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") hereby respectfully requests a modification of its license for the AMC-2 fixed-satellite space station to (a) reassign the spacecraft to 4.98º E.L. +/-0.1 degrees;[1] (b) extend the satellite's license term to May 31, 2016, and (c) authorize the deorbit of the satellite at end of life. SES will operate AMC-2 at 4.98º E.L. in accordance with the International Telecommunication Union ("ITU") filings and coordination agreements of the Swedish Administration.

Reassignment of AMC-2 will serve the public interest by allowing SES to use AMC-2 to commence service in the C-band and additional Ku-band frequencies ahead of the launch of the SES-5 satellite,[2] which has been delayed. In addition, extending the AMC-2 license term as requested will serve the public interest by enabling SES Americom to continue to

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[1] The instant modification supersedes the request filed earlier this year to transfer AMC-2 from U.S. licensing authority to Swedish licensing authority for operations at the nominal 5º E.L. orbital location, File No. SAT-T/C-20110527-00100. SES has withdrawn the AMC-2 transfer of control application and associated submissions. *See* WTH2011101790738380 (withdrawal of AMC-2 transfer of control application); WTH2011101791252966 (withdrawal of STA request for drift of AMC-2 to 4.98º E.L. pending action on transfer of control application).

[2] The SES-5 satellite is also known as ASTRA-4B and was originally named SIRIUS 5. *See* Press Release, *SES Orders New SIRIUS 5 Satellite from Loral* (Oct. 10, 2008), http://www.ses-astra.com/business/en/news-events/press-archive/2008/08-10-09/index.php.

offer services using AMC-2, thus promoting efficient use of satellite and orbital resources. Finally, grant of deorbit authority for AMC-2 is consistent with Commission precedent and will facilitate orderly removal of AMC-2 to a disposal orbit at its end of life.

A completed FCC Form 312 is attached, and SES incorporates by reference the technical information previously provided in support of AMC-2.[3] In addition, SES is providing here technical information relating to the proposed modification to the AMC-2 license on Schedule S and in narrative form pursuant to Section 25.114 of the Commission's Rules.

MODIFICATION

Re-assignment to 4.98° E.L. AMC-2 is a hybrid C/Ku-band satellite that is licensed to operate pursuant to FCC authority at the nominal 79° W.L. location with a license term that expires on March 5, 2012.[4] SES also currently operates AMC-5, a Ku-band only satellite, at the nominal 79° W.L. location.[5] SES Americom's commonly-owned affiliate SES ASTRA AB[6] ("ASTRA AB") operates satellites at and around the 5° E.L. position pursuant to

[3] *See* File Nos. SAT-MOD-20100324-00056; SAT-MOD-20101215-00261.

[4] *See* File Nos. SAT-MOD-20100324-00056 (grant-stamped June 21, 2010) & SAT-MOD-20101215-00261 (grant-stamped March 8, 2011) ("March AMC-2 Grant").

[5] *See* File No. SAT-MOD-20100706-00154, call sign S2156 (grant-stamped Jan. 20, 2011). SES recently requested authority to relocate AMC-5 to 80.9° W.L. for operations pursuant to Argentine ITU filings. *See* File No. SAT-MOD-20110929-00192. The Commission has granted special temporary authority ("STA") to permit SES to commence relocation of AMC-5 to 80.9° W.L. effective October 31 pending action on the modification. *See* File No. SAT-STA-20110929-00191, call sign S2156 (grant-stamped Oct. 20, 2011).

[6] SES ASTRA AB was formerly known as SES SIRIUS AB. *See* Press Release, *SES SIRIUS Becomes SES ASTRA* (Jun. 23, 2010), http://www.ses-astra.com/business/en/news-events/news-latest/index.php?pressRelease=/pressReleases/pressReleaseList/10-06-22/index.php.

Swedish authority[7] and had planned to augment existing services with the new SES-5 satellite at the end of 2011. Due to delays in manufacturing and launch manifests, however, the launch of SES-5 is likely to be delayed beyond its planned commencement of service date. Reassignment of AMC-2 to the nominal 5° E.L. orbital location will allow expansion of service from that orbital location pending the successful launch of SES-5. No customers of AMC-2 will be adversely affected, as they have been transferred to other satellites in anticipation of the planned relocation.

SES has received special temporary authority ("STA") to begin the drift of AMC-2 to 4.98° E.L.,[8] and has also requested STA to operate the satellite upon arrival at 4.98° E.L.[9] SES here seeks modification of the AMC-2 license to reassign the satellite to 4.98° E.L. for regular operations at that location.

Grant of the requested authority to relocate and operate AMC-2 will serve the public interest and is consistent with Commission precedent. The Commission has repeatedly observed that its policy is to allow "satellite operators to rearrange satellites in their fleet to

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[7] For example, ASTRA 4A is at the nominal 4.8° E.L. orbital location, and ASTRA 1E is at the nominal 5.0° E.L. orbital location. ASTRA 1E will be relocated prior to the arrival of AMC-2, so there will be no overlap of the two satellites' stationkeeping volume. ASTRA 4A operates in the 11.7-12.75 GHz, 14.0-14.25 GHz, 17.3-18.1 GHz, 18.8-19.3 GHz, 19.7-19.95 GHz, 21.5-21.75 GHz, 29.15-29.4 GHz and 29.5-30.0 GHz bands, and ASTRA 1E operates in the 10.7-11.2 GHz and 11.45-12.1 GHz, 12.75-13.25 GHz, 14.0-14.25 GHz and 17.3-17.7 GHz bands. Both ASTRA 4A and ASTRA 1E operate pursuant to ITU filings submitted by Sweden.

[8] File No. SAT-STA-20111017-00205 (grant-stamped Oct. 20, 2011).

[9] File No. SAT-STA-20111017-00204.

reflect business and customer considerations where no public interest factors are adversely affected."[10] As the International Bureau has explained:

> the Commission attempts, when possible, to leave spacecraft design decisions to the space station licensee because the licensee is in a better position to determine how to tailor its system to meet the particular needs of its customers. Consequently the Commission will generally grant a licensee's request to modify its system, provided there are no compelling countervailing public interest considerations.[11]

Pursuant to this policy, the Commission has routinely authorized satellite operators to configure or reconfigure their fleets in order to satisfy customer demand, including demand for capacity outside the U.S. For example, the Commission has authorized U.S. licensees to relocate satellites from orbital positions over the U.S. to locations without U.S. coverage in order to respond to existing or potential demand for capacity.[12] Similarly, the

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[10] *SES Americom, Inc.*, Order and Authorization, DA 06-757 (IB rel. Apr. 7, 2006) at 4, ¶ 8, *citing Amendment of the Commission's Space Station Licensing Rules and Policies,* Second Report and Order, 18 FCC Rcd 12507, 12509, ¶ 7 (2003).

[11] *AMSC Subsidiary Corp.*, Order and Authorization, DA 98-493, 13 FCC Rcd 12316 (IB 1998) ("*AMSC Modification Order*") at 12318, ¶ 8 (footnote omitted). Although AMSC never implemented the relocation authorized in this case, the Commission has repeatedly reaffirmed its policy of allowing licensees to change their fleet configurations to accommodate customer requirements. *See, e.g., Space Station Licensing Rules and Policies*, First Reconsideration Order and Fifth Report and Order, FCC 04-147, 19 FCC Rcd 12637, 12653, ¶ 39 ("we generally permit licensees to modify their systems to adapt to changing business and customer needs," citing *AMSC Modification Order* and other cases).

[12] *See, e.g., Intelsat North America LLC,* Call Sign S2159, File No. SAT-T/C-20100112-00009 ("Galaxy 27 Relicensing Application"), grant-stamped July 30, 2010 (authorizing Intelsat to relocate Galaxy 27 from 129° W.L. to 45.10° E.L.); *PanAmSat Licensee Corp.,* Call Sign S2253, File No. SAT-MOD-20080225-00051, grant-stamped July 22, 2008 (authorizing relocation of Galaxy 11 from 91° W.L. to 32.80° E.L. in order to supplement service provided there by Intelsat 802, which had suffered an anomaly that reduced its available power); *AMSC Modification Order* (authorizing AMSC to relocate its satellite away from 101° W.L. in order to provide service to southern Africa).

Commission has granted U.S. licenses to operators for satellites at locations from which no U.S. coverage is planned or possible.[13]

Here, the proposed change will allow SES to make efficient use of AMC-2 in order to expand the available capacity at the nominal 5° E.L. orbital location. Because SES has already transferred customers that had been using AMC-2 at the nominal 79º W.L. orbital location, the relocation of AMC-2 will not have any impact on existing services.

Reassignment of AMC-2 to 4.98º E.L. will not adversely affect other operators. The proposed stationkeeping volume will not overlap with that of any other spacecraft. SES will operate only the TT&C frequencies of AMC-2 during the drift.[14] SES will follow standard industry practices for coordination of TT&C transmissions during the relocation process.

At 4.98º E.L., SES will operate the AMC-2 satellite under Sweden's ITU satellite network filings and coordination agreements. ASTRA AB has all necessary authority from the Swedish Post and Telecommunications Agency ("PTS") to utilize the C- and Ku-band frequencies at the nominal 5° E.L. orbital position. The Technical Appendix demonstrates that the AMC-2 network is compliant with Commission rules for operation in a two-degree spacing environment and is compatible with co-frequency satellites adjacent to the 4.98º E.L. orbital location.

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13 *See, e.g.*, *Afrispace, Inc.*, Order and Authorization, DA 06-4, 21 FCC Rcd 7 (IB 2006) (authorizing launch and operation of AfriStar-2 satellite for service to Africa and Europe from 21° E.L.); *Assignment of Orbital Locations to Space Stations in the Ka-Band*, Order, DA 96-708 (IB 1996) (assigning 33 orbital locations between 62° W.L. and 175.25° E.L. to 13 Ka-band applicants, finding that the public interest would be served by authorizing international operations pending the development of policies for Ka-band satellite service within the U.S.).

14 The AMC-2 TT&C frequencies are as follows:
Command: 6423.5 MHz (horizontal polarization; uplink)
Telemetry: 3700.5 MHz (vertical polarization; downlink), 4199.5 MHz (vertical polarization; downlink), and 12198.0 MHz (horizontal polarization; downlink).

SES proposes to operate AMC-2 upon arrival at 4.98º E.L. with an east-west stationkeeping tolerance of +/- 0.1 degrees. The stationkeeping volume proposed for AMC-2 will not overlap with that of any other spacecraft. This relaxed stationkeeping tolerance will extend the fuel life of AMC-2 and will not adversely affect any other operators. SES herein seeks a waiver of Section 25.210(j) of the Commission's rules to permit AMC-2 to operate with a +/- 0.1 degree stationkeeping tolerance at 4.98º E.L.

Extension of License Term. SES also requests extension of the AMC-2 license term to May 31, 2016. SES has calculated that there is sufficient fuel onboard the AMC-2 spacecraft for the spacecraft to continue providing reliable service during the proposed extended license term and to deorbit the spacecraft to a disposal altitude of 150 km above geostationary orbit (see below).[15] As a result, extending the license term for AMC-2 will serve the public interest by allowing SES Americom to continue to use the spacecraft to provide service to customers, promoting the efficient use of satellite and orbital resources.

Deorbit Authority. Finally, SES seeks Commission authority to relocate AMC-2 at its end of life to a disposal orbit with a minimum perigee altitude of at least 150 km above the geostationary arc. Because AMC-2 was launched before March 18, 2002, the spacecraft is not subject to the minimum perigee requirements of Section 25.283(a).[16] The Commission has previously authorized the use of a 150-km deorbit altitude for spacecraft launched prior to

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15 SES developed the nominal lifetime prediction by estimating future fuel consumption, including for the planned AMC-2 relocation and deorbiting maneuvers, and taking into account fuel usage predictions based on data from previous maneuvers. SES's calculations use lifetime models that incorporate uncertainty in a number of variables including initial tank loading, fuel usage efficiency and the oxidizer to fuel ratio.

16 *See* 47 C.F.R. § 25.283(d).

March 18, 2002.[17] Calculations performed by SES indicate that at the conclusion of the requested extension period, the spacecraft will have sufficient fuel to reach the proposed deorbit altitude, barring a catastrophic failure of satellite components. Grant of the requested deorbit authority is consistent with Commission precedent and will facilitate placement of AMC-2 in a disposal orbit at its end of life.

WAIVER REQUESTS

SES requests limited waivers of the Commission's requirements in connection with the instant modification application. Grant of the waivers 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.[18]

Section 25.114(d)(3): SES 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 has provided antenna gain information in the required .gxt format with one exception. The gain characteristics for the global horn antenna are not provided as a .gxt file

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17 *See, e.g., SES Americom, Inc.,* Application for Modification of Satcom SN-4 Fixed Satellite Space Station License, DA 05-1812, 20 FCC Rcd 11542 (Sat. Div. 2005) at ¶ 15.

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

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.

The Commission has previously waived the requirements of Section 25.114(d)(3) in similar factual circumstances, including with respect to AMC-2.[19] 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.[20] Here, in lieu of the single .gxt file that cannot be provided, SES has submitted alternative data sufficient to permit the Commission and any interested party to evaluate the antenna's interference potential. Accordingly, SES requests that the Commission grant a limited waiver of Section 25.114(d)(3).

<u>Section 25.210(j)</u>: Section 25.210(j) specifies that geostationary space stations "must be maintained within 0.05º of their assigned orbital longitude in the east/west direction, unless specifically authorized by the Commission to operate with a different longitudinal tolerance." 47 C.F.R. § 25.210(j). The Commission has previously waived this rule based on a finding that allowing an increased stationkeeping volume would "not adversely affect the operations of other spacecraft, and would conserve fuel for future operations."[21]

The facts here fit squarely within this precedent. As discussed above, allowing AMC-2 to be maintained within an increased stationkeeping volume will not harm other

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19 *See, e.g.*, March AMC-2 Grant, Attachment at ¶ 7 (waiving Section 25.114(d)(3) with respect to AMC-2 global horn antenna); *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*, Order and Authorization, DA 06-2439, 21 FCC Rcd 14023, 14033 at ¶ 17 (IB 2006) (conditionally accepting antenna gain information not filed in .gxt format).

20 *Galaxy 17 Grant* at n.5.

21 *See, e.g., SES Americom, Inc. Application for Modification of Satcom SN-4 Fixed Satellite Space Station License*, 20 FCC Rcd 11542, 11545 (Sat. Div. 2005).

operators. AMC-2's stationkeeping volume will not overlap with that of any other satellites. Allowing AMC-2 to be flown at 4.98° E.L. in an expanded east-west stationkeeping volume of +/-0.1 degrees will result in fuel savings for the spacecraft. This will prolong the time during which AMC-2 will be available to provide service in response to customer requirements. Under these circumstances, grant of any necessary waiver of Section 25.210(j) will serve the public interest.

CONCLUSION

For the foregoing reasons, SES seeks a modification of the AMC-2 license to reassign the spacecraft to 4.98º E.L. +/- 0.1 degrees for operations in the conventional C- and Ku-bands, as described in the attached materials. SES also requests an extension of the AMC-2 license term and authority to deorbit the satellite at its end of life.

Respectfully submitted,

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ATTACHMENT A

TECHNICAL APPENDIX

IN SUPPORT OF AMC-2 AT 4.98°E.L.

TECHNICAL APPENDIX

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

This technical appendix is submitted in support of the modification application of SES Americom, Inc. ("SES Americom," doing business as SES) seeking reassignment of AMC-2 to 4.98° E.L. from its current orbital position of 78.95º W.L.

SES 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 4.98° E.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 4.98° E.L, the spacecraft will be flown in inverted mode and the C-band and Ku-band transponders will provide coverage of Sub-Saharan Africa. SES proposes to maintain AMC-2 at 4.98° E.L. with an east/west stationkeeping tolerance of +/- 0.1 degrees. In the narrative section of this application, SES is requesting a waiver of §25.202(g) to permit such relaxed stationkeeping.[2] As SES has indicated previously, SES has stopped north/south stationkeeping for AMC-2.[3] The inclination of the spacecraft when it arrives at 4.98° E.L. will be approximately 0.36 degrees, and the inclination with change at a rate of about 0.8 degrees per year.[4]

2.0 Schedule S (§25.114(c))

The Schedule S database is included with this filing. This section describes the main updates in the Schedule S relating to the proposed operation of AMC-2 at 4.98° E.L. with respect to

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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.

[2] *See* Narrative at 8-9.

[3] *See* Letter of Karis A. Hastings, Counsel for SES Americom, Inc., to Marlene H. Dortch, Secretary, Federal Communications Commission, dated Sept. 8, 2011 (notifying Commission that AMC-2 will be commencing inclined orbit operations).

[4] *See id.*

previous Schedule S submissions for this spacecraft, and addresses some items not covered in the Schedule S.

1. *Transponder frequency plan.* No changes.
2. *Telemetry and Telecommand (TT&C) frequencies and beams.* The TT&C link budgets are included in the Schedule S.

   A global horn antenna is used for receiving telecommand carriers ("GBLR"), as well as for C-band telemetry ("GBLT"). The communication antennas ("KTV" and "KTH") are used for transmitting telemetry carriers in Ku-band.
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.
4. *Conversion of G/T values to Saturation Flux Density values.* Same as at 101° W.L.[5]
5. *Transponder frequency response of C- and Ku-transponder*. Same as at 101° W.L.[6]
6. *Carrier parameters and link budgets.* The carrier parameters and link budgets as displayed in Sections S11 and S13 have been updated based on the planned operations of AMC-2 at 4.98° E.L.
7. *Beam diagrams.* The attached beam diagrams in Section S8 have been updated to reflect the projected coverages at 4.98° E.L.
8. *TT&C Station Locations.* Information is provided in Section S14 regarding the TT&C earth stations in Luxembourg and Greece that will be used with AMC-2 at 4.98° E.L.

<u>3.0 PFD limits (§25.114(d)(5) and §25.208)</u>

Table 1 demonstrates that the PFD values in C-band from AMC-2 at 4.98° E.L. comply with §25.208. Only digital carrier operations are planned for the operations at 4.98° E.L.

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

Table 1 Maximum PFD values and margins relative to permissible limits of §25.208 (Max. PFD computed based in equal power distribution across the transponder[7])

	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	35.1	-167.7	-152.0	15.7
	10	35.9	-166.8	-149.5	17.3
	15	36.8	-165.7	-147.0	18.7
	20	37.7	-164.7	-144.5	20.2
	25	38.9	-163.4	-142.0	21.4
DL:H-Pol	5	35.8	-167.0	-152.0	15.0
	10	36.3	-166.4	-149.5	16.9
	15	36.8	-165.7	-147.0	18.7
	20	37.6	-164.8	-144.5	20.3
	25	38.5	-163.8	-142.0	21.8

No PFD limits for the 11700 – 12200 MHz band are specified in Section 25.208 of the FCC Rules or in No. 21.16 of the ITU Radio Regulations with respect to the operation of geostationary satellites.

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)

[7] For example, if the maximum EIRP is 35.1 dBW at the 5 degrees elevation contour, it was assumed that this power was evenly spread over the 36 MHz transponder bandwidth. The EIRP density in 4 kHz would then be calculated as follows: $35.1 - 10\log(36*10^6/4*10^3) = -4.4$ dBW/4kHz

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		4.05
CTV (C-band, V-pol, transmit beam)	CTV.gxt	42.10	
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		5.82
CTH (C-band, H-pol, transmit beam)	CTH.gxt	40.80	
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") and ("GBLT") 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 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 and 4 show the Emission designators and typical link budgets. Further carrier details and the TT&C link budgets are included in the Schedule S, Page S13.

Table 3 Link budgets for 4 typical Ku-band carriers

Link Parameters	**Units**	**6M95G1W**	**5M00G1W**	**100KG1W**	**1M60G1W**
Uplink Frequency	GHz	14.240	14.240	14.240	14.240
Downlink Frequency	GHz	11.940	11.940	11.940	11.940
Carrier Allocated Bandwidth	kHz	6945.0	5035.0	55.0	1390.0
Energy Dispersal	MHz	n/a	n/a	n/a	n/a
Uplink:					
Nominal E/S e.i.r.p. per carrier	dBW	61.6	60.2	40.1	54.7
Earth Station Diameter	m	2.4	2.4	2.4	3.8
Earth Station Gain	dBi	49.1	49.1	49.1	53.1
Uplink Input Power per Carrier	dBW	12.5	11.1	-9.0	1.5
Free Space Loss	dB	206.9	206.9	206.9	206.9
G/T Satellite	dB/K	0.0	0.0	0.0	0.0
C/N Thermal Uplink	dB	15.6	15.6	15.6	16.2
C/I XPOL, ACI, IM, ASI	dB	20.0	20.0	20.0	20.6
C/(N+I) uplink	dB	14.3	14.3	14.3	14.9
Downlink:					
Satellite e.i.r.p. per carrier (-2.9dB contour)	dBW	35.6	34.2	14.0	28.7
Maximum e.i.r.p. density	dBW/4kHz	6.9	6.9	6.9	7.4
Free Space Loss	dB	205.5	205.5	205.5	205.5
Earth Station Diameter	m	2.4	2.4	2.4	3.8
Earth Station Gain	dBi	47.7	47.7	47.7	51.7
Noise Temperature	kHz	120.0	120.0	120.0	120.0
Earth Station G/T	dB/K	26.9	26.9	26.9	30.9
C/N Thermal Downlink	dB	18.0	18.0	18.0	22.6
C/I XPOL, ACI, IM, ASI	dB	17.7	17.7	17.7	22.2
C/(N+I) downlink	dB	14.8	14.8	14.8	19.4
Adjacent Satellite Interference:					
Uplink Inp. Pwr. Dens. @ 2 degrees	dBW/Hz	-50	-50	-50	-50
Downlink e.i.r.p. Dens @ 2 degrees	dBW/Hz	-26	-26	-26	-26
C/I up (single satellite)	dB	23.0	23.0	23.0	23.6
C/I dn (single satellite)	dB	20.7	20.7	20.7	25.2
Aggregate C/I up	dB	20.0	20.0	20.0	20.6
Aggregate C/I down	dB	17.7	17.7	17.7	22.2
Overall:					
C/(N+I) overall	dB	11.5	11.5	11.5	13.5
C/(N+I) required	dB	6.9	6.9	6.9	9.3
System Margin	dB	4.6	4.6	4.6	4.3

Table 4 Link budgets for 4 typical C-band carriers

Link Parameters	**Units**	**9M00G7 W**	**1M50G7 W**	**100KG1 D**	**4M05G7 W**
Uplink Frequency	GHz	6.185	6.185	6.185	6.185
Downlink Frequency	GHz	3.960	3.960	3.960	3.960
Carrier Allocated Bandwidth	kHz	6667.0	1117.0	40.7	3000.0
Energy Dispersal	MHz	n/a	n/a	n/a	n/a
Uplink:					
Nominal E/S e.i.r.p. per carrier	dBW	57.1	52.3	38.7	53.4
Earth Station Diameter	m	3.8	3.8	3.8	3.8
Earth Station Gain	dBi	45.9	45.9	45.9	45.9
Uplink Input Power per Carrier	dBW	11.3	6.4	-7.2	7.5
Free Space Loss	dB	199.7	199.7	199.7	199.7
G/T Satellite	dB/K	0.0	0.0	-2.9	2.1
C/N Thermal Uplink	dB	17.8	20.7	18.6	19.6
C/I XPOL, ACI, IM, ASI	dB	12.0	14.8	15.7	14.6
C/(N+I) uplink	dB	11.0	13.8	13.9	13.4
Downlink:					
Satellite e.i.r.p. per carrier (-2.1dB contour)	dBW	25.3	20.5	4.0	17.6
Maximum e.i.r.p. density	dBW/4kHz	-4.8	-1.9	-4.0	-9.0
Free Space Loss	dB	195.9	195.9	195.9	195.9
Earth Station Diameter	m	3.8	3.8	3.8	3.8
Earth Station Gain	dBi	42.1	42.1	42.1	42.1
Noise Temperature	kHz	100.0	100.0	100.0	100.0
Earth Station G/T	dB/K	22.1	22.1	22.1	22.1
C/N Thermal Downlink	dB	11.9	14.8	12.7	7.7
C/I XPOL, ACI, IM, ASI	dB	12.2	15.1	13.0	9.0
C/(N+I) downlink	dB	9.1	11.9	9.9	5.3
Adjacent Satellite Interference:					
Uplink Inp. Pwr. Dens. @ 2 degrees	dBW/Hz	-47	-47	-47	-50
Downlink e.i.r.p. Dens @ 2 degrees	dBW/Hz	-37	-37	-37	-38
C/I up (single satellite)	dB	15.0	17.8	18.7	17.6
C/I dn (single satellite)	dB	15.2	18.1	16.0	12.0
Aggregate C/I up	dB	12.0	14.8	15.7	14.6
Aggregate C/I down	dB	12.2	15.1	13.0	9.0
Overall:					
C/(N+I) overall	dB	6.9	9.8	8.4	4.7
C/(N+I) required	dB	4.1	6.9	6.9	4.1
System Margin	dB	2.7	2.9	1.5	0.5

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 4.98° E.L. with neighboring spacecraft. Annex 2 addresses Ku-band and Annex 3 addresses C-band. Operations in the 11.7-12.2 GHz band will conform to existing coordination agreements with the nearest co-frequency EUROBIRD and THOR spacecraft at 9° E.L. and 0.8° W.L.

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

The information required under Section 25.114(d)(14) of the Commission's Rules is already on file with the Commission.[8] SES incorporates that information by reference and provides below a few minor updates to its previous showing.

§25.114(d)(14)(i): Onstation operations require stationkeeping within the +/- 0.1 degree E-W control box.

§25.114(d)(14)(ii): The Commission has granted SES a waiver of Section 25.283(c) of the Commission's rules in connection with the residual oxidizer that will remain in the AMC-2 tanks at the end of the spacecraft's life.[9]

§25.114(d)(14)(iii): The instant application seeks authority for operation of AMC-2 at the 4.98° E.L. orbital location. SES currently operates ASTRA 4A and ASTRA 1E in the vicinity of the planned orbital location for AMC-2. When AMC-2 arrives at 4.98° E.L., ASTRA 4A will be positioned at 4.81° E.L. with a station keeping accuracy of +/- 0.05 degrees, and ASTRA 1E will be positioned at 4.66° E.L. with a station keeping accuracy of +/- 0.08 degrees. There will therefore be no overlap of the AMC-2 stationkeeping volume with that of ASTRA 4A or ASTRA 1E. SES is not aware of any other FCC- or non-FCC licensed spacecraft that are operational or planned to be deployed at 4.98° E.L. or to nearby orbital locations such that there would be an overlap with the requested stationkeeping volume of AMC-2.

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[8] *See* File No. SAT-MOD-20100324-00056, Technical Appendix, Section 7.

[9] *See* File No. SAT-MOD-20100324-00056, Call Sign S2134, grant-stamped June 21, 2010, Attachment to Grant at ¶ 8.

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 10 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): SES seeks authority in this modification to relocate AMC-2 at its end of life to a disposal orbit with a minimum perigee altitude of at least 150 km above the geostationary arc. SES has previously provided the supporting information for this disposal plan.[10]

[10] *See* File No. SAT-MOD-20100324-00056, Technical Appendix, Section 7.

ANNEX 1

<u>COVERAGE</u> <u>MAPS</u>

Figure 1.
Transmit beam CTH
C-band, H-pol, Antenna peak gain: 30.31 dB, peak EIRP: 40.8 dBW

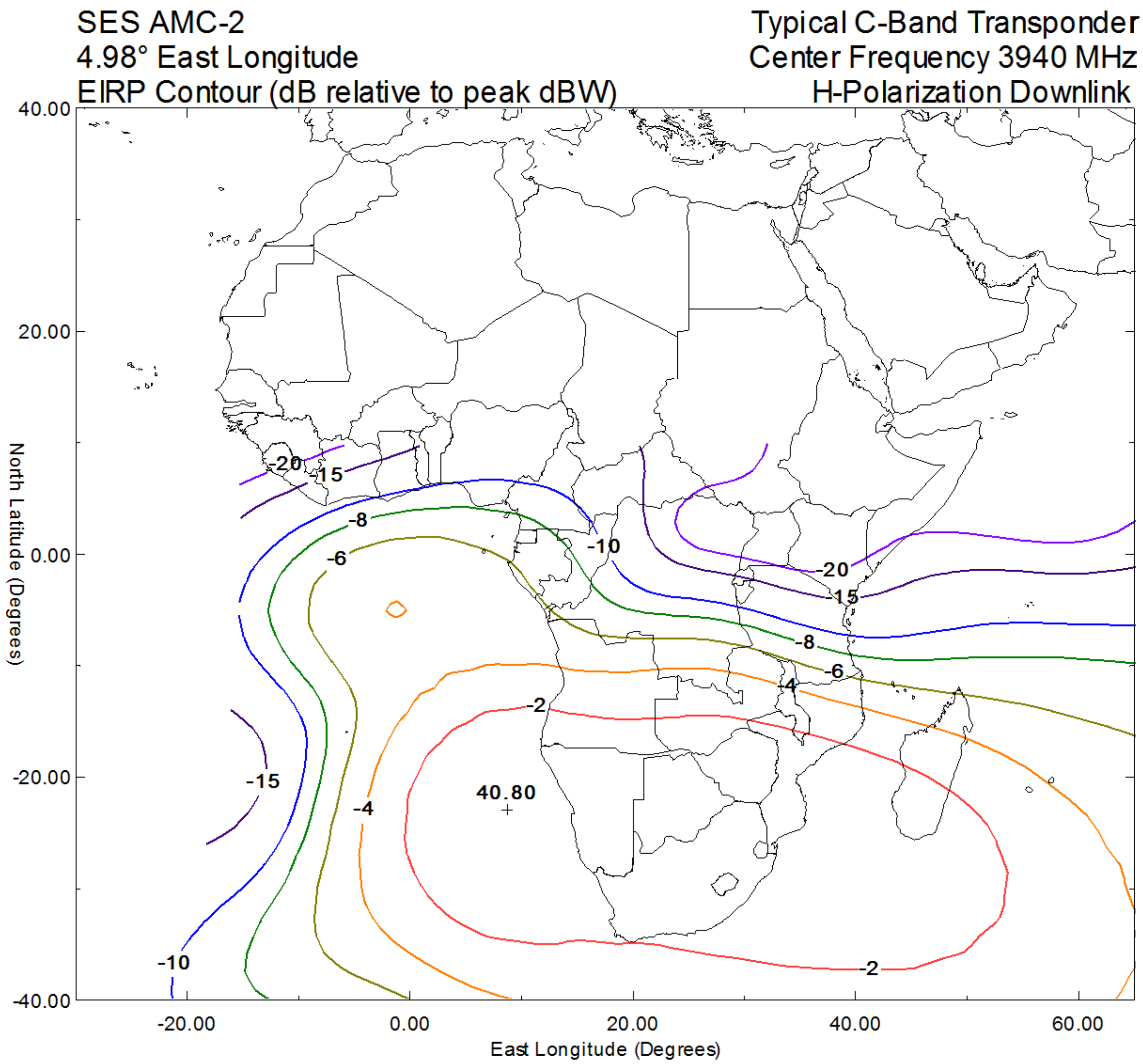

Figure 2.
Receive beam CRV
C-band, V-pol, Antenna peak gain: 31.3 dB, peak G/T: 4.05 dB/K

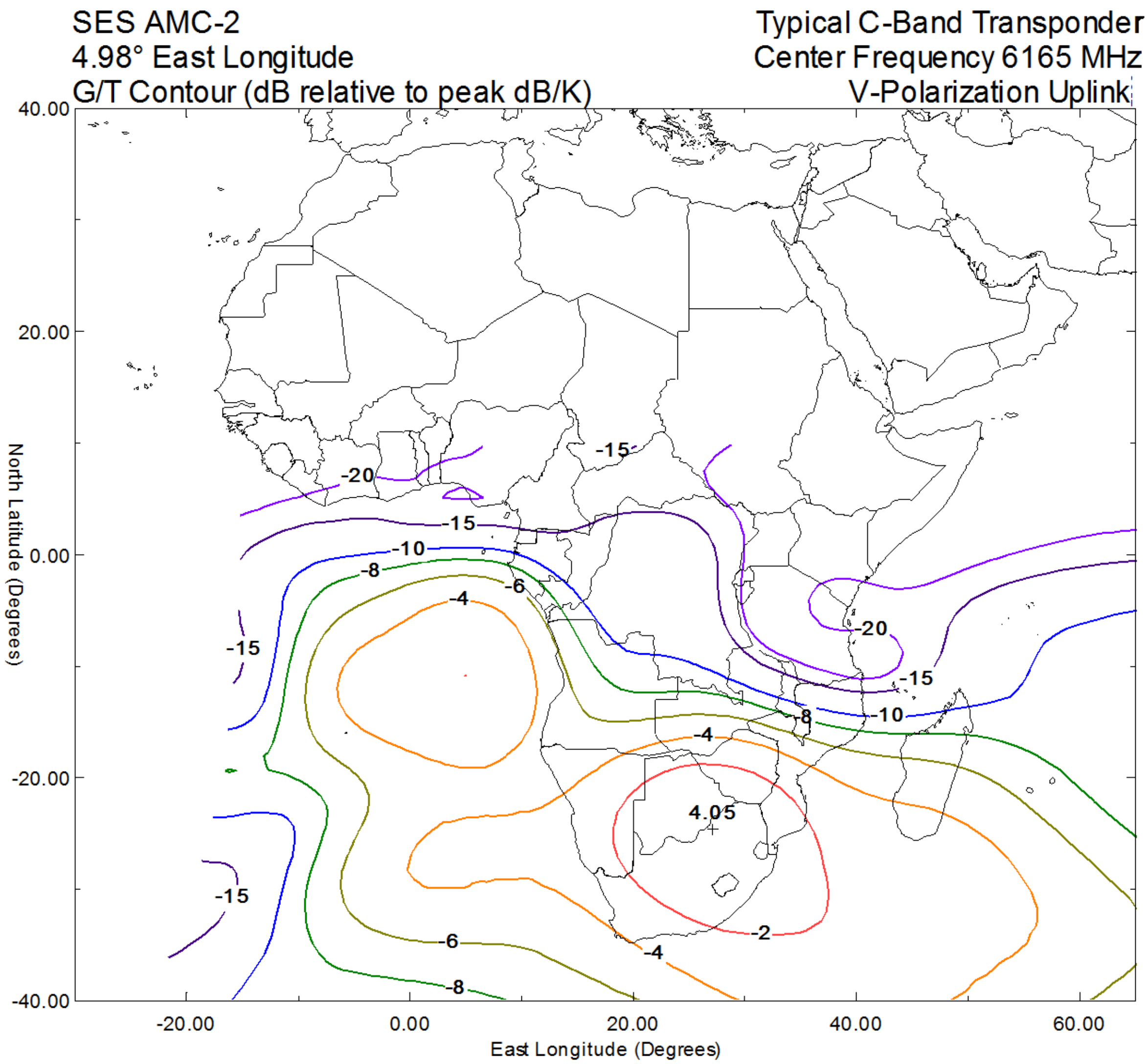

Figure 3.
Transmit beam CTV
C-band, V-pol, Antenna peak gain: 31.04 dB, peak EIRP: 42.10 dBW

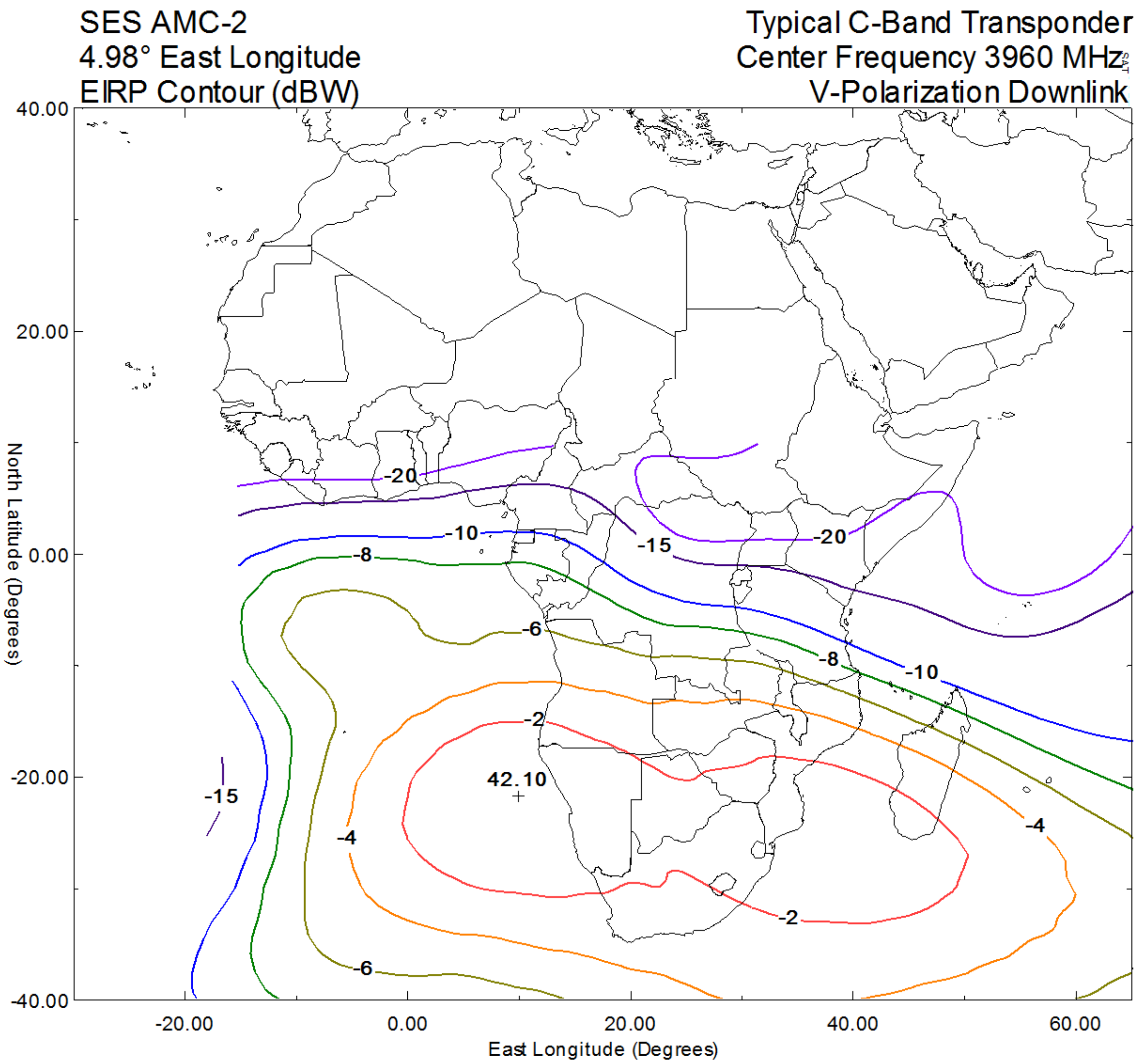

Figure 4.
Receive beam CRH
C-band, H-pol, Antenna peak gain: 32.89 dB, peak G/T: 5.82 dB/K

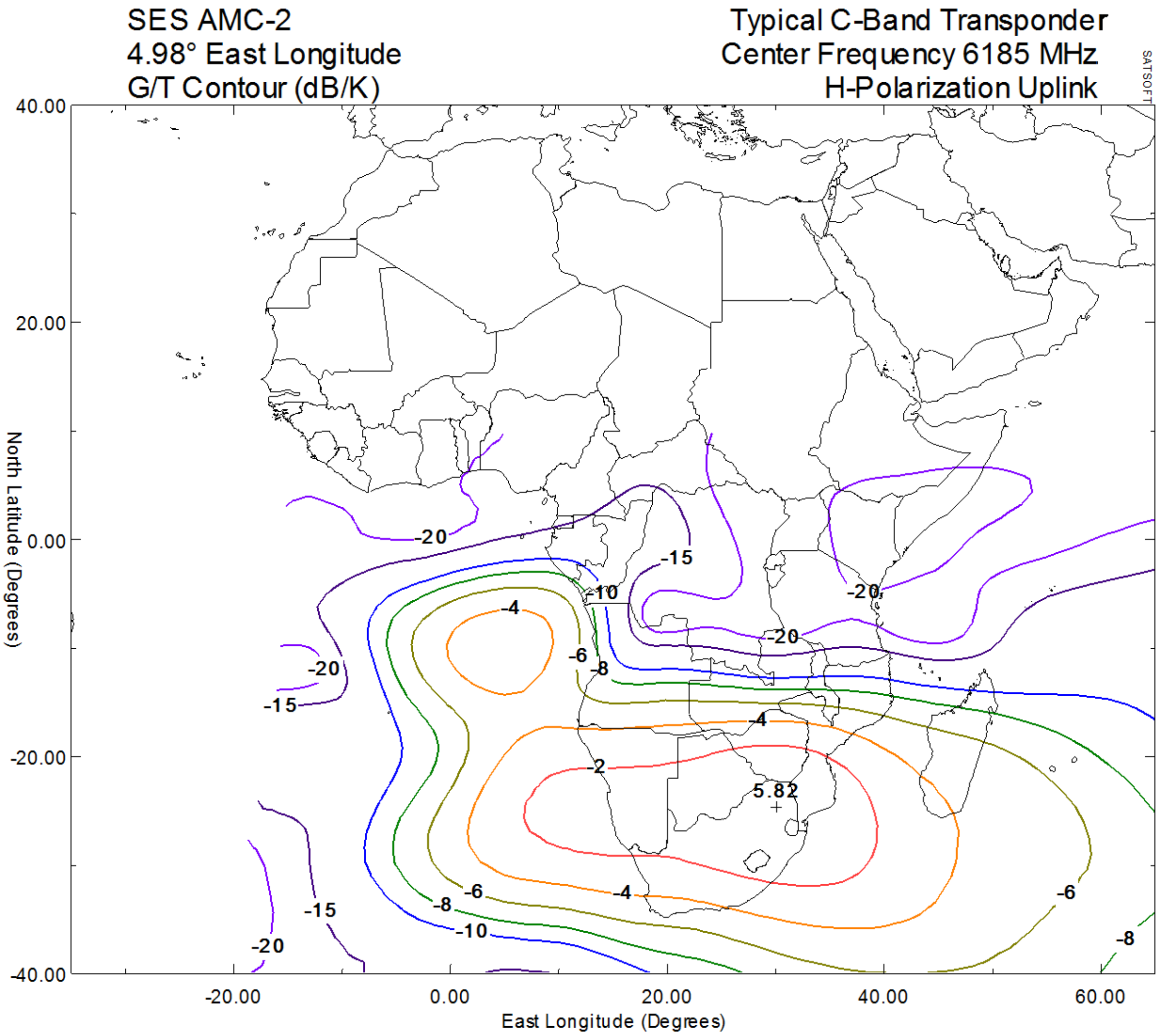

Figure 5.
Transmit beam KTH
Ku-band, H-pol, Antenna peak gain: 33.27 dB, peak EIRP: 49.68 dBW

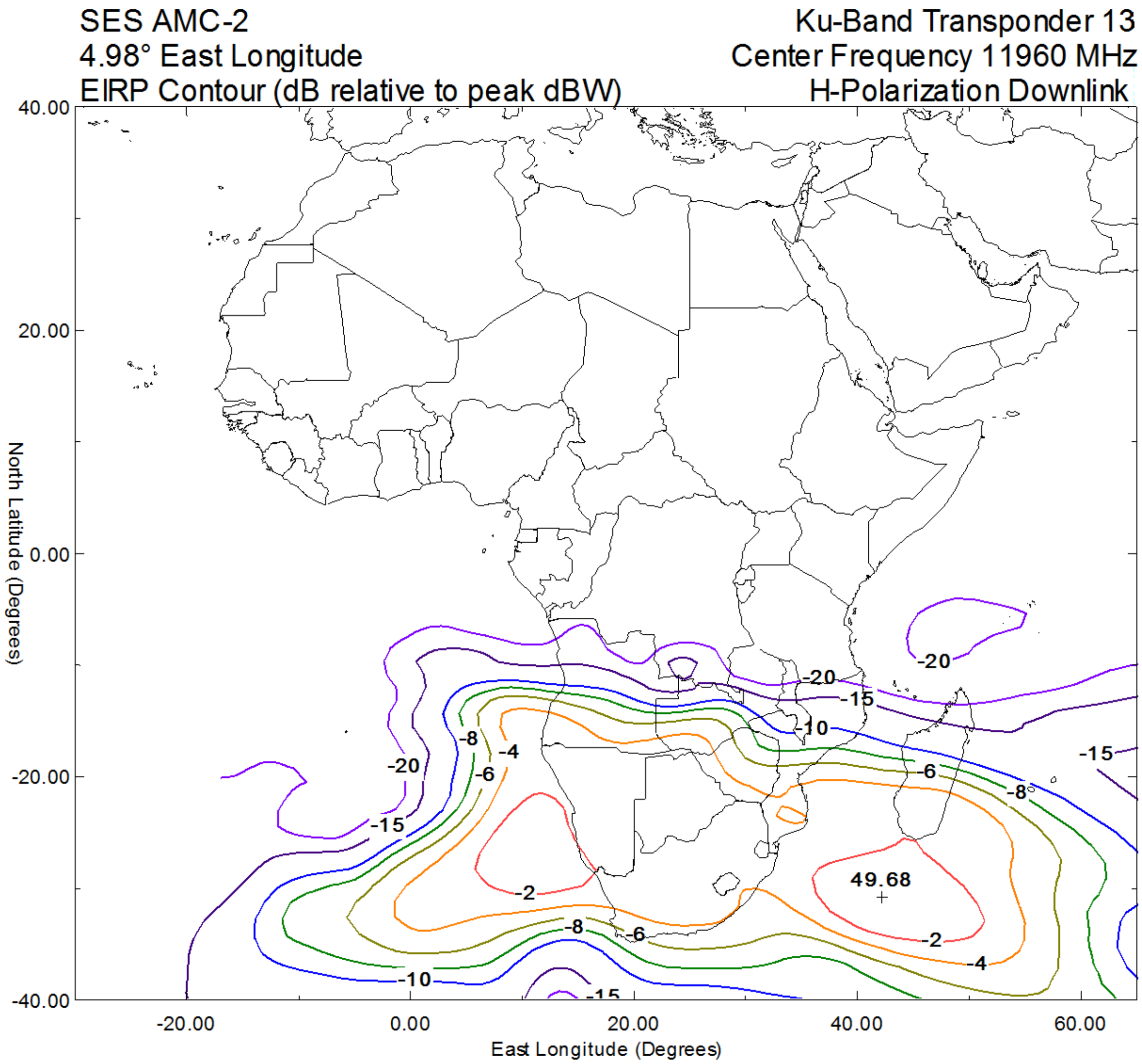

Figure 6.
Receive beam KRV
Ku-band, V-pol, Antenna peak gain: 30.86 dB, peak G/T: 3.46 dB/K

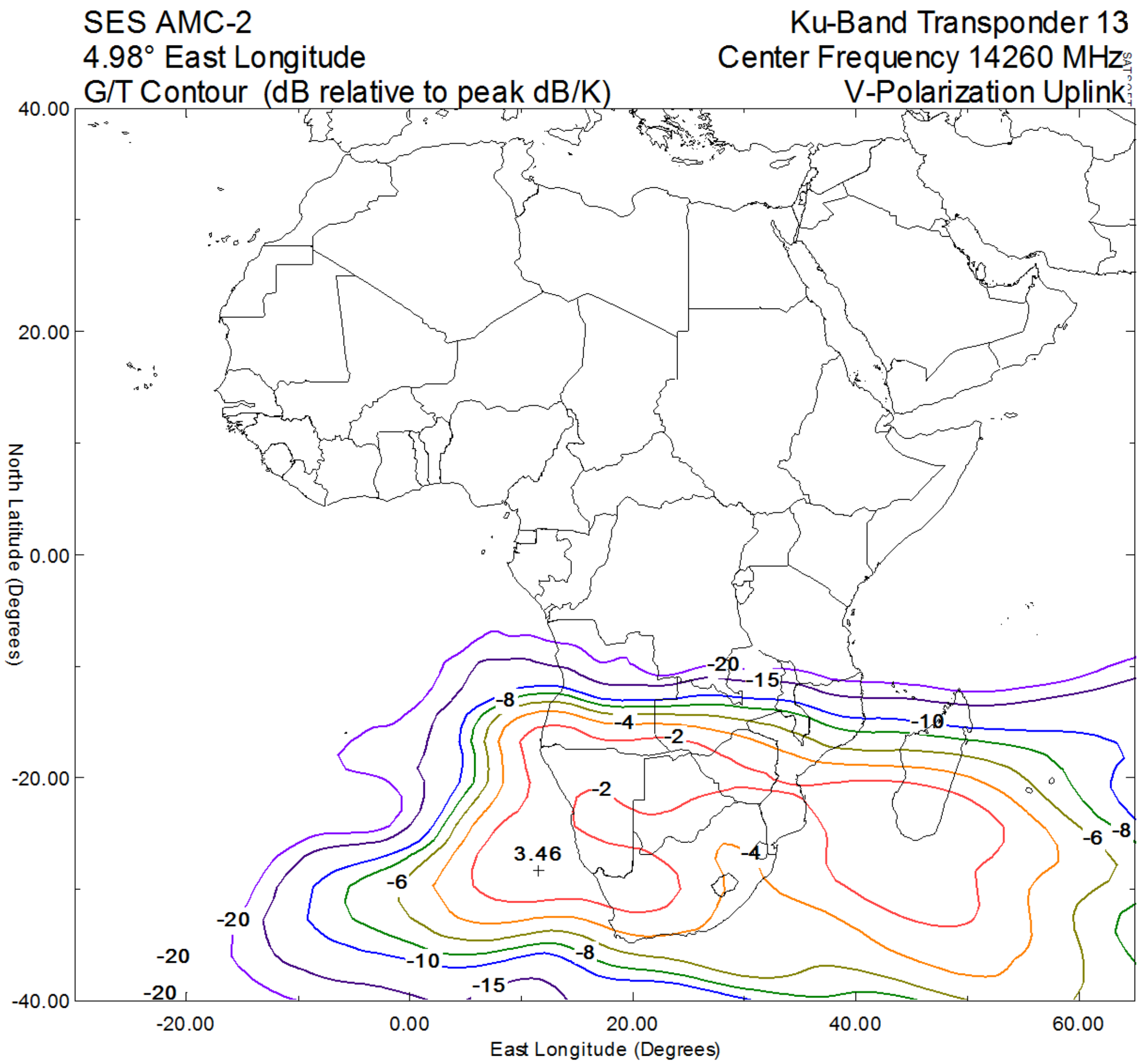

Figure 7.
Transmit beam KTV
Ku-band, V-pol, Antenna peak gain: 33.0 dB, peak EIRP: 49.2 dBW

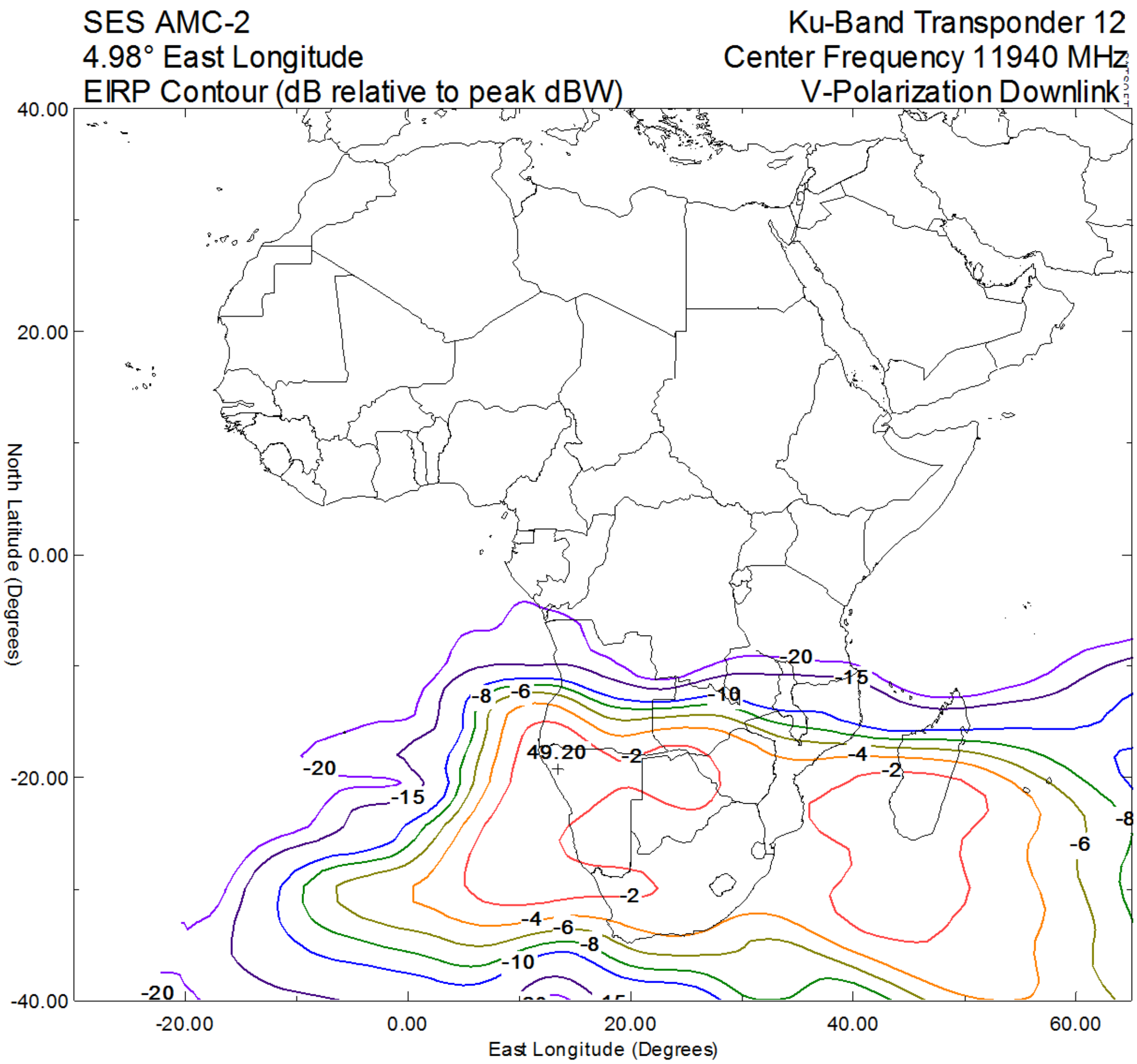

Figure 8.
Receive beam KRH
Ku-band, H-pol, Antenna peak gain: 33.63 dB, peak G/T: 5.93 dB/K

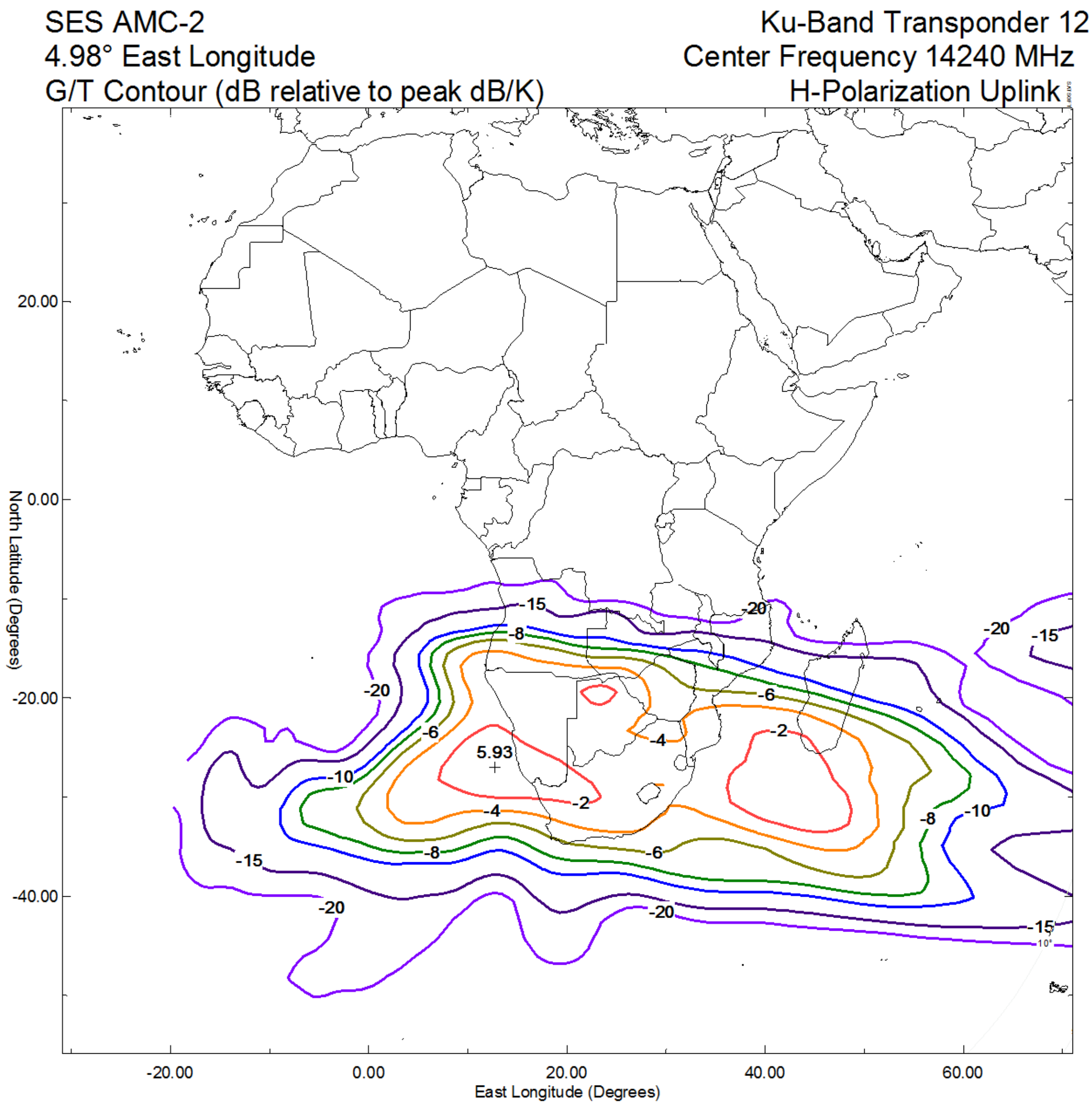

Fig 9. Global Horn Characteristics

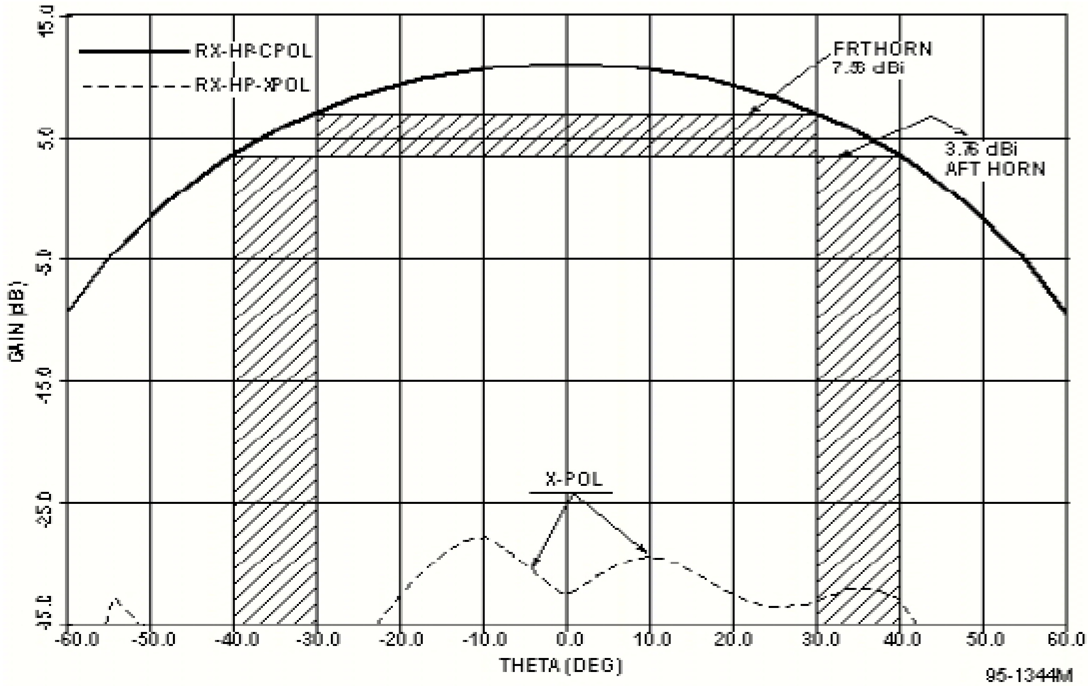

Figure 2.3-4. Measured Performance of Command Horn

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 as close as 1.98º 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 as close as 1.98º orbit spacing.

1 General Ku-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 1.98º 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:

Table 1. Uplink C/I for 1.98 geocentric spacing

Antenna Size	On-Axis Gain	Off-axis gain	C/I
1.2	43.0	20.9	22.1
1.8	46.6	20.9	25.6
2.4	49.1	20.9	28.1
4.5	54.5	20.9	33.6
6	57.0	20.9	36.1

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 General Ku-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 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 1.98º 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 1.98 geocentric spacing. Similar EIRPs

Antenna Size	On-Axis Gain	Off-axis gain	Off-axis discrimination	Delta EIRP	C/I
1.2	41.7	20.9	20.8	0.0	20.8
1.8	45.2	20.9	24.3	0.0	24.3
2.4	47.7	20.9	26.8	0.0	26.8
4.5	53.2	20.9	32.2	0.0	32.2
6	55.7	20.9	34.7	0.0	34.7

Table 3. Downlink C/I for 1.98 geocentric spacing. Different EIRPs

Antenna Size	On-Axis Gain	Off-axis gain	Off-axis discrimination	Delta EIRP	C/I
1.2	41.7	20.9	20.8	-2.0	18.8
1.8	45.2	20.9	24.3	-2.0	22.3
2.4	47.7	20.9	26.8	-2.0	24.8
4.5	53.2	20.9	32.2	-2.0	30.2
6	55.7	20.9	34.7	-2.0	32.7

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.

3 Specific Ku-band interference analysis

A review of the orbital arc around the planned AMC-2 orbital position of 4.98° E.L. showed that there are currently two spacecraft operating in (partly) overlapping frequency bands within approximately 2 degrees. EUTELSAT-W3A is located 2.02 degrees away at 7° E.L. EUROBIRD 4A is located .98 degrees away at 4° E.L. The overlap with the frequencies used on the AMC-2 spacecraft occurs only in the uplink band, i.e. in the 14.0-14.5 GHz band.
As a general analysis was already presented in sections 1 and 2 of this Annex, the attached Tables 4 to 6 show some examples of uplink C/I analysis for some typical carriers for the interference analysis of AMC-2 with respect to EUTELSAT-W3A. For the AMC-2 spacecraft, the typical carriers are based on the link budgets that were presented in the section "Emission Designators and Link Budgets (§25.114(d)(4))" and are indicated in Table 4. The uplink carrier parameters for the adjacent satellite at 7° E.L. had to be assumed as details on typical carrier parameters and transponder performance could not be found in the public domain. For that reason the same carrier parameters were assumed as used on AMC-2. Furthermore, one additional carrier was assumed with a sensitive uplink (i.e. VSAT inbound type carrier from a 1.2m uplink antenna, carrier designator 512KG7W). Table 5 shows the carrier parameters assumed for the operations at 7° E.L.

From the results in Table 6 it is seen that the C/I values are generally above 20 dB and that therefore the AMC-2 network is compatible with this co-coverage, co-frequency satellite, spaced 2.02º away.

Table 4. AMC-2 carriers parameters used in interference analysis as interfering carriers

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	(up density)	(dn density)
1	6M95G1W	5.787	49.1	61.6	38.5	47.7	-55.1	-29.1
2	5M00G1W	4.196	49.1	60.2	37.1	47.7	-55.1	-29.1
3	100KG1W	0.041	49.1	40.1	16.9	47.7	-55.1	-29.1
4	1M60G1W	1.029	53.1	54.7	31.6	51.7	-58.6	-28.6

Table 5. Uplink carriers parameters used in interference analysis at 7° E.L as wanted carriers

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	(up density)
1	6M95G1W	5.787	49.1	61.6	-55.1
2	5M00G1W	4.196	49.1	60.2	-55.1
3	100KG1W	0.041	49.1	40.1	-55.1
4	1M60G1W	1.029	53.1	54.7	-58.6
5	512KG7W	0.384	43.0	42.0	-56.8

Table 6. Uplink C/I estimates based on carrier parameters shown in Tables 4 and 5

		Interfering			
	Uplink C/I	**1**	**2**	**3**	**4**
Wanted	**1**	28.6	28.6	28.6	32.1
	2	28.6	28.6	28.6	32.1
	3	28.6	28.6	28.6	32.1
	4	29.2	29.2	29.2	32.6
	5	20.8	20.8	20.8	24.3

The approach to the interference analysis of AMC-2 with respect to EUROBIRD 4A is slightly different due to the fact that these spacecraft would be separated by only 0.98 degrees. In order to show that AMC-2 operations will be compatible with the EUROBIRD 4A operations the geographical separation of the uplink beams needs to be taken into account.

SES has determined based on publicly available data that the frequency overlap in the band 14.0 – 14.5 GHz occurs with respect to the fixed beam of the EUROBIRD 4A spacecraft. This fixed beam provides coverage of Europe, Northern Africa and the Middle East.

As shown in Annex 1 of this document, the planned coverage of AMC-2 is over Sub-Saharan Africa. For this reason a geographical isolation between the fixed uplink beam on the EUROBIRD 4A spacecraft and the uplink beam on the AMC-2 spacecraft can be taken into account. A conservative value of 8 dB will be used in the analysis set forth below.

For the actual C/I calculations, the same carrier parameters as shown in Table 4 will be used for AMC-2. The carrier parameters to be used for EUROBIRD 4A are the same as in Table 5.

Table 7 below shows the uplink C/I estimates, taking into account the geographical isolation of 8 dB.

From the results in this Table it is seen that the C/I values are generally above 20 dB and that therefore the AMC-2 network is compatible and does not cause more interference compared to the 2 degree spacing case calculated in Table 6 above.

Table 7. Uplink C/I estimates based on carrier parameters shown in Tables 4 and 5 for the operation of AMC-2 with respect to EUROBIRD 4A

		Interfering			
	Uplink C/I	**1**	**2**	**3**	**4**
Wanted	1	28.0	28.0	28.0	31.5
	2	28.0	28.0	28.0	31.5
	3	28.0	28.0	28.0	31.5
	4	28.6	28.6	28.6	32.0
	5	20.2	20.2	20.2	23.6

4 Operations in the band 11.7-12.2 GHz

AMC-2 will operate the Ku-band downlink in 11.7-12.2 GHz, which is a BSS band with respect to the planned coverage as set out in Annex 1. The closest operational networks in the band 11.7-12.2 GHz are EUROBIRD 9A at 9° E.L. and THOR-5 and THOR-6 at 0.8° W.L. The orbital separations between AMC-2 at 4.98° E.L and these spacecraft are 4.02° and 5.78° respectively.

According to the Annex 1 to Appendix 30 of the ITU Radio Regulations , in order for an administration not to be considered as being affected, the downlink EIRP per 27 MHz, should not exceed the levels as indicated in Table 8 below. If an administration is considered affected, then coordination must be effected in accordance with Appendix 30.

Table 8. Maximum allowed EIRP/27MHz for AMC-2 based on conditions as set out in Annex 1 to Appendix 30 of the ITU Radio Regulations

AMC-2 w.r.t. to:	**EUROBIRD 9A**	**THOR-5/6**
Wanted satellite position	9.0° E.L.	0.8° W.L.
Interfering satellite position	4.98° E.L.	4.98° E.L.
Min. geocentric orbital separation	3.82°	5.78°
Max. pfd (dBW/m2/27MHz)	-114.65	-110.15
Max. EIRP (dBW/27MHz)	48.9	53.4

According to the information provided in Annex 1 and the Schedule S, the maximum Ku-band downlink EIRP of AMC-2 is 49.7 dBW. However, the aggregate downlink EIRP in 27 MHz, based on the carrier parameters provided in Table 4, will not exceed the levels indicated in Table 8 and there will therefore be no potential for harmful interference. Furthermore, SES has completed coordination with the operators of the EUROBIRD and THOR satellite networks, and the operations of AMC-2 will conform to the existing coordination agreements that are in place for this frequency band with respect to these networks.

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 1.98º or more 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 1.98º orbital spacing.

1. General 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 1.98º 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:

Table 1. C-band uplink C/I for 1.98 geocentric spacing

Antenna Size	On-Axis Gain	Off-axis gain	C/I
2.4	41.7	20.9	20.8
3	43.6	20.9	22.7
4.5	47.2	20.9	26.2
6.1	49.8	20.9	28.9
7.5	51.6	20.9	30.6

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. General 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 1.98º 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 1.98 geocentric spacing. Similar EIRPs

Antenna Size	On-Axis Gain	Off-axis gain	Off-axis discrimination	C/I
2.4	38.2	20.9	17.2	17.2
3	40.1	20.9	19.2	19.2
4.5	43.6	20.9	22.7	22.7
6.1	46.3	20.9	25.3	25.3
7.5	48.1	20.9	27.1	27.1

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.

3. Specific C-band interference analysis

A review of the orbital arc around the planned AMC-2 orbital position of 4.98° E.L. showed that there are two satellites operating in C-band within two degrees of this location, EUTELSAT-3A and RASCOM-QAF-1R at 3° E.L. The nominal orbital separation with respect to 4.98° E.L. is 1.98 degrees. There is no operational C-band satellite operating in the vicinity of 7° E.L.

As a general analysis was already presented in sections 1 and 2 of this Annex, the attached Tables 4 to 6 show some examples of C/I analysis for some typical carriers. For the AMC-2 spacecraft, the typical carriers are based on the link budgets that were presented in the section "Emission Designators and Link Budgets (§25.114(d)(4))" and are indicated in Table 3. The carrier parameters for the adjacent satellites at 3° E.L. had to be assumed as details on typical carrier parameters and transponder performance could not be found in the public domain. Four types of carriers were assumed, of which 3 would be typical digital TV SCPC carriers (i.e. 13M5G7W, 7M42G7W and 5M90 G7W), and one would be a typical VSAT inbound carrier (347KG7W).

Based on publicly available information, it appears that the coverage of the EUTELSAT-3A satellite is limited to Europe and Northern Africa and that therefore there is substantial geographic isolation with respect to the AMC-2 beams as provided in Annex-1. Table 4 shows all the carrier parameters assumed for the operations at 3° E.L. It should be noted that the C/I criterion mentioned is based on the 6% coordination threshold (i.e. C/N + 12.2 dB).

Table 3. AMC-2 carriers parameters used in interference analysis as interfering carriers

Carrier ID	Emission Designator	Noise Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	(up density)	(dn density)
1	9M00G7W	6.667	45.9	57.1	27.4	42.1	-57.0	-40.8
2	1M50G7W	1.117	45.9	52.3	22.6	42.1	-54.1	-37.9
3	100KG1D	0.041	45.9	38.7	6.1	42.1	-53.3	-40.0
4	4M05G7W	3.000	45.9	53.4	19.7	42.1	-57.3	-45.0
5	n/a	45.000	51.5	76.9	38.5	42.1	-51.1	-38.0

Table 4. Carriers parameters used in interference analysis at 3° E.L as wanted carriers

Carrier ID	Emission Designator	Noise Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	C/I Criterion	(up density)	(dn density)
1	13M5G7W	10.000	47.4	57.8	31.1	38.1	16.3	-59.6	-38.9
2	7M42G7W	5.500	47.4	57.5	30.9	41.8	20.5	-57.3	-36.5
3	5M90G7W	4.377	47.4	57.2	30.5	38.1	19.1	-56.6	-35.9
4	347KG7W	0.256	41.9	40.4	15.4	43.5	18.2	-55.5	-38.7

Table 5. Uplink C/I estimates based on carrier parameters shown in Tables 3 and 4

		Interfering (AMC-2@4.98E)			
	Carrier ID	**1**	**2**	**3**	**4**
Wanted (3E)	**1**	2.0	-0.9	0.2	4.9
	2	2.6	-0.3	0.2	4.7
	3	2.2	-0.7	0.4	5.1
	4	2.6	-0.2	-0.2	4.1

It can be seen in Table 5 that there are a few negative C/I margins (with respect to the criteria of 6%). The worst case is represented for Wanted Carrier 1 with respect to Interfering Carrier 2. The deficit with respect to the 6% C/I criterion is 0.9 dB, which is equivalent to an increase of 7.4% of victim noise temperature. The C/I deficit indicated will lead to an impact on the overall C/N+I of only 0.3 dB. It is expected that these C/I levels can be successfully coordinated between these two spacecraft and therefore no harmful interference will be caused.

Engineering Declaration

DECLARATION OF PATRICK VAN NIFTRIK

I, Patrick van Niftrik, 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/_*Patrick van Niftrik*____________________
for SES Americom, Inc.

Dated: October 25, 2011