordinated on a case-by-case basis with nearby spacecraft, and are therefore not addressed in this analysis. Digital signals are more robust and operate typically down to much lower C/N ratios than analog signals. They are therefore more tolerant of interference, thereby improving the ability to coordinate at 1.95º orbit spacing.

1 Uplink analysis

This scenario addresses uplink interference between digital carriers in both the wanted and victim satellite networks. The analysis assumes that the transponder gains can be matched to give similar wanted input signal spectral density levels at the two satellites. The Uplink C/I will be a function of the difference between the gain of the transmitting earth stations at boresight and the gain at the off-axis (topocentric) angle.

The topocentric angle for a geocentric separation of 1.95º is approximately 2.1º. The sidelobe envelope at 2.1º off boresight for an antenna that meets the 29-25 log (θ) reference pattern is 20.9 dBi. The boresight gain will be a function of the size of the transmitting earth station. The following Table 1 lists the boresight gain, the off-axis gain and the corresponding C/I that would result in this interference scenario:

[4] SES WORLD SKIES notes that there is one co-frequency satellite that will be less than 1.95 degrees away from AMC-2 at 78.95° W.L. The Venesat-1 satellite operates at 78° W.L. under a Uruguayan ITU network filing that is lower in priority than the U.S. ITU filing at the nominal 79° W.L. location. Coordination discussions with the Venesat-1 operator are in progress to ensure that operations at 78° W.L. will not negatively impact the co-frequency operations of AMC-2 at 78.95° W.L.

Table 1. Uplink C/I for 2 degree geocentric spacing.

Antenna size	On-axis gain	Off-axis gain	C/I
1.20	43.04	20.94	22.09
1.80	46.56	20.94	25.61
2.40	49.06	20.94	28.11
4.50	54.52	20.94	33.57
6.00	57.02	20.94	36.07

Assuming that the minimum (i.e., threshold) C/N for a digital service is 8 dB, the effect of the C/I (22.09 dB) from the 1.2 meter earth station in Table 1 above would only degrade the C/N by 0.17 dB, equivalent to an increase of 3.9% in the victim system's noise temperature. This is less than the ITU coordination trigger criteria; i.e., internationally, if a 6% increase in noise temperature is not exceeded, then coordination is not needed between the concerned networks.

2 Downlink analysis

This scenario addresses downlink interference between digital carriers in both the wanted and victim satellite networks. The analysis assumes that the EIRPs of the two satellites are either similar, or the wanted network has an EIRP of 2 dB lower than AMC-2. Similar to the uplink, the downlink C/I will be a function of the difference between the gain of the receiving earth stations at boresight and the gain at the off-axis angle, as well as any difference in EIRP between the two networks.

The topocentric angle for a geocentric separation of 1.95º is approximately 2.1º. The gain at 2.1º off boresight for an antenna that meets the 29-25 log (θ) reference pattern is 20.9 dBi. The boresight gain will be a function of the size of the receiving earth station. The following Tables list the boresight gain, the off-axis gain and the corresponding C/I that would result in this interference scenario, where the EIRP of the two networks is similar (Table 2) and where the EIRP of the two networks is different by 2 dB (Table 3):

Table 2. Downlink C/I for 2 degree geocentric spacing. Similar EIRPs

Antenna size	On-axis gain	Off-axis gain	Off-axis discrimination	Delta EIRP	C/I
1.20	41.70	20.94	20.75	0.00	20.75
1.80	45.22	20.94	24.27	0.00	24.27
2.40	47.72	20.94	26.77	0.00	26.77
4.50	53.18	20.94	32.23	0.00	32.23
6.00	55.68	20.94	34.73	0.00	34.73

Table 3. Downlink C/I for 2 degree geocentric spacing. Different EIRPs

Antenna size	On-axis gain	Off-axis gain	Off-axis discrimination	Delta EIRP	C/I
1.20	41.70	20.94	20.75	-2.00	18.75
1.80	45.22	20.94	24.27	-2.00	22.27
2.40	47.72	20.94	26.77	-2.00	24.77
4.50	53.18	20.94	32.23	-2.00	30.23
6.00	55.68	20.94	34.73	-2.00	32.73

Again, assuming that the minimum (i.e., threshold) C/N for a digital service is 8 dB, the effect of the C/I (18.75 dB) into the 1.2 meter earth station in Table 3 above would only degrade the C/N by 0.35 dB, equivalent to an increase of 8.4% in the victim system's noise temperature.
Although this does exceed the normal criteria of 6% by a small amount, the victim system's link degradation is still less than 0.5 dB, which is significantly less than the likely link margin.
Attached tables 4 and 5 show some examples of the uplink C/I analysis for typical carriers on the satellite networks. The adjacent satellite is assumed to be at an orbital separation of 1.95° W.L. The uplink sites of AMC-2 can be anywhere in the CONUS region. It is seen that the C/I values are generally above 20 dB.
Tables 6 and 7 show some examples of the downlink C/I analysis for typical carriers on the satellite networks. The bottom half of Table 7 shows a C/I value of about 20 dB is realized in all other cases of interference into the adjacent satellite transponders.

Table 4 AMC-2 and adjacent satellite uplink carriers
(AMC-2 at 78.95°W.L, Adjacent satellite at 77°W.L, Topocentric separation at the receiver location 2.1°, antenna pointing error 0.3°)

AMC-2 Carriers								
		36M0G7W	27M0G7W	6M95G1W	5M00G1W	1M60G1W	100KG1W	
Bandwidth	MHz	36.0	27.0	6.0	5.0	1.6	0.1	
UL EIRP	dBW	78	76.8	70.2	69.4	58	42	
UL flange power	dBW	20.7	19.5	17.2	16.4	11.4	-0.8	
UL flange power dens.	dBW/Hz	-54.9	-54.8	-50.6	-50.6	-50.6	-50.8	
UL ant. Dia	m	6.1	6.1	3.7	3.7	1.8	1.2	
UL ant. Gain	dBi	57.3	57.3	53	53	46.6	42.8	
UL EIRP density	dBW/Hz	2.4	2.5	2.4	2.4	-4.0	-8.0	
Sidelobe gain(at 1.8 deg)	dBi	22.6	22.6	22.6	22.6	22.6	22.6	
Off-ax. EIRP dens	dBW/Hz	-32.2	-32.2	-28.0	-28.0	-28.0	-28.2	
G/T	dB/K	2.0	2.0	2.0	2.0	2.0	2.0	
C/N(thermal)	dB	25.5	25.6	25.5	25.5	19.1	15.1	
Adj. Satellite carriers								
		25M0G7W	17M5G7W	Dig. TV(20.0)	Dig. TV(3.95)	TDMA	64Kbps	9.6Kbps
Bandwidth	MHz	25.0	17.5	14.9	3.4	36.0	0.1	0.0235
UL EIRP	dBW	75	67.9	75	60	75	42	36
UL flange power	dBW	15.6	8.5	15.6	13.4	21.2	-0.8	-6.8
UL flange power dens.	dBW/Hz	-58.4	-63.9	-56.1	-51.9	-54.4	-50.8	-50.5
UL ant. Dia	m	7.5	7.5	7.5	1.8	4.5	1.2	1.2
UL ant. Gain	dBi	59.4	59.4	59.4	46.6	53.8	42.8	42.8
UL EIRP density	dBW/Hz	1.0	-4.5	3.3	-5.3	-0.6	-8.0	-7.7
Sidelobe gain(at 1.8 deg)	dBi	22.6	22.6	22.6	22.6	22.6	22.6	22.6
Off-ax. EIRP dens	dBW/Hz	-35.8	-41.3	-33.5	-29.3	-31.7	-28.2	-27.9
G/T	dB/K	0.5	0.5	0.5	0.5	0.5	0.5	0.5
C/N(thermal)	dB	22.6	17.1	24.9	16.3	21.0	13.6	13.9

Table 5 Uplink C/I estimates in carriers shown in Table 4

Uplink C/I in AMC-2 carriers due to interference from adj. Satellite							
		AMC-2 carriers					
Adj. Sat carriers		36M0G7W	27M0G7W	6M95G1W	5M00G1W	1M60G1W	100KG1W
36M0G7W		38.2	38.2	38.2	38.2	31.7	27.8
27M0G7W		43.7	43.8	43.7	43.7	37.3	33.3
Dig. TV(20.0)		36.0	36.0	35.9	35.9	29.5	25.5
Dig. TV(3.95)		31.7	31.8	31.7	31.7	25.3	21.3
TDMA		34.2	34.2	34.2	34.2	27.7	23.7
64Kbps		30.6	30.7	30.6	30.6	24.1	20.2
9.6Kbps		30.3	30.4	30.3	30.3	23.9	19.9
Uplink C/I in Adj. sat carriers due to interference from AMC-2 carriers							
		AMC-2 carriers					
Adj. Sat carriers		36M0G7W	27M0G7W	6M95G1W	5M00G1W	1M60G1W	100KG1W
36M0G7W		33.3	33.2	29.0	29.0	29.0	29.2
27M0G7W		27.7	27.7	23.4	23.4	23.5	23.7
Dig. TV(20.0)		35.5	35.5	31.2	31.2	31.3	31.4
Dig. TV(3.95)		26.9	26.9	22.6	22.7	22.7	22.9
TDMA		31.7	31.6	27.4	27.4	27.5	27.6
64Kbps		24.2	24.2	20.0	20.0	20.0	20.2
9.6Kbps		24.5	24.5	20.3	20.3	20.3	20.5

Table 6 AMC-2 and adjacent satellite downlink carriers
(AMC-2 at 78.95°W.L, Adjacent satellite at 77°W.L, Topocentric separation at the receiver location 2.1°, antenna pointing error 0.3°)

AMC-2 Carriers		36M0G7W	6M95G1W	5M00G1W	1M60G1W	100KG1W		
Bandwidth	MHz	36.0	6.0	5.0	1.6	0.1		
Satelllite EIRP max	dBW	49.7	49.7	49.7	49.7	49.7		
Carrier EIRP	dBW	48.7	40.4	38.9	36.0	24.0		
Carrier EIRP dens	dBW/Hz	-26.9	-27.4	-28.1	-26.0	-26.0		
RxES ant. Dia	m	1.2	1.8	1.8	1.2	1.2		
RxES ant. Gain	dBi	41.2	45.1	45.1	41.2	41.2		
Sidelobe gain(at 1.8 deg)	dBi	22.6	22.6	22.6	22.6	22.6		
C/N(thermal)	dB	14.9	18.2	17.6	15.7	15.7		
Adj. Satellite carriers								
		36M0G7W	27M0G7W	Dig. TV(20.0)	Dig. TV(3.95)	TDMA	64Kbps	9.6Kbps
Bandwidth	MHz	36.0	27.0	14.9	3.4	36.0	0.1	0.0235
Satelllite EIRP max	dBW	51.0	51.0	51.0	51.0	51.0	51.0	51.0
Carrier EIRP	dBW	51.0	51.0	44.2	36.8	47.0	25.0	19.0
Carrier EIRP dens	dBW/Hz	-24.6	-23.3	-27.6	-28.6	-28.6	-25.0	-24.7
RxES ant. Dia	m	1.2	1.2	1.8	1.8	4.5	1.2	1.2
RxES ant. Gain	dBi	41.2	41.2	45.1	45.1	52.6	41.2	41.2
Sidelobe gain(at 1.8 deg)	dBi	22.6	22.6	22.6	22.6	22.6	22.6	22.6
C/N(thermal)	dB	17.2	18.4	18.1	17.1	24.6	16.7	17.0

Table 7 Downlink C/I estimates in carriers shown in Table 6

Downlink C/I in AMC-2 carriers due to interference from adj. Satellite					
	AMC-2 carriers				
Adj. Sat carriers	36M0G7W	6M95G1W	5M00G1W	1M60G1W	100KG1W
36M0G7W(EIRP: 52 dBW)	16.3	19.6	19.0	17.1	17.1
36M0G7W(EIRP: 46 dBW)	21.3	24.6	24.0	22.1	22.1
27M0G7W	15.0	18.4	17.7	15.9	15.9
Dig. TV(20.0)	19.3	22.6	22.0	20.1	20.1
Dig. TV(3.95)	20.3	23.6	23.0	21.1	21.1
TDMA	20.3	23.6	23.0	21.1	21.1
64Kbps	19.7	23.1	22.4	20.5	17.6
9.6Kbps	19.4	22.8	22.1	20.3	20.3
Downlink C/I in Adj. sat carriers due to interference from AMC-2 carriers					
	AMC-2 carriers				
Adj. Sat carriers	36M0G7W	6M95G1W	5M00G1W	1M60G1W	100KG1W
36M0G7W(EIRP: 52 dBW)	20.9	21.4	22.1	20.1	20.0
36M0G7W(EIRP: 46 dBW)	21.9	22.5	23.1	21.1	21.0
27M0G7W	22.1	22.7	23.3	21.3	21.3
Dig. TV(20.0)	21.8	22.3	23.0	21.0	20.9
Dig. TV(3.95)	20.8	21.3	22.0	20.0	19.9
TDMA	28.3	28.8	29.5	27.5	27.4
64Kbps	20.4	21.0	21.6	19.6	19.6
9.6Kbps	20.7	21.3	21.9	19.9	19.9

ANNEX 3

INTERFERENCE ANALYSIS

IN SUPPORT OF AMC-2

(C-BAND)

Two-Degree Spacing Analysis for AMC-2

The following analysis will illustrate that the AMC-2 satellite is compatible with a co-coverage, co-frequency satellite, spaced 1.95º or more away.[5] This analysis is performed for digital signals in both networks, and analog TV/FM signal calculations are provided for information in the Annex to this Attachment. Analog TV/FM signals are coordinated on a case-by-case basis with nearby spacecraft. Further, at C-band, it should be recognized that the FCC has a frequency/polarization plan that ensures that adjacent satellites operate the same channels on opposite polarizations. This channelization plan ensures that the center four MHz of analog transmissions, where most of the power of the analog signal is concentrated, fall within the guardband of transponders on the adjacent satellites with the same polarization. This polarization and channelization advantage was not taken into account in the analysis in the Annex, and as a result, the interference shown in the Annex from the analog emissions is higher than would occur in practice. Digital signals are more robust and operate typically down to much lower C/N ratios than analog signals. They are therefore more tolerant of interference, thereby improving the ability to coordinate at 1.95º orbital spacing.

1. C-band Uplink Analysis

This scenario addresses uplink interference between digital carriers in both the wanted and victim satellite networks. The analysis assumes that the transponder gains can be matched to give similar wanted input signal spectral density levels at the two satellites. The Uplink C/I will be a function of the difference between the gain of the transmitting earth stations at boresight and the gain at the off-axis (topocentric) angle.

The topocentric angle for a geocentric separation of 1.95º is approximately 2.1º. The gain at 2.1º off boresight for an antenna that meets the 29-25 log (θ) reference pattern is 20.9 dBi. The boresight gain will be a function of the size of the transmitting earth station. The following table lists the boresight gain, the off-axis gain and the corresponding C/I that would result in this interference scenario:

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[5] SES WORLD SKIES notes that there is one co-frequency satellite that will be less than 1.95 degrees away from AMC-2 at 78.95° W.L. The Venesat-1 satellite operates at 78° W.L. under a Uruguayan ITU network filing that is lower in priority than the U.S. ITU filing at the nominal 79° W.L. location. Coordination discussions with the Venesat-1 operator are in progress to ensure that operations at 78° W.L. will not negatively impact the co-frequency operations of AMC-2 at 78.95° W.L.

Table 1.
C-band Uplink C/I for 2 degree geocentric spacing.

Antenna size	On-axis gain	Off-axis gain	C/I
2.40	41.70	20.94	20.75
3.00	43.64	20.94	22.69
4.50	47.16	20.94	26.21
6.10	49.80	20.94	28.85
7.50	51.59	20.94	30.65

Assuming that the minimum (i.e., threshold) C/N for a digital service is 8 dB, the effect of the C/I (20.8 dB) on the 2.4 meter earth station in Table 1 above would only degrade the C/N by 0.22 dB, equivalent to an increase of 5.3% in the victim system's noise temperature. This is less than the ITU coordination trigger criteria; *i.e.*, internationally, if a 6% increase in noise temperature is not exceeded, then coordination is not needed between the concerned networks.

2. C-band Downlink Analysis

This scenario addresses downlink interference between digital carriers in both the wanted and victim satellite networks. The analysis assumes that the EIRPs of the two satellites are similar. Similar to the uplink, the downlink C/I will be a function of the difference between the gain of the receiving earth stations at boresight and the gain at the off-axis angle, as well as any difference in EIRP between the two networks.

The topocentric angle for a geocentric separation of 1.95º is approximately 2.1º. The gain at 2.1º off boresight for an antenna that meets the 29-25 log (θ) reference pattern is 20.9 dBi. The boresight gain will be a function of the size of the transmitting earth station. The following table lists the boresight gain, the off-axis gain and the corresponding C/I that would result in this interference scenario, where the EIRP of the two networks is similar (Table 2):

Table 2.
C-band Downlink C/I for 2 degree geocentric spacing. Similar EIRPs

Antenna size	On-axis gain	Off-axis gain	Off-axis discrimination	C/I
2.40	38.18	20.94	17.23	17.23
3.00	40.11	20.94	19.17	19.17
4.50	43.64	20.94	22.69	22.69
6.10	46.28	20.94	25.33	25.33
7.50	48.07	20.94	27.13	27.13

Again, assuming that the minimum (i.e., threshold) C/N for a digital service is 8 dB, the effect of the C/I (17.23 dB) into the 2.4 meter earth station in Table 2 above would only degrade the C/N by 0.5 dB, equivalent to an increase of 11.9% in the victim system's noise temperature. Although this does exceed the normal criteria of 6%, it is expected that such a C/I level can be coordinated. In addition, it should be noted that this analysis does not take into account the FCC's requirement that adjacent satellites operate the same channel on opposite polarizations.

3. Additional interference analysis

Additional C-band interference analysis is provided in the Annex to this Attachment, for a variety of carriers. It should be noted that analog carriers are included for information, but that these carriers require coordination on a case-by-case basis.

Table 3 shows the key uplink parameters of AMC-2 and adjacent satellite carriers. Table 4 shows C/I estimates in AMC-2 and adjacent satellite carrier uplinks. The C/I values in the adjacent carriers are at least 23 dB.

Table 5 shows the key downlink parameters of AMC-2 and adjacent satellite carriers. Table 6 shows C/I estimates in AMC-2 and adjacent satellite carrier uplinks. The C/I values in the adjacent carriers are minimally about 19.0 dB.

Table 3: AMC-2 and adjacent satellite uplink carrier characteristics –C-band (AMC-2 at 78.95° W.L., Adjacent satellite at 77° W.L., Topocentric separation at the receiver location 2.1°, antenna pointing error 0.3°)

AMC-2 Carriers		36M0G7W	6M95G1W	1M60G1W	100KG1W
Bandwidth	MHz	36.0	6.0	1.6	0.1
UL EIRP	dBW	69	57.1	50.6	38.6
UL flange power	dBW	19.2	11.6	5.6	-6.3
UL flange power dens.	dBW/Hz	-56.4	-56.2	-56.4	-56.3
UL ant. Dia	m	6.1	3.7	3.4	3.4
UL ant. Gain	dBi	49.8	45.46	44.72	44.72
UL EIRP density	dBW/Hz	-6.6	-10.7	-11.4	-11.4
Sidelobe gain (at 1.8 deg)	dBi	22.6	22.6	22.6	22.6
Off-ax. EIRP dens	dBW/Hz	-33.7	-33.6	-33.8	-33.7
G/T	dB/K	2.0	2.0	2.0	2.0
C/N (thermal)	dB	16.5	12.4	11.7	11.7
Adj. Satellite carriers		36M0G7W	6M5G1W	1M50G1W	100K50G1W
Bandwidth	MHz	32.6	5.8	1.3	0.1
UL EIRP	dBW	70	58.1	51.7	39.6
UL flange power	dBW	13.42	1.52	2.61	-8.77
UL flange power dens.	dBW/Hz	-61.71	-66.11	-58.53	-58.77
UL ant. Dia	m	9.00	9.00	3.80	3.50
UL ant. Gain	dBi	56.58	56.58	49.09	48.37
UL EIRP density	dBW/Hz	-5.1	-9.5	-9.4	-10.4
Sidelobe gain (at 1.8 deg)	dBi	22.6	22.6	22.6	22.6
Off-ax. EIRP dens	dBW/Hz	-39.1	-43.5	-35.9	-36.2
G/T	dB/K	0.5	0.5	0.5	0.5
C/N (thermal)	dB	16.5	12.1	12.2	11.2

Table 4: C-band uplink C/I estimates in carriers shown in Table 3

Uplink C/I in AMC-2 carriers due to interference from adj. satellite				
	AMC-2 carriers			
Adj. Sat carriers	36M0G7W	6M5G1W	1M50G1W	100KG1W
36M0G7W	32.5	28.4	27.7	27.7
6M5G1W	36.9	32.8	32.1	32.1
1M50G1W	29.3	25.2	24.5	24.5
100K50G1W	29.6	25.5	24.7	24.8
Uplink C/I in adj. sat carriers due to interference from AMC-2 carriers				
	AMC-2 carriers			
Adj. Sat carriers	36M0G7W	6M5G1W	1M50G1W	100KG1W
36M0G7W	28.6	28.4	28.7	28.5
6M5G1W	24.2	24.0	24.3	24.1
1M50G1W	24.3	24.1	24.4	24.2
100K50G1W	23.3	23.2	23.4	23.3

Table 5: AMC-2 and adjacent satellite downlink carrier characteristics – C-band (AMC-2 at 78.95° W.L., Adjacent satellite at 77° W.L., Topocentric separation at the receiver location 2.1°, antenna pointing error 0.3°)

AMC-2 Carriers		36M0G7W	6M95G1W	1M60G1W	100KG1W
Bandwidth (occupied)	MHz	32.6	5.8	1.3	0.1
Satellite EIRP max	dBW	41.5	41.5	41.5	41.5
Carrier EIRP	dBW	40.0	30.5	25.7	12.7
Carrier EIRP dens	dBW/Hz	-35.1	-37.1	-35.4	-37.3
Rx ES ant. Dia	m	6.1	7	5.4	4.5
Rx ES ant. Gain	dBi	46.28	47.48	45.22	43.64
Sidelobe gain (at 1.8 deg)	dBi	22.6	22.6	22.6	22.6
C/N (thermal)	dB	21.7	20.9	20.4	16.9
Adj. Satellite carriers		36M0G7W	6M95G1W	1M60G1W	100KG1W
Bandwidth (occupied)	MHz	32.6	5.8	1.3	0.1
Satellite EIRP max	dBW	41.5	41.5	41.5	41.5
Carrier EIRP	dBW	40.0	30.5	25.7	12.7
Carrier EIRP dens	dBW/Hz	-35.1	-37.1	-35.4	-37.3
Rx ES ant. Dia	m	6.1	7	5.4	4.5
Rx ES ant. Gain	dBi	46.28	47.48	45.22	43.64
Sidelobe gain (at 1.8 deg)	dBi	22.6	22.6	22.6	22.6
C/N (thermal)	dB	21.7	20.9	20.4	16.9

Table 6: C-band downlink C/I estimates in carriers shown in Table 5

Downlink C/I in AMC-2 carriers due to interference from adj. satellite				
	AMC-2 carriers			
Adj. Sat carriers	36M0G7W	6M95G1W	1M60G1W	100KG1W
36M0G7W	23.7	22.9	22.3	18.9
6M95G1W	25.7	24.9	24.3	20.9
1M60G1W	23.9	23.1	22.6	19.2
100KG1W	25.8	25.0	24.5	21.0
Downlink C/I in adj. sat carriers due to interference from AMC-2 carriers				
	AMC-2 carriers			
Adj. Sat carriers	36M0G7W	6M95G1W	1M60G1W	100KG1W
36M0G7W	23.7	25.7	23.9	25.8
6M95G1W	22.9	24.9	23.1	25.0
1M60G1W	22.3	24.3	22.6	24.5
100KG1W	18.9	20.9	19.2	21.0

Engineering Declaration

DECLARATION OF Krish Jonnalagadda

I, Krish Jonnalagadda, hereby certify under penalty of perjury that I am the technically qualified person responsible for preparation of the technical information contained in the foregoing exhibit; that I am familiar with the technical requirements of Part 25; and that I either prepared or reviewed the technical information contained in the exhibit and that it is complete and accurate to the best of my knowledge, information and belief.

_*/s/ Krish Jonnalagadda*____________________
Manager, Spectrum Development
SES Americom, Inc.

Dated: March 24, 2010