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

In the Matter of Application of	)	
	)	
SES Americom, Inc.	)	File No. SAT-LOA-__________
	)	
For Authority to Launch and Operate an Expansion Satellite at 129.1° W.L.	))	

APPLICATION OF SES AMERICOM, INC.

SES Americom, Inc. ("SES Americom," doing business as "SES"), hereby applies for authority under the Communications Act of 1934, as amended, and the Federal Communications Commission's regulations thereunder, to launch and operate a conventional Ku-band[1] expansion satellite at the nominal 129° W.L. orbital location,[2] to be designated SES-129W. A completed FCC Form 312 is attached, and technical information relating to the proposed spacecraft is provided on Schedule S and in narrative form pursuant to Section 25.114 of the Commission's Rules.

In a decision released last week, the Commission announced that it was making the Ku-band spectrum at the nominal 129° W.L. orbital location available for filing.[3] This application is being filed in response to that announcement. SES-129W will make Ku-band satellite capacity available for a range of high quality video, broadband and data services, including direct-to-home ("DTH") services. Grant of this application is in the public interest

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1 The "conventional Ku-band" refers to the 11.7-12.2 GHz and 14.0-14.5 GHz frequencies.

2 To facilitate joint stationkeeping with collocated spacecraft, SES proposes to operate SES-129W at a slight offset from 129° W.L., specifically at 129.1º W.L.

3 *See Intelsat Licensee LLC*, Memorandum Opinion and Order, DA 12-1532, File No. SAT-MSC-20100628-00160 (Sat. Div. rel. Sept. 25, 2012) at ¶ 18.

because it will permit SES to make new capacity available to customers at the nominal 129° W.L. orbital location.

INTRODUCTION

SES Americom is a pioneer and leading provider of satellite services in the United States. Headquartered in Princeton, New Jersey, SES Americom and its affiliates provide U.S. and international satellite services through a fleet of over 50 geosynchronous communications satellites. SES Americom (then known as RCA American Communications, Inc.) launched its first domestic communications satellite in December 1975. Today, SES and its affiliates operate two dozen satellites with coverage of the United States, providing satellite capacity for broadcast and cable video distribution, VSAT data networks, remote communications, and the U.S. government.

Broadcasters, cable systems and programmers use SES satellites both to distribute programming and for specialized satellite newsgathering services. SES established one of the first cable satellite "neighborhoods" more than 20 years ago, and today distributes cable television programming for the major cable networks. Virtually every U.S. cable and Direct Broadcast Satellite ("DBS") household receives some of its programming via the SES fleet. SES also has one of the largest satellite "neighborhoods" for the U.S. radio programming industry.

Dozens of specialized satellite-based communication networks have been designed, installed, maintained and serviced by SES for government organizations as diverse as the Department of State, NASA, NOAA, and the U.S. Armed Forces.[4] The company's satellites are also used to help provide basic voice, data and Internet communications to remote areas. As

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[4] Government services are provided by SES Americom's wholly-owned subsidiary, Americom Government Services, Inc., d/b/a SES Government Solutions.

the demand increases for high-quality telecommunications, SES technical experts continue to develop innovative and cost-effective solutions to address customers' evolving needs.

INFORMATION REQUIRED BY SECTION 25.114(c)

The information required by Section 25.114(c) is contained in the Schedule S database being submitted with this application, as supplemented by the narrative Technical Appendix.

INFORMATION REQUIRED BY SECTION 25.114(d)

The information required by Section 25.114(d) is contained herein and in the narrative Technical Appendix being submitted with this application.

PUBLIC INTEREST CONSIDERATIONS

Launch and operation of SES-129W will serve the public interest by enabling SES to make Ku-band satellite capacity available for a variety of high-quality video, broadband and data services to the North American market. Among other things, SES-129W would enable SES to augment the DBS capacity on Ciel-2 at 128.85° W.L. (operated by SES's Canadian affiliate, Ciel Satellite L.P.) with conventional Ku-band DTH capacity.[5] Grant of authority for SES-129W is therefore consistent with Commission precedent and with policies designed to maximize the efficient use of spectrum and orbital resources.

Like other satellites in the SES Americom fleet, SES will commercialize the satellite capacity on SES-129W on a non-common carrier basis by negotiating contracts individually with its customers.

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[5] *See SES Americom, Inc., Order and Authorization*, 18 FCC Rcd 16589 (Int'l Bur. 2003) at ¶ 1 (authorizing the use of SES Americom's fleet for DTH would "promote fair and increased competition in the provision of satellite service in the United States" and would "provide benefits to the public by maximizing consumer choice.").

CONCLUSION

SES is requesting here, and in the related materials attached hereto, authority to launch and operate the SES-129W expansion satellite at the nominal 129º W.L. orbital location in order to permit SES to introduce new service to customers. SES submits that the public interest, convenience, and necessity will be served by a grant, in accordance with this Application, of authority to launch and operate the proposed satellite.

Respectfully submitted,

SES AMERICOM, INC.

By: *<u>/s/ Daniel C.H. Mah</u>*

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ATTACHMENT A

TECHNICAL APPENDIX

IN SUPPORT OF SES-129K (129.1°W.L.)

TECHNICAL APPENDIX

1.0 Overall Description

The SES Americom satellite SES-129K is a Ku-band communications satellite designed for operations from the 129.1° W.L. orbital location with coverage of the Contiguous USA, Alaska, Hawaii, Mexico, and parts of Canada and the Caribbean.

The spacecraft will operate in the standard Ku-band frequencies with downlink frequencies from 11.7 to 12.2 GHz and uplink frequencies from 14.0 to 14.5 GHz.

Dual linear polarization is used in the uplink and downlink direction, and the downlink can also be operated in circular polarization.

Table 1 shows the frequency plan of the satellite. The frequency bands are divided into 24 Ku-band transponders of 36 MHz bandwidth each.

2.0 Schedule S

The Schedule S database is attached as an electronic file.
The following items supplement the information provided in Schedule S.

1. *Transponder frequency plan.*

Sections S9 and S10 of Schedule S show the transponder frequency plans. Beams with IDs KRV, KTV, KRH, KTH, KTR and KTL provide coverage over CONUS, Mexico, Alaska, Hawaii, and parts of Canada and the Caribbean.

Transponders K01 to K24 connect beams KRH and KTV, and beams KRV and KTH, while transponders K25 to K48 connect beams KRH to KTR and beams KRV to KTL.

Table 1: Ku-band Frequency Plan

Channel	Receive Frequency (MHz)	Polarization	Transmit Frequency (MHz)	Polarization
1	14020	H	11720	V/RHC
2	14040	V	11740	H/LHC
3	14060	H	11760	V/RHC
4	14080	V	11780	H/LHC
5	14100	H	11800	V/RHC
6	14120	V	11820	H/LHC
7	14140	H	11840	V/RHC
8	14160	V	11860	H/LHC
9	14180	H	11880	V/RHC
10	14200	V	11900	H/LHC
11	14220	H	11920	V/RHC
12	14240	V	11940	H/LHC
13	14260	H	11960	V/RHC
14	14280	V	11980	H/LHC
15	14300	H	12000	V/RHC
16	14320	V	12020	H/LHC
17	14340	H	12040	V/RHC
18	14360	V	12060	H/LHC
19	14380	H	12080	V/RHC
20	14400	V	12100	H/LHC
21	14420	H	12120	V/RHC
22	14440	V	12140	H/LHC
23	14460	H	12160	V/RHC
24	14480	V	12180	H/LHC

2. TWTA redundancy.

Ku-band

The communications receivers are configured in a 4-for-2 redundancy (as a minimum) with cross-strapping between polarizations and coverage beams such that any two receivers can complete the mission. Each transponder has a useable bandwidth up to 36 MHz, and is operated using single or dual Traveling Wave Tube Amplifiers (TWTAs) of 150W output power. The spacecraft carries a total of 64 payload TWTAs operated with 48 active/16 spares in dual TWTA mode.

3. Saturation Flux Density values.

SFD values can be obtained by using the expression:

SFD = -94 – (G/T) +Transponder Gain Setting, dBW/m2

4. Transponder frequency response.

The frequency response and total group delay, specified over the transponder bandwidth, are provided in Tables 2 and 3 below.

Table 2: Ku-band Transponder Frequency Response

	Frequency Offset (MHz)	dB p-p
36 MHz channel	±14	1.2
	±16	1.5
	±18	3.6

Table 3: Ku-band Transponder Total Group Delay

	Frequency Offset (MHz)	Relative Group Delay (ns p-p)
36 MHz channel	0	6.0
	±8	9.0
	±12	16.0
	±16	45.0
	±18	85.0

5. *Telemetry and Telecommand (TT&C) frequencies and beams.*

Table 4 shows the TT&C carrier center frequencies and bandwidths.

Table 4: TT&C Carrier Frequencies[1]

	Frequency, MHz	Nominal polarization
Command carriers (bandwidth: 800 kHz)		
Ku-band	14499.0	H
Beacons/Telemetry (bandwidth: 400 kHz)		
Ku-band pair	11701.0	H/LHC
	12199.0	V/RHC

5.1 Command carrier characteristics and link budgets

1. Bandwidth (2-sided): 800 kHz
2. Capture range (2-sided): 2.0 MHz
3. Transmit earth station sidelobe envelope: 29 – 25 log θ, dB
4. Uplink power flux at the satellite:
   -92 dBW/m^2 to -60 dBW/m^2

Table 5 shows the command carrier link budgets in the Ku-band.

Table 5: Ku-band Command Carrier Link Budget

S13.d.	**K_TC**
Tx ES dia (typical), m	8.4
Tx ES gain, dBi	60.2
Tx ES antenna input power, dBW	10
Tx ES EIRP, dBW	70.2
Link loss, dB	207.5
Satellite G/T, dB/K	3
Command carrier bandwidth, MHz	0.8
Tx ES antenna input power density, dBW/Hz	-50
Carrier-to-Noise Ratio, dB	35.3
Required CNR, dB	10
Margin	25.3

[1] SES Americom will advise the Commission of any changes to these frequencies after coordination has been completed.

5.2 Telemetry/Beacon carrier link budgets

Table 6 shows telemetry link budgets, with a typical EIRP of 19 dBW in the coverage area.

Table 6: Ku-band Telemetry Link Budget

S13.d.	**K_TM**
EIRP, dBW	19
Carrier bandwidth, MHz	0.4
EIRP density, dBW/4kHz	-1.00
Tx ES dia (typical), m	5.7
Rx ES antenna gain, dB	55.0
Rx ES G/T, dB/K	34.6
Rain fade, dB	8
CNR, dB	11.18
CNR (required), dB	9
Margin, dB	2.2

3.0 Satellite Antenna Gain Contours

Annex 1 shows the antenna gain contours for the 6 different antenna beams: transmit and receive beams, H- and V-polarizations for Ku-band, and also LHCP and RHCP polarizations for Ku-band transmit beams. Table 7 shows the correspondence between peak gains of the antennas and maximum EIRP or G/T values.

Table 7: Maximum Co-pol Gain, EIRP and G/T Values

		Ku-band		Ku-band	
		H-pol	V-pol	LHCP-pol	RHCP-pol
Transmit beam	Gain (max.), dBi	33.5	33.5	33.5	33.5
	EIRP (max.), dBW	54.8	54.8	54.8	54.8
Receive beam	Gain (max.), dBi	35	35	n/a	n/a
	G/T (max), dB/K	7.6	7.6	n/a	n/a

These files with co-pol data are also provided as gxt files in Schedule S:

1. KRH.gxt (H-pol, Ku-band receive beam)
2. KTH.gxt (H-pol, Ku-band transmit beam)
3. KRV.gxt (V-pol, Ku-band receive beam)
4. KTV.gxt (V-pol, Ku-band transmit beam)
5. KTL.gxt (LHCP-pol, Ku-band transmit beam)
6. KTR.gxt (RHCP-pol, Ku-band transmit beam)

4.0 Emission Designators and Link Budgets

The services provided by SES-129K will be wide ranging, including digital TV and digital transmission services ranging from 56 KBPS to high-speed. Sample link budgets for these services follow. Table 8 provides the characteristics of the earth stations used for this analysis and estimated link margins for Ku-band carriers. Table 9 shows analog TV/FM (emission designator 36M0F3F) link budgets for Ku-band.

Table 8: Ku-band Link Budgets for 7 Typical Links

S13.c.	**K_A**	**K_B**	**K_C**	**K_D**	**K_E**	**K_F**	**K_G**
Parameter	Digital TV MCPC 40 Mbps QPSK ¾ RS	Digital TV MCPC 32 Mbps QPSK ¾ RS	Digital TV SCPC QPSK ¾ RS	Digital TV SCPC QPSK ¾ RS	56 Kbps QPSK ¾ RS	1.544 Mbps QPSK ¾ RS	Digital TV MCPC 50 Mbps 8PSK ⅔ RS
Carrier designation	36M0G7W	27M0G7W	6M95G1W	5M00G1W	100KG1W	1M60G1W	36M0G7W
Data Rate (dB-Hz)	76	75	69	67.6	47.5	61.9	77
Throughput rate (Mbps)	40	32	8	6	0.056	1.544	50
Symbol rate (Msps)	28.8	22.9	5.7	4.2	0.041	1.117	27.2
Uplinks:							
Transmit Power (dBW)	20	20	8.9	8.9	-2	8	20
Transmit Loss (dB)	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5
Antenna diameter (m)	6.1	6.1	3.7	3.7	1.8	1.8	6.1
Antenna Gain (dBi)	57.3	57.3	53.0	53.0	46.7	46.7	57.3
Ground Station EIRP (dBW)	74.8	74.8	59.4	59.4	42.2	52.2	74.8
Uplink Rain Loss (dB)	-2	-2	-2	-2	-2	-2	-2
Free Space Loss (dB)	-207	-207	-207	-207	-207	-207	-207
Satellite G/T (dB/K)	3	3	3	3	3	3	3
Boltzmann's Constant (dBW/K-Hz)	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6
Eb/N0 (dB)	21.4	22.4	13.0	14.4	17.3	12.9	20.4
Eb/I0 (dB)	18	18	16	16	16	16	18
Total Eb/(N0 + I0) (dB)	16.4	16.7	11.2	12.1	13.6	11.2	16.0
Downlinks:							
Satellite Carrier EIRP (dBW)	52.5	51.3	42.4	40.9	23.9	36.0	52.5
Interference bandwidth (MHz)	36	27	6.95	5	0.1	1.6	36
Satellite EIRP density (dBW/4KHz)	12.96	12.96	9.96	9.96	9.96	9.96	12.96
Downlink Rain Loss (dB)	-3	-3	-3	-3	-3	-3	-3
Free Space Loss (dB)	-205.4	-205.4	-205.4	-205.4	-205.4	-205.4	-205.4
Ground station antenna dia (m)	1.2	1.2	2.4	2.4	1.2	2.4	2.4
Ground Station G/T (dB/K)	20.9	20.9	26.9	26.9	20.9	26.9	26.9
Eb/N0 (dB)	17.6	17.4	20.5	20.5	17.5	21.2	22.6
C/IM (dB)			18	18	18	18	
Eb/Imo (dB)			16.6	16.6	16.6	16.6	
C/I (dB)	15	15	15	15	15	15	15
Eb/I0 (ASI) (dB)	13.6	13.6	13.6	13.6	13.6	13.6	12.3
Eb/I0 (dB)	13.6	13.6	13.6	13.6	13.6	13.6	12.3
Eb/(N0 + I0) (dB)	12.1	12.1	11.3	11.3	10.8	11.4	12.0
Total Up/Down Eb/(N0+Io)(dB)	10.8	10.8	8.2	8.7	9.0	8.3	10.5
Required Eb/N0 (dB)	5.4	5.4	5.4	5.4	5.4	5.4	7.2
Margin (dB)	5.4	5.4	2.8	3.3	3.6	2.9	3.3

Table 9: Ku-band Link Budgets for TV/FM

S13.d.	**K_H**
	Ku-band
Parameter	Typical TV/FM link
Carrier designation	36M0F3F
Uplinks:	
Transmit Power (dBW)	22
Transmit Loss (dB)	-1
Antenna diameter (m)	6.1
Antenna Gain (dBi)	57.3
Ground Station EIRP (dBW)	78.3
Uplink Rain Loss (dB)	-2
Free Space Loss (dB)	-207
Satellite G/T (dB/K)	3
Bandwidth (dB-Hz)	75.6
Boltzmann's Constant (dBW/K-Hz)	-228.6
C/N, uplink (dB)	25.4
Downlinks:	
Satellite Carrier EIRP (dBW)	52.5
Downlink Rain Loss (dB)	-3
Free Space Loss (dB)	-205.4
Ground station antenna dia (m)	1.2
Ground Station G/T (dB/K)	20.9
C/N, DL (dB)	18.0
C/I ASI (dB)	18
C/Ntot, dB	15.0
Required (dB)	11
Margin (dB)	4.0

5.0 Power Flux Density limits

FCC Part 25.208 does not specify power flux density limits in the 11.7-12.2 GHz frequency band.

6.0 Cessation of Emissions

Each TWTA is commandable to apply or remove RF drive of the associated amplifier as required under § 25.207. Each TWTA can also be commanded on and off, although they are normally powered for the entire mission, after the satellite arrives on station.

7.0 Interference Analysis

Annex 2 shows the results of an interference analysis for operations in a 2-degree spacing environment.

8.0 Maximum Operational Levels

SES-129K will be operated consistently with coordination agreements with adjacent satellites. In any case, in the Ku band frequencies, the downlink EIRP density of the SES-129K digital carriers will not exceed -19 dBW/Hz in the 11.7-12.2 GHz band; and the input power density of the uplink digital carriers of earth stations operating with SES-129K in the 14.0-14.5 GHz band will not exceed -47 dBW/Hz.

9.0 Mitigation of Orbital Debris

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

§ 25.114(d)(14)(i): SES Americom has assessed and limited the amount of debris released in a planned manner during normal operations of SES-129K. During the satellite ascent, after separation from the launcher, no debris would be generated. As with all recent SES Americom satellite launches, all deployments would be conducted using pyrotechnic devices designed to retain all physical debris. No debris is generated during normal on-station operations, and the spacecraft will be in a stable configuration. On-station operations require stationkeeping within the +/- 0.05 degree N-S and E-W control box, thereby ensuring adequate collision avoidance distance from other satellites in geosynchronous orbit. In the event that co-location of this and another satellite is required, use of the proven Inclination-Eccentricity (I-E) separation method can be employed. This strategy is presently in use by SES to ensure proper operation and safety of multiple satellites within one orbital box.

SES Americom 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. The design of SES Americom's recent spacecraft locates all sources of stored energy within the body of the structure, which provides protection from small orbital debris. SES Americom 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 Americom’s required probability of success of the mission. SES Americom 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 Americom 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 Americom 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 SES-129K spacecraft is such that the risk of explosion is minimized both during and after mission operations. In designing and building the spacecraft, the manufacturer takes 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 are 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, will be monitored by telemetry.

At the end of operational life, after the satellite has reached its final disposal orbit, all on-board sources of stored energy will be depleted or secured, and the batteries will be discharged.

§ 25.114(d)(14)(iii): SES Americom 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 Americom 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 SES-129K at the 129.1° W.L. orbital location. SES Americom is not aware of any other FCC- or non-FCC licensed spacecraft that are operational or planned to be deployed at the nominal 129° W.L. or to nearby orbital locations such that there would be an overlap with the requested stationkeeping volume of SES-129K. Ciel 2 operates at 128.85° W.L. and Galaxy-12 operates at 129.0° W.L., both with a stationkeeping box of 0.05°.

SES uses the Space Data Center ("SDC") system from the Space Data Association 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 SDC 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 Americom plans to maneuver SES-129K to a disposal orbit with a minimum perigee of 288.9 km above the normal operational altitude. The proposed disposal orbit altitude complies with the altitude resulting from application of the IADC formula based on the following calculation:

Area of the satellite (average aspect area): 66.0 m^2
Mass of the spacecraft: 2346.0 kg
C_R (solar radiation pressure coefficient): 1.15

Therefore the Minimum Disposal Orbit Perigee Altitude, as calculated under the IADC formula is:

36,021 km + (1000 x C_R x A/m) = 36074.9 km, or 288.9 km above the GSO arc (35,786 km)

SES Americom intends to reserve 28.8 kg of fuel in order to account for post-mission disposal of SES-129K. SES Americom has assessed fuel gauging uncertainty and has provided an adequate margin of fuel reserve to address the assessed uncertainty.

ANNEX 1

COVERAGE MAPS

Figure 1. Ku-band, Transmit beam, LHCP-pol (KTL)
EIRP max. 54.8 dBW, Antenna gain max. 33.5 dBi

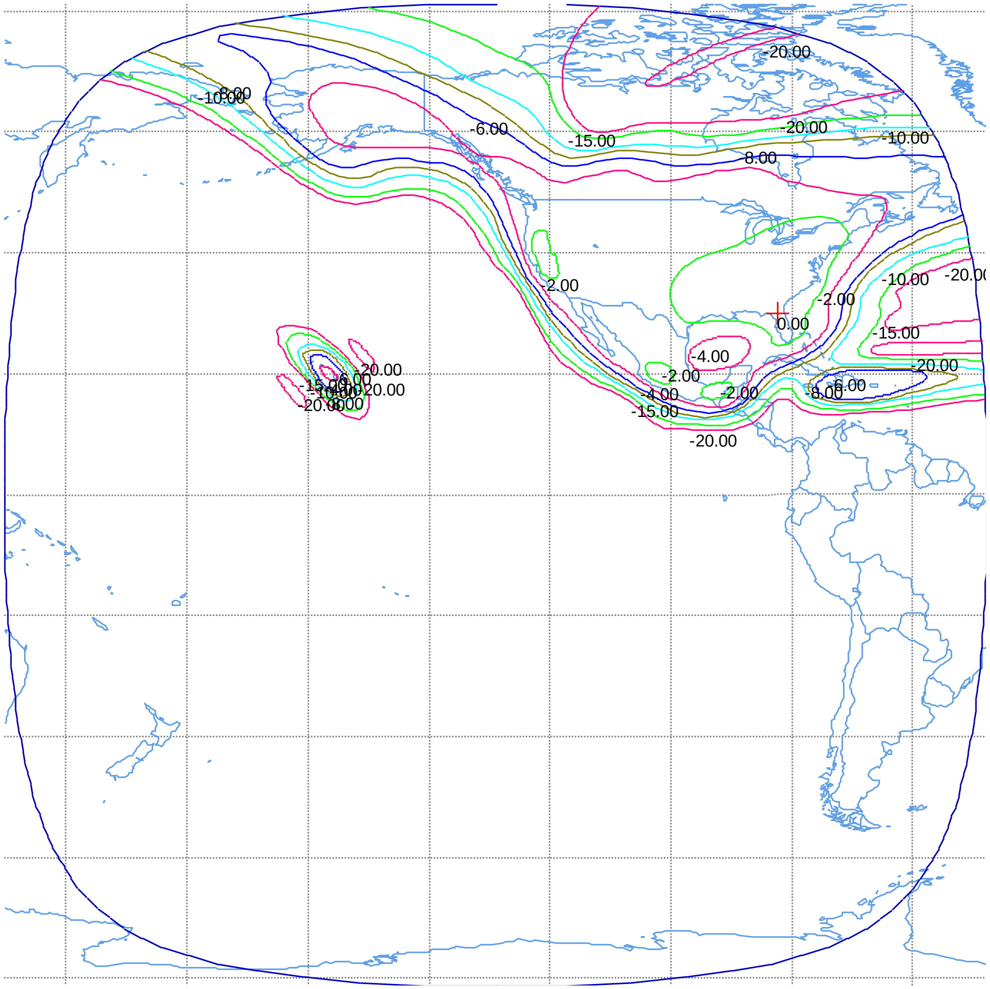


Figure 2. Ku-band, Transmit beam, RHCP-pol (KTR)
EIRP max. 54.8 dBW, Antenna gain max. 33.5 dBi

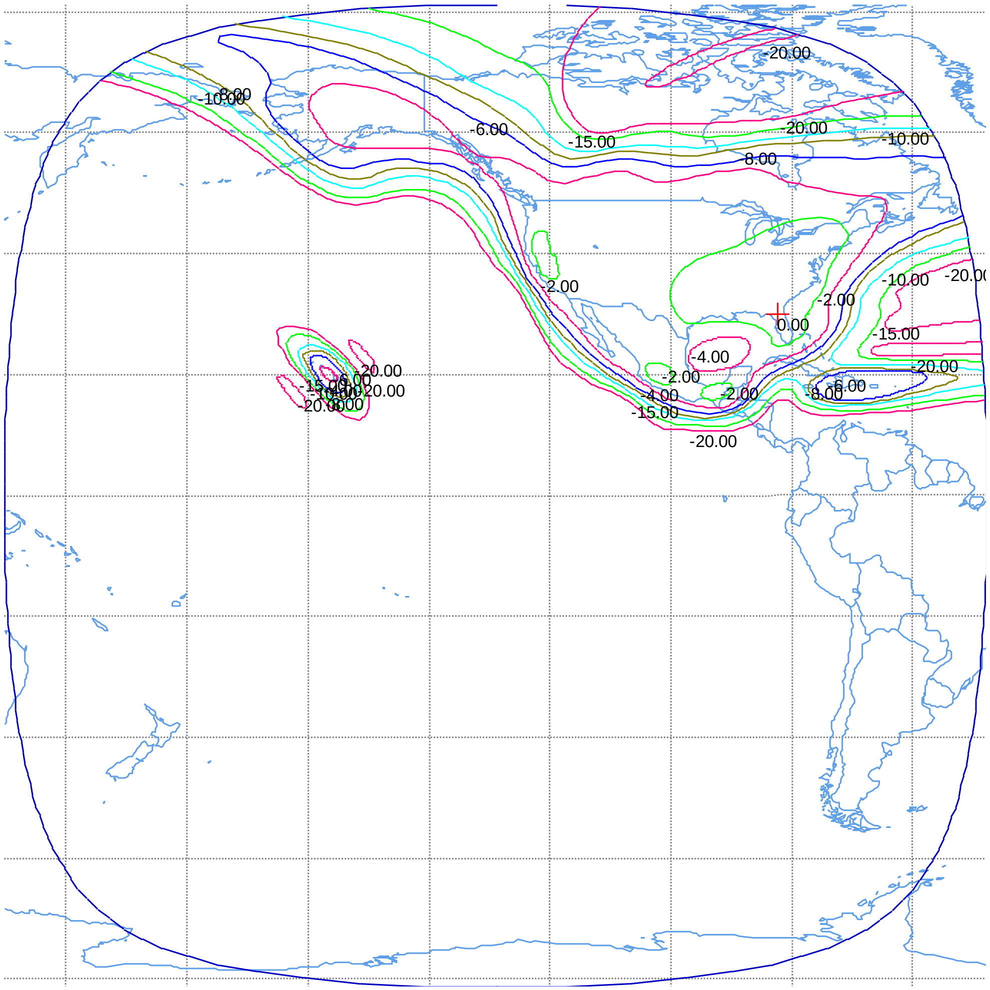


Figure 3. Ku-band, Receive beam, H-pol (KRH)
G/T max 7.6 dB/K, Antenna Gain max 35 dBi

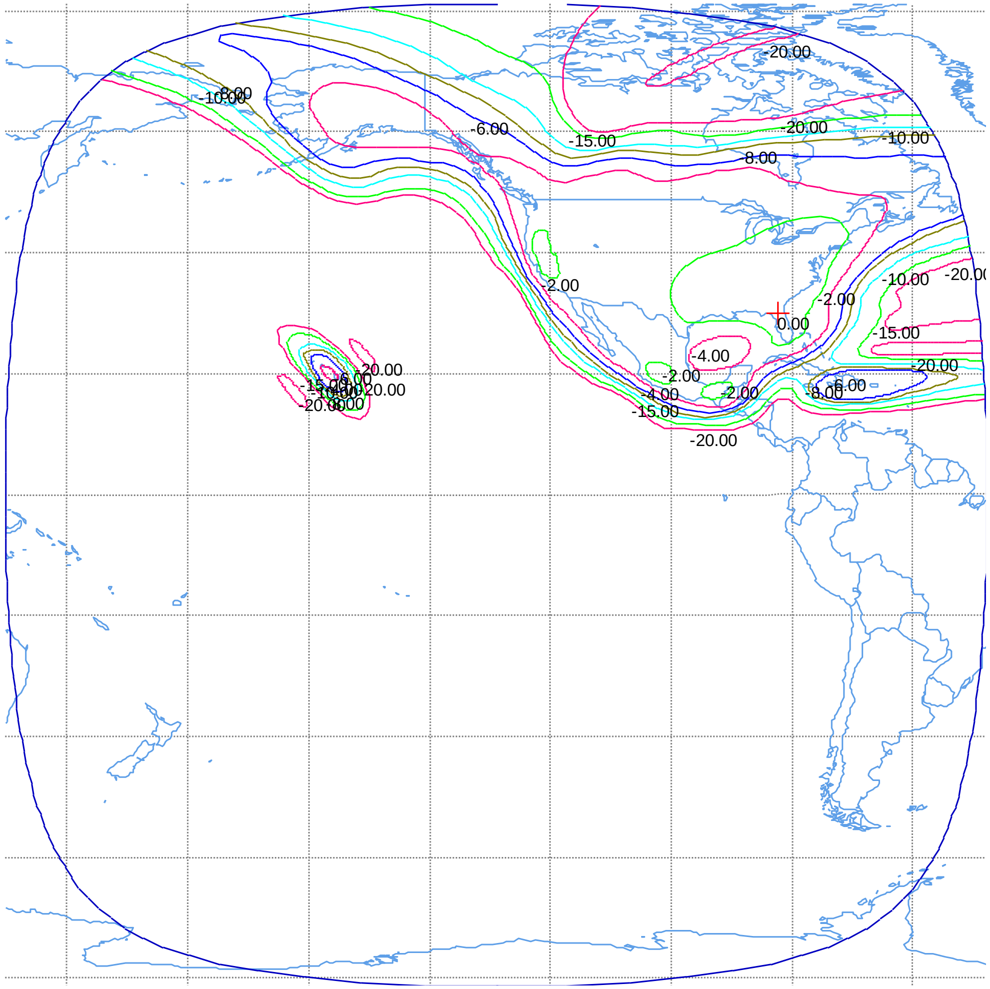


Figure 4. Ku-band, Receive beam, V-pol (KRV)
G/T max 7.6 dB/K, Antenna Gain max 35 dBi

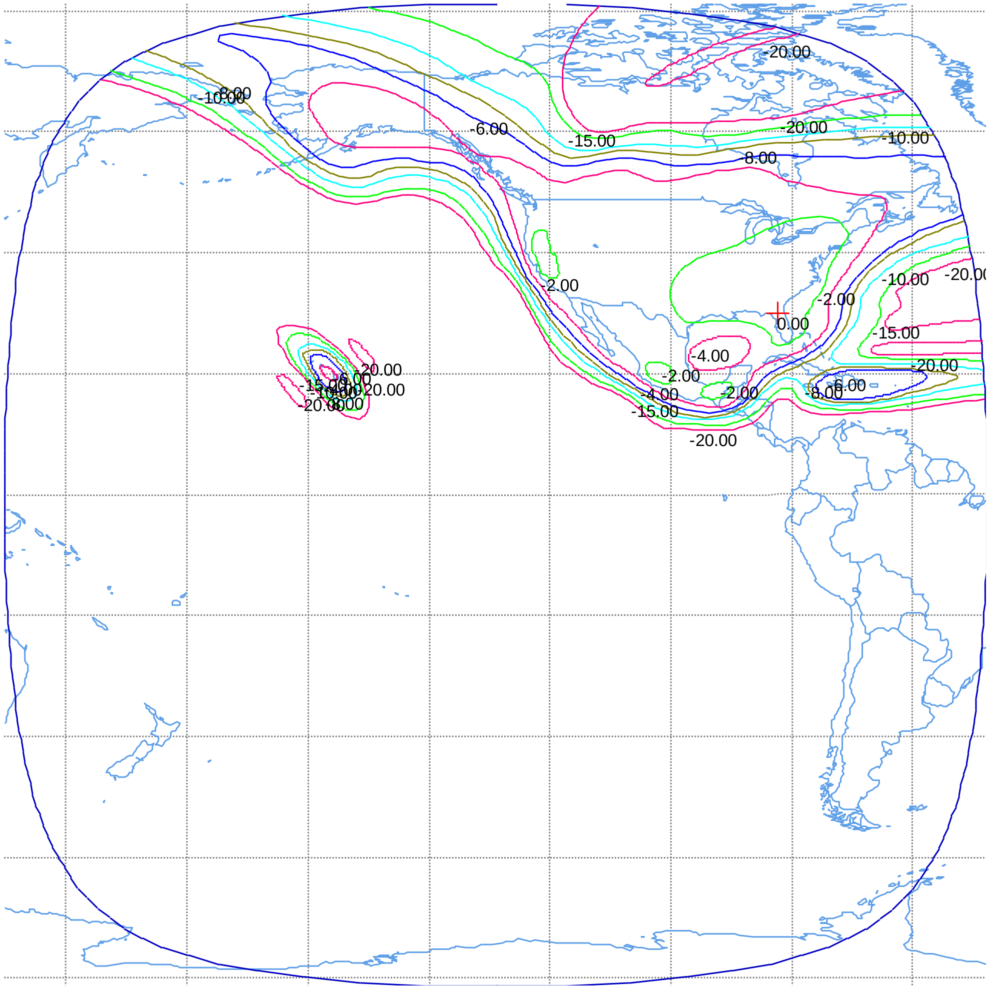


Figure 5. Ku-band, Transmit beam, H-pol (KTH)
EIRP max 54.8 dBW, Antenna Gain max 33.5 dBi

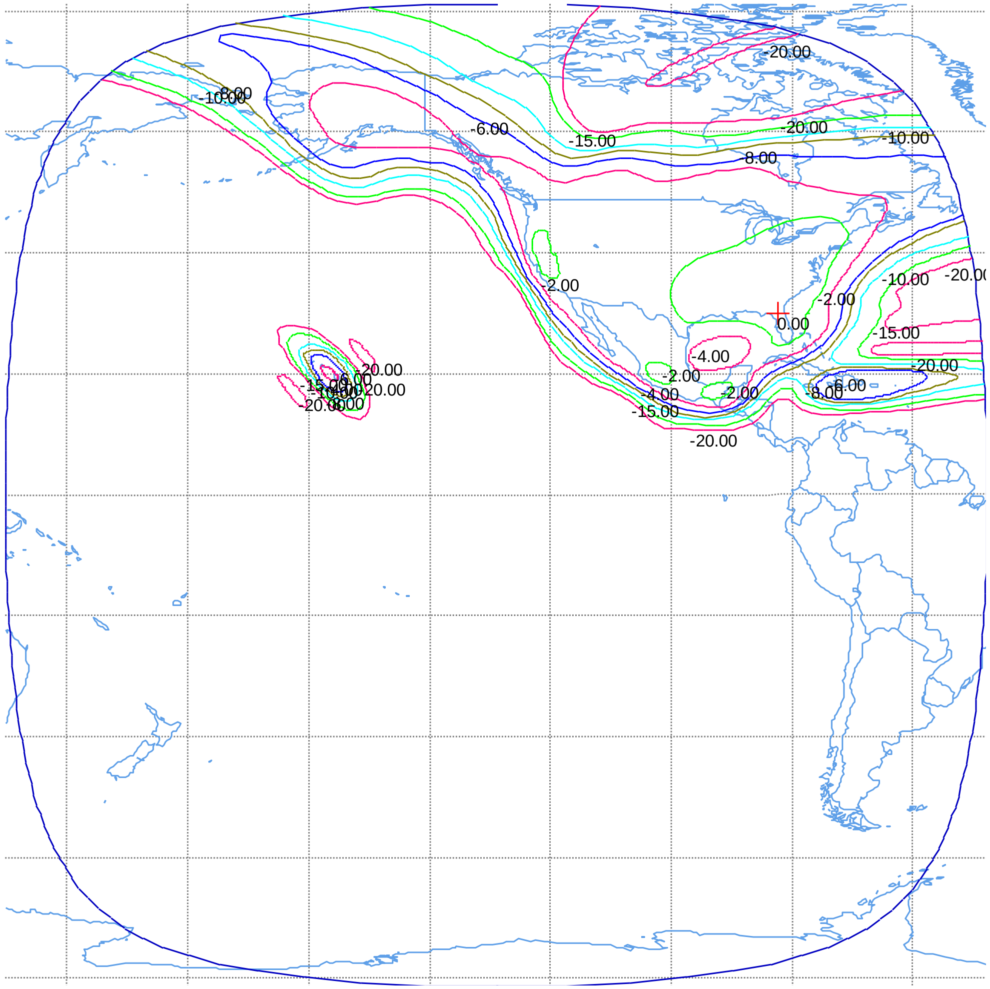
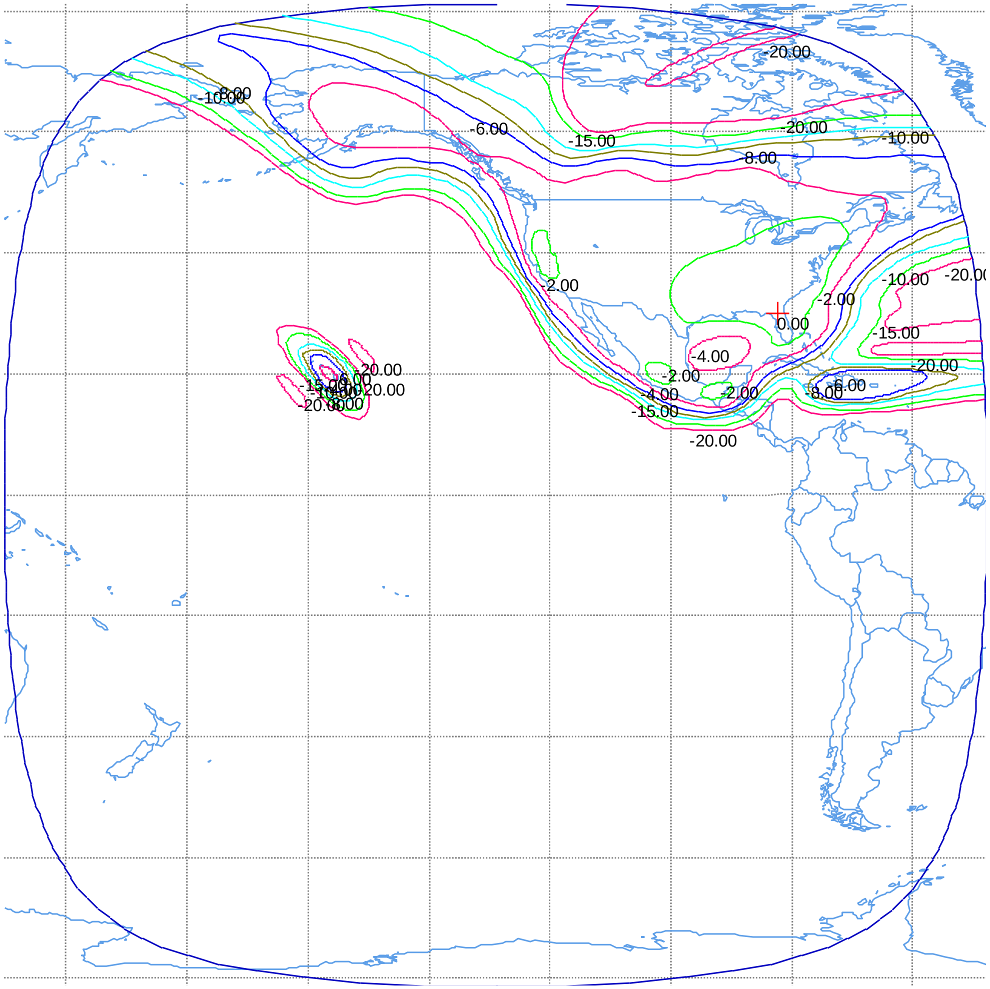


Figure 6. Ku-band, Transmit beam, V-pol (KTV)
EIRP max 54.8 dBW, Antenna Gain max 33.5 dBi



ANNEX 2

INTERFERENCE ANALYSIS

IN SUPPORT OF SES-129K

Two-degree Spacing Analysis

The only operational Ku-band satellite adjacent to the 129.1° W.L. position is SPTVJSAT/Intelsat's Horizons 1 at 127° W.L. with more than 2° geocentric separation. There is not a Ku-band satellite at 131° W.L. SES Americom will assess the coordination status of the US ITU filing at 129° W.L. and commence coordination discussions with SPTVJSAT/Intelsat as needed. It is expected that any outstanding coordination with SPTVJSAT/Intelsat will be concluded without major problems.

Satellite transponders of SES-129K will be operated at power levels no higher than that allowed by the FCC, or generally coordinated with adjacent satellite operators.

The following analysis will demonstrate that the SES-129K network is compatible with a co-coverage, co-frequency satellite, spaced 2 degrees away. 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 2º orbital 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 station antennas at boresight and the gain at the off-axis (topocentric) angle.

1.1 Ku-band uplink C/I estimates

The topocentric angle for a geocentric separation of 2º is approximately 2.2º. The sidelobe envelope at 2.2º 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 antenna. The following Table A.1 lists the boresight gain, the off-axis gain and the corresponding C/I that would result in this interference scenario:

Table A.1: Ku-band uplink C/I for 2-degree geocentric spacing

Antenna size (m)	On-axis gain (dBi)	Off-axis gain	C/I (dB)
1.2	43.04	20.94	22.09
1.8	46.56	20.94	25.61
2.4	49.06	20.94	28.11
4.5	54.52	20.94	33.57
6.0	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 A.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 triggered 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 SES-129K. Similar to the uplink, the downlink C/I will be a function of the difference between the gain of the receiving earth station antennas 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 2º is approximately 2.2º. The gain at 2.2º 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 antenna.

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 A.2) and where the EIRP of the two networks is different by 2 dB (Table A.3):

Table A.2: Ku-band downlink C/I for 2-degree geocentric spacing EIRP of the wanted and interfering satellites is the same

Antenna size (m)	On-axis gain (dBi)	Off-axis gain	Off-axis discrimination (dB)	C/I (dB)
1.2	41.70	20.94	20.75	20.75
1.8	45.22	20.94	24.27	24.27
2.4	47.72	20.94	26.77	26.77
4.5	53.18	20.94	32.23	32.23
6.0	55.68	20.94	34.73	34.73

Table A.3: Ku-band downlink C/I for 2-degree geocentric spacing EIRP of the wanted satellite is 2 dB lower than that of the interfering satellite

Antenna size (m)	On-axis gain (dBi)	Off-axis gain	Off-axis discrimination (dB)	C/I (dB)
1.2	41.70	20.94	20.75	18.75
1.8	45.22	20.94	24.27	22.27
2.4	47.72	20.94	26.77	24.77
4.5	53.18	20.94	32.23	30.23
6.0	55.68	20.94	34.73	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 A.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.

3. Additional examples of C/I estimates based on Horizons 1

Tables A.4 to A.7 show some examples of single-entry C/I analysis for typical carriers on the satellite networks. The adjacent satellite is assumed to be Horizons 1 at 127° W.L., but the same results apply to a theoretical 131° W.L neighbor also. Basic carrier information and earth station antenna sizes for Horizons 1 were pulled from data on file with the Commission.[2]

Tables A.4 and A.5 show downlink C/I estimates into SES-129K and into the adjacent satellite carriers, respectively. The C/I values of the adjacent carriers are at least 18 dB.

Tables A.6 and A.7 show uplink C/I estimates into SES-129K and into the adjacent satellite carriers, respectively. The C/I values of the adjacent carriers are minimally about 21 dB.

[2] *See Horizons Satellite LLC*, File No. SAT-PDR-20030210-00015, Petition for Declaratory Ruling, Appendix A Exhibit A-1.

Table A.4: Downlink C/I into SES-129K carriers at 129.1° W.L. from Horizons 1 at 127° W.L.

Downlink C/I analysis		***Adjacent into SES***				*SES Carriers*						
Ku-band						Emission		36M0G7W	6M95G1W	5M00G1W	1M60G1W	100KG1W
						Bandwidth		30.00	5.79	4.17	1.33	0.08
Orbital Position : SES Americo		**129.1**				Receive Earth Station (m)		1.2	1.2	1.2	1.2	1.2
Orbital Position Adjacent Satell		**127.0**				Satellite EIRP		54.8	54.8	54.8	54.8	54.8
Geocentric Separation		2.0				Downlink EIRP density		-20.0	-23.8	-23.8	-23.8	-23.8
Topocentric Separation		2.2				RX Earth Station Gain		41.7	41.7	41.7	41.7	41.7
						Sidelobe Characteristic		29.0	29.0	29.0	29.0	29.0
						Off-axis Gain		20.4	20.4	20.4	20.4	20.4
Adjacent Satellite Carriers												
Emission	Satellite EIRP	Bandw. (MHz)	Downlink EIRP density	Receive Ant. (m)	Earth Station Gain	Sidelobe Charact.	Off-axis Gain	C/I	C/I	C/I	C/I	C/I
36M0G7W	51.8	30.0	-23.0	1.8	45.2	29	20.4	24.3	20.5	20.5	20.5	20.5
6M00G7W	51.8	5.0	-26.8	3.7	51.5	29	20.4	28.0	24.3	24.3	24.3	24.3
1M45G7W	51.8	1.2	-26.8	1.8	45.2	29	20.4	28.0	24.3	24.3	24.3	24.3
200KG7W	51.8	0.2	-26.8	2.4	47.7	29	20.4	28.0	24.3	24.3	24.3	24.3
100KG7W	51.8	0.1	-26.8	2.4	47.7	29	20.4	28.0	24.3	24.3	24.3	24.3
400KG7W	51.8	0.3	-26.8	6.1	55.8	29	20.4	28.0	24.3	24.3	24.3	24.3

Table A.5: Downlink C/I into Horizons 1 at 127° W.L. from SES-129K at 129.1° W.L.

Downlink C/I analysis		***SES Americom into Adjacent***				*SES Carriers*						
Ku-band						Emission		36M0G7W	6M95G1W	5M00G1W	1M60G1W	100KG1W
						Bandwidth		30.00	5.79	4.17	1.33	0.08
Orbital Position : SES Americom		**129.1**				Receive Earth Station (m)		1.2	1.2	1.2	1.2	1.2
Orbital Position Adjacent Satellite		**127.0**				Satellite EIRP		54.8	54.8	54.8	54.8	54.8
Geocentric Separation		2.0				Downlink EIRP density		-20.0	-24.8	-24.8	-24.8	-24.8
Topocentric Separation		2.2				RX Earth Station Gain		41.7	41.7	41.7	41.7	41.7
						Sidelobe Characteristic		29.0	29.0	29.0	29.0	29.0
						Off-axis Gain		20.4	20.4	20.4	20.4	20.4
Adjacent Satellite Carriers												
Emission	Satellite EIRP	Bandw. (MHz)	Downlink EIRP density	Receive Ant. (m)	Earth Station Gain	Sidelobe Charact.	Off-axis Gain	C/I	C/I	C/I	C/I	C/I
36M0G7W	51.8	30.0	-23.0	1.8	45.2	29	20.4	21.8	26.6	26.6	26.6	26.6
6M00G7W	51.8	5.0	-26.8	3.7	51.5	29	20.4	24.2	29.0	29.0	29.0	29.0
1M45G7W	51.8	1.2	-26.8	1.8	45.2	29	20.4	18.0	22.8	22.8	22.8	22.8
200KG7W	51.8	0.2	-26.8	2.4	47.7	29	20.4	20.5	25.3	25.3	25.3	25.3
100KG7W	51.8	0.1	-26.8	2.4	47.7	29	20.4	20.5	25.3	25.3	25.3	25.3
400KG7W	51.8	0.3	-26.8	6.1	55.8	29	20.4	28.6	33.4	33.4	33.4	33.4

Table A.6: Uplink C/I into SES-129K carriers at 129.1° W.L. from Horizons 1 at 127° W.L.

Uplink C/I analysis			*Adjacent into SES*			*SES Carriers*								
Ku-band						Emission				36M0G7W	6M95G1	5M00G1W	1M60G1W	100KG1W
						Bandwidth (MHz)				30.00	5.79	4.17	1.33	0.08
						Satellite FTS				-87.0	-87.0	-87.0	-87.0	-87.0
						Uplink EIRP				76.0	64.1	62.6	57.7	45.6
Orbital Position : SES Americom			**129.1**			Uplink Power (max) (feed inp.)				18.7	11.1	15.9	11.0	2.5
Orbital Position Adjacent Satellite			**127.0**			Uplink Power density (feed)				-56.1	-56.5	-50.3	-50.3	-46.8
Geocentric Separation			2.0			Uplink Earth Station (m)				6.1	3.7	1.8	1.8	1.2
Topocentric Separation			2.2			Earth Station Gain				57.3	53.0	46.7	46.7	43.2
						Upl. EIRP density				1.2	-3.6	-3.6	-3.6	-3.6
						Sidelobe Characteristic				29.0	29.0	29.0	29.0	29.0
						Off-axis Eirp density				-35.6	-36.1	-29.8	-29.8	-26.3
Adjacent Satellite Carriers														
Emission	Bandw. (MHz)	Satellite FTS	Uplink EIRP	Uplink Eirp density	Transm. Ant. (m)	Earth Station Gain	Sidelobe Charact.	Off-axis Eirp density		C/I	C/I	C/I	C/I	C/I
36M0G7W	30.0	-86.0	77.0	2.2	6.1	57.3	29	-34.6		35.9	31.1	31.1	31.1	31.1
6M00G7W	5.0	-86.0	64.4	-2.6	6.1	57.3	29	-39.4		40.7	35.9	35.9	35.9	35.9
1M45G7W	1.2	-86.0	58.3	-2.6	6.1	57.3	29	-39.4		40.7	35.9	35.9	35.9	35.9
200KG7W	0.2	-86.0	49.7	-2.6	6.1	57.3	29	-39.4		40.7	35.9	35.9	35.9	35.9
100KG7W	0.1	-86.0	46.6	-2.6	6.1	57.3	29	-39.4		40.7	35.9	35.9	35.9	35.9
400KG7W	0.3	-86.0	52.7	-2.6	3	51.1	29	-33.3		34.5	29.7	29.7	29.7	29.7

Table A.7: Uplink C/I into Horizons 1 at 127° W.L. from SES-129K at 129.1° W.L

Uplink C/I analysis			*SES into Adjacent*			*SES Carriers*								
Ku-band						Emission				36M0G7W	6M95G1W	5M00G1W	1M60G1W	100KG1W
						Bandwidth (MHz)				30.00	5.79	4.17	1.33	0.08
						Satellite FTS				-87.0	-87.0	-87.0	-87.0	-87.0
						Uplink EIRP				76.0	68.1	66.6	61.7	49.6
Orbital Position : SES Americom			**129.1**			Uplink Power (max) (feed inp.)				18.7	15.1	19.9	15.0	6.5
Orbital Position Adjacent Satellite			**127.0**			Uplink Power density (feed)				-56.1	-56.5	-50.3	-50.3	-46.8
Geocentric Separation			2.0			Uplink Earth Station (m)				6.1	3.7	1.8	1.8	1.2
Topocentric Separation			2.2			Earth Station Gain				57.3	53.0	46.7	46.7	43.2
						Upl. EIRP density				1.2	-3.6	-3.6	-3.6	-3.6
						Sidelobe Characteristic				29.0	29.0	29.0	29.0	29.0
						Off-axis Eirp density				-35.6	-36.1	-29.8	-29.8	-26.3
Adjacent Satellite Carriers														
Emission	Bandw. (MHz)	Satellite FTS	Uplink EIRP	Uplink Eirp density	Transm. Ant. (m)	Earth Station Gain	Sidelobe Charact.	Off-axis Eirp density		C/I	C/I	C/I	C/I	C/I
36M0G7W	30.0	-88.0	75.0	0.2	6.1	57.3	29	-36.6		35.9	36.3	30.1	30.1	26.5
6M00G7W	5.0	-88.0	62.4	-4.6	6.1	57.3	29	-41.4		31.1	31.5	25.3	25.3	21.8
1M45G7W	1.2	-88.0	56.3	-4.6	6.1	57.3	29	-41.4		31.1	31.5	25.3	25.3	21.8
200KG7W	0.2	-88.0	47.7	-4.6	6.1	57.3	29	-41.4		31.1	31.5	25.3	25.3	21.8
100KG7W	0.1	-88.0	44.6	-4.6	6.1	57.3	29	-41.4		31.1	31.5	25.3	25.3	21.8
400KG7W	0.3	-88.0	50.7	-4.6	3	51.1	30	-34.3		31.1	31.5	25.3	25.3	21.8

Engineering Declaration

DECLARATION OF Kimberly Baum

I, Kimberly Baum, 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/_*Kimberly M. Baum*____________________

Vice President, Spectrum Management & Development Americas

SES Americom, Inc.

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