FCC IBFS - Electronic Filing

Submission_id :IB2015000519
Successfully filed on :Mar 18 2015 2:40:29:336PM

The current authorization of Call Sign E080100 expires on Aug 5 2024 1:10:00:000PM. The filing of a modification application does not automatically extend the expiration date of an authorization. In addition, grant of a modification will not extend the expiration date unless that is the modification sought. In general, an application for renewal of the authorization must be filed separately in order to extend the expiration date.

Return to Main Menu

Approved by OMB
3060-0678

Date & Time Filed: Mar 18 2015 2:40:29:336PM
File Number: SES-MFS-20150318-00164

FCC APPLICATION FOR SPACE AND EARTH STATION:MOD OR AMD - MAIN FORM FCC 312 MAIN FORM FOR OFFICIAL USE ONLY	FCC Use Only

APPLICANT INFORMATION

Enter a description of this application to identify it on the main menu:
2015 MOD to Increase EIRP, Change Max Skew & Add Satellites

1-8. Legal Name of Applicant

Name:	Row 44 Inc.	Phone Number:	818-706-3111
DBA Name:		Fax Number:	
Street:	4353 Park Terrace Drive	E-Mail:	smclellan@globaleagleent.com
City:	Westlake Village	State:	CA
Country:	USA	Zipcode:	91361 -
Attention:	Mr. Simon McLellan		

9-16. Name of Contact Representative

Name:	David S. Keir	Phone Number:	202-429-8970
Company:	Lerman Senter PLLC	Fax Number:	202-293-7783
Street:	2000 K Street, NW Suite 600	E-Mail:	dkeir@lermansenter.com
City:	Washington	State:	DC
Country:	USA	Zipcode:	20006-
Attention:	David Keir	Relationship:	Legal Counsel

CLASSIFICATION OF FILING

17. Choose the button next to the classification that applies to this filing for both questions a. and b. Choose only one for 17a and only one for 17b.

- (●) a1. Earth Station
- ( ) a2. Space Station

- (N/A) b1. Application for License of New Station
- (N/A) b2. Application for Registration of New Domestic Receive-Only Station
- ( ) b3. Amendment to a Pending Application
- (●) b4. Modification of License or Registration
- b5. Assignment of License or Registration
- b6. Transfer of Control of License or Registration
- ( ) b7. Notification of Minor Modification
- (N/A) b8. Application for License of New Receive-Only Station Using Non-U.S. Licensed Satellite
- (N/A) b9. Letter of Intent to Use Non-U.S. Licensed Satellite to Provide Service in the United States
- (N/A) b10. Other (Please specify)
- (N/A) b11. Application for Earth Station to Access a Non-U.S.satellite Not Currently Authorized to Provide the Proposed Service in the Proposed Frequencies in the United States.

17c. Is a fee submitted with this application?
(●) If Yes, complete and attach FCC Form 159.

If No, indicate reason for fee exemption (see 47 C.F.R.Section 1.1114).
( ) Governmental Entity ( ) Noncommercial educational licensee
( ) Other(please explain):

17d.
Fee Classification CGB - Mobile Satellite Earth Stations

18. If this filing is in reference to an existing station, enter:
(a) Call sign of station:
E080100

19. If this filing is an amendment to a pending application enter both fields, if this filing is a modification please enter only the file number:
(a) Date pending application was filed:
(b) File number:
SESMOD2012102300963

TYPE OF SERVICE

20. NATURE OF SERVICE: This filing is for an authorization to provide or use the following type(s) of service(s): Select all that apply:

- ☐ a. Fixed Satellite
- ☐ b. Mobile Satellite
- ☐ c. Radiodetermination Satellite
- ☐ d. Earth Exploration Satellite
- ☐ e. Direct to Home Fixed Satellite
- ☐ f. Digital Audio Radio Service
- ☒ g. Other (please specify)

ESAA application of FSS

21. STATUS: Choose the button next to the applicable status. Choose only one.

○ Common Carrier ◉ Non-Common Carrier

22. If earth station applicant, check all that apply.

- ☒ Using U.S. licensed satellites
- ☒ Using Non-U.S. licensed satellites

23. If applicant is providng INTERNATIONAL COMMON CARRIER service, see instructions regarding Sec. 214 filings. Choose one. Are these facilities:

○ Connected to a Public Switched Network ○ Not connected to a Public Switched Network ◉ N/A

24. FREQUENCY BAND(S): Place an 'X' in the box(es) next to all applicable frequency band(s).

☐ a. C-Band (4/6 GHz) ☒ b. Ku-Band (12/14 GHz)

☐ c.Other (Please specify upper and lower frequencies in MHz.)

Frequency Lower: Frequency Upper: (Please specify additional frequencies in an attachment)

TYPE OF STATION

25. CLASS OF STATION: Choose the button next to the class of station that applies. Choose only one.

- ○ a. Fixed Earth Station
- ○ b. Temporary-Fixed Earth Station
- ○ c. 12/14 GHz VSAT Network
- ◉ d. Mobile Earth Station
- ○ e. Geostationary Space Station
- ○ f. Non-Geostationary Space Station
- ○ g. Other (please specify)

26. TYPE OF EARTH STATION FACILITY:

◉ Transmit/Receive ○ Transmit-Only ○ Receive-Only ○ N/A

"For Space Station applications, select N/A."

PURPOSE OF MODIFICATION

27. The purpose of this proposed modification is to: (Place an 'X' in the box(es) next to all that apply.)

- ☒ a -- authorization to add new emission designator and related service
- ☐ b -- authorization to change emission designator and related service
- ☒ c -- authorization to increase EIRP and EIRP density
- ☐ d -- authorization to replace antenna
- ☐ e -- authorization to add antenna
- ☐ f -- authorization to relocate fixed station
- ☐ g -- authorization to change frequency(ies)
- ☒ h -- authorization to add frequency
- ☒ i -- authorization to add Points of Communication (satellites & countries)
- ☐ j -- authorization to change Points of Communication (satellites & countries)
- ☐ k -- authorization for facilities for which environmental assessment and radiation hazard reporting is required
- ☐ l -- authorization to change orbit location
- ☐ m -- authorization to perform fleet management
- ☐ n -- authorization to extend milestones
- ☒ o -- Other (Please specify)

ENVIRONMENTAL POLICY

28. Would a Commission grant of any proposal in this application or amendment have a significant environmental impact as defined by 47 CFR 1.1307? If YES, submit the statement as required by Sections 1.1308 and 1.1311 of the ○ **Yes** ◉ **No**

Commission's rules, 47 C.F.R. 1.1308 and 1.1311, as an exhibit to this application.A Radiation Hazard Study must accompany all applications for new transmitting facilities, major modifications, or major amendments.	**Exhibit C**

ALIEN OWNERSHIP Earth station applicants not proposing to provide broadcast, common carrier, aeronautical en route or aeronautical fixed radio station services are not required to respond to Items 30-34.

29. Is the applicant a foreign government or the representative of any foreign government?	○ **Yes** ◉ **No**
30. Is the applicant an alien or the representative of an alien?	○ **Yes** ○ **No** ◉ **N/A**
31. Is the applicant a corporation organized under the laws of any foreign government?	○ **Yes** ○ **No** ◉ **N/A**
32. Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	○ **Yes** ○ **No** ◉ **N/A**
33. Is the applicant a corporation directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	○ **Yes** ○ **No** ◉ **N/A**
34. If any answer to questions 29, 30, 31, 32 and/or 33 is Yes, attach as an exhibit an identification of the aliens or foreign entities, their nationality, their relationship to the applicant, and the percentage of stock they own or vote.	

BASIC QUALIFICATIONS

35. Does the Applicant request any waivers or exemptions from any of the Commission's Rules? If Yes, attach as an exhibit, copies of the requests for waivers or exceptions with supporting documents.	○ **Yes** ◉ **No**
36. Has the applicant or any party to this application or amendment had any FCC station authorization or license revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission? If Yes, attach as an exhibit, an explination of circumstances.	○ **Yes** ◉ **No**
37. Has the applicant, or any party to this application or amendment, or any party directly or indirectly controlling the applicant ever been convicted of a felony by any state or federal court? If Yes, attach as an exhibit, an explination of circumstances.	○ **Yes** ◉ **No**
38. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the applicant, guilty of unlawfully monopolizing or attemptiing unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement or any other means or unfair methods of competition?If Yes, attach as an exhibit, an explanation of circumstances	○ **Yes** ◉ **No**
39. Is the applicant, or any person directly or indirectly controlling the applicant, currently a party in any pending matter referred to in the preceding two items? If yes, attach as an exhinit, an explanation of the circumstances.	○ **Yes** ◉ **No**
40. If the applicant is a corporation and is applying for a space station license, attach as an exhibit the names, address, and citizenship of those stockholders owning a record and/or voting 10 percent or more of the Filer's voting stock and the percentages so held. In the case of fiduciary control, indicate the beneficiary(ies) or class of beneficiaries. Also list the names and addresses of the officers and directors of the Filer.	
41. By checking Yes, the undersigned certifies, that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. *See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes.*	◉ **Yes** ○ **No**
42a. Does the applicant intend to use a non-U.S. licensed satellite to provide service in the United States? If Yes, answer 42b and attach an exhibit providing the information specified in *47 C.F.R. 25.137, as appropriate*. If No, proceed to question 43.	◉ **Yes** ○ **No** **Exhibit B**
42b. What administration has licensed or is in the process of licensing the space station? If no license will be issued, what administration has coordinated or is in the process of coordinating the space station?	

43. Description. (Summarize the nature of the application and the services to be provided). Row 44 seeks to expand its aeronautical mobile-satellite service network capacity and availability by increasing EIRP, modifying the maximum skew angle for and adding both new emission designators and additional satellite points of communication to its licensed ESAA network. See Attached Narrative.Description

43a. Geographic Service Rule Certification By selecting A, the undersigned certifies that the applicant is not subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25.	◉ **A**
By selecting B, the undersigned certifies that the applicant is subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25 and will comply with such requirements.	○ **B**

By selecting C, the undersigned certifies that the applicant is subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25 and will not comply with such requirements because it is not feasible as a technical matter to do so, or that, while technically feasible, such services would require so many compromises in satellite design and operation as to make it economically unreasonable. A narrative description and technical analysis demonstrating this claim are attached.	○ C Exhibit A

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CERTIFICATION

The Applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application. The applicant certifies that grant of this application would not cause the applicant to be in violation of the spectrum aggregation limit in 47 CFR Part 20. All statements made in exhibits are a material part hereof and are incorporated herein as if set out in full in this application. The undersigned, individually and for the applicant, hereby certifies that all statements made in this application and in all attached exhibits are true, complete and correct to the best of his or her knowledge and belief, and are made in good faith.

44. Applicant is a (an): (Choose the button next to applicable response.)

- ○ Individual
- ○ Unincorporated Association
- ○ Partnership
- ◉ Corporation
- ○ Governmental Entity
- ○ Other (please specify)

45. Name of Person Signing	46. Title of Person Signing
Simon McLellan	Senior Engineer

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).

SATELLITE EARTH STATION AUTHORIZATIONS
FCC Form 312 - Schedule B:(Technical and Operational Description)

FOR OFFICIAL USE ONLY

Location of Earth Station Site

E1: Site Identifier:	Remote Terminal #1	E5. Call Sign:	E080100
E2: Contact Name	Simon McLellan	E6. Phone Number:	(949) 636-0732
E3. Street:		E7. City:	
		E8. County:	
E4. State		E9. Zip Code	
E10. Area of Operation:		CONUS + Territorial & International Waters (within Desigated Satellite Footprints)	
E11. Latitude:	0 ° 0 ' 0.0 " N		
E12. Longitude:	0 ° 0 ' 0.0 " W		
E13. Lat/Lon Coordinates are:	○ NAD-27	◉ NAD-83	○ N/A
E14. Site Elevation (AMSL):	0.0 meters		

E15. If the proposed antenna(s) operate in the Fixed Satellite Service (FSS) with geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a) and (b) as demonstrated by the manufacturer's qualification measurement? If NO, provide as a technical analysis showing compliance with two-degree spacing policy.	○ Yes ◉ No ○ N/A
E16. If the proposed antenna(s) do not operate in the Fixed Satellite Service (FSS), or if they operate in the Fixed Satellite Service (FSS) with non-geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a2) and (b) as demonstrated by the manufacturer's qualification measurements?	○ Yes ○ No ◉ N/A
E17. Is the facility operated by remote control? If YES, provide the location and telephone number of the control point.	◉ Yes ○ No
	○ Yes ◉ No

E18. Is frequency coordination required? If YES, attach a frequency coordination report as	
E19. Is coordination with another country required? If YES, attach the name of the country(ies) and plot of coordination contours as	○ Yes ◉ No
E20. FAA Notification - (See 47 CFR Part 17 and 47 CFR part 25.113(c)) Where FAA notification is required, have you attached a copy of a completed FCC Form 854 and/or the FAA's study regarding the potential hazard of the structure to aviation? FAILURE TO COMPLY WITH 47 CFR PARTS 17 AND 25 WILL RESULT IN THE RETURN OF THIS APPLICATION.	○ Yes ◉ No

POINTS OF COMMUNICATION

Satellite Name:OTHER | OTHER | If you selected OTHER, please enter the following:	
E21. Common Name:	E22. ITU Name:
E23. Orbit Location:	E24. Country: USA

Satellite Name:OTHER | OTHER | If you selected OTHER, please enter the following:	
E21. Common Name:	E22. ITU Name:
E23. Orbit Location:	E24. Country: USA

POINTS OF COMMUNICATION (Destination Points)

E25. Site Identifier: Remote Terminal #1	
E26. Common Name:	E27. Country: USA

ANTENNA

Site ID	E28. Antenna Id	E29. Quantity	E30. Manufacturer	E31. Model	E32. Antenna Size	E41/42. Antenna Gain Transmint and/or Recieve(____dBi at _____GHz)
Remote Terminal #1	A	1000	Aerosat Avionics	70-100-0000-01	0.6	31.8 dBi at 11.7
Remote Terminal #1	A	1000	Aerosat Avionics	70-100-0000-01	0.6	28.6 dBi at 14.47

E28. Antenna Id	E33/34. Diameter Minor/Major(meters)	E35. Above Ground Level(meters)	E36. Above Sea Level(meters)	E37. Building Height Above Ground Level(meters)	E38. Total Input Power at antenna flange(Watts)	E39. Maximum Antenna Height Above Rooftop(meters)	E40. Total EIRP for al carriers(dBW)
A	0.0/0.0	0.0	0.0	0.0	10.0	0.0	41.8

FREQUENCY

E28. Antenna Id	E43/44. Frequency Bands(MHz)	E45. T/R Mode	E46. Antenna Polarization(H,V,L,R)	E47. Emission Designator	E48. Maximum EIRP per Carrier(dBW)	E49. Maximum ERIP Density per Carrier(dBW/4kHz)
A	11700 12200	R	Horizontal and Vertical	36M0G7D	0.0	0.0
E50. Modulation and Services QPSK or octal PSK						
A	14050 14470	T	Horizontal and Vertical	1M60G7D	38.6	14.6
E50. Modulation and Services QPSK or octal PSK						

FREQUENCY COORDINATION

E28. Antenna Id	E51. Satellite Orbit Type	E52/53. Frequency Limits(MHz)	E54/55. Range of Satellite Arc Eastern/Western Limit	E56. Earth Station Azimuth Angle Eastern Limit	E57. Antenna Elevation Angle Eastern Limit	E58. Earth Station Azimuth Angle Western Limit	E59. Antenna Elevation Angle Western Limit	E60. Maximum EIRP Density toward the Horizon(dBW/4kHz)
A	Geostationary	11700.0000 12200.0000	83.0/127.0	206.6	35.0	138.7	11.2	0.0
	Geostationary	14050.0000 14470.0000	83.0/127.0	206.6	35.0	138.7	11.2	5.4

REMOTE CONTROL POINT LOCATION

E61. Call Sign	E66. Phone Number

NOTE: Please enter the callsign of the controlling station, not the callsign for which this application is being filed.	

E62. Street Address			
E63. City	E68. County	E67/68. State/Country /	E64. Zip Code

SATELLITE EARTH STATION AUTHORIZATIONS
FCC Form 312 - Schedule B:(Technical and Operational Description)

FOR OFFICIAL USE ONLY

Location of Earth Station Site

E1: Site Identifier:	Remote Terminal #2	E5. Call Sign:	E080100
E2: Contact Name	Simon McLellan	E6. Phone Number:	(949) 636-0732
E3. Street:		E7. City:	
		E8. County:	
E4. State		E9. Zip Code	
E10. Area of Operation:		CONUS + Territorial & International Waters (within Desigated Satellite Footprints)	
E11. Latitude:	0 ° 0 ' 0.0 " N		
E12. Longitude:	0 ° 0 ' 0.0 " W		
E13. Lat/Lon Coordinates are:	○ NAD-27	◉ NAD-83	○ N/A
E14. Site Elevation (AMSL):	0.0 meters		

E15. If the proposed antenna(s) operate in the Fixed Satellite Service (FSS) with geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a) and (b) as demonstrated by the manufacturer's qualification measurement? If NO, provide as a technical analysis showing compliance with two-degree spacing policy.	○ Yes ◉ No ○ N/A
E16. If the proposed antenna(s) do not operate in the Fixed Satellite Service (FSS), or if they operate in the Fixed Satellite Service (FSS) with non-geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a2) and (b) as demonstrated by the manufacturer's qualification measurements?	○ Yes ○ No ◉ N/A
E17. Is the facility operated by remote control? If YES, provide the location and telephone number of the control point.	◉ Yes ○ No
E18. Is frequency coordination required? If YES, attach a frequency coordination report as	○ Yes ◉ No
E19. Is coordination with another country required? If YES, attach the name of the country(ies) and plot of coordination contours as	○ Yes ◉ No
E20. FAA Notification - (See 47 CFR Part 17 and 47 CFR part 25.113(c)) Where FAA notification is required, have you attached a copy of a completed FCC Form 854 and/or the FAA's study regarding the potential hazard of the structure to aviation? FAILURE TO COMPLY WITH 47 CFR PARTS 17 AND 25 WILL RESULT IN THE RETURN OF THIS APPLICATION.	○ Yes ◉ No

POINTS OF COMMUNICATION

Satellite Name:SES-6 (S2870) | New Skies | 40.5 W.L. If you selected OTHER, please enter the following:	
E21. Common Name:	E22. ITU Name:
E23. Orbit Location:	E24. Country:

Satellite Name:SES-1 | SES-1 | 101.0 W.L. If you selected OTHER, please enter the following:	
E21. Common Name:	E22. ITU Name:
E23. Orbit Location:	E24. Country:

Satellite Name:AMC 9 (S2434) | AMC 9 | 83 W.L. If you selected OTHER, please enter the following:	
E21. Common Name:	E22. ITU Name:
E23. Orbit Location:	E24. Country:

Satellite Name:AMC 2 | AMC 2 | 80.85 W.L. If you selected OTHER, please enter the following:

E21. Common Name:	E22. ITU Name:
E23. Orbit Location:	E24. Country:

POINTS OF COMMUNICATION (Destination Points)

E25. Site Identifier: Remote Terminal #2	
E26. Common Name:	E27. Country: USA

ANTENNA

Site ID	E28. Antenna Id	E29. Quantity	E30. Manufacturer	E31. Model	E32. Antenna Size	E41/42. Antenna Gain Transmint and/or Recieve(____dBi at _____GHz)
Remote Terminal #2	B	1000	TECOM	Ku-Stream	0.62	28.8 dBi at 14.25
Remote Terminal #2	B	1000	TECOM	Ku-Stream	0.62	31.1 dBi at 11.75

E28. Antenna Id	E33/34. Diameter Minor/Major(meters)	E35. Above Ground Level(meters)	E36. Above Sea Level(meters)	E37. Building Height Above Ground Level(meters)	E38. Total Input Power at antenna flange(Watts)	E39. Maximum Antenna Height Above Rooftop(meters)	E40. Total EIRP for al carriers(dBW)
B	0.0/0.0	0.0	0.0	0.0	31.6	0.0	43.8

FREQUENCY

E28. Antenna Id	E43/44. Frequency Bands(MHz)	E45. T/R Mode	E46. Antenna Polarization(H,V,L,R)	E47. Emission Designator	E48. Maximum EIRP per Carrier(dBW)	E49. Maximum ERIP Density per Carrier(dBW/4kHz)
B	11450 11700	R	Horizontal and Vertical	36M0G7D	0.0	0.0
E50. Modulation and Services QPSK or octal PSK						
B	11700 12200	R	Horizontal and Vertical	36M0G7D	0.0	0.0
E50. Modulation and Services QPSK or octal PSK						
B	12250 12750	R	Horizontal and Vertical	36M0G7D	0.0	0.0
E50. Modulation and Services QPSK or octal PSK						
B	14050 14470	T	Horizontal and Vertical	3M20G7D	41.8	14.8
E50. Modulation and Services QPSK or octal PSK						
B	10950.0000 11200.0000	R	Horizontal and Vertical	36M0G7D	0.0	0.0
E50. Modulation and Services QPSK or octal PSK						
B	14050.0000 14470.0000	T	Horizontal and Vertical	1M60G7D	36.0	11.9
E50. Modulation and Services QPSK or octal PSK						
B	14050.0000 14470.0000	T	Horizontal and Vertical	3M20G7D	43.3	16.2
E50. Modulation and Services QPSK or octal PSK						
B	14050.0000 14470.0000	T	Horizontal and Vertical	6M40G7D	43.8	13.7
E50. Modulation and Services QPSK or octal PSK						

FREQUENCY COORDINATION

E28. Antenna Id	E51. Satellite Orbit Type	E52/53. Frequency Limits(MHz)	E54/55. Range of Satellite Arc Eastern/Western Limit	E56. Earth Station Azimuth Angle Eastern Limit	E57. Antenna Elevation Angle Eastern Limit	E58. Earth Station Azimuth Angle Western Limit	E59. Antenna Elevation Angle Western Limit	E60. Maximum EIRP Density toward the Horizon(dBW/4kHz)
B	Geostationary	10950.0000 11200.0000	40.5/40.5	323.4	28.7	299.2	17.5	0.0
	Geostationary	11450.0000 11700.0000	37.5/127.0	194.4	20.9	119.5	2.6	0.0

	Geostationary	11700.0000 12200.0000	37.5/194.0	194.4	20.9	259.8	6.3	0.0
	Geostationary	12250.0000 12750.0000	55.5/194.0	127.5	39.6	259.8	6.3	0.0
	Geostationary	14050.0000 14470.0000	37.5/194.0	194.4	20.9	259.8	6.3	13.3

REMOTE CONTROL POINT LOCATION

E61. Call Sign E940460 NOTE: Please enter the callsign of the controlling station, not the callsign for which this application is being filed.			E66. Phone Number (301) 601-7205
E62. Street Address One Aerojet Way			
E63. City North Las Vegas	E68. County Clark	E67/68. State/Country NV/ USA	E64. Zip Code 89030

FCC NOTICE REQUIRED BY THE PAPERWORK REDUCTION ACT

The public reporting for this collection of information is estimated to average 2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the required data, and completing and reviewing the collection of information. If you have any comments on this burden estimate, or how we can improve the collection and reduce the burden it causes you, please write to the Federal Communications Commission, AMD-PERM, Paperwork Reduction Project (3060-0678), Washington, DC 20554. We will also accept your comments regarding the Paperwork Reduction Act aspects of this collection via the Internet if you send them to PRA@fcc.gov. PLEASE DO NOT SEND COMPLETED FORMS TO THIS ADDRESS.

Remember - You are not required to respond to a collection of information sponsored by the Federal government, and the government may not conduct or sponsor this collection, unless it displays a currently valid OMB control number or if we fail to provide you with this notice. This collection has been assigned an OMB control number of 3060-0678.

THE FOREGOING NOTICE IS REQUIRED BY THE PAPERWORK REDUCTION ACT OF 1995, PUBLIC LAW 104-13, OCTOBER 1, 1995, 44 U.S.C. SECTION 3507.

Attachment

Description of Application for Modification of License

1.0 OVERVIEW

This application seeks to modify the current Row 44, Inc. ("Row 44")[1] Ku-band Earth Stations Aboard Aircraft ("ESAA") license to increase EIRP for transmit conditions with 25° skew or less to the receiving satellite, add new emission designators, and to transmit at lower EIRP than is presently authorized at skew angles ranging up to 55°, angles of arrival at which Row 44 does not currently operate. In addition, Row 44 seeks authority to add two additional satellites as points of communication – AMC-2 at 80.85° W.L. and SES-6 at 40.5° W.L. These additional points of communication are both space stations licensed to and operated by SES, S.A. SES-6 is a non-U.S. satellite, but is already included on the FCC's Ku-band Permitted List.

All of the requested changes relate solely to the 0.62 meter TECOM Ku-Stream antenna, which is identified as Remote Terminal #2 in the existing Row 44 license (Call Sign E080100). No other changes in the technical parameters contained in the current ESAA license are proposed except as set forth herein, in Form 312 and Schedule B thereto, and in the Technical Appendix, Exhibit A to this application. To the extent practicable, the Form 312 includes only information that is changing due to the requested modification (e.g., it includes both the new satellite points of communication and those previously-authorized satellites for which changes in operating parameters are requested, but not the other satellites included as points of communication under Row 44's current license for which no operational modification is sought herein).

The proposed modifications to Row 44's existing authority apply only to certain satellite points of communication that are currently part of the Row 44 license – specifically AMC-9 and SES-1, operated by SES – as well as to the newly-requested satellites identified above. The requested changes in operating parameters will provide enhanced service to airline passengers on flights operating over North American airspace and in the Atlantic and Pacific Ocean regions by allowing increased system capacity and service availability. Except as specifically set forth herein, Row 44 seeks these modifications subject to all terms and conditions set forth in its current license.[2]

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[1] The in-flight connectivity business established by Row 44 now operates under the name Global Eagle Entertainment, which is the parent company of Row 44 (*see* IBFS File No. SES-T/C-20121203-01063). As Row 44 remains the name of the FCC licensee, that designation is used in this application.

[2] *See* Row 44 Inc., Radio Station Authorization, Call Sign E080100, File No. SES-MOD-20121023-00963, as amended by SES-AFS-20130920-00833 & SES-AFS-20140203-00029 (Sat. Div., granted Aug. 29, 2014).

Row 44 seeks to implement service on one or more of the satellites subject to its amended modification application as soon as practicable, and respectfully requests that this modification application be placed on public notice as quickly as possible in order to facilitate this projected implementation schedule. To the extent necessary, Row 44 will seek Special Temporary Authority to permit modified service using certain satellites in advance of final action on the entirety of the current request for modification.

2.0 TECHNICAL DESCRIPTION, LINK BUDGETS AND PREDICTED COVERAGE AREA

Exhibit A includes a technical description of the proposed changes, a depiction of the coverage contours in relation to combinations of EIRP and skew angle (skew angle ranging from 25° to 55°), as well as representative link budgets. *See* 47 C.F.R. § 25.227(b)(4).

3.0 COORDINATION LETTER

Row 44's intended operations are within the scope that SES has coordinated with the adjacent satellite operators, and should not cause harmful interference into adjacent satellites operating in accordance with FCC's two-degree spacing policy. A copy of a supplemental coordination letter covering Row 44's proposed new operations with the identified SES satellites is attached hereto as Exhibit B. *See* 47 C.F.R. §25.227(b)(2).

Row 44's operations, as modified, will continue to conform to the terms of its existing coordination agreements with the National Aeronautics and Space Administration ("NASA") and the National Science Foundation ("NSF"), as required under Condition 90057 its current ESAA license.[3]

[3] Row 44's coordination agreements with NASA and NSF pre-date the adoption of current rule Sections 25.227(c)(1) & (d)(1), which provide for Public Notice to allow comment on coordination agreements governing operations of ESAA networks in frequency bands shared with NASA and NSF facilities. Accordingly, to the extent necessary, Row 44 requests that the Public Notice issued announcing acceptance of this modification application include the referenced notifications concerning Row 44's existing coordination agreements with NASA and NSF.

4.0 RADIATION HAZARD STUDY

Exhibit C to this application is a revised radiation hazard assessment, submitted pursuant to Section 25.227(b)(8) of the Commission's Rules, reflecting the changed operating parameters requested for the TECOM antenna.

5.0 SPACECRAFT, FREQUENCY & BEAM COVERAGE

See chart on next page

Spacecraft, Frequency & Beam Coverage Table
(All Provide Some Coverage to U.S. Locations)

Satellite	Location	Beam Coverage Area	Tx (GHz)	Rx (GHz)	Satellite Operator
AMC-2	80.85W	North America, Central America, Caribbean and North Atlantic	14.05-14.47	11.7-12.2	**SES**
AMC-9	83.0W	North America, Caribbean and North Atlantic	14.05-14.47	11.7-12.2	
SES-1	101.0W	North America, Central America, and Caribbean	14.05-14.47	11.7–12.2	
SES-6*	40.5W	Atlantic Ocean	14.05-14.47	10.95-11.2; 11.45-11.7	
IS-19	166.0E	Pacific Ocean	14.05-14.47	12.25-12.75	**Intelsat**
Eutelsat 115WA (Satmex 5)*	114.9W	North America and Pacific Ocean	14.05-14.47	11.7-12.2	**Eutelsat**
Eutelsat 117WA (Satmex 8)*	116.8 W	North America and Caribbean	14.05-14.47	11.7-12.2	
T11N†	37.5W	North Atlantic Ocean	14.05-14.47	11.45-11.7; 11.7-12.2	**Telesat**
Estrella do Sul (T14R)*	63.0W	North Atlantic Ocean, Canada and Caribbean	14.05-14.47	11.7–12.2	
Horizons 1*	127.0W	North America and Pacific Ocean	14.05-14.47	11.7–12.2	**JSAT**

* = Non-U.S.-licensed satellites included on Ku-band Permitted List

† = T11N is a U.S.-licensed satellite (Call Sign S2357) operated by Telesat Canada

= New Points of Communication requested in this modification application

= Existing Points of Communication, changed operating parameters requested

6.0 LICENSEE CERTIFICATION

I, Simon McLellan, VP Engineering of Row 44, Inc., hereby certify as follows:

1. The target space station operator for the satellites subject to this modification application has confirmed that proposed Earth Stations Aboard Aircraft operations are within coordinated parameters for adjacent satellites up to 6 degrees away on the geostationary arc; and

2. The licensee will continue to comply with the requirements of paragraphs (a)(6), (a)(9), (a)(10), and (a)(11) of Section 25.227 of the Commission's Rules and the conditions of its existing license.

Simon McLellan
VP Engineering
Row 44, Inc.

March 17, 2015

EXHIBIT A

Approach

Row 44's present implementation involves a single EIRP and skew-limit. Row 44 proposes to augment its operation by establishing four EIRP–skew limit combinations and 3 emission bandwidth combinations.

Table 1 depicts the present Row 44 authorization:

Table 1 - Present Authorization

EIRP Limit (in a 1.024 MHz emission bandwidth)	Skew Limit
38.8 dBW (14.7 dBW/ 4 kHz, 40.0 dBm TX power)	35 degrees

Table 2 depicts the proposed authorizations involving skew angle, EIRP density / TX power, and emission bandwidth:

Table 2 - Proposed Authorization

EIRP Density and TX Power (1.024 MHz emission bandwidth)	EIRP Density and TX Power (2.048 MHz emission bandwidth)	EIRP Density and TX Power (4.096 MHz emission bandwidth)	Skew Limit
16.2 dBW/ 4 kHz (41.5 dBm TX power)	16.2 dBW/ 4 kHz (44.5 dBm TX power)	13.7 dBW/ 4 kHz (45.0 dBm TX power)	25 degrees
14.7 dBW/ 4 kHz (40.0 dBm TX power)	14.7 dBW/ 4 kHz (43.0 dBm TX power)	13.7 dBW/ 4 kHz (45.0 dBm TX power)	35 degrees
13.7 dBW/ 4 kHz (39.0 dBm TX power)	13.7 dBW/ 4 kHz (42.0 dBm TX power)	13.7 dBW/ 4 kHz (45.0 dBm TX power)	45 degrees
11.9 dBW/ 4 kHz (37.2 dBm TX power)	11.9 dBW/ 4 kHz (40.2 dBm TX power)	11.9 dBW/ 4 kHz (43.2 dBm TX power)	55 degrees

Introducing the revised limits and emission bandwidths in Table 2 will allow:

(1) Row 44 to transmit at higher EIRP densities within geographic areas limiting skew to 25 degrees, facilitating higher inroute data rates for users / aircraft within those areas

(2) Row 44 to continue to transmit at existing EIRP densities (and facilitating existing data rates), within geographic areas where skew is limited to 35 degrees

(3) Row 44 to transmit at lower EIRP densities within geographic areas limiting skew to 45 and 55 degrees, thereby facilitating services for users / aircraft where data communications were previously unavailable

(4) Row 44 to transmit at a variety of combinations of EIRP and emission bandwidths, thereby optimizing bandwidth usage, and providing users higher data rates than those of the present.

In all cases of skew limits of 25, 35, 45, or 55 degrees, Row 44 shall comply with the EIRP density limits established in Section 25.227.

Table 3 depicts the proposed applicability of the Table 2 categories between satellites and skew angles:

Table 3 – Applicability of Table 2 Skew-EIRP Limits

Satellite	25 degrees	35 degrees	45 degrees	55 degrees
SES-1	yes	yes	yes	N/A
AMC-9	yes	yes	yes	N/A
AMC-2	yes	yes	yes	N/A
SES-6	yes	yes	yes	yes

This Exhibit also includes sample link budgets pertaining to each of the combinations of EIRP, emission bandwidth, skew limit, and satellite. These are located at the end of this Exhibit. Note that in all cases, the link budgets for 1.024 MHz emission bandwidths apply to those for 2.048 MHz as well, as the EIRP densities are the identical, and link performance subsequently the same.

EIRP Density Plots

Horizontal Polarization; 1.024 and 2.048 MHz Bandwidths

The EIRP spectral densities shown in Figures C-1 to C-2, C-3 to C-4, and C-5 to C-6 for 14.05 GHz, 14.25 GHz, and 14.47 GHz respectively, all with horizontal polarization, indicate FCC co-polarization emission compliance according to FCC 25.227. Collectively, each plot addresses configurations of:

25^0 Skew:

41.5 dBm transmit power in a 1.024 MHz bandwidth, 44.5 dBm transmit power in a 2.048 MHz bandwidth

35^0 Skew:

40.0 dBm transmit power in a 1.024 MHz bandwidth, 43.0 dBm transmit power in a 2.048 MHz bandwidth

45^0 Skew:

39.0 dBm transmit power in a 1.024 MHz bandwidth, 42.0 dBm transmit power in a 2.048 MHz bandwidth

55^0 Skew:

37.2 dBm transmit power in a 1.024 MHz bandwidth, 40.2 dBm transmit power in a 2.048 MHz bandwidth

Figures C-1, C-3, and C-5 depict the EIRP spectral density in dBW/4kHz for a $\pm$10 degree azimuth axis along with the associated Section 25.227 compliance mask. Figures C-2, C-4, and C-6 depict the EIRP spectral density in dBW/4kHz for a $\pm$180 degree expanded azimuth axis along with the associated Section 25.227 compliance mask.

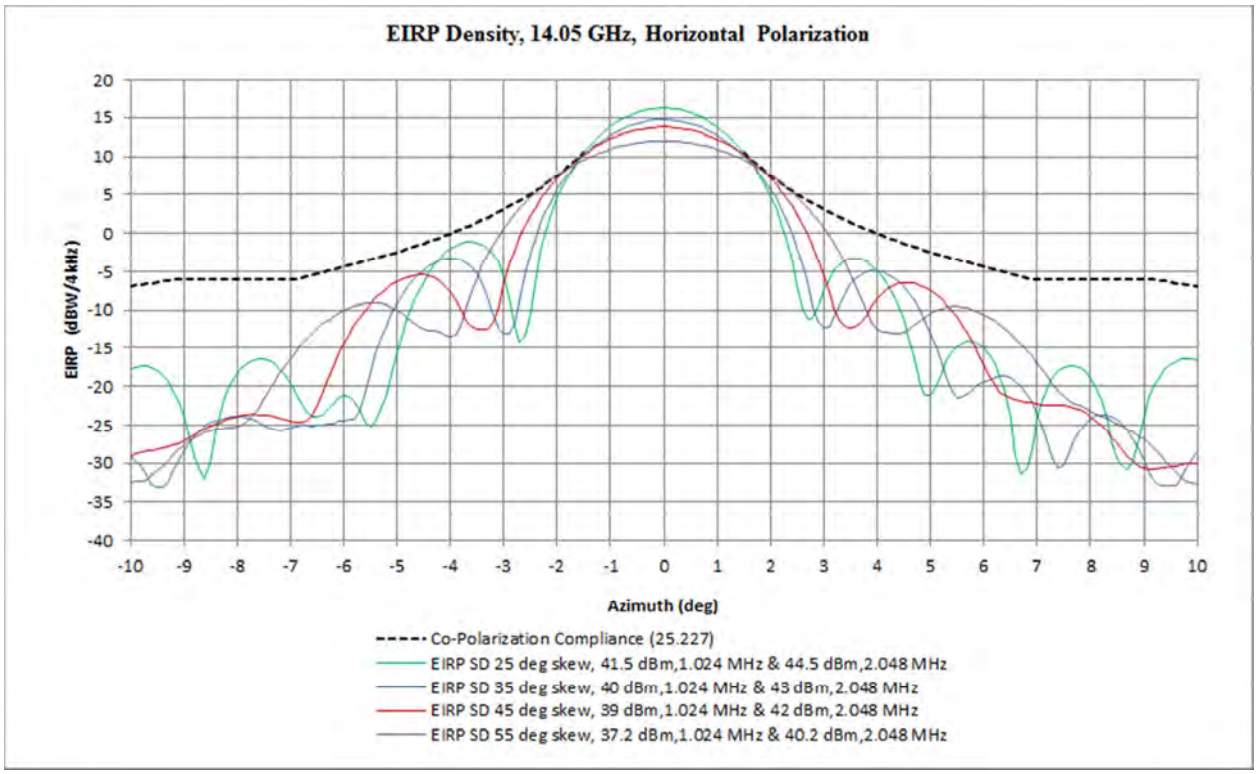

Figure C- 1 EIRP Spectral Density in dBW/4 kHz for 14.05 GHz (Horizontal Polarization) (25.227 Sidelobe Compliance)

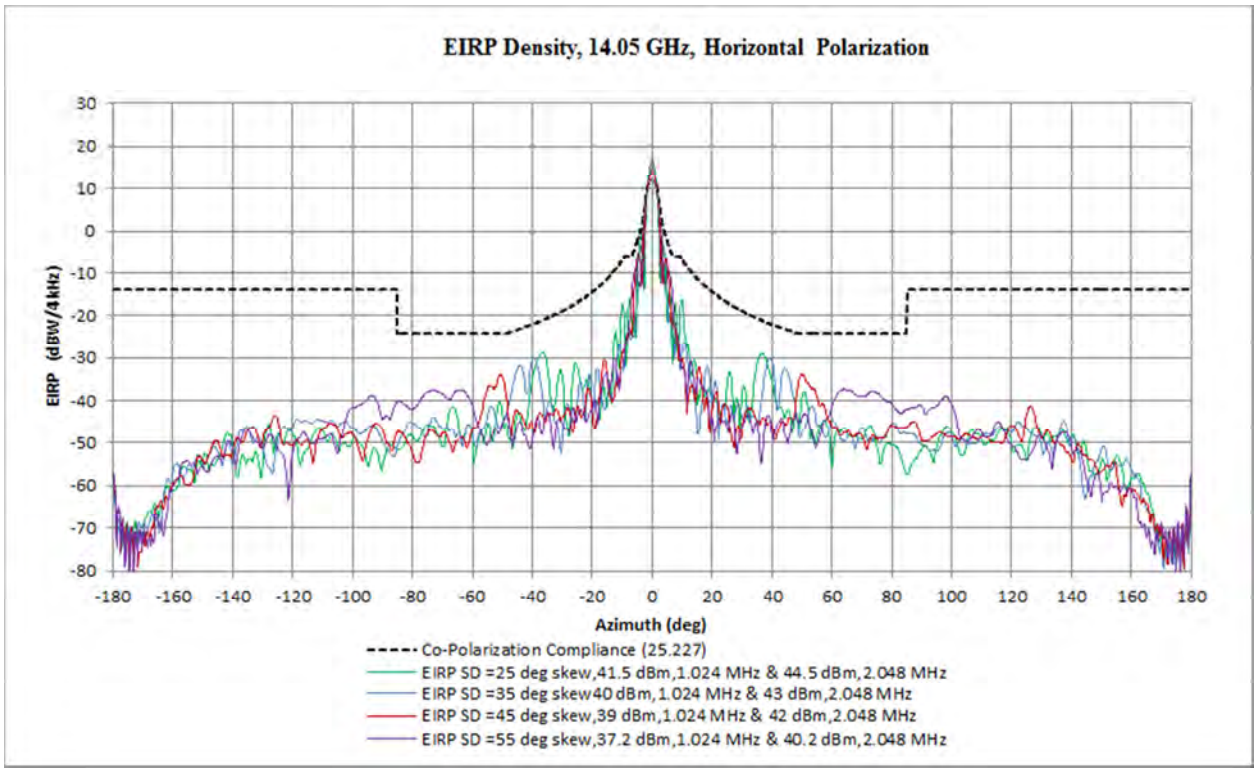

Figure C-2 EIRP Spectral Density in dBW/4 kHz for 14.05 GHz (Horizontal Polarization) (25.227 Expanded Azimuth)

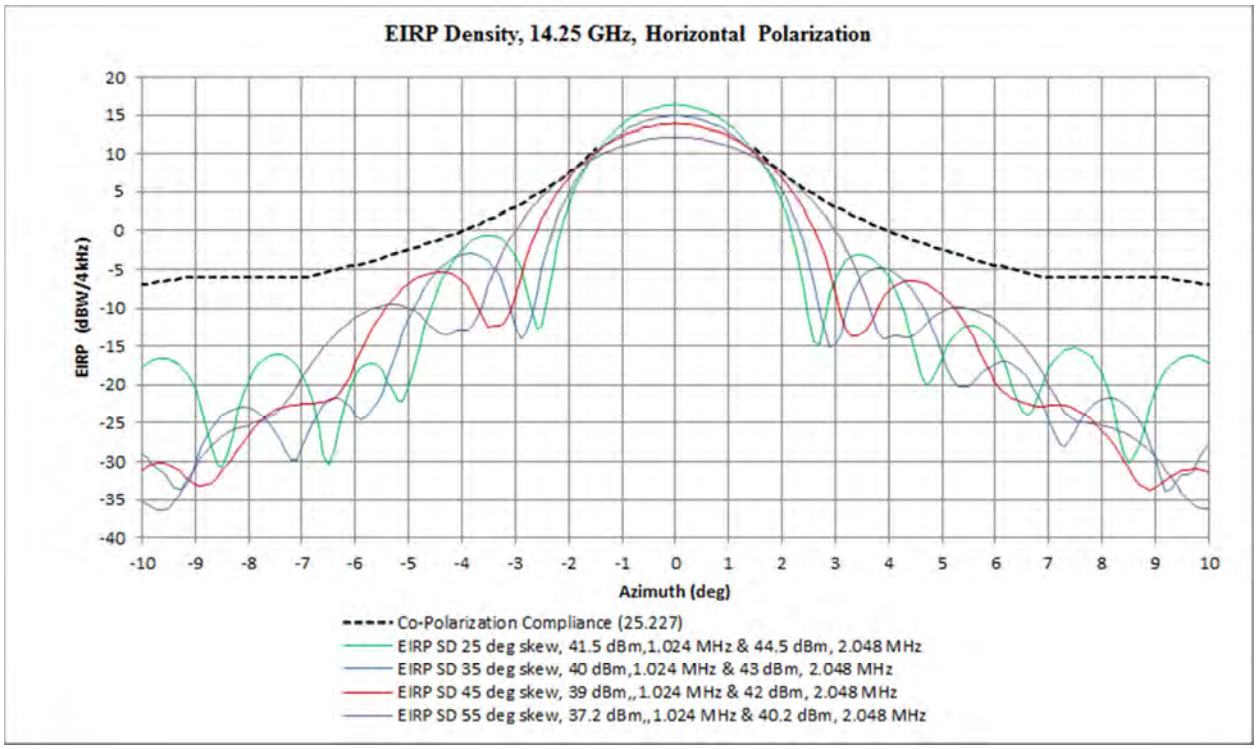

Figure C-3 EIRP Spectral Density in dBW/4 kHz for 14.25 GHz (Horizontal Polarization) (25.227 Sidelobe Compliance)

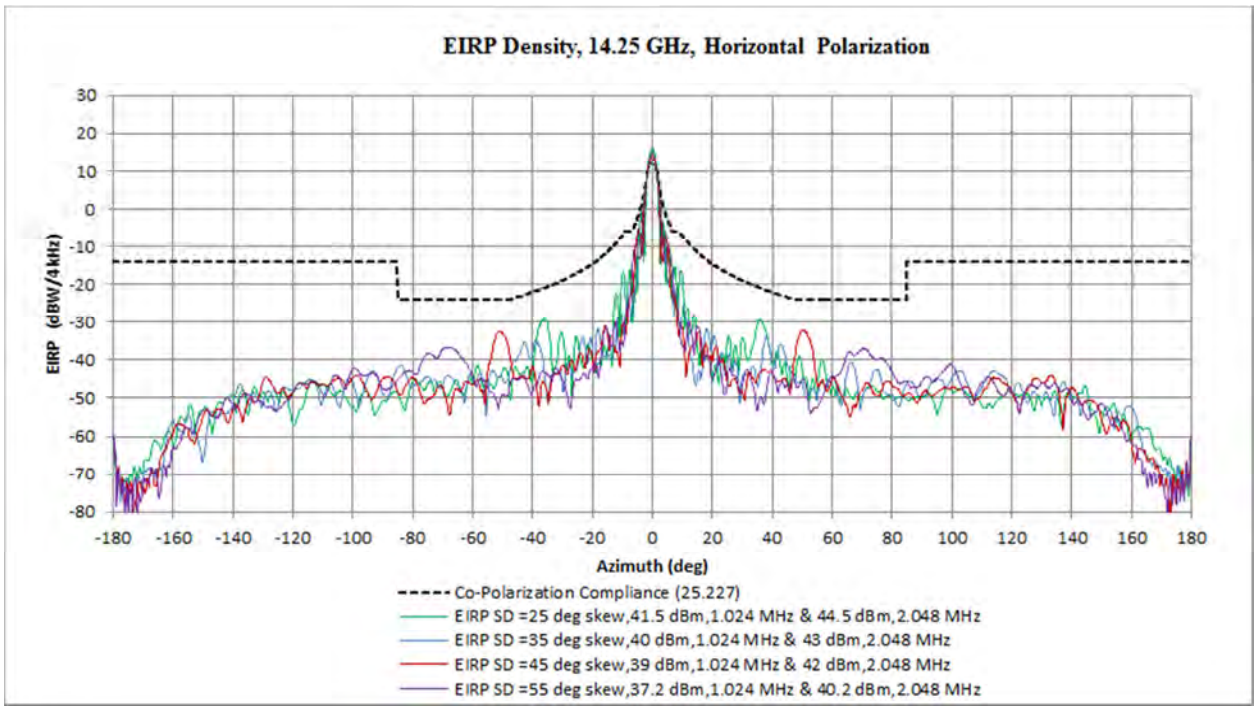

Figure C-4 EIRP Spectral Density in dBW/4 kHz for 14.25 GHz (Horizontal Polarization) (25.227 Expanded Azimuth)

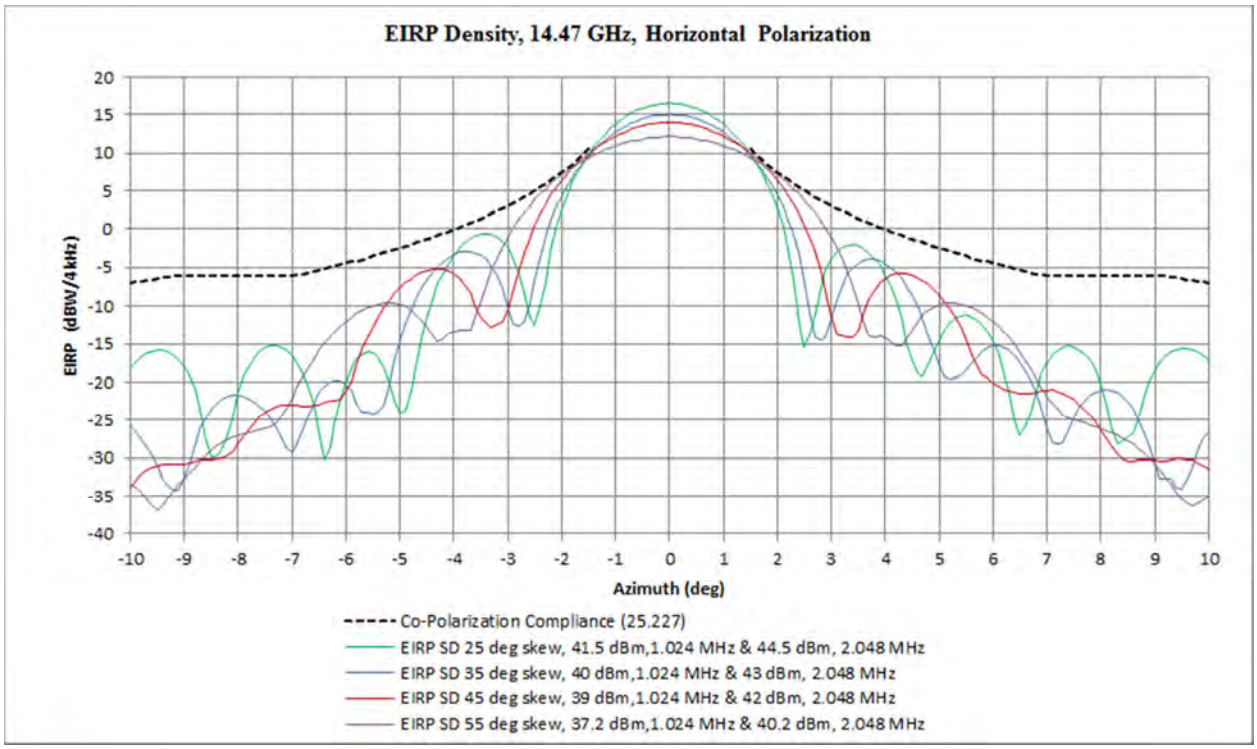

Figure C-5 EIRP Spectral Density in dBW/4 kHz for 14.47 GHz (Horizontal Polarization) (25.227 Sidelobe Compliance)

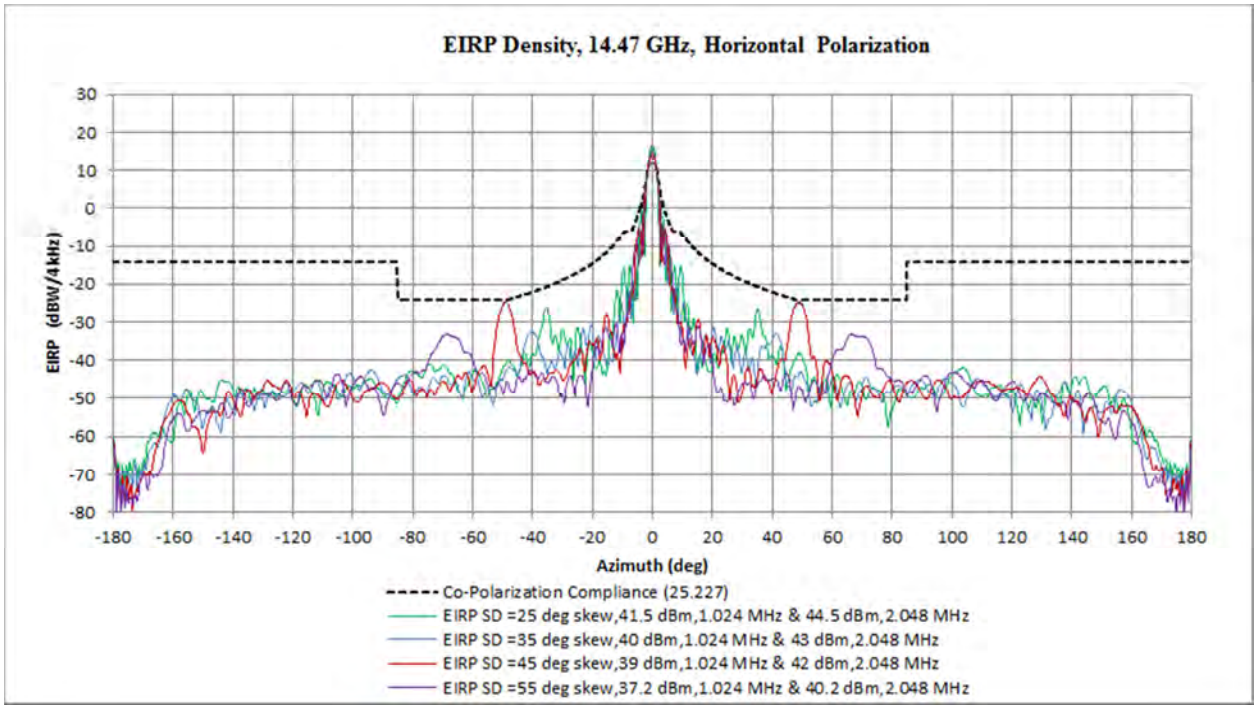

Figure C-6 EIRP Spectral Density in dBW/4 kHz for 14.47 GHz (Horizontal Polarization) (25.227 Expanded Azimuth)

Vertical Polarization; 1.024 and 2.048 MHz Bandwidths

The EIRP spectral densities shown in Figures C-7 to C-8, C-9 to C-10, and C-11 to C-12 for 14.05 GHz, 14.25 GHz, and 14.47 GHz respectively, all with vertical polarization, indicate FCC co-polarization emission compliance according to FCC 25.227. Collectively, each plot addresses configurations of:

25^0 Skew:

41.5 dBm transmit power in a 1.024 MHz bandwidth, 44.5 dBm transmit power in a 2.048 MHz bandwidth

35^0 Skew:

40.0 dBm transmit power in a 1.024 MHz bandwidth, 43.0 dBm transmit power in a 2.048 MHz bandwidth

45^0 Skew:

39.0 dBm transmit power in a 1.024 MHz bandwidth, 42.0 dBm transmit power in a 2.048 MHz bandwidth

55^0 Skew:

37.2 dBm transmit power in a 1.024 MHz bandwidth, 40.2 dBm transmit power in a 2.048 MHz bandwidth

Figures C-7, C-9, and C-11 depict the EIRP spectral density in dBW/4kHz for a $\pm$10 degree azimuth axis along with the associated Section 25.227 compliance mask. Figures C-8, C-10, and C-12 depict the EIRP spectral density in dBW/4kHz for a $\pm$180 degree expanded azimuth axis along with the associated Section 25.227 compliance mask.

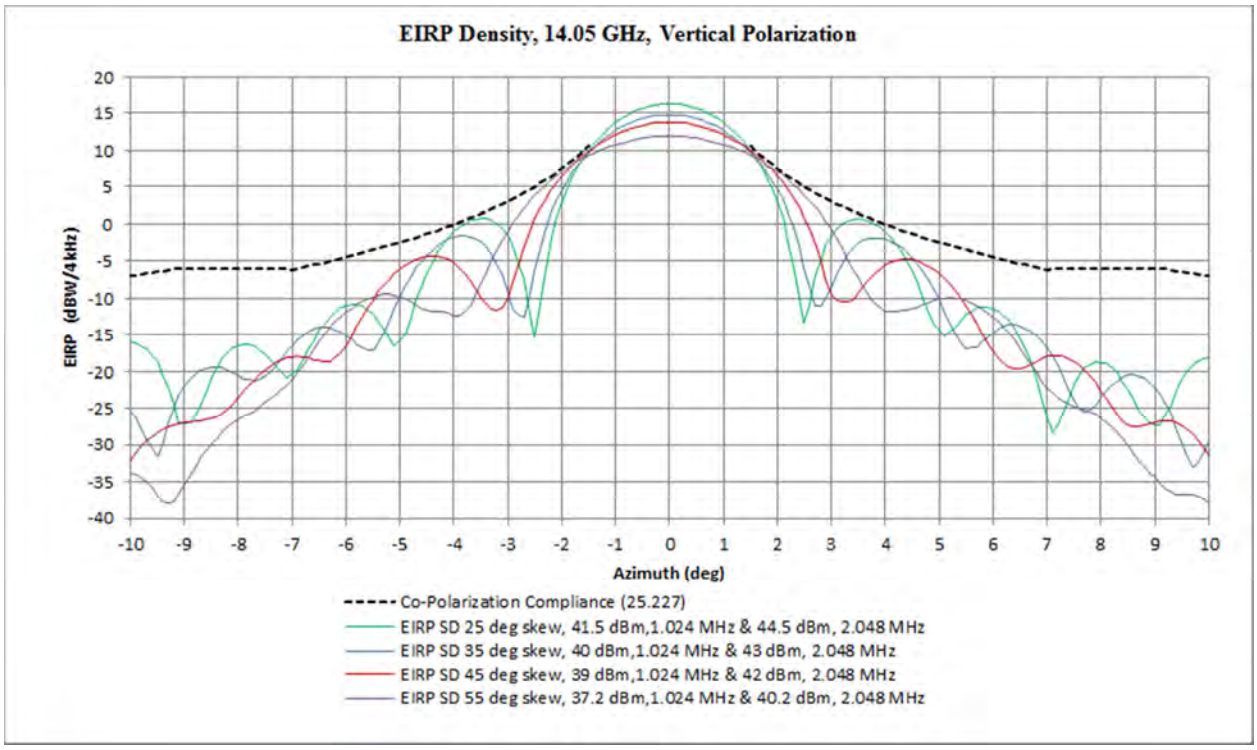

Figure C-7 EIRP Spectral Density in dBW/4 kHz for 14.05 GHz (Vertical Polarization) (25.227 Sidelobe Compliance)

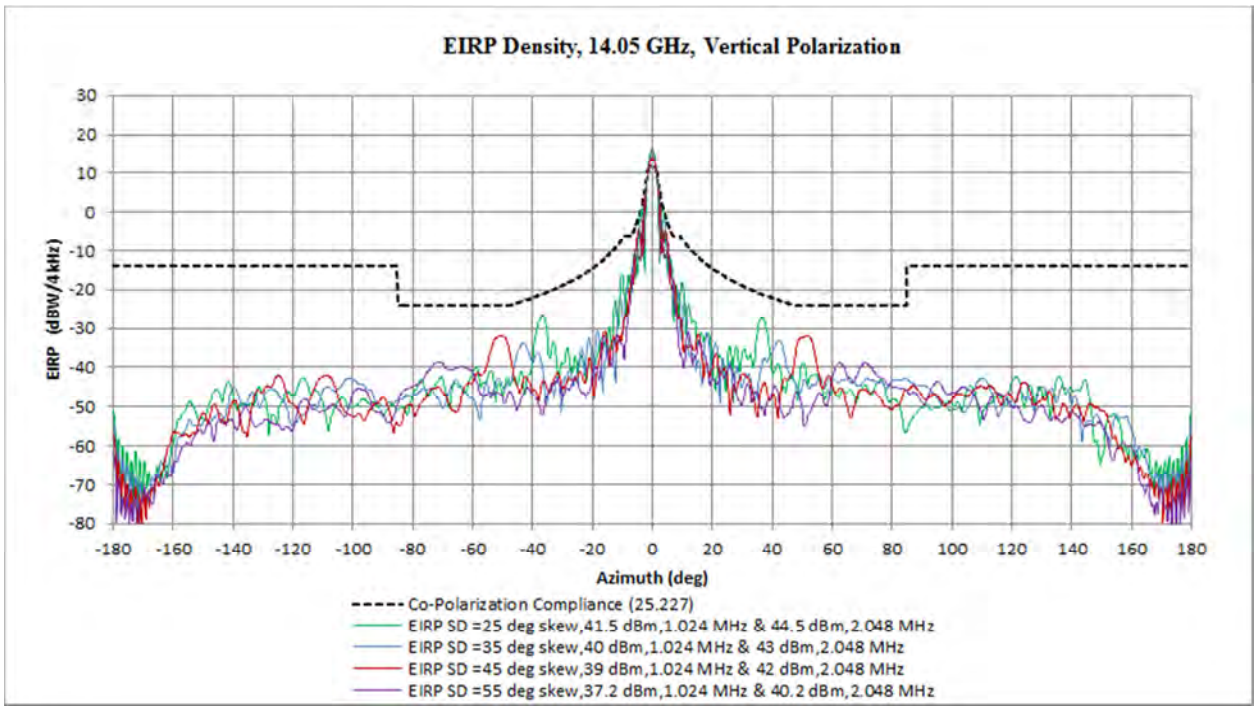

Figure C-8 EIRP Spectral Density in dBW/4 kHz for 14.05 GHz (Vertical Polarization) (25.227 Expanded Azimuth)

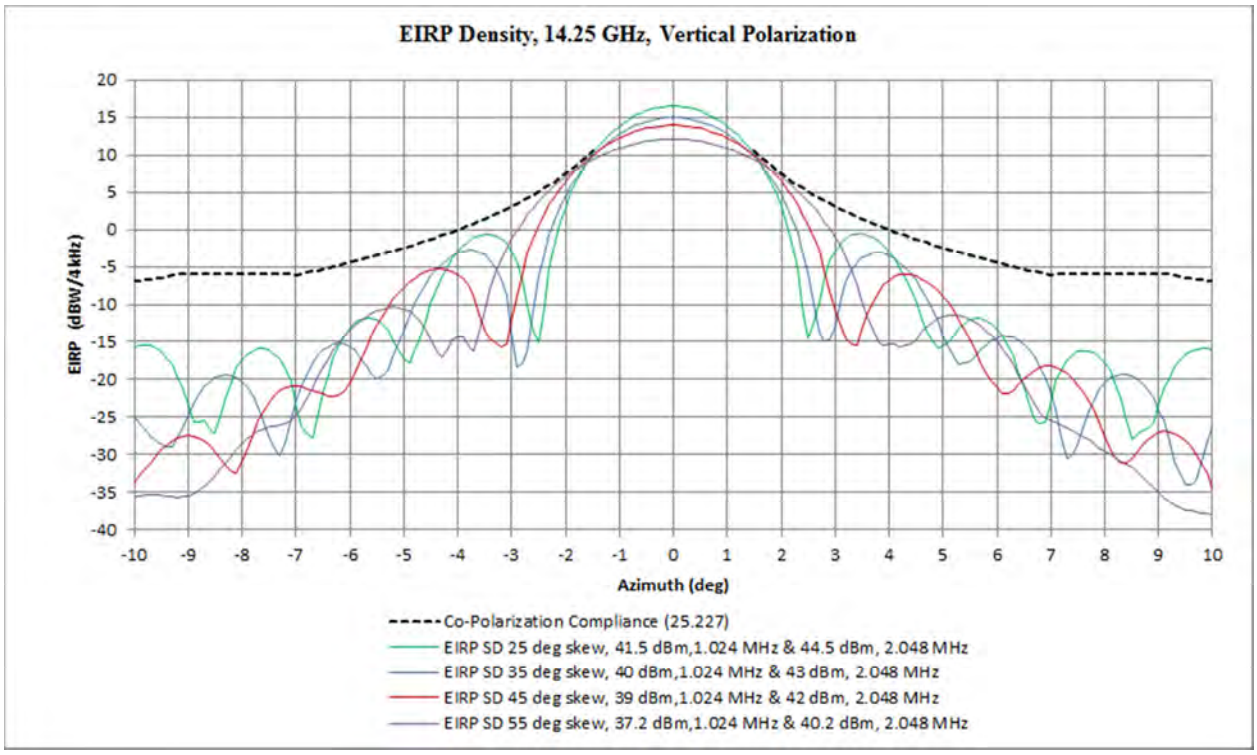

Figure C-9 EIRP Spectral Density in dBW/4 kHz for 14.25 GHz (Vertical Polarization) (25.227 Sidelobe Compliance)

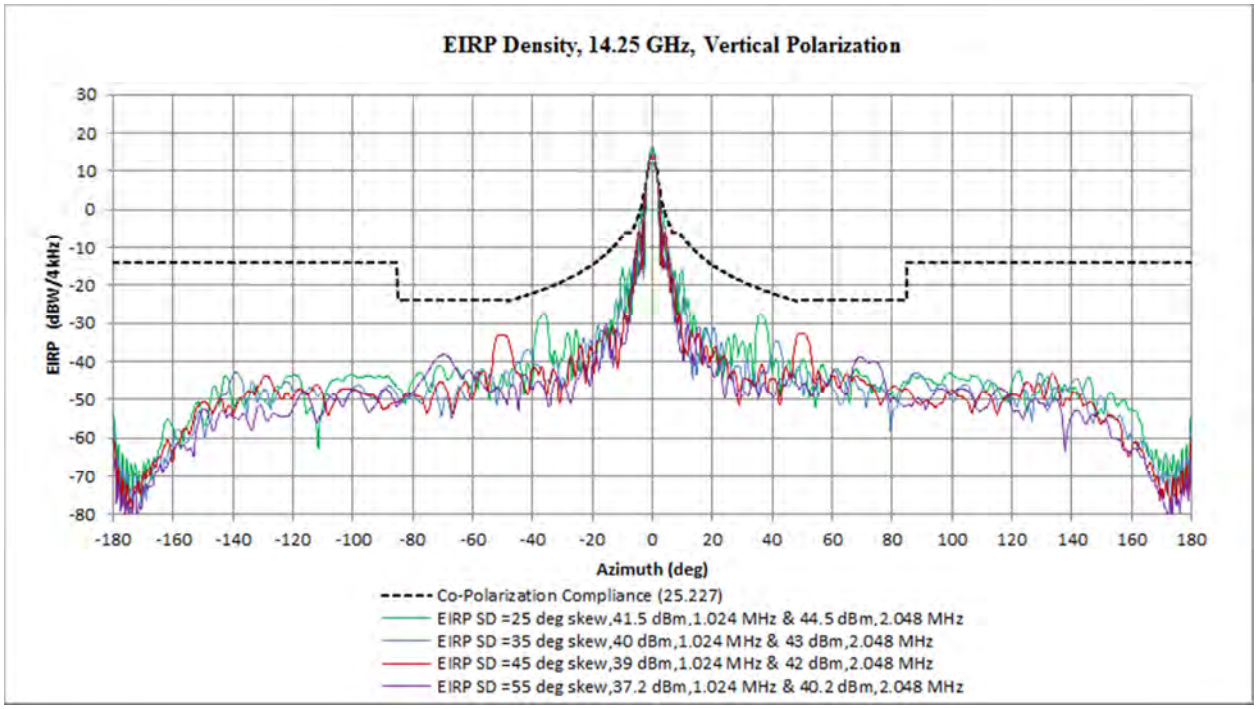

Figure C-10 EIRP Spectral Density in dBW/4 kHz for 14.25 GHz (Vertical Polarization) (25.227 Expanded Azimuth)

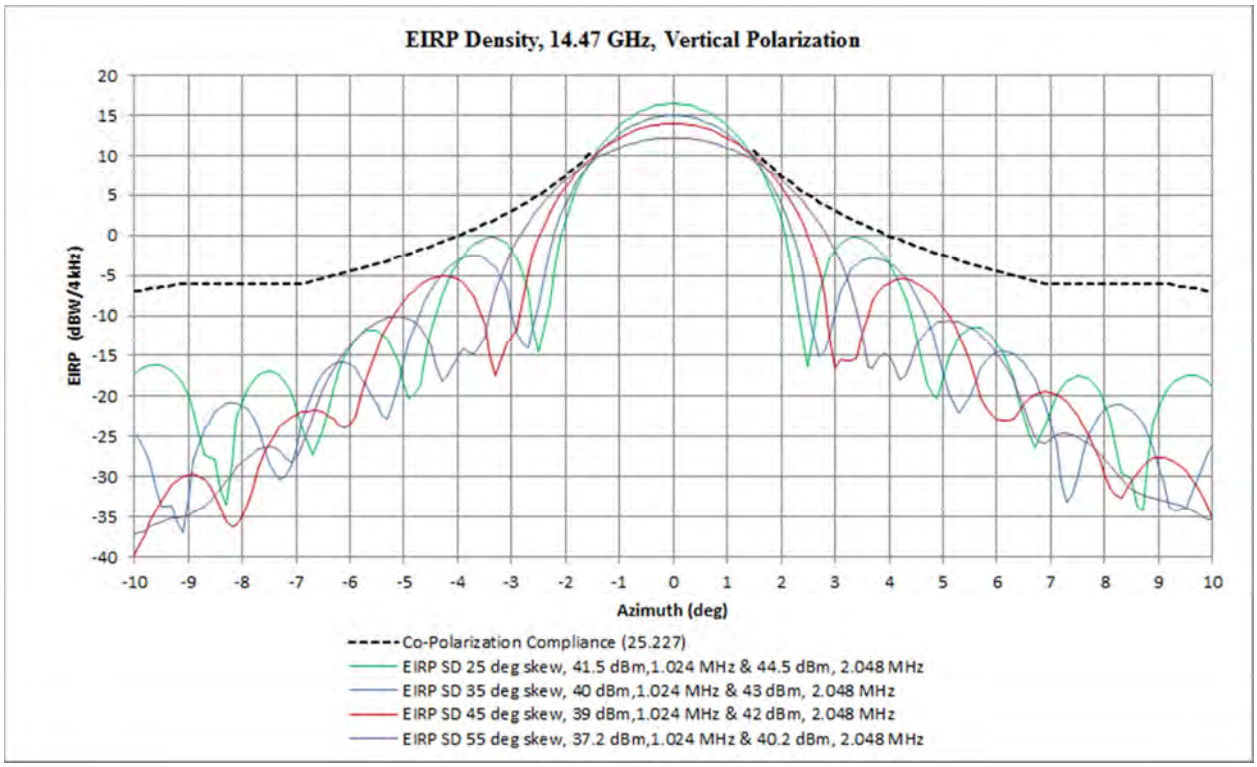

Figure C-11 EIRP Spectral Density in dBW/4 kHz for 14.47 GHz (Vertical Polarization) (25.227 Sidelobe Compliance)

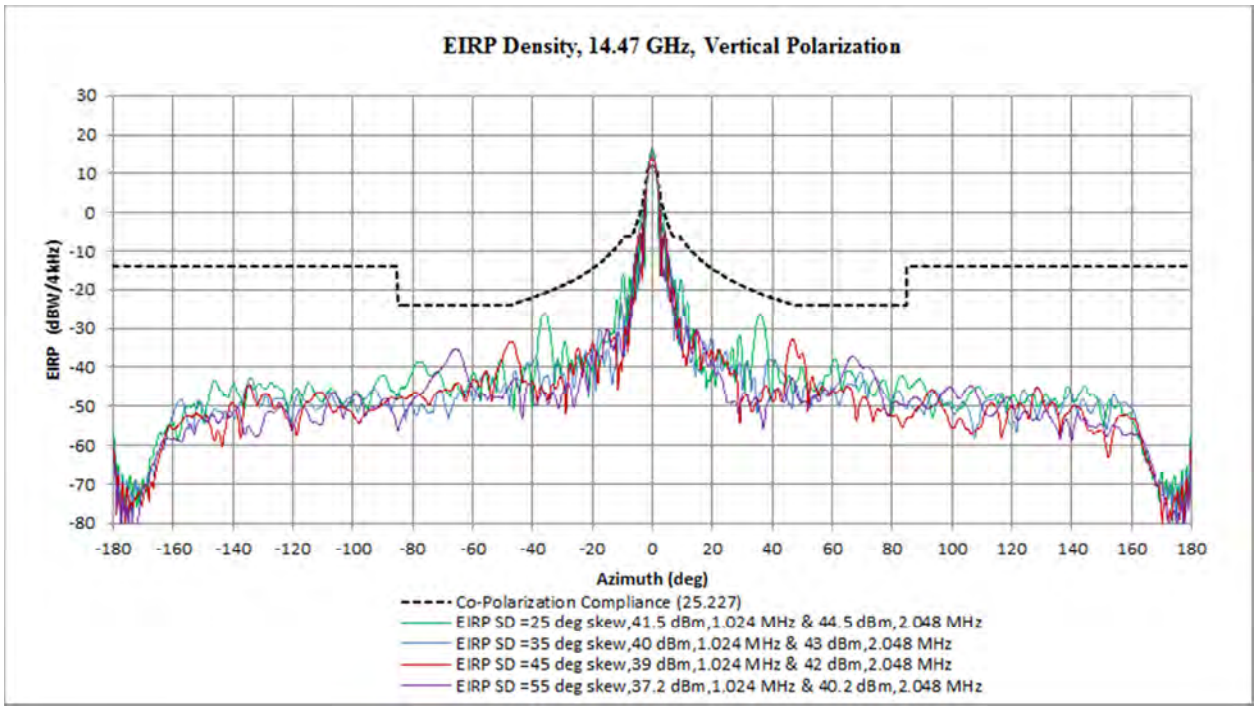

Figure C-12 EIRP Spectral Density in dBW/4 kHz for 14.47 GHz (Vertical Polarization) (25.227 Expanded Azimuth)

Horizontal Polarization; 4.096 MHz Bandwidth

The EIRP spectral densities shown in Figures C-13 to C-14, C-15 to C-16, and C-17 to C-18 for 14.05 GHz, 14.25 GHz, and 14.47 GHz respectively, all with horizontal polarization, indicate FCC co-polarization emission compliance according to FCC 25.227. The plots correspond to the following:

25^0 Skew:

45.0 dBm transmit power in a 4.096 MHz bandwidth

35^0 Skew:

45.0 dBm transmit power in a 4.096 MHz bandwidth

45^0 Skew:

45.0 dBm transmit power in a 4.096 MHz bandwidth

55^0 Skew:

43.2 dBm transmit power in a 4.096 MHz bandwidth

Figures C-13, C-15, and C-17 depict the EIRP spectral density in dBW/4kHz for a $\pm$10 degree azimuth axis along with the associated Section 25.227 compliance mask. Figures C-14, C-16, and C-18 depict the EIRP spectral density in dBW/4kHz for a $\pm$180 degree expanded azimuth axis along with the associated Section 25.227 compliance mask.

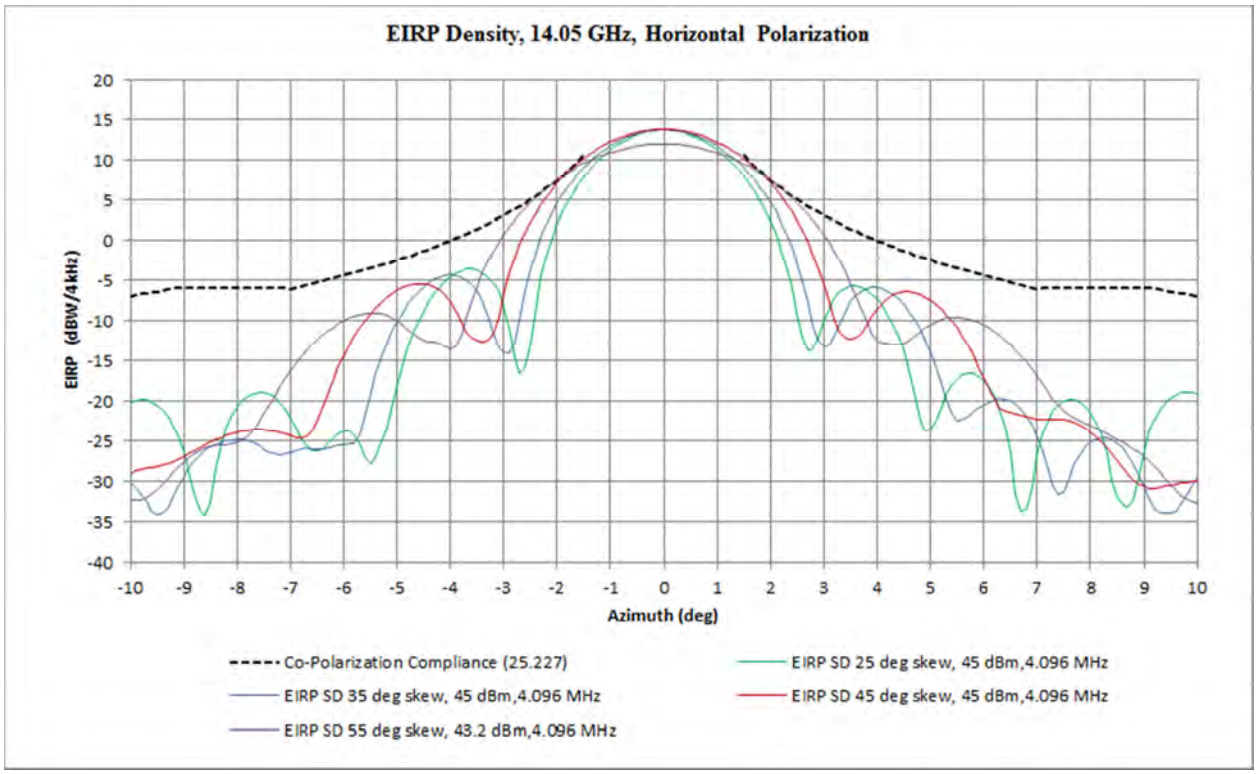

Figure C-13 EIRP Spectral Density in dBW/4 kHz for 14.05 GHz with 4.096 MHz (Horizontal Polarization) (25.227 Sidelobe Compliance)

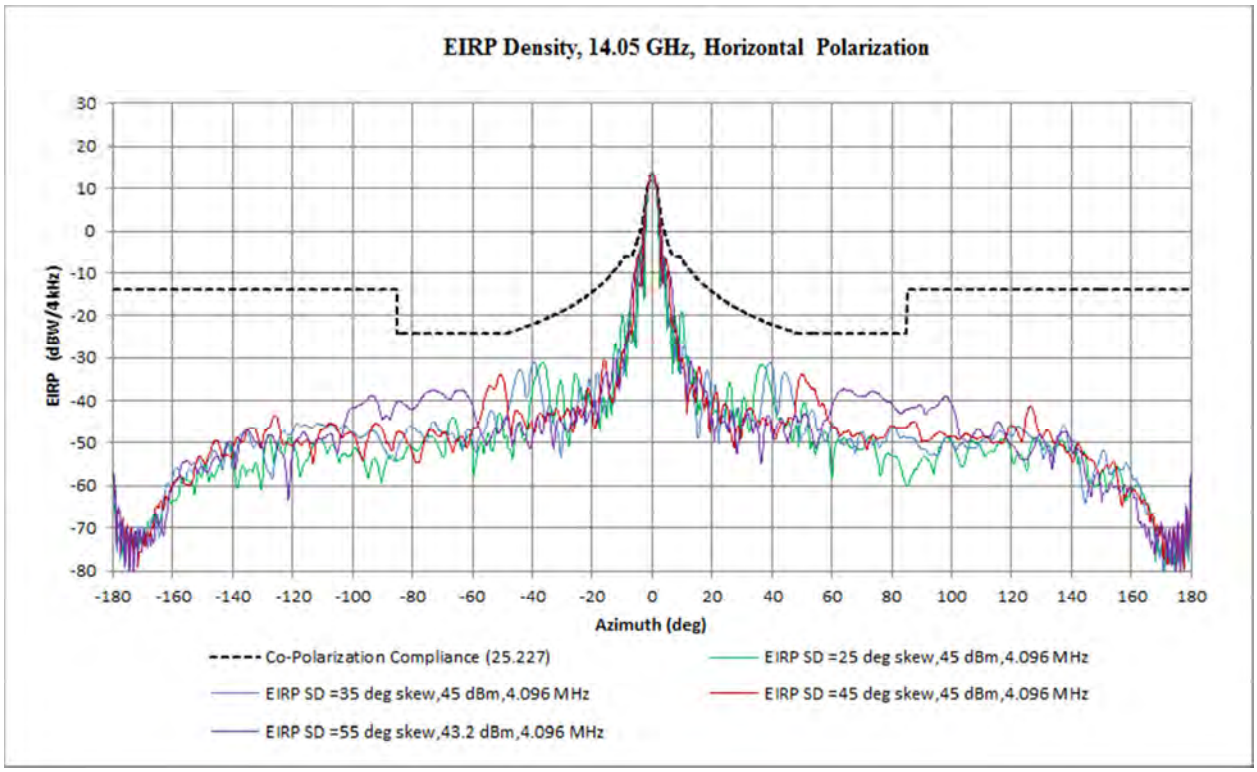

Figure C-14 EIRP Spectral Density in dBW/4 kHz for 14.05 GHz with 4.096 MHz (Horizontal Polarization) (25.227 Expanded Azimuth)

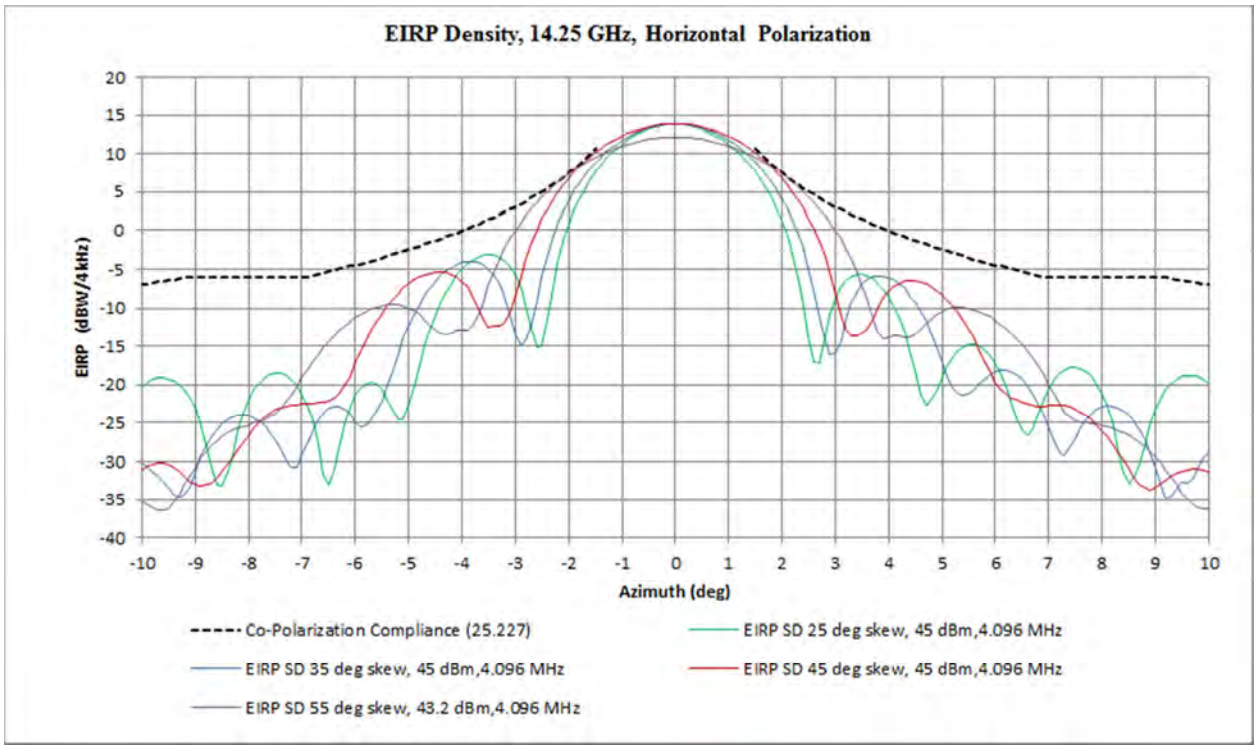

Figure C-15 EIRP Spectral Density in dBW/4 kHz for 14.25 GHz with 4.096 MHz (Horizontal Polarization) (25.227 Sidelobe Compliance)

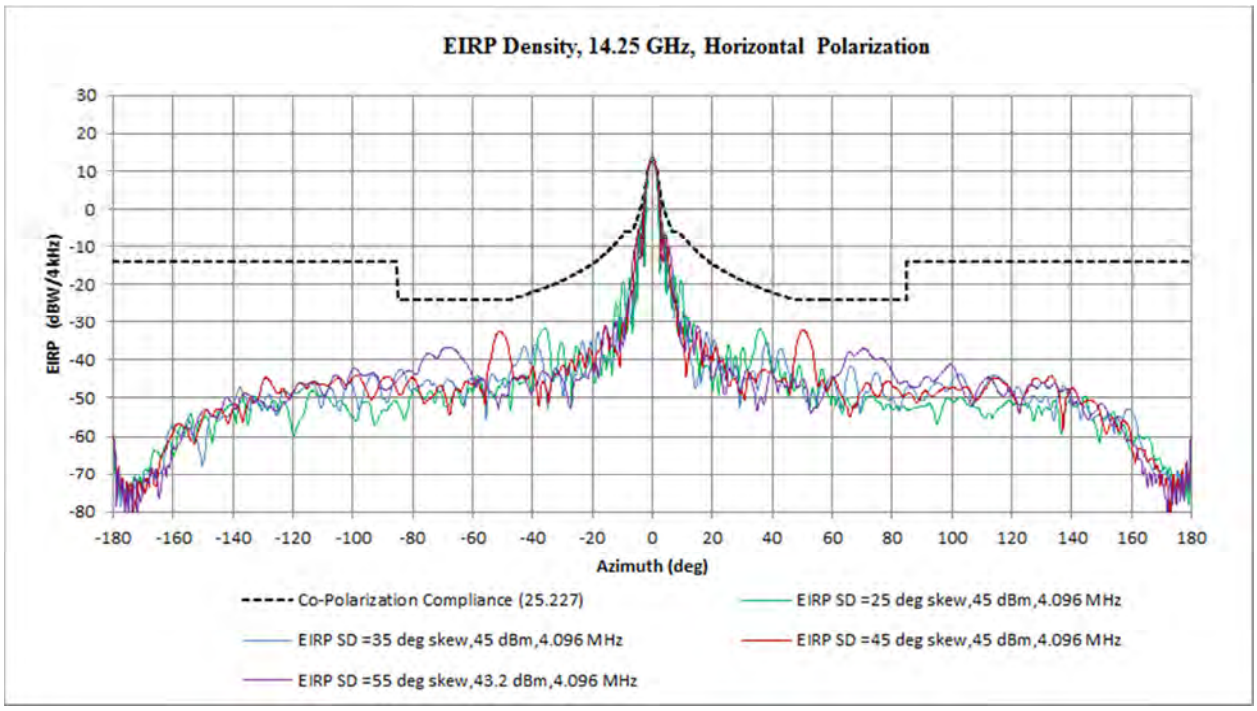

Figure C-16 EIRP Spectral Density in dBW/4 kHz for 14.25 GHz with 4.096 MHz (Horizontal Polarization) (25.227 Expanded Azimuth)

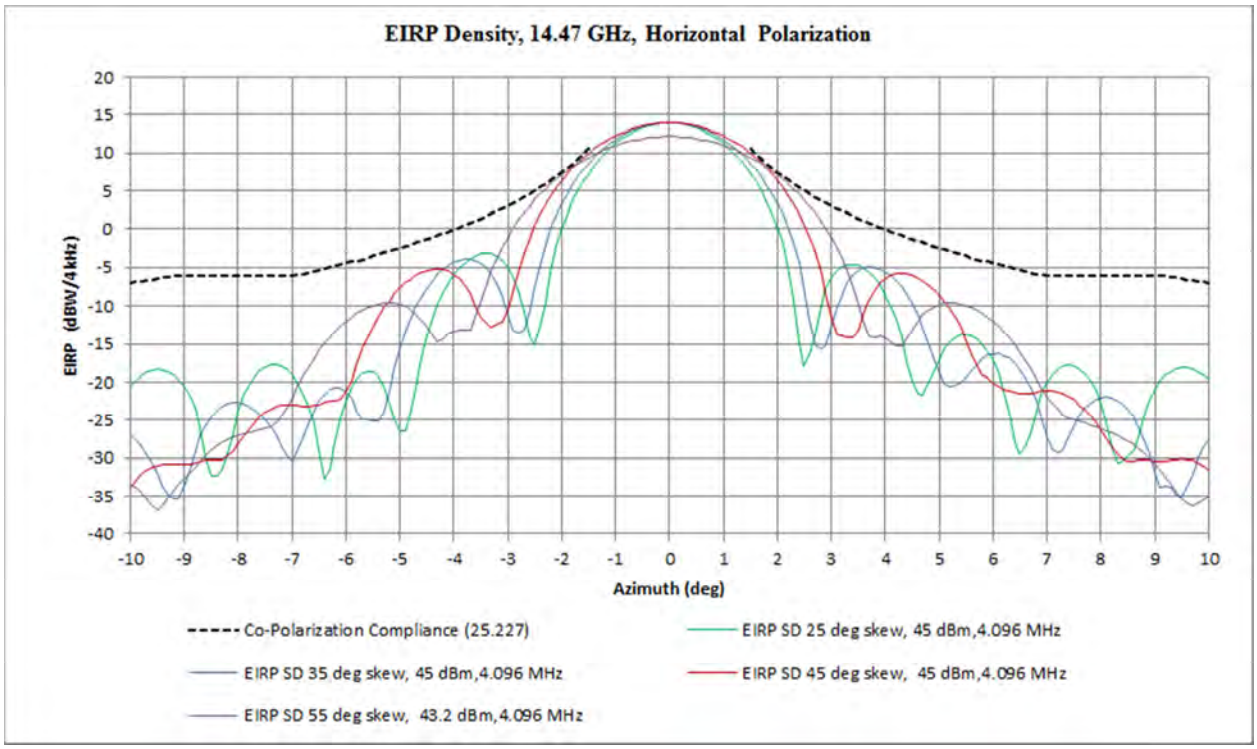

Figure C-17 EIRP Spectral Density in dBW/4 kHz for 14.47 GHz with 4.096 MHz (Horizontal Polarization) (25.227 Sidelobe Compliance)

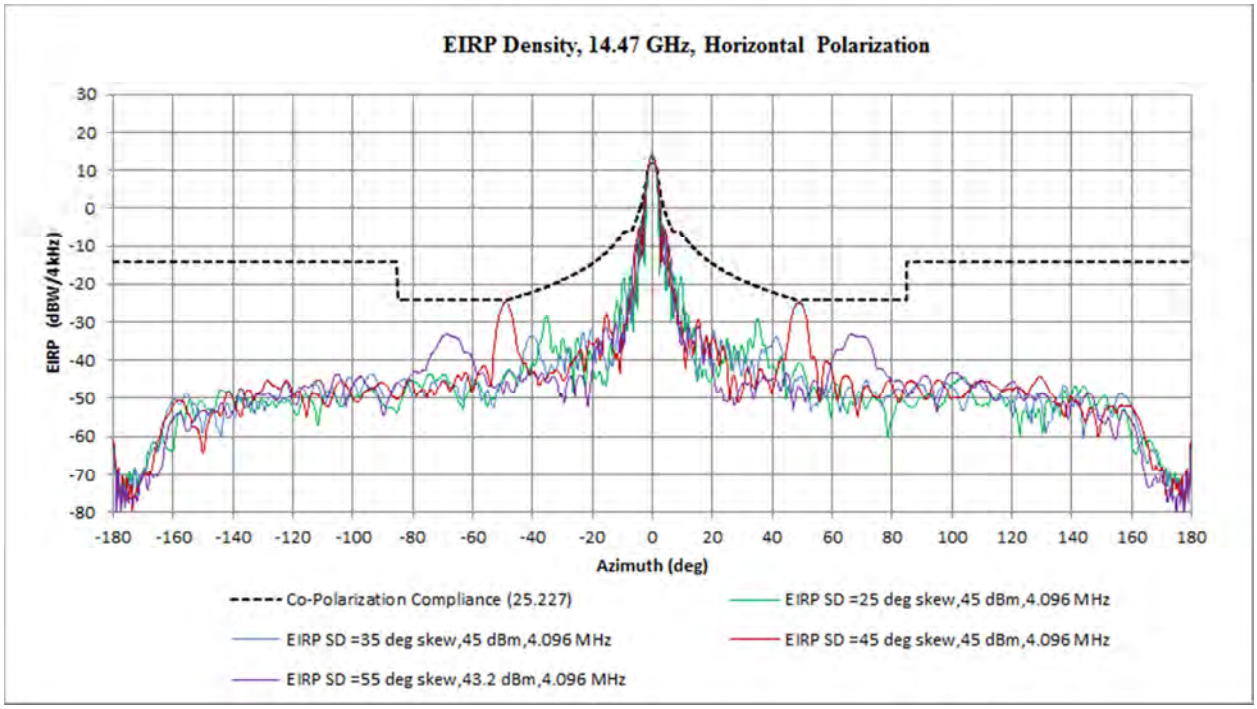

Figure C-18 EIRP Spectral Density in dBW/4 kHz for 14.47 GHz with 4.096 MHz (Horizontal Polarization) (25.227 Expanded Azimuth)

Vertical Polarization; 4.096 MHz Bandwidth

The EIRP spectral densities shown in Figures C-19 to C-20, C-21 to C-22, and C-23 to C-24 for 14.05 GHz, 14.25 GHz, and 14.47 GHz respectively, all with vertical polarization, indicate FCC co-polarization emission compliance according to FCC 25.227. The plots correspond to the following:

25^0 Skew:

45.0 dBm transmit power in a 4.096 MHz bandwidth

35^0 Skew:

45.0 dBm transmit power in a 4.096 MHz bandwidth

45^0 Skew:

45.0 dBm transmit power in a 4.096 MHz bandwidth

55^0 Skew:

43.2 dBm transmit power in a 4.096 MHz bandwidth

Figures C-19, C-21, and C-23 depict the EIRP spectral density in dBW/4kHz for a $\pm$10 degree azimuth axis along with the associated Section 25.227 compliance mask. Figures C-20, C-22, and C-24 depict the EIRP spectral density in dBW/4kHz for a $\pm$180 degree expanded azimuth axis along with the associated Section 25.227 compliance mask.

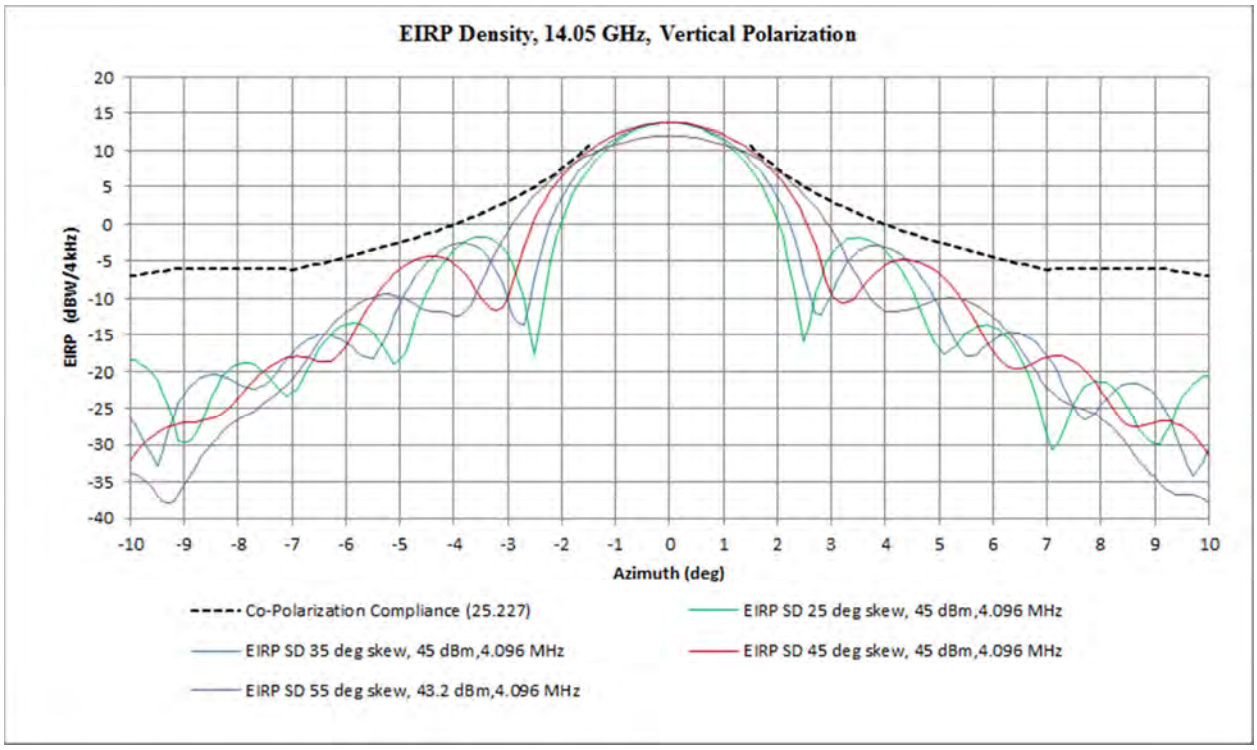

Figure C-19 EIRP Spectral Density in dBW/4 kHz for 14.05 GHz with 4.096 MHz (Vertical Polarization) (25.227 Sidelobe Compliance)

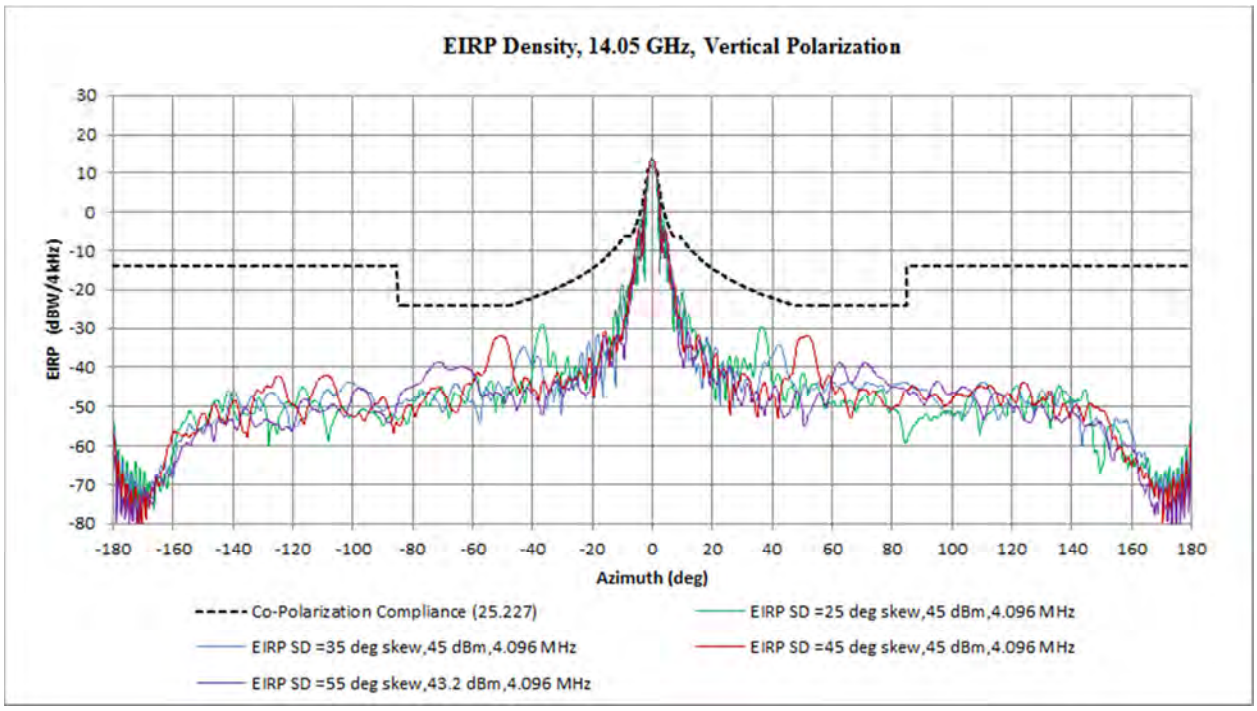

Figure C-20 EIRP Spectral Density in dBW/4 kHz for 14.05 GHz with 4.096 MHz (Vertical Polarization) (25.227 Expanded Azimuth)

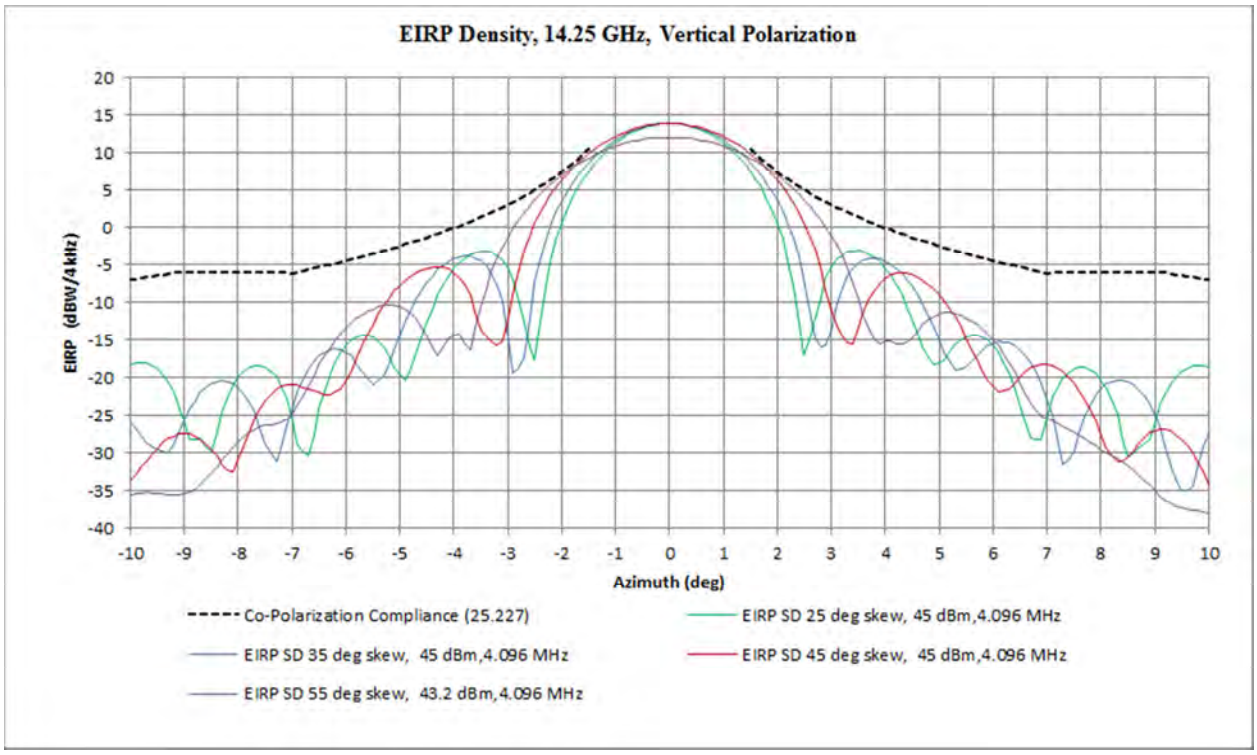

Figure C-21 EIRP Spectral Density in dBW/4 kHz for 14.25 GHz with 4.096 MHz (Vertical Polarization) (25.227 Sidelobe Compliance)

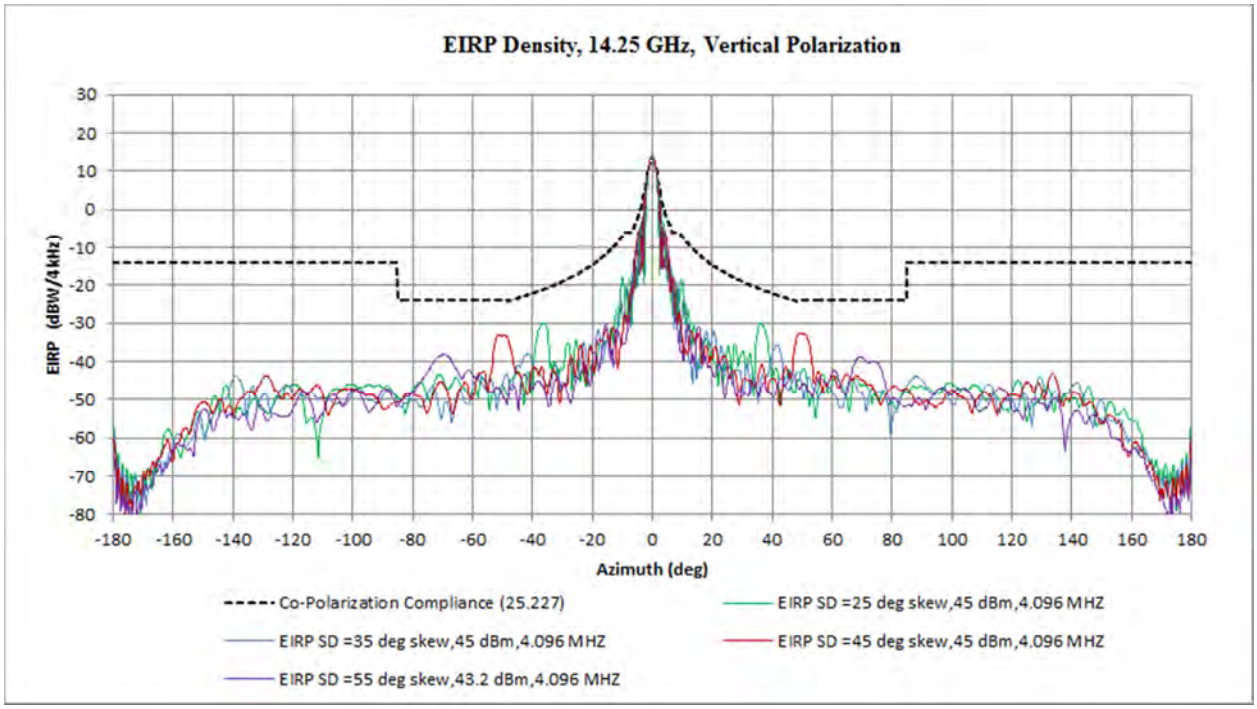

Figure C-22 EIRP Spectral Density in dBW/4 kHz for 14.25 GHz with 4.096 MHz (Vertical Polarization) (25.227 Expanded Azimuth)

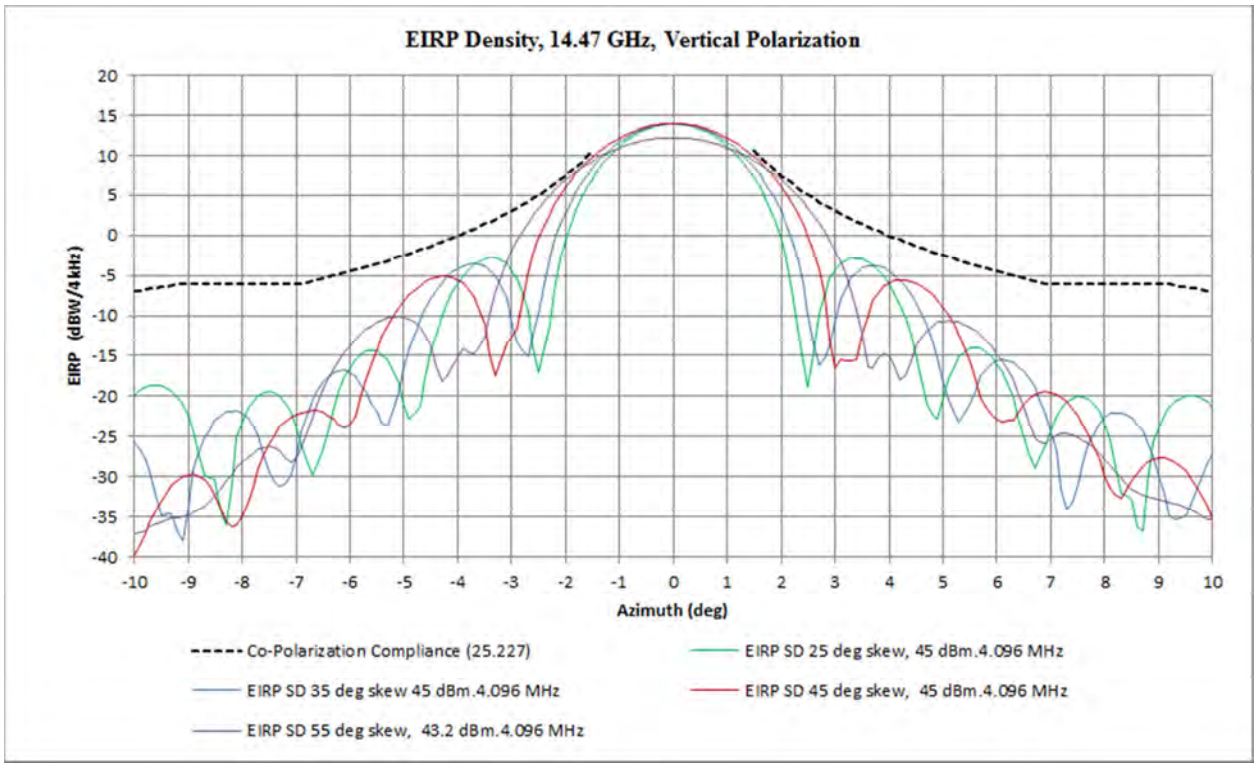

Figure C-23 EIRP Spectral Density in dBW/4 kHz for 14.47 GHz with 4.096 MHz (Vertical Polarization) (25.227 Sidelobe Compliance)

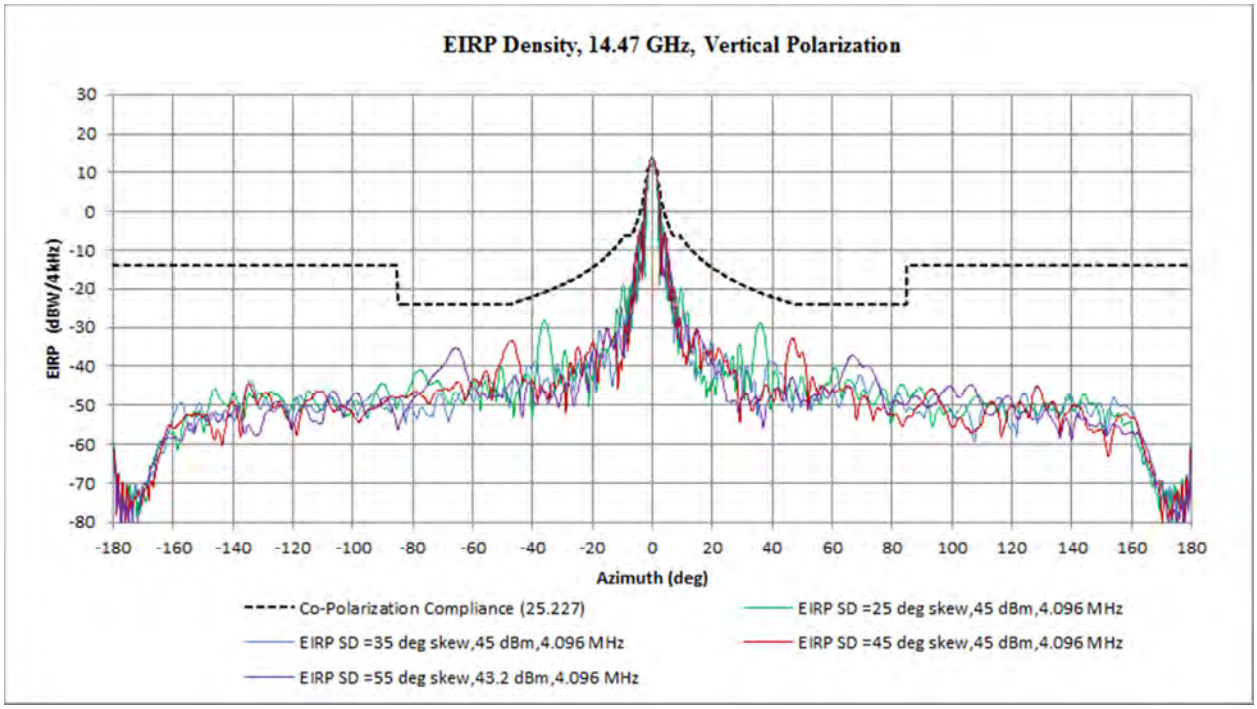

Figure C-24 EIRP Spectral Density in dBW/4 kHz for 14.47 GHz with 4.096 MHz (Vertical Polarization) (25.227 Expanded Azimuth)

Geographic Representation

Figures C-25, C-26, C-27, and C-28 illustrate the proposed geographic relationships between skew and EIRP density for SES-1, AMC-9, AMC-2, and SES-6, respectively. The boundaries apply, such that for any location between them, the skew is less than or equal to that at each of the boundaries. The authorized EIRP for the given skew value is applicable to any geographic location within those boundaries.

Note that since authorization for operation out to 55 degrees skew is sought only for SES-6, only its figure includes the 55 degree skew boundary.

Figure C-25 Geographic skew boundaries and EIRP density levels for SES-1 at 101 West. EIRP density limits are applicable anywhere between the associated left and right skew boundary contours. (Red: 25 degree boundaries; Green: 35 degree boundaries; Orange: 45 degree boundaries. Labels are located in the vicinity of areas of satellite coverage.)

Note that where two EIRP density values are specified, the 'lesser' value corresponds to the HPT's output being limited from providing the necessary output (for a 4.096 MHz bandwidth emission) that would result in an EIRP density equal to the 'higher' value.

Figure C-26 Geographic skew boundaries and EIRP density levels for AMC-9 at 83 West. EIRP density limits are applicable anywhere between the associated left and right skew boundary contours. (Red: 25 degree boundaries; Green: 35 degree boundaries; Orange: 45 degree boundaries. Labels are located in the vicinity of areas of satellite coverage.)

Note that where two EIRP density values are specified, the 'lesser' value corresponds to the HPT's output being limited from providing the necessary output (for a 4.096 MHz bandwidth emission) that would result in an EIRP density equal to the 'higher' value.

Figure C-27 Geographic skew boundaries and EIRP density levels for AMC-2 at 80.9 West. EIRP density limits are applicable anywhere between the associated left and right skew boundary contours. (Red: 25 degree boundaries; Green: 35 degree boundaries; Orange: 45 degree boundaries. Labels are located in the vicinity of areas of satellite coverage.)

Note that where two EIRP density values are specified, the 'lesser' value corresponds to the HPT's output being limited from providing the necessary output (for a 4.096 MHz bandwidth emission) that would result in an EIRP density equal to the 'higher' value.

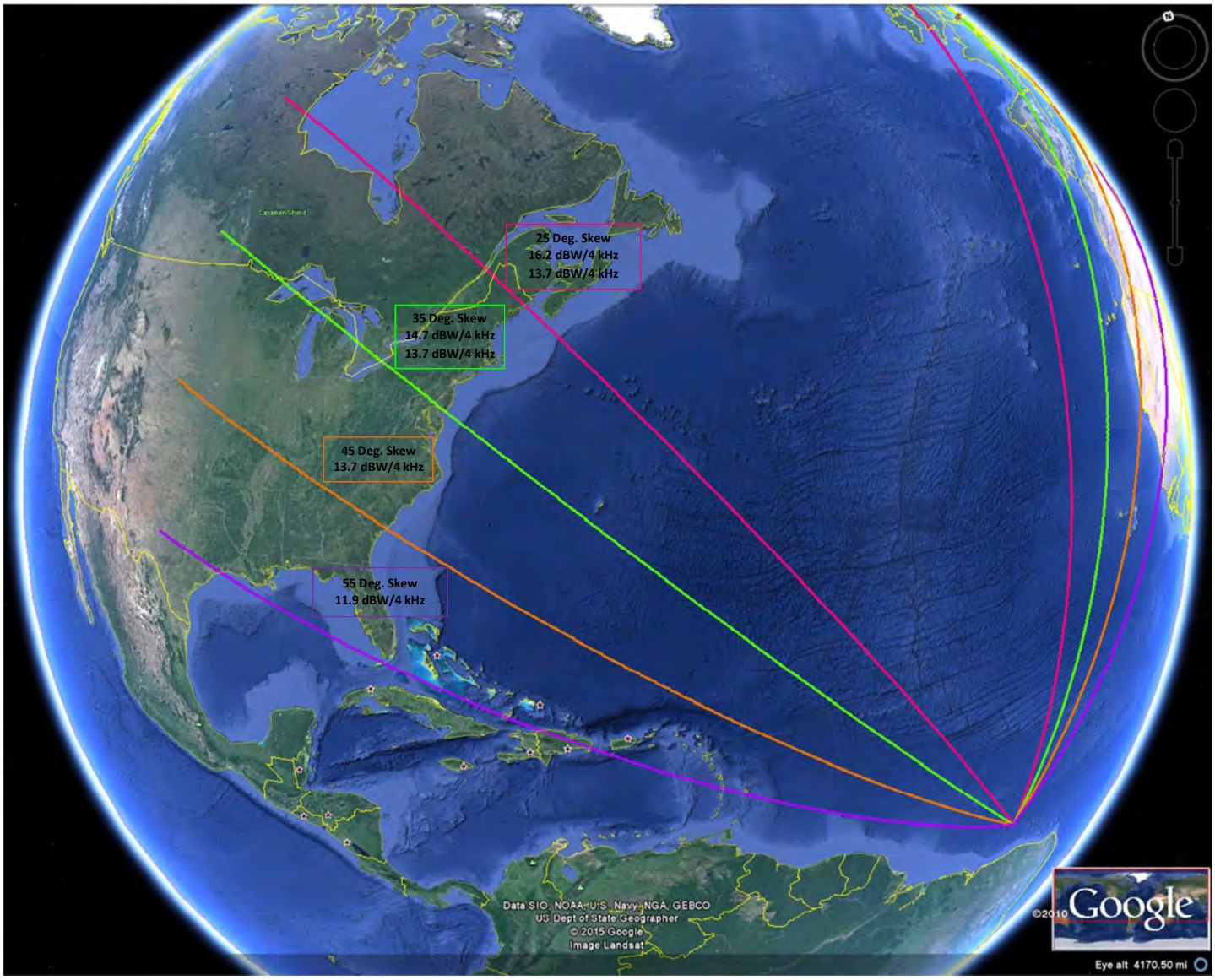

Figure C-28 Geographic skew boundaries and EIRP density levels for SES-6 at 40.5 West. EIRP density limits are applicable anywhere between the associated left and right skew boundary contours. (Red: 25 degree boundaries; Green: 35 degree boundaries; Orange: 45 degree boundaries; Purple: 55 degree boundaries. Labels are located in the vicinity of areas of satellite coverage.)

Note that where two EIRP density values are specified, the ‘lesser’ value corresponds to the HPT’s output being limited from providing the necessary output (for a 4.096 MHz bandwidth emission) that would result in an EIRP density equal to the ‘higher’ value.

SES-1 Link Budgets

Applicable to transmissions up to skew angles of 25, 35, and 45 degrees, and respective EIRP densities of 16.2, 14.7, and 13.7 dBW/4 kHz

Applicable transmit powers and emission bandwidths:

41.5, 40.0, and 39.0 dBm in 1.024 MHz, respectively

44.5, 43.0, and 42.0 dBm in 2.048 MHz, respectively

Inroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	1.024
Spread BW (MHz):	1.024
Required C/N (dB):	4.2
Outroute Signal:	QPSK 5/6
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	5.4
Satellite:	SES-1
Longitude (deg East):	-101
G/T towards Remote (dB/K):	5.80
G/T towards NOC (dB/K):	2.40
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	48.8
Saturated EIRP towards remote (dBW):	50.2
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**50.20**
Downlink EIRP Inroute (dBW):	**20.86**
Remote:	Chicago
Latitude (deg North):	41.8
Longitude (deg East):	-87.7
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	41.5
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-13.58**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 25 degrees

Inroute signal:	**QPSK 2/3**	rate	**1.024**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 5/6**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Chicago	41.8	-87.7
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	39.30	38.30	38.30
Uplink Path Loss (dB)	207.09	207.09	207.09
Spreading Loss (dB)	-162.54	-162.54	-162.54
Flux Density at Satellite (dBW/m^2)	-123.24	-124.24	-124.24
Uplink C/T (dB)	-161.99	-162.99	-162.99
C/No (dB)	66.61	65.61	65.61
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**6.51**	**5.51**	**4.92**
Satellite downlink EIRP (dBW)	21.86	20.86	20.86
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-148.32	-151.32	-151.32
C/No (dB)	80.28	77.28	77.28
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**20.18**	**17.18**	**14.65**
Cumulative C/N (dB)	6.32	5.22	4.48
Necessary C/N (dB)	4.20	4.20	4.20
Cumulative Inroute Link Margin (dB)	**2.12**	**1.02**	**0.28**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 25 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	7.6 m
RX Antenna Gain (dBi):	56.5
Antenna Noise Temp (K):	61
Antenna LNA Temp (K):	70
Total Noise Temp (K):	131
Antenna G/T (dB/K):	35.33
TX Antenna Gain (dBi):	58.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	78.10	76.10	76.10
Uplink Path Loss (dB)	206.99	206.99	206.99
Spreading Loss (dB)	-162.44	-162.44	-162.44
Flux Density at Satellite (dBW/m^2)	-84.34	-86.34	-86.34
Uplink C/T (dB)	-126.49	-128.49	-128.49
C/No (dB)	102.11	100.11	100.11
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**27.34**	**25.34**	**17.98**
Satellite downlink EIRP (dBW)	50.20	50.20	50.20
Downlink Path Loss (dB)	205.60	205.60	205.60
Downlink C/T (dB)	-143.70	-144.70	-144.70
C/No (dB)	10.13	9.13	9.13
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**10.13**	**9.13**	**6.14**
Cumulative C/N (dB)	10.05	9.03	5.87
Necessary C/N (dB)	5.4	5.4	5.4
Cumulative Outroute Link Margin (dB)	**4.65**	**3.63**	**0.47**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	1.024
Spread BW (MHz):	1.024
Required C/N (dB):	2.1
Outroute Signal:	QPSK 3/4
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	4.2
Satellite:	SES-1
Longitude (deg East):	-101
G/T towards Remote (dB/K):	5.40
G/T towards NOC (dB/K):	2.40
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	48.8
Saturated EIRP towards remote (dBW):	48.3
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**48.30**
Downlink EIRP Inroute (dBW):	**18.93**
Remote:	Baltimore
Latitude (deg North):	39.29
Longitude (deg East):	-76.62
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	40
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-15.08**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 35 degrees

Inroute signal:	**QPSK 1/2**	rate	**1.024**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 3/4**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Baltimore	39.29	-76.62
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	37.80	36.80	36.80
Uplink Path Loss (dB)	207.13	207.13	207.13
Spreading Loss (dB)	-162.57	-162.57	-162.57
Flux Density at Satellite (dBW/m^2)	-124.77	-125.77	-125.77
Uplink C/T (dB)	-163.93	-164.93	-164.93
C/No (dB)	64.68	63.68	63.68
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**4.57**	**3.57**	**3.19**
Satellite downlink EIRP (dBW)	19.93	18.93	18.93
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-150.25	-153.25	-153.25
C/No (dB)	78.35	75.35	75.35
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**18.25**	**15.25**	**13.46**
Cumulative C/N (dB)	4.39	3.29	2.80
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**2.29**	**1.19**	**0.70**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 35 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	7.6 m
RX Antenna Gain (dBi):	56.5
Antenna Noise Temp (K):	61
Antenna LNA Temp (K):	70
Total Noise Temp (K):	131
Antenna G/T (dB/K):	35.33
TX Antenna Gain (dBi):	58.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	78.10	76.10	76.10
Uplink Path Loss (dB)	207.08	207.08	207.08
Spreading Loss (dB)	-162.53	-162.53	-162.53
Flux Density at Satellite (dBW/m^2)	-84.43	-86.43	-86.43
Uplink C/T (dB)	-126.58	-128.58	-128.58
C/No (dB)	102.02	100.02	100.02
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**27.25**	**25.25**	**17.96**
Satellite downlink EIRP (dBW)	48.30	48.30	48.30
Downlink Path Loss (dB)	205.63	205.63	205.63
Downlink C/T (dB)	-145.63	-146.63	-146.63
C/No (dB)	8.20	7.20	7.20
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**8.20**	**7.20**	**5.06**
Cumulative C/N (dB)	8.14	7.13	4.85
Necessary C/N (dB)	4.2	4.2	4.2
Cumulative Outroute Link Margin (dB)	**3.94**	**2.93**	**0.65**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	0.512
Spread BW (MHz):	1.024
Required C/N (dB):	2.1
Outroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	3.3
Satellite:	SES-1
Longitude (deg East):	-101
G/T towards Remote (dB/K):	3.10
G/T towards NOC (dB/K):	2.40
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	48.8
Saturated EIRP towards remote (dBW):	46.9
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**46.90**
Downlink EIRP Inroute (dBW):	**15.85**
Remote:	Miami
Latitude (deg North):	25.79
Longitude (deg East):	-80.21
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	39
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.08**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 45 degrees

Inroute signal:	**QPSK 1/2**	rate	**0.512**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 2/3**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Miami	25.79	-80.21
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	36.80	35.80	35.80
Uplink Path Loss (dB)	206.90	206.90	206.90
Spreading Loss (dB)	-162.35	-162.35	-162.35
Flux Density at Satellite (dBW/m^2)	-125.55	-126.55	-126.55
Uplink C/T (dB)	-167.00	-168.00	-168.00
C/No (dB)	61.60	60.60	60.60
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**4.51**	**3.51**	**3.13**
Satellite downlink EIRP (dBW)	16.85	15.85	15.85
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-153.32	-156.32	-156.32
C/No (dB)	75.28	72.28	72.28
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**18.18**	**15.18**	**13.42**
Cumulative C/N (dB)	4.33	3.23	2.74
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**2.23**	**1.13**	**0.64**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 45 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	7.6 m
RX Antenna Gain (dBi):	56.5
Antenna Noise Temp (K):	61
Antenna LNA Temp (K):	70
Total Noise Temp (K):	131
Antenna G/T (dB/K):	35.33
TX Antenna Gain (dBi):	58.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	78.10	76.10	76.10
Uplink Path Loss (dB)	207.04	207.04	207.04
Spreading Loss (dB)	-162.49	-162.49	-162.49
Flux Density at Satellite (dBW/m^2)	-84.39	-86.39	-86.39
Uplink C/T (dB)	-126.54	-128.54	-128.54
C/No (dB)	102.06	100.06	100.06
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**27.29**	**25.29**	**17.97**
Satellite downlink EIRP (dBW)	46.90	46.90	46.90
Downlink Path Loss (dB)	205.40	205.40	205.40
Downlink C/T (dB)	-146.80	-147.80	-147.80
C/No (dB)	7.03	6.03	6.03
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.03**	**6.03**	**4.31**
Cumulative C/N (dB)	6.98	5.97	4.13
Necessary C/N (dB)	3.3	3.3	3.3
Cumulative Outroute Link Margin (dB)	**3.68**	**2.67**	**0.83**

SES-1 Link Budgets

Applicable to transmissions up to skew angles of 25, 35, and 45 degrees, and EIRP densities of each:

13.7 dBW/4 kHz

Applicable transmit power and emission bandwidth:

45 dBm, 4.096 MHz

Inroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	2.048
Spread BW (MHz):	4.096
Required C/N (dB):	4.2
Outroute Signal:	QPSK 5/6
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	5.4
Satellite:	SES-1
Longitude (deg East):	-101
G/T towards Remote (dB/K):	5.80
G/T towards NOC (dB/K):	2.40
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	48.8
Saturated EIRP towards remote (dBW):	50.2
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**50.20**
Downlink EIRP Inroute (dBW):	**24.36**
Remote:	Chicago
Latitude (deg North):	41.8
Longitude (deg East):	-87.7
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 25 degrees

Inroute signal:	**QPSK 2/3**	rate	**2.048**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 5/6**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Chicago	41.8	-87.7
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	207.09	207.09	207.09
Spreading Loss (dB)	-162.54	-162.54	-162.54
Flux Density at Satellite (dBW/m^2)	-119.74	-120.74	-120.74
Uplink C/T (dB)	-158.49	-159.49	-159.49
C/No (dB)	70.11	69.11	69.11
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**7.00**	**6.00**	**5.34**
Satellite downlink EIRP (dBW)	25.36	24.36	24.36
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-142.92	-145.92	-145.92
C/No (dB)	85.68	82.68	82.68
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**22.57**	**19.57**	**15.82**
Cumulative C/N (dB)	6.88	5.81	4.97
Necessary C/N (dB)	4.20	4.20	4.20
Cumulative Inroute Link Margin (dB)	**2.68**	**1.61**	**0.77**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 25 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.00	207.00	207.00
Spreading Loss (dB)	-162.45	-162.45	-162.45
Flux Density at Satellite (dBW/m^2)	-82.35	-84.35	-84.35
Uplink C/T (dB)	-124.50	-126.50	-126.50
C/No (dB)	104.10	102.10	102.10
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**29.33**	**27.33**	**18.28**
Satellite downlink EIRP (dBW)	50.20	50.20	50.20
Downlink Path Loss (dB)	205.60	205.60	205.60
Downlink C/T (dB)	-143.70	-144.70	-144.70
C/No (dB)	10.13	9.13	9.13
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**10.13**	**9.13**	**6.14**
Cumulative C/N (dB)	10.08	9.07	5.88
Necessary C/N (dB)	5.4	5.4	5.4
Cumulative Outroute Link Margin (dB)	**4.68**	**3.67**	**0.48**

Inroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	2.048
Spread BW (MHz):	4.096
Required C/N (dB):	4.2
Outroute Signal:	QPSK 3/4
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	4.2
Satellite:	SES-1
Longitude (deg East):	-101
G/T towards Remote (dB/K):	5.40
G/T towards NOC (dB/K):	2.40
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	48.8
Saturated EIRP towards remote (dBW):	48.3
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**48.30**
Downlink EIRP Inroute (dBW):	**23.93**
Remote:	Baltimore
Latitude (deg North):	39.29
Longitude (deg East):	-76.62
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 35 degrees

Inroute signal:	**QPSK 2/3**	rate	**2.048**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 3/4**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Baltimore	39.29	-76.62
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	207.13	207.13	207.13
Spreading Loss (dB)	-162.57	-162.57	-162.57
Flux Density at Satellite (dBW/m^2)	-119.77	-120.77	-120.77
Uplink C/T (dB)	-158.93	-159.93	-159.93
C/No (dB)	69.68	68.68	68.68
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**6.56**	**5.56**	**4.97**
Satellite downlink EIRP (dBW)	24.93	23.93	23.93
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-143.35	-146.35	-146.35
C/No (dB)	85.25	82.25	82.25
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**22.14**	**19.14**	**15.63**
Cumulative C/N (dB)	6.44	5.38	4.61
Necessary C/N (dB)	4.20	4.20	4.20
Cumulative Inroute Link Margin (dB)	**2.24**	**1.18**	**0.41**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 35 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.00	207.00	207.00
Spreading Loss (dB)	-162.45	-162.45	-162.45
Flux Density at Satellite (dBW/m^2)	-82.35	-84.35	-84.35
Uplink C/T (dB)	-124.50	-126.50	-126.50
C/No (dB)	104.10	102.10	102.10
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**29.33**	**27.33**	**18.28**
Satellite downlink EIRP (dBW)	48.30	48.30	48.30
Downlink Path Loss (dB)	205.63	205.63	205.63
Downlink C/T (dB)	-145.63	-146.63	-146.63
C/No (dB)	8.20	7.20	7.20
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**8.20**	**7.20**	**5.06**
Cumulative C/N (dB)	8.16	7.16	4.86
Necessary C/N (dB)	4.2	4.2	4.2
Cumulative Outroute Link Margin (dB)	**3.96**	**2.96**	**0.66**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	2.048
Spread BW (MHz):	4.096
Required C/N (dB):	2.1
Outroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	3.3
Satellite:	SES-1
Longitude (deg East):	-101
G/T towards Remote (dB/K):	3.10
G/T towards NOC (dB/K):	2.40
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	48.8
Saturated EIRP towards remote (dBW):	46.9
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**46.90**
Downlink EIRP Inroute (dBW):	**21.85**
Remote:	Miami
Latitude (deg North):	25.79
Longitude (deg East):	-80.21
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 45 degrees

Inroute signal:	**QPSK 1/2**	rate	**2.048**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 2/3**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Miami	25.79	-80.21
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	206.90	206.90	206.90
Spreading Loss (dB)	-162.35	-162.35	-162.35
Flux Density at Satellite (dBW/m^2)	-119.55	-120.55	-120.55
Uplink C/T (dB)	-161.00	-162.00	-162.00
C/No (dB)	67.60	66.60	66.60
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**4.49**	**3.49**	**3.11**
Satellite downlink EIRP (dBW)	22.85	21.85	21.85
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-145.42	-148.42	-148.42
C/No (dB)	83.18	80.18	80.18
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**20.07**	**17.07**	**14.58**
Cumulative C/N (dB)	4.37	3.30	2.81
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**2.27**	**1.20**	**0.71**

Link Budget for satellite SES-1 at -101.0 degrees

Skew operational limit: 45 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.00	207.00	207.00
Spreading Loss (dB)	-162.45	-162.45	-162.45
Flux Density at Satellite (dBW/m^2)	-82.35	-84.35	-84.35
Uplink C/T (dB)	-124.50	-126.50	-126.50
C/No (dB)	104.10	102.10	102.10
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**29.33**	**27.33**	**18.28**
Satellite downlink EIRP (dBW)	46.90	46.90	46.90
Downlink Path Loss (dB)	205.40	205.40	205.40
Downlink C/T (dB)	-146.80	-147.80	-147.80
C/No (dB)	7.03	6.03	6.03
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.03**	**6.03**	**4.31**
Cumulative C/N (dB)	7.00	5.99	4.14
Necessary C/N (dB)	3.3	3.3	3.3
Cumulative Outroute Link Margin (dB)	**3.70**	**2.69**	**0.84**

AMC-9 Link Budgets

Applicable to transmissions up to skew angles of 25, 35, and 45 degrees, and respective EIRP densities of 16.2, 14.7, and 13.7 dBW/4 kHz

Applicable transmit powers and emission bandwidths:

41.5, 40.0, and 39.0 dBm in 1.024 MHz, respectively

44.5, 43.0, and 42.0 dBm in 2.048 MHz, respectively

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	1.024
Spread BW (MHz):	1.024
Required C/N (dB):	2.1
Outroute Signal:	QPSK 5/6
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	5.4
Satellite:	AMC-9
Longitude (deg East):	-83
G/T towards Remote (dB/K):	5.00
G/T towards NOC (dB/K):	3.50
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	50.5
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**50.50**
Downlink EIRP Inroute (dBW):	**20.80**
Remote:	New York City
Latitude (deg North):	40.73
Longitude (deg East):	-74.02
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	41.5
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-13.58**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 25 degrees

Inroute signal:	**QPSK 1/2**	rate	**1.024**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 5/6**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	New York City	40.73	-74.02
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	39.30	38.30	38.30
Uplink Path Loss (dB)	207.05	207.05	207.05
Spreading Loss (dB)	-162.50	-162.50	-162.50
Flux Density at Satellite (dBW/m^2)	-123.20	-124.20	-124.20
Uplink C/T (dB)	-162.75	-163.75	-163.75
C/No (dB)	65.85	64.85	64.85
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**5.74**	**4.74**	**4.24**
Satellite downlink EIRP (dBW)	21.80	20.80	20.80
Downlink Path Loss (dB)	205.67	205.67	205.67
Downlink C/T (dB)	-148.54	-151.54	-151.54
C/No (dB)	80.06	77.06	77.06
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**19.96**	**16.96**	**14.52**
Cumulative C/N (dB)	5.58	4.49	3.85
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**3.48**	**2.39**	**1.75**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 25 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	7.6 m
RX Antenna Gain (dBi):	56.5
Antenna Noise Temp (K):	61
Antenna LNA Temp (K):	70
Total Noise Temp (K):	131
Antenna G/T (dB/K):	35.33
TX Antenna Gain (dBi):	58.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	78.10	76.10	76.10
Uplink Path Loss (dB)	206.97	206.97	206.97
Spreading Loss (dB)	-162.42	-162.42	-162.42
Flux Density at Satellite (dBW/m^2)	-84.32	-86.32	-86.32
Uplink C/T (dB)	-125.37	-127.37	-127.37
C/No (dB)	103.23	101.23	101.23
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**28.46**	**26.46**	**18.16**
Satellite downlink EIRP (dBW)	50.50	50.50	50.50
Downlink Path Loss (dB)	205.56	205.56	205.56
Downlink C/T (dB)	-143.36	-144.36	-144.36
C/No (dB)	10.47	9.47	9.47
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**10.47**	**9.47**	**6.31**
Cumulative C/N (dB)	10.40	9.38	6.03
Necessary C/N (dB)	5.4	5.4	5.4
Cumulative Outroute Link Margin (dB)	**5.00**	**3.98**	**0.63**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	0.512
Spread BW (MHz):	1.024
Required C/N (dB):	2.1
Outroute Signal:	QPSK 5/6
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	5.4
Satellite:	AMC-9
Longitude (deg East):	-83
G/T towards Remote (dB/K):	2.50
G/T towards NOC (dB/K):	3.50
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	50
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**50.00**
Downlink EIRP Inroute (dBW):	**16.80**
Remote:	Albuquerque
Latitude (deg North):	35.11
Longitude (deg East):	-106.62
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	40
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-15.08**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 35 degrees

Inroute signal:	**QPSK 1/2**	rate	**0.512**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 5/6**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Albuquerque	35.11	-106.62
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	37.80	36.80	36.80
Uplink Path Loss (dB)	207.05	207.05	207.05
Spreading Loss (dB)	-162.50	-162.50	-162.50
Flux Density at Satellite (dBW/m^2)	-124.70	-125.70	-125.70
Uplink C/T (dB)	-166.75	-167.75	-167.75
C/No (dB)	61.85	60.85	60.85
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**4.76**	**3.76**	**3.35**
Satellite downlink EIRP (dBW)	17.80	16.80	16.80
Downlink Path Loss (dB)	205.67	205.67	205.67
Downlink C/T (dB)	-152.54	-155.54	-155.54
C/No (dB)	76.06	73.06	73.06
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**18.97**	**15.97**	**13.93**
Cumulative C/N (dB)	4.59	3.50	2.99
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**2.49**	**1.40**	**0.89**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 35 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	7.6 m
RX Antenna Gain (dBi):	56.5
Antenna Noise Temp (K):	61
Antenna LNA Temp (K):	70
Total Noise Temp (K):	131
Antenna G/T (dB/K):	35.33
TX Antenna Gain (dBi):	58.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	78.10	76.10	76.10
Uplink Path Loss (dB)	207.07	207.07	207.07
Spreading Loss (dB)	-162.52	-162.52	-162.52
Flux Density at Satellite (dBW/m^2)	-84.42	-86.42	-86.42
Uplink C/T (dB)	-125.47	-127.47	-127.47
C/No (dB)	103.13	101.13	101.13
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**28.36**	**26.36**	**18.15**
Satellite downlink EIRP (dBW)	50.00	50.00	50.00
Downlink Path Loss (dB)	205.56	205.56	205.56
Downlink C/T (dB)	-143.86	-144.86	-144.86
C/No (dB)	9.97	8.97	8.97
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**9.97**	**8.97**	**6.06**
Cumulative C/N (dB)	9.91	8.89	5.80
Necessary C/N (dB)	5.4	5.4	5.4
Cumulative Outroute Link Margin (dB)	**4.51**	**3.49**	**0.40**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	0.512
Spread BW (MHz):	1.024
Required C/N (dB):	2.1
Outroute Signal:	QPSK 5/6
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	5.4
Satellite:	AMC-9
Longitude (deg East):	-83
G/T towards Remote (dB/K):	3.50
G/T towards NOC (dB/K):	3.50
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	49.4
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**49.40**
Downlink EIRP Inroute (dBW):	**16.76**
Remote:	Phoenix
Latitude (deg North):	33.48
Longitude (deg East):	-112.12
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	39
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.08**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 45 degrees

Inroute signal:	**QPSK 1/2**	rate	**0.512**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 5/6**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Phoenix	33.48	-112.12
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	36.80	35.80	35.80
Uplink Path Loss (dB)	207.09	207.09	207.09
Spreading Loss (dB)	-162.54	-162.54	-162.54
Flux Density at Satellite (dBW/m^2)	-125.74	-126.74	-126.74
Uplink C/T (dB)	-166.79	-167.79	-167.79
C/No (dB)	61.81	60.81	60.81
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**4.72**	**3.72**	**3.32**
Satellite downlink EIRP (dBW)	17.76	16.76	16.76
Downlink Path Loss (dB)	205.67	205.67	205.67
Downlink C/T (dB)	-152.58	-155.58	-155.58
C/No (dB)	76.03	73.03	73.03
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**18.93**	**15.93**	**13.91**
Cumulative C/N (dB)	4.56	3.47	2.96
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**2.46**	**1.37**	**0.86**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 45 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	7.6 m
RX Antenna Gain (dBi):	56.5
Antenna Noise Temp (K):	61
Antenna LNA Temp (K):	70
Total Noise Temp (K):	131
Antenna G/T (dB/K):	35.33
TX Antenna Gain (dBi):	58.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	78.10	76.10	76.10
Uplink Path Loss (dB)	207.13	207.13	207.13
Spreading Loss (dB)	-162.57	-162.57	-162.57
Flux Density at Satellite (dBW/m^2)	-84.47	-86.47	-86.47
Uplink C/T (dB)	-125.53	-127.53	-127.53
C/No (dB)	103.08	101.08	101.08
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**28.30**	**26.30**	**18.14**
Satellite downlink EIRP (dBW)	49.40	49.40	49.40
Downlink Path Loss (dB)	205.59	205.59	205.59
Downlink C/T (dB)	-144.49	-145.49	-145.49
C/No (dB)	9.34	8.34	8.34
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**9.34**	**8.34**	**5.72**
Cumulative C/N (dB)	9.28	8.27	5.48
Necessary C/N (dB)	5.4	5.4	5.4
Cumulative Outroute Link Margin (dB)	**3.88**	**2.87**	**0.08**

AMC-9 Link Budgets

Applicable to transmissions up to skew angles of 25, 35, and 45 degrees, and EIRP densities of each:

13.7 dBW/4 kHz

Applicable transmit power and emission bandwidth:

45 dBm, 4.096 MHz

Inroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	2.048
Spread BW (MHz):	4.096
Required C/N (dB):	4.2
Outroute Signal:	QPSK 5/6
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	5.4
Satellite:	AMC-9
Longitude (deg East):	-83
G/T towards Remote (dB/K):	5.00
G/T towards NOC (dB/K):	3.50
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	50.5
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**50.50**
Downlink EIRP Inroute (dBW):	**24.30**
Remote:	New York City
Latitude (deg North):	40.73
Longitude (deg East):	-74.02
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 25 degrees

Inroute signal:	**QPSK 2/3**	rate	**2.048**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 5/6**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	**Long**
Remote:	New York City	40.73	-74.02
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	207.05	207.05	207.05
Spreading Loss (dB)	-162.50	-162.50	-162.50
Flux Density at Satellite (dBW/m^2)	-119.70	-120.70	-120.70
Uplink C/T (dB)	-159.25	-160.25	-160.25
C/No (dB)	69.35	68.35	68.35
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**6.23**	**5.23**	**4.68**
Satellite downlink EIRP (dBW)	25.30	24.30	24.30
Downlink Path Loss (dB)	205.67	205.67	205.67
Downlink C/T (dB)	-143.14	-146.14	-146.14
C/No (dB)	85.46	82.46	82.46
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**22.35**	**19.35**	**15.72**
Cumulative C/N (dB)	6.13	5.07	4.35
Necessary C/N (dB)	4.20	4.20	4.20
Cumulative Inroute Link Margin (dB)	**1.93**	**0.87**	**0.15**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 25 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.16	207.16	207.16
Spreading Loss (dB)	-162.61	-162.61	-162.61
Flux Density at Satellite (dBW/m^2)	-82.51	-84.51	-84.51
Uplink C/T (dB)	-123.56	-125.56	-125.56
C/No (dB)	105.04	103.04	103.04
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**30.27**	**28.27**	**18.39**
Satellite downlink EIRP (dBW)	50.50	50.50	50.50
Downlink Path Loss (dB)	205.56	205.56	205.56
Downlink C/T (dB)	-143.36	-144.36	-144.36
C/No (dB)	10.47	9.47	9.47
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**10.47**	**9.47**	**6.31**
Cumulative C/N (dB)	10.42	9.41	6.05
Necessary C/N (dB)	5.4	5.4	5.4
Cumulative Outroute Link Margin (dB)	**5.02**	**4.01**	**0.65**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	2.048
Spread BW (MHz):	4.096
Required C/N (dB):	2.1
Outroute Signal:	QPSK 5/6
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	5.4
Satellite:	AMC-9
Longitude (deg East):	-83
G/T towards Remote (dB/K):	2.50
G/T towards NOC (dB/K):	3.50
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	50
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**50.00**
Downlink EIRP Inroute (dBW):	**21.80**
Remote:	Albuquerque
Latitude (deg North):	35.11
Longitude (deg East):	-106.62
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 35 degrees

Inroute signal:	**QPSK 1/2**	rate	**2.048**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 5/6**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	**Long**
Remote:	Albuquerque	35.11	-106.62
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	207.05	207.05	207.05
Spreading Loss (dB)	-162.50	-162.50	-162.50
Flux Density at Satellite (dBW/m^2)	-119.70	-120.70	-120.70
Uplink C/T (dB)	-161.75	-162.75	-162.75
C/No (dB)	66.85	65.85	65.85
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**3.74**	**2.74**	**2.41**
Satellite downlink EIRP (dBW)	22.80	21.80	21.80
Downlink Path Loss (dB)	205.67	205.67	205.67
Downlink C/T (dB)	-145.64	-148.64	-148.64
C/No (dB)	82.96	79.96	79.96
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**19.85**	**16.85**	**14.46**
Cumulative C/N (dB)	3.63	2.57	2.15
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**1.53**	**0.47**	**0.05**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 35 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.16	207.16	207.16
Spreading Loss (dB)	-162.61	-162.61	-162.61
Flux Density at Satellite (dBW/m^2)	-82.51	-84.51	-84.51
Uplink C/T (dB)	-123.56	-125.56	-125.56
C/No (dB)	105.04	103.04	103.04
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**30.27**	**28.27**	**18.39**
Satellite downlink EIRP (dBW)	50.00	50.00	50.00
Downlink Path Loss (dB)	205.56	205.56	205.56
Downlink C/T (dB)	-143.86	-144.86	-144.86
C/No (dB)	9.97	8.97	8.97
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**9.97**	**8.97**	**6.06**
Cumulative C/N (dB)	9.93	8.92	5.81
Necessary C/N (dB)	5.4	5.4	5.4
Cumulative Outroute Link Margin (dB)	**4.53**	**3.52**	**0.41**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	2.048
Spread BW (MHz):	4.096
Required C/N (dB):	2.1
Outroute Signal:	QPSK 5/6
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	5.4
Satellite:	AMC-9
Longitude (deg East):	-83
G/T towards Remote (dB/K):	3.50
G/T towards NOC (dB/K):	3.50
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	49.4
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**49.40**
Downlink EIRP Inroute (dBW):	**22.76**
Remote:	Phoenix
Latitude (deg North):	33.48
Longitude (deg East):	-112.12
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 45 degrees

Inroute signal:	**QPSK 1/2**	rate	**2.048**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 5/6**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Phoenix	33.48	-112.12
NOC:	Las Vegas	36.24	-115.12

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	207.09	207.09	207.09
Spreading Loss (dB)	-162.54	-162.54	-162.54
Flux Density at Satellite (dBW/m^2)	-119.74	-120.74	-120.74
Uplink C/T (dB)	-160.79	-161.79	-161.79
C/No (dB)	67.81	66.81	66.81
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**4.70**	**3.70**	**3.30**
Satellite downlink EIRP (dBW)	23.76	22.76	22.76
Downlink Path Loss (dB)	205.67	205.67	205.67
Downlink C/T (dB)	-144.67	-147.67	-147.67
C/No (dB)	83.93	80.93	80.93
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**20.81**	**17.81**	**14.99**
Cumulative C/N (dB)	4.60	3.54	3.02
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**2.50**	**1.44**	**0.92**

Link Budget for satellite AMC-9 at -83.0 degrees

Skew operational limit: 45 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Las Vegas
Latitude (deg North):	36.24
Longitude (deg East):	-115.12
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.16	207.16	207.16
Spreading Loss (dB)	-162.61	-162.61	-162.61
Flux Density at Satellite (dBW/m^2)	-82.51	-84.51	-84.51
Uplink C/T (dB)	-123.56	-125.56	-125.56
C/No (dB)	105.04	103.04	103.04
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**30.27**	**28.27**	**18.39**
Satellite downlink EIRP (dBW)	49.40	49.40	49.40
Downlink Path Loss (dB)	205.59	205.59	205.59
Downlink C/T (dB)	-144.49	-145.49	-145.49
C/No (dB)	9.34	8.34	8.34
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**9.34**	**8.34**	**5.72**
Cumulative C/N (dB)	9.30	8.29	5.49
Necessary C/N (dB)	5.4	5.4	5.4
Cumulative Outroute Link Margin (dB)	**3.90**	**2.89**	**0.09**

AMC-2 Link Budgets

Applicable to transmissions up to skew angles of 25, 35, and 45 degrees, and respective EIRP densities of 16.2, 14.7, and 13.7 dBW/4 kHz

Applicable transmit powers and emission bandwidths:

41.5, 40.0, and 39.0 dBm in 1.024 MHz, respectively

44.5, 43.0, and 42.0 dBm in 2.048 MHz, respectively

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	1.024
Spread BW (MHz):	1.024
Required C/N (dB):	2.1
Outroute Signal:	QPSK 3/4
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	4.2
Satellite:	AMC-2
Longitude (deg East):	-80.9
G/T towards Remote (dB/K):	4.90
G/T towards NOC (dB/K):	5.90
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	47.1
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**47.10**
Downlink EIRP Inroute (dBW):	**20.84**
Remote:	Atlanta
Latitude (deg North):	33.64
Longitude (deg East):	-84.43
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	41.5
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-13.58**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 25 degrees

Inroute signal:	**QPSK 1/2**	rate	**1.024**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 3/4**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Atlanta	33.64	-84.43
NOC:	Woodbine MD	38.376	-77.081

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	39.30	38.30	38.30
Uplink Path Loss (dB)	206.92	206.92	206.92
Spreading Loss (dB)	-162.36	-162.36	-162.36
Flux Density at Satellite (dBW/m^2)	-123.06	-124.06	-124.06
Uplink C/T (dB)	-162.72	-163.72	-163.72
C/No (dB)	65.89	64.89	64.89
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**5.78**	**4.78**	**4.28**
Satellite downlink EIRP (dBW)	21.84	20.84	20.84
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-146.44	-149.44	-149.44
C/No (dB)	82.16	79.16	79.16
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**22.06**	**19.06**	**15.59**
Cumulative C/N (dB)	5.68	4.62	3.97
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**3.58**	**2.52**	**1.87**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 25 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:	Woodbine MD
Latitude (deg North):	38.376
Longitude (deg East):	-77.081
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.00	207.00	207.00
Spreading Loss (dB)	-162.45	-162.45	-162.45
Flux Density at Satellite (dBW/m^2)	-82.35	-84.35	-84.35
Uplink C/T (dB)	-121.00	-123.00	-123.00
C/No (dB)	107.60	105.60	105.60
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**32.83**	**30.83**	**18.59**
Satellite downlink EIRP (dBW)	47.10	47.10	47.10
Downlink Path Loss (dB)	205.42	205.42	205.42
Downlink C/T (dB)	-146.62	-147.62	-147.62
C/No (dB)	7.21	6.21	6.21
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.21**	**6.21**	**4.43**
Cumulative C/N (dB)	7.20	6.19	4.27
Necessary C/N (dB)	4.2	4.2	4.2
Cumulative Outroute Link Margin (dB)	**3.00**	**1.99**	**0.07**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 35 degrees

Inroute signal:	**QPSK 1/2**	rate	**1.024**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 3/5**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	San Antonio	29.53	-98.47
NOC:	Woodbine MD	38.376	-77.081

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	1.024
Spread BW (MHz):	1.024
Required C/N (dB):	2.1
Outroute Signal:	QPSK 3/5
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	2.4
Satellite:	AMC-2
Longitude (deg East):	-80.9
G/T towards Remote (dB/K):	4.80
G/T towards NOC (dB/K):	5.90
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	45.3
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**45.30**
Downlink EIRP Inroute (dBW):	**19.23**
Remote:	San Antonio
Latitude (deg North):	29.53
Longitude (deg East):	-98.47
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	40
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-15.08**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	37.80	36.80	36.80
Uplink Path Loss (dB)	206.92	206.92	206.92
Spreading Loss (dB)	-162.37	-162.37	-162.37
Flux Density at Satellite (dBW/m^2)	-124.57	-125.57	-125.57
Uplink C/T (dB)	-164.32	-165.32	-165.32
C/No (dB)	64.28	63.28	63.28
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**4.18**	**3.18**	**2.83**
Satellite downlink EIRP (dBW)	20.23	19.23	19.23
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-148.04	-151.04	-151.04
C/No (dB)	80.56	77.56	77.56
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**20.45**	**17.45**	**14.80**
Cumulative C/N (dB)	4.08	3.02	2.56
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**1.98**	**0.92**	**0.46**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 35 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Woodbine MD
Latitude (deg North):	38.376
Longitude (deg East):	-77.081
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.00	207.00	207.00
Spreading Loss (dB)	-162.45	-162.45	-162.45
Flux Density at Satellite (dBW/m^2)	-82.35	-84.35	-84.35
Uplink C/T (dB)	-121.00	-123.00	-123.00
C/No (dB)	107.60	105.60	105.60
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**32.83**	**30.83**	**18.59**
Satellite downlink EIRP (dBW)	45.30	45.30	45.30
Downlink Path Loss (dB)	205.43	205.43	205.43
Downlink C/T (dB)	-148.43	-149.43	-149.43
C/No (dB)	5.40	4.40	4.40
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**5.40**	**4.40**	**3.15**
Cumulative C/N (dB)	5.40	4.39	3.03
Necessary C/N (dB)	2.4	2.4	2.4
Cumulative Outroute Link Margin (dB)	**3.00**	**1.99**	**0.63**

Inroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	0.512
Spread BW (MHz):	1.024
Required C/N (dB):	4.2
Outroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	3.3
Satellite:	AMC-2
Longitude (deg East):	-80.9
G/T towards Remote (dB/K):	5.10
G/T towards NOC (dB/K):	5.90
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	47
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**47.00**
Downlink EIRP Inroute (dBW):	**18.28**
Remote:	San Diego
Latitude (deg North):	32.73
Longitude (deg East):	-117.19
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	39
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.08**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 45 degrees

Inroute signal:	**QPSK 2/3**	rate	**0.512**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 2/3**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	San Diego	32.73	-117.19
NOC:	Woodbine MD	38.376	-77.081

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	36.80	35.80	35.80
Uplink Path Loss (dB)	207.17	207.17	207.17
Spreading Loss (dB)	-162.62	-162.62	-162.62
Flux Density at Satellite (dBW/m^2)	-125.82	-126.82	-126.82
Uplink C/T (dB)	-165.27	-166.27	-166.27
C/No (dB)	63.33	62.33	62.33
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**6.24**	**5.24**	**4.68**
Satellite downlink EIRP (dBW)	19.28	18.28	18.28
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-148.99	-151.99	-151.99
C/No (dB)	79.61	76.61	76.61
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**22.51**	**19.51**	**15.79**
Cumulative C/N (dB)	6.14	5.08	4.36
Necessary C/N (dB)	4.20	4.20	4.20
Cumulative Inroute Link Margin (dB)	**1.94**	**0.88**	**0.16**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 45 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Woodbine MD
Latitude (deg North):	38.376
Longitude (deg East):	-77.081
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.00	207.00	207.00
Spreading Loss (dB)	-162.45	-162.45	-162.45
Flux Density at Satellite (dBW/m^2)	-82.35	-84.35	-84.35
Uplink C/T (dB)	-121.00	-123.00	-123.00
C/No (dB)	107.60	105.60	105.60
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**32.83**	**30.83**	**18.59**
Satellite downlink EIRP (dBW)	47.00	47.00	47.00
Downlink Path Loss (dB)	205.68	205.68	205.68
Downlink C/T (dB)	-146.98	-147.98	-147.98
C/No (dB)	6.85	5.85	5.85
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**6.85**	**5.85**	**4.19**
Cumulative C/N (dB)	6.84	5.84	4.04
Necessary C/N (dB)	3.3	3.3	3.3
Cumulative Outroute Link Margin (dB)	**3.54**	**2.54**	**0.74**

AMC-2 Link Budgets

Applicable to transmissions up to skew angles of 25, 35, and 45 degrees, and EIRP densities of each:

13.7 dBW/4 kHz

Applicable transmit power and emission bandwidth:

45 dBm, 4.096 MHz

Inroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	2.048
Spread BW (MHz):	4.096
Required C/N (dB):	4.2
Outroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	3.3
Satellite:	AMC-2
Longitude (deg East):	-80.9
G/T towards Remote (dB/K):	4.90
G/T towards NOC (dB/K):	5.90
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	47.1
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**47.10**
Downlink EIRP Inroute (dBW):	**24.34**
Remote:	Atlanta
Latitude (deg North):	33.64
Longitude (deg East):	-84.43
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 25 degrees

Inroute signal:	**QPSK 2/3**	rate	**2.048**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 2/3**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Atlanta	33.64	-84.43
NOC:	Woodbine MD	38.376	-77.081

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	206.92	206.92	206.92
Spreading Loss (dB)	-162.36	-162.36	-162.36
Flux Density at Satellite (dBW/m^2)	-119.56	-120.56	-120.56
Uplink C/T (dB)	-159.22	-160.22	-160.22
C/No (dB)	69.39	68.39	68.39
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**6.27**	**5.27**	**4.71**
Satellite downlink EIRP (dBW)	25.34	24.34	24.34
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-142.94	-145.94	-145.94
C/No (dB)	85.66	82.66	82.66
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**22.55**	**19.55**	**15.81**
Cumulative C/N (dB)	6.17	5.11	4.39
Necessary C/N (dB)	4.20	4.20	4.20
Cumulative Inroute Link Margin (dB)	**1.97**	**0.91**	**0.19**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 25 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Woodbine MD
Latitude (deg North):	38.376
Longitude (deg East):	-77.081
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.00	207.00	207.00
Spreading Loss (dB)	-162.45	-162.45	-162.45
Flux Density at Satellite (dBW/m^2)	-82.35	-84.35	-84.35
Uplink C/T (dB)	-121.00	-123.00	-123.00
C/No (dB)	107.60	105.60	105.60
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**32.83**	**30.83**	**18.59**
Satellite downlink EIRP (dBW)	47.10	47.10	47.10
Downlink Path Loss (dB)	205.42	205.42	205.42
Downlink C/T (dB)	-146.62	-147.62	-147.62
C/No (dB)	7.21	6.21	6.21
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.21**	**6.21**	**4.43**
Cumulative C/N (dB)	7.20	6.19	4.27
Necessary C/N (dB)	3.3	3.3	3.3
Cumulative Outroute Link Margin (dB)	**3.90**	**2.89**	**0.97**

Inroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	2.048
Spread BW (MHz):	4.096
Required C/N (dB):	4.2
Outroute Signal:	QPSK 3/5
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	2.4
Satellite:	AMC-2
Longitude (deg East):	-80.9
G/T towards Remote (dB/K):	4.80
G/T towards NOC (dB/K):	5.90
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	45.3
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**45.30**
Downlink EIRP Inroute (dBW):	**24.23**
Remote:	San Antonio
Latitude (deg North):	29.53
Longitude (deg East):	-98.47
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 35 degrees

Inroute signal:	**QPSK 2/3**	rate	**2.048**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 3/5**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	San Antonio	29.53	-98.47
NOC:	Woodbine MD	38.376	-77.081

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	206.92	206.92	206.92
Spreading Loss (dB)	-162.37	-162.37	-162.37
Flux Density at Satellite (dBW/m^2)	-119.57	-120.57	-120.57
Uplink C/T (dB)	-159.32	-160.32	-160.32
C/No (dB)	69.28	68.28	68.28
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**6.17**	**5.17**	**4.62**
Satellite downlink EIRP (dBW)	25.23	24.23	24.23
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-143.04	-146.04	-146.04
C/No (dB)	85.56	82.56	82.56
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**22.44**	**19.44**	**15.76**
Cumulative C/N (dB)	6.07	5.01	4.30
Necessary C/N (dB)	4.20	4.20	4.20
Cumulative Inroute Link Margin (dB)	**1.87**	**0.81**	**0.10**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 35 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Woodbine MD
Latitude (deg North):	38.376
Longitude (deg East):	-77.081
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.00	207.00	207.00
Spreading Loss (dB)	-162.45	-162.45	-162.45
Flux Density at Satellite (dBW/m^2)	-82.35	-84.35	-84.35
Uplink C/T (dB)	-121.00	-123.00	-123.00
C/No (dB)	107.60	105.60	105.60
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**32.83**	**30.83**	**18.59**
Satellite downlink EIRP (dBW)	45.30	45.30	45.30
Downlink Path Loss (dB)	205.43	205.43	205.43
Downlink C/T (dB)	-148.43	-149.43	-149.43
C/No (dB)	5.40	4.40	4.40
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**5.40**	**4.40**	**3.15**
Cumulative C/N (dB)	5.40	4.39	3.03
Necessary C/N (dB)	2.4	2.4	2.4
Cumulative Outroute Link Margin (dB)	**3.00**	**1.99**	**0.63**

Inroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	2.048
Spread BW (MHz):	4.096
Required C/N (dB):	4.2
Outroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	3.3
Satellite:	AMC-2
Longitude (deg East):	-80.9
G/T towards Remote (dB/K):	5.10
G/T towards NOC (dB/K):	5.90
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49.5
Saturated EIRP towards remote (dBW):	47
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**47.00**
Downlink EIRP Inroute (dBW):	**24.28**
Remote:	San Diego
Latitude (deg North):	32.73
Longitude (deg East):	-117.19
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 45 degrees

Inroute signal:	**QPSK 2/3**	rate	**2.048**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 2/3**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	San Diego	32.73	-117.19
NOC:	Woodbine MD	38.376	-77.081

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	207.17	207.17	207.17
Spreading Loss (dB)	-162.62	-162.62	-162.62
Flux Density at Satellite (dBW/m^2)	-119.82	-120.82	-120.82
Uplink C/T (dB)	-159.27	-160.27	-160.27
C/No (dB)	69.33	68.33	68.33
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**6.22**	**5.22**	**4.66**
Satellite downlink EIRP (dBW)	25.28	24.28	24.28
Downlink Path Loss (dB)	205.51	205.51	205.51
Downlink C/T (dB)	-142.99	-145.99	-145.99
C/No (dB)	85.61	82.61	82.61
Noise BW (dB-Hz)	63.11	63.11	63.11
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**22.49**	**19.49**	**15.78**
Cumulative C/N (dB)	6.12	5.06	4.34
Necessary C/N (dB)	4.20	4.20	4.20
Cumulative Inroute Link Margin (dB)	**1.92**	**0.86**	**0.14**

Link Budget for satellite AMC-2 at -80.9 degrees

Skew operational limit: 45 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Woodbine MD
Latitude (deg North):	38.376
Longitude (deg East):	-77.081
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.00	207.00	207.00
Spreading Loss (dB)	-162.45	-162.45	-162.45
Flux Density at Satellite (dBW/m^2)	-82.35	-84.35	-84.35
Uplink C/T (dB)	-121.00	-123.00	-123.00
C/No (dB)	107.60	105.60	105.60
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**32.83**	**30.83**	**18.59**
Satellite downlink EIRP (dBW)	47.00	47.00	47.00
Downlink Path Loss (dB)	205.68	205.68	205.68
Downlink C/T (dB)	-146.98	-147.98	-147.98
C/No (dB)	6.85	5.85	5.85
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**6.85**	**5.85**	**4.19**
Cumulative C/N (dB)	6.84	5.84	4.04
Necessary C/N (dB)	3.3	3.3	3.3
Cumulative Outroute Link Margin (dB)	**3.54**	**2.54**	**0.74**

SES-6 Link Budgets

Applicable to transmissions up to skew angles of 25, 35, 45, and 55 degrees, and respective EIRP densities of 16.2, 14.7, 13.7, and 11.9 dBW/4 kHz

Applicable transmit powers and emission bandwidths:

41.5, 40.0, 39.0, and 37.2 dBm in 1.024 MHz, respectively

44.5, 43.0, 42.0, and 40.2 dBm in 2.048 MHz, respectively

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	0.512
Spread BW (MHz):	1.024
Required C/N (dB):	2.1
Outroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	10
Required C/N (dB):	3.3
Satellite:	SES-6
Longitude (deg East):	-40.5
G/T towards Remote (dB/K):	0.40
G/T towards NOC (dB/K):	1.25
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49
Saturated EIRP towards remote (dBW):	47.7
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**42.93**
Downlink EIRP Inroute (dBW):	**15.47**
Remote:	Limestone Maine
Latitude (deg North):	46.95
Longitude (deg East):	-67.89
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	41.5
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-13.58**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 25 degrees

Inroute signal:	**QPSK 1/2**	rate	**0.512**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 2/3**	rate	**10**	**Msps**	in bandwidth	**10**	**MHz**

		Lat	Long
Remote:	Limestone Maine	46.95	-67.89
NOC:	Betzdorf	49.69	6.33

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	39.30	38.30	38.30
Uplink Path Loss (dB)	207.28	207.28	207.28
Spreading Loss (dB)	-162.73	-162.73	-162.73
Flux Density at Satellite (dBW/m^2)	-123.43	-124.43	-124.43
Uplink C/T (dB)	-167.58	-168.58	-168.58
C/No (dB)	61.02	60.02	60.02
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**3.93**	**2.93**	**2.59**
Satellite downlink EIRP (dBW)	16.47	15.47	15.47
Downlink Path Loss (dB)	206.04	206.04	206.04
Downlink C/T (dB)	-152.34	-155.34	-155.34
C/No (dB)	76.26	73.26	73.26
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**19.17**	**16.17**	**14.05**
Cumulative C/N (dB)	3.80	2.72	2.29
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**1.70**	**0.62**	**0.19**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 25 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Betzdorf
Latitude (deg North):	49.69
Longitude (deg East):	6.33
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	45
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.98**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	75.10	73.10	73.10
Uplink Path Loss (dB)	207.53	207.53	207.53
Spreading Loss (dB)	-162.98	-162.98	-162.98
Flux Density at Satellite (dBW/m^2)	-87.88	-89.88	-89.88
Uplink C/T (dB)	-131.18	-133.18	-133.18
C/No (dB)	97.42	95.42	95.42
Noise BW (dB-Hz)	70.00	70.00	70.00
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**27.42**	**25.42**	**17.99**
Satellite downlink EIRP (dBW)	42.93	42.93	42.93
Downlink Path Loss (dB)	205.79	205.79	205.79
Downlink C/T (dB)	-151.16	-152.16	-152.16
C/No (dB)	7.44	6.44	6.44
Noise BW (dB-Hz)	70.00	70.00	70.00
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.44**	**6.44**	**4.58**
Cumulative C/N (dB)	7.40	6.39	4.39
Necessary C/N (dB)	3.3	3.3	3.3
Cumulative Outroute Link Margin (dB)	**4.10**	**3.09**	**1.09**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	0.256
Spread BW (MHz):	1.024
Required C/N (dB):	2.1
Outroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	10
Required C/N (dB):	3.3
Satellite:	SES-6
Longitude (deg East):	-40.5
G/T towards Remote (dB/K):	1.20
G/T towards NOC (dB/K):	1.25
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49
Saturated EIRP towards remote (dBW):	48.2
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**43.43**
Downlink EIRP Inroute (dBW):	**14.82**
Remote:	Providence
Latitude (deg North):	41.72
Longitude (deg East):	-71.43
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	40
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-15.08**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 35 degrees

Inroute signal:	**QPSK 1/2**	rate	**0.256**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 2/3**	rate	**10**	**Msps**	in bandwidth	**10**	**MHz**

		Lat	Long
Remote:	Providence	41.72	-71.43
NOC:	Betzdorf	49.69	6.33

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	37.80	36.80	36.80
Uplink Path Loss (dB)	207.23	207.23	207.23
Spreading Loss (dB)	-162.68	-162.68	-162.68
Flux Density at Satellite (dBW/m^2)	-124.88	-125.88	-125.88
Uplink C/T (dB)	-168.23	-169.23	-169.23
C/No (dB)	60.37	59.37	59.37
Noise BW (dB-Hz)	54.08	54.08	54.08
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**6.29**	**5.29**	**4.73**
Satellite downlink EIRP (dBW)	15.82	14.82	14.82
Downlink Path Loss (dB)	206.04	206.04	206.04
Downlink C/T (dB)	-152.99	-155.99	-155.99
C/No (dB)	75.61	72.61	72.61
Noise BW (dB-Hz)	54.08	54.08	54.08
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**21.53**	**18.53**	**15.35**
Cumulative C/N (dB)	6.16	5.09	4.37
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**4.06**	**2.99**	**2.27**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 35 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Betzdorf
Latitude (deg North):	49.69
Longitude (deg East):	6.33
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	45
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.98**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	75.10	73.10	73.10
Uplink Path Loss (dB)	207.53	207.53	207.53
Spreading Loss (dB)	-162.98	-162.98	-162.98
Flux Density at Satellite (dBW/m^2)	-87.88	-89.88	-89.88
Uplink C/T (dB)	-131.18	-133.18	-133.18
C/No (dB)	97.42	95.42	95.42
Noise BW (dB-Hz)	70.00	70.00	70.00
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**27.42**	**25.42**	**17.99**
Satellite downlink EIRP (dBW)	43.43	43.43	43.43
Downlink Path Loss (dB)	205.74	205.74	205.74
Downlink C/T (dB)	-150.61	-151.61	-151.61
C/No (dB)	7.99	6.99	6.99
Noise BW (dB-Hz)	70.00	70.00	70.00
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.99**	**6.99**	**4.94**
Cumulative C/N (dB)	7.94	6.93	4.73
Necessary C/N (dB)	3.3	3.3	3.3
Cumulative Outroute Link Margin (dB)	**4.64**	**3.63**	**1.43**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	0.256
Spread BW (MHz):	1.024
Required C/N (dB):	2.1
Outroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	10
Required C/N (dB):	3.3
Satellite:	SES-6
Longitude (deg East):	-40.5
G/T towards Remote (dB/K):	0.50
G/T towards NOC (dB/K):	1.25
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49
Saturated EIRP towards remote (dBW):	48.2
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**43.43**
Downlink EIRP Inroute (dBW):	**13.10**
Remote:	Washington DC
Latitude (deg North):	38.85
Longitude (deg East):	-77.04
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	39
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.08**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 45 degrees

Inroute signal:	**QPSK 1/2**	rate	**0.256**	**Msps**	in bandwidth	**1.024**	**MHz**
Outroute signal:	**QPSK 2/3**	rate	**10**	**Msps**	in bandwidth	**10**	**MHz**

		Lat	Long
Remote:	Washington DC	38.85	-77.04
NOC:	Betzdorf	49.69	6.33

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	36.80	35.80	35.80
Uplink Path Loss (dB)	207.25	207.25	207.25
Spreading Loss (dB)	-162.70	-162.70	-162.70
Flux Density at Satellite (dBW/m^2)	-125.90	-126.90	-126.90
Uplink C/T (dB)	-169.95	-170.95	-170.95
C/No (dB)	58.65	57.65	57.65
Noise BW (dB-Hz)	54.08	54.08	54.08
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**4.57**	**3.57**	**3.18**
Satellite downlink EIRP (dBW)	14.10	13.10	13.10
Downlink Path Loss (dB)	206.04	206.04	206.04
Downlink C/T (dB)	-154.71	-157.71	-157.71
C/No (dB)	73.89	70.89	70.89
Noise BW (dB-Hz)	54.08	54.08	54.08
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**19.81**	**16.81**	**14.44**
Cumulative C/N (dB)	4.44	3.37	2.87
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**2.34**	**1.27**	**0.77**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 45 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:	Betzdorf
Latitude (deg North):	49.69
Longitude (deg East):	6.33
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-13.98**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.53	207.53	207.53
Spreading Loss (dB)	-162.98	-162.98	-162.98
Flux Density at Satellite (dBW/m^2)	-82.88	-84.88	-84.88
Uplink C/T (dB)	-126.18	-128.18	-128.18
C/No (dB)	102.42	100.42	100.42
Noise BW (dB-Hz)	70.00	70.00	70.00
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**32.42**	**30.42**	**18.57**
Satellite downlink EIRP (dBW)	43.43	43.43	43.43
Downlink Path Loss (dB)	205.76	205.76	205.76
Downlink C/T (dB)	-150.63	-151.63	-151.63
C/No (dB)	7.97	6.97	6.97
Noise BW (dB-Hz)	70.00	70.00	70.00
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.97**	**6.97**	**4.92**
Cumulative C/N (dB)	7.96	6.95	4.74
Necessary C/N (dB)	3.3	3.3	3.3
Cumulative Outroute Link Margin (dB)	**4.66**	**3.65**	**1.44**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	0.256
Spread BW (MHz):	2.048
Required C/N (dB):	2.1
Outroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	10
Required C/N (dB):	3.3
Satellite:	SES-6
Longitude (deg East):	-40.5
G/T towards Remote (dB/K):	0.00
G/T towards NOC (dB/K):	1.25
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49
Saturated EIRP towards remote (dBW):	47.7
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**42.93**
Downlink EIRP Inroute (dBW):	**14.18**
Remote:	San Juan
Latitude (deg North):	18.44
Longitude (deg East):	-66
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	40.2
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-17.89**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 55 degrees

Inroute signal:	**QPSK 1/2**	rate	**0.256**	**Msps**	in bandwidth	**2.048**	**MHz**
Outroute signal:	**QPSK 2/3**	rate	**10**	**Msps**	in bandwidth	**10**	**MHz**

		Lat	Long
Remote:	San Juan	18.44	-66
NOC:	Betzdorf	49.69	6.33

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	38.00	37.00	37.00
Uplink Path Loss (dB)	206.87	206.87	206.87
Spreading Loss (dB)	-162.32	-162.32	-162.32
Flux Density at Satellite (dBW/m^2)	-124.32	-125.32	-125.32
Uplink C/T (dB)	-168.87	-169.87	-169.87
C/No (dB)	59.73	58.73	58.73
Noise BW (dB-Hz)	54.08	54.08	54.08
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**5.65**	**4.65**	**4.16**
Satellite downlink EIRP (dBW)	15.18	14.18	14.18
Downlink Path Loss (dB)	206.04	206.04	206.04
Downlink C/T (dB)	-153.63	-156.63	-156.63
C/No (dB)	74.97	71.97	71.97
Noise BW (dB-Hz)	54.08	54.08	54.08
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**20.89**	**17.89**	**15.03**
Cumulative C/N (dB)	5.52	4.45	3.82
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**3.42**	**2.35**	**1.72**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 55 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:	Betzdorf
Latitude (deg North):	49.69
Longitude (deg East):	6.33
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-13.98**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.53	207.53	207.53
Spreading Loss (dB)	-162.98	-162.98	-162.98
Flux Density at Satellite (dBW/m^2)	-82.88	-84.88	-84.88
Uplink C/T (dB)	-126.18	-128.18	-128.18
C/No (dB)	102.42	100.42	100.42
Noise BW (dB-Hz)	70.00	70.00	70.00
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**32.42**	**30.42**	**18.57**
Satellite downlink EIRP (dBW)	42.93	42.93	42.93
Downlink Path Loss (dB)	205.38	205.38	205.38
Downlink C/T (dB)	-150.75	-151.75	-151.75
C/No (dB)	7.85	6.85	6.85
Noise BW (dB-Hz)	70.00	70.00	70.00
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.85**	**6.85**	**4.85**
Cumulative C/N (dB)	7.84	6.83	4.67
Necessary C/N (dB)	3.3	3.3	3.3
Cumulative Outroute Link Margin (dB)	**4.54**	**3.53**	**1.37**

SES-6 Link Budgets

Applicable to transmissions up to skew angles of 25, 35, 45, and 55 degrees, and EIRP densities of:

13.7 dBW/4 kHz: 25, 35, and 45 degrees slew

11.9 dBW/4 kHz: 55 degrees skew

Applicable transmit power and emission bandwidth:

45 dBm, 4.096 MHz: 25, 35, and 45 degrees slew

43.2 dBm, 4.096 MHz: 55 degrees slew

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	1.024
Spread BW (MHz):	4.096
Required C/N (dB):	2.1
Outroute Signal:	QPSK 2/3
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	3.3
Satellite:	SES-6
Longitude (deg East):	-40.5
G/T towards Remote (dB/K):	0.40
G/T towards NOC (dB/K):	1.25
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49
Saturated EIRP towards remote (dBW):	47.7
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**47.70**
Downlink EIRP Inroute (dBW):	**18.97**
Remote:	estone Maine (Loring)
Latitude (deg North):	46.95
Longitude (deg East):	-67.89
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 25 degrees

Inroute signal:	**QPSK 1/2**	rate	**1.024**	**Msps**	in bandwidth	**4.096**	**MHz**	
Outroute signal:	**QPSK 2/3**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**	

		Lat	Long
Remote:	Limestone Maine (Lorin	46.95	-67.89
NOC:	Betzdorf	49.69	6.33

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	207.28	207.28	207.28
Spreading Loss (dB)	-162.73	-162.73	-162.73
Flux Density at Satellite (dBW/m^2)	-119.93	-120.93	-120.93
Uplink C/T (dB)	-164.08	-165.08	-165.08
C/No (dB)	64.52	63.52	63.52
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**4.42**	**3.42**	**3.04**
Satellite downlink EIRP (dBW)	19.97	18.97	18.97
Downlink Path Loss (dB)	206.04	206.04	206.04
Downlink C/T (dB)	-148.84	-151.84	-151.84
C/No (dB)	79.76	76.76	76.76
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**19.66**	**16.66**	**14.35**
Cumulative C/N (dB)	4.29	3.21	2.73
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**2.19**	**1.11**	**0.63**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 25 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Betzdorf
Latitude (deg North):	49.69
Longitude (deg East):	6.33
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.53	207.53	207.53
Spreading Loss (dB)	-162.98	-162.98	-162.98
Flux Density at Satellite (dBW/m^2)	-82.88	-84.88	-84.88
Uplink C/T (dB)	-126.18	-128.18	-128.18
C/No (dB)	102.42	100.42	100.42
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**27.65**	**25.65**	**18.03**
Satellite downlink EIRP (dBW)	47.70	47.70	47.70
Downlink Path Loss (dB)	205.79	205.79	205.79
Downlink C/T (dB)	-146.39	-147.39	-147.39
C/No (dB)	7.44	6.44	6.44
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.44**	**6.44**	**4.58**
Cumulative C/N (dB)	7.40	6.39	4.39
Necessary C/N (dB)	3.3	3.3	3.3
Cumulative Outroute Link Margin (dB)	**4.10**	**3.09**	**1.09**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	1.024
Spread BW (MHz):	4.096
Required C/N (dB):	2.1
Outroute Signal:	QPSK 3/4
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	4.2
Satellite:	SES-6
Longitude (deg East):	-40.5
G/T towards Remote (dB/K):	1.20
G/T towards NOC (dB/K):	1.25
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49
Saturated EIRP towards remote (dBW):	48.2
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**48.20**
Downlink EIRP Inroute (dBW):	**19.82**
Remote:	Providence
Latitude (deg North):	41.72
Longitude (deg East):	-71.43
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 35 degrees

Inroute signal:	**QPSK 1/2**	rate	**1.024**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 3/4**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Providence	41.72	-71.43
NOC:	Betzdorf	49.69	6.33

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	207.23	207.23	207.23
Spreading Loss (dB)	-162.68	-162.68	-162.68
Flux Density at Satellite (dBW/m^2)	-119.88	-120.88	-120.88
Uplink C/T (dB)	-163.23	-164.23	-164.23
C/No (dB)	65.37	64.37	64.37
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**5.27**	**4.27**	**3.82**
Satellite downlink EIRP (dBW)	20.82	19.82	19.82
Downlink Path Loss (dB)	206.04	206.04	206.04
Downlink C/T (dB)	-147.99	-150.99	-150.99
C/No (dB)	80.61	77.61	77.61
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**20.51**	**17.51**	**14.83**
Cumulative C/N (dB)	5.14	4.07	3.49
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**3.04**	**1.97**	**1.39**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 35 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Betzdorf
Latitude (deg North):	49.69
Longitude (deg East):	6.33
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.53	207.53	207.53
Spreading Loss (dB)	-162.98	-162.98	-162.98
Flux Density at Satellite (dBW/m^2)	-82.88	-84.88	-84.88
Uplink C/T (dB)	-126.18	-128.18	-128.18
C/No (dB)	102.42	100.42	100.42
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**27.65**	**25.65**	**18.03**
Satellite downlink EIRP (dBW)	48.20	48.20	48.20
Downlink Path Loss (dB)	205.74	205.74	205.74
Downlink C/T (dB)	-145.84	-146.84	-146.84
C/No (dB)	7.99	6.99	6.99
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.99**	**6.99**	**4.94**
Cumulative C/N (dB)	7.95	6.94	4.73
Necessary C/N (dB)	4.2	4.2	4.2
Cumulative Outroute Link Margin (dB)	**3.75**	**2.74**	**0.53**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	1.024
Spread BW (MHz):	4.096
Required C/N (dB):	2.1
Outroute Signal:	QPSK 3/4
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	4.2
Satellite:	SES-6
Longitude (deg East):	-40.5
G/T towards Remote (dB/K):	0.50
G/T towards NOC (dB/K):	1.25
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49
Saturated EIRP towards remote (dBW):	48.2
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**48.20**
Downlink EIRP Inroute (dBW):	**19.10**
Remote:	Washington DC
Latitude (deg North):	38.85
Longitude (deg East):	-77.04
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	45
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-16.10**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 45 degrees

Inroute signal:	**QPSK 1/2**	rate	**1.024**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 3/4**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	Long
Remote:	Washington DC	38.85	-77.04
NOC:	Betzdorf	49.69	6.33

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	42.80	41.80	41.80
Uplink Path Loss (dB)	207.25	207.25	207.25
Spreading Loss (dB)	-162.70	-162.70	-162.70
Flux Density at Satellite (dBW/m^2)	-119.90	-120.90	-120.90
Uplink C/T (dB)	-163.95	-164.95	-164.95
C/No (dB)	64.65	63.65	63.65
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**4.55**	**3.55**	**3.16**
Satellite downlink EIRP (dBW)	20.10	19.10	19.10
Downlink Path Loss (dB)	206.04	206.04	206.04
Downlink C/T (dB)	-148.71	-151.71	-151.71
C/No (dB)	79.89	76.89	76.89
Noise BW (dB-Hz)	60.10	60.10	60.10
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**19.79**	**16.79**	**14.42**
Cumulative C/N (dB)	4.42	3.35	2.85
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**2.32**	**1.25**	**0.75**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 45 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Betzdorf
Latitude (deg North):	49.69
Longitude (deg East):	6.33
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.53	207.53	207.53
Spreading Loss (dB)	-162.98	-162.98	-162.98
Flux Density at Satellite (dBW/m^2)	-82.88	-84.88	-84.88
Uplink C/T (dB)	-126.18	-128.18	-128.18
C/No (dB)	102.42	100.42	100.42
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**27.65**	**25.65**	**18.03**
Satellite downlink EIRP (dBW)	48.20	48.20	48.20
Downlink Path Loss (dB)	205.76	205.76	205.76
Downlink C/T (dB)	-145.86	-146.86	-146.86
C/No (dB)	7.97	6.97	6.97
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.97**	**6.97**	**4.92**
Cumulative C/N (dB)	7.92	6.91	4.72
Necessary C/N (dB)	4.2	4.2	4.2
Cumulative Outroute Link Margin (dB)	**3.72**	**2.71**	**0.52**

Inroute Signal:	QPSK 1/2
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Baseband BW (MHz):	0.512
Spread BW (MHz):	4.096
Required C/N (dB):	2.1
Outroute Signal:	QPSK 3/4
Uplink Frequency (MHz):	14250
Downlink Frequency (MHz):	12000
Bandwidth (MHz):	30
Required C/N (dB):	4.2
Satellite:	SES-6
Longitude (deg East):	-40.5
G/T towards Remote (dB/K):	0.00
G/T towards NOC (dB/K):	1.25
G/T Degradation (dB):	0
Saturation Flux Density (dBW/m^2):	-90.5
Saturated EIRP towards NOC (dBW):	49
Saturated EIRP towards remote (dBW):	47.7
Attenuation Setting (dB):	0
Downlink EIRP Outroute (dBW):	**47.70**
Downlink EIRP Inroute (dBW):	**17.18**
Remote:	San Juan
Latitude (deg North):	18.44
Longitude (deg East):	-66
TX Antenna Gain (dBi):	28.80
TX Power (dBm):	43.2
TX Backoff (dB):	1
Power into flange (dBW/4 kHz):	**-17.90**
RX G/T (dB/K):	11.70
Antenna Mispoint (dB):	0.5
Rain Attenuation (dB):	0
Atmospheric Attenuation (dB):	0.5
Inroute Uplink Interference	
Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-17.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-20.0
Cumulative Interf. Uplink (dB):	**-13.88**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 55 degrees

Inroute signal:	**QPSK 1/2**	rate	**0.512**	**Msps**	in bandwidth	**4.096**	**MHz**
Outroute signal:	**QPSK 3/4**	rate	**30**	**Msps**	in bandwidth	**30**	**MHz**

		Lat	**Long**
Remote:	San Juan	18.44	-66
NOC:	Betzdorf	49.69	6.33

Inroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	41.00	40.00	40.00
Uplink Path Loss (dB)	206.87	206.87	206.87
Spreading Loss (dB)	-162.32	-162.32	-162.32
Flux Density at Satellite (dBW/m^2)	-121.32	-122.32	-122.32
Uplink C/T (dB)	-165.87	-166.87	-166.87
C/No (dB)	62.73	61.73	61.73
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-13.88
Uplink C/N (dB)	**5.64**	**4.64**	**4.15**
Satellite downlink EIRP (dBW)	18.18	17.18	17.18
Downlink Path Loss (dB)	206.04	206.04	206.04
Downlink C/T (dB)	-150.63	-153.63	-153.63
C/No (dB)	77.97	74.97	74.97
Noise BW (dB-Hz)	57.09	57.09	57.09
Interference (dB)	N/A	N/A	-18.19
Downlink C/N (dB)	**20.88**	**17.88**	**15.02**
Cumulative C/N (dB)	5.51	4.43	3.81
Necessary C/N (dB)	2.10	2.10	2.10
Cumulative Inroute Link Margin (dB)	**3.41**	**2.33**	**1.71**

Link Budget for satellite SES-6 at -40.5 degrees

Skew operational limit: 55 degrees

Outroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-10.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-20.0
Cumulative Interf. Downlink (dB):	**-9.17**

NOC:

	Betzdorf
Latitude (deg North):	49.69
Longitude (deg East):	6.33
Antennna diameter (m):	9 m
RX Antenna Gain (dBi):	58.5
Antenna Noise Temp (K):	64
Antenna LNA Temp (K):	70
Total Noise Temp (K):	134
Antenna G/T (dB/K):	37.23
TX Antenna Gain (dBi):	60.1
TX power (dBm):	50
TX backoff (dB):	0
Power into flange (dBW/ 4 kHz):	**-18.75**
Antenna mis-point (dB):	0.5
Rain Attenuation (dB):	1
Atmospheric Attenuation (dB):	0.5

Inroute Downlink Interference

Adjacent Channel Downlink (dB):	-30.0
Adjacent Satellite Downlink (dB):	-25.0
Cross-Pol Downlink (dB):	-20.0
Intermod Downlink (dB):	-30.0
Cumulative Interf. Downlink (dB):	**-18.19**

Outroute Uplink Interference

Adjacent Channel Uplink (dB):	-30.0
Adjacent Satellite Uplink (dB):	-30.0
Cross-Pol Uplink (dB):	-20.0
Intermod Uplink (dB):	-30.0
Cumulative Interf. Uplink (dB):	**-18.86**

Outroute Path:	**Ideal Link**	**Mispoint/ Rain/ Atmospheric Losses**	**Intermod/ Satellite/ Cross-pol Interference**
EIRP towards satellite (dBW)	80.10	78.10	78.10
Uplink Path Loss (dB)	207.53	207.53	207.53
Spreading Loss (dB)	-162.98	-162.98	-162.98
Flux Density at Satellite (dBW/m^2)	-82.88	-84.88	-84.88
Uplink C/T (dB)	-126.18	-128.18	-128.18
C/No (dB)	102.42	100.42	100.42
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-18.86
Uplink C/N (dB)	**27.65**	**25.65**	**18.03**
Satellite downlink EIRP (dBW)	47.70	47.70	47.70
Downlink Path Loss (dB)	205.38	205.38	205.38
Downlink C/T (dB)	-145.98	-146.98	-146.98
C/No (dB)	7.85	6.85	6.85
Noise BW (dB-Hz)	74.77	74.77	74.77
Interference (dB)	N/A	N/A	-9.17
Downlink C/N (dB)	**7.85**	**6.85**	**4.85**
Cumulative C/N (dB)	7.81	6.79	4.64
Necessary C/N (dB)	4.2	4.2	4.2
Cumulative Outroute Link Margin (dB)	**3.61**	**2.59**	**0.44**

Exhibit B

SES Coordination Certification Letter

SES

Federal Communications Commission
International Bureau
445 12th Street, S.W.
Washington, D.C. 20554

March 17, 2015

Re: Engineering Certification Concerning AMC-2, AMC-9, SES-1 & SES-6

To Whom It May Concern:

This letter certifies that SES is aware that Row 44, Inc. ("Row 44") is planning to seek a modification ("Modification Application") of its blanket authorization from the Federal Communications Commission ("FCC") to operate technically identical Ku-band transmit/receive Earth Stations Aboard Aircraft ("ESAA") under Call Sign E080100. SES understands that Row 44 will be filing the Modification Application pursuant to the current ESAA Rules, including Section 25.227, and that it will propose an increase in EIRP in some cases, addition of new emissions and frequencies, and changes in maximum skew angle in order to improve system capacity on North American routes.

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SES notes that the proposed operations of the Row 44 ESAA terminals at the off-axis EIRP density levels and other operating parameters provided to SES and reflected in the Technical Annex (Exhibit A) to be submitted with Row 44's Modification Application comply with the Section 25.227(a) off-axis EIRP density mask in the plane of the geostationary satellite orbit ("GSO") and therefore no further coordination with GSO operators is required for these operations on AMC-9 at 83° W.L. or SES-1 at 101° W.L., which are currently included as points of communication in the Row 44 license, as well as on AMC-2 at 80.85° W.L. or SES-6 at 40.5° W.L., which Row 44 seeks to add via its proposed modification. SES also acknowledges that the proposed operation of the Row 44 terminals has the potential to create harmful interference to satellite networks adjacent to these satellites that may be unacceptable. If the FCC authorizes the modified operation that Row 44 proposes, SES will include the power density levels specified by Row 44 in all future satellite network coordination agreements it completes with other operators with respect to these satellites, and Row 44 will comply with all such coordination agreements reached by SES.

Sincerely,

Kimberly M. Baum
Vice President, Spectrum Management and Development Americas
SES Americom, Inc.

Exhibit C
Radiation Hazard Analysis

Introduction

This exhibit constitutes the Radiation Hazard Analysis for Row 44's transmitter considering the FCC procedure outlined in FCC Bulletin #65. The limit for exposure to RF energy, (frequencies greater than 1.5 GHz), is 5 mW/cm^2 up to a 6 minute duration (categorized as Occupational / 'Controlled Exposure'), and 1 mW/cm^2 up to a 30 minute duration (categorized as General Population / 'Uncontrolled Exposure').[1]

Analysis regarding radiation exposure is presented considering behavior in the Near Field, Far Field and Transition 'regions'. Appropriate separation-distances are provided for the 'Controlled' and 'Uncontrolled Exposure' scenarios, considering individuals located in the direction of either the antenna's main beam or its side-lobes.

Analysis

The extent of the Near Field region in the main beam is defined as distances out to a radius R_{nf} according to the relation

$$R_{nf} = D^2/4\lambda$$

where D is the antenna panel width and λ is the transmit wavelength.

The Near Field maximum Power Density, S_{nf}, is determined from

$$S_{nf} = 0.1\eta\ P_{PA}/A \text{ (in } mW/cm^2)$$

where P_{PA} is the transmit power (after cable losses), A is the surface area of the antenna aperture, and η the efficiency of the antenna aperture. (With an antenna height h, the surface area A = Dh.)

The Far Field region for the main beam is defined as beginning and continuing out-from a radius R_{ff}, given by

$$R_{ff} = 0.60\ D^2/\lambda$$

[1] "Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields," Federal Communications Commission, Office of Engineering and Technology, Bulletin 65, Fourth Edition, August, 1999, p.15.
http://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet56/oet56e4.pdf

The Far Field Power Density S_{ff} at the Far Field radius and farther is determined (in terms of the EIRP, denoted by P_{EIRP}) from

$$S_{ff} = P_{EIRP}/4\pi R_{ff}^2 \text{ (in mW/cm}^2\text{)}$$

(The value of P_{EIRP} should already consider coax losses and aperture efficiency.)

Note that when the radius is expressed in meters, the Power Density is in units of W/m^2. The results are converted to units consistent with the FCC limits (mW/cm^2) by multiplying values in W/m^2 by 0.1.

Exposure from the Main Antenna Beam

Row 44's antenna has dimensions D = 0.625 m (24.6"), h = 0.157 m (6.2"), and a surface area A = $0.098m^2$. At the highest transmit frequency of 14.5 GHz, the wavelength is 0.0207 m. The Near Field radius is then

R_{nf} = 4.72 m

The antenna aperture efficiency factor is 0.93 and the feeder coax loss is 4.58 dB.

Based on the wavelength and panel-width given farther above, the Far Field radius is then

R_{ff} = 11.33 m

In the operation of Row 44's system, the antenna may be fed with ten different signal levels, as provided in Tables 1 and 2. The associated Near Field radius Power Density values are:

Table 1 Transmit Power and Near Field Power Density at Distance Rnf

Transmit power (dBm)	EIRP (dBW)	S_{nf} (mW/cm^2)
45.0	43.8	10.4
44.5	43.3	9.30
43.2	42.0	6.90
43.0	41.8	6.59
42.0	40.8	5.23
41.5	40.3	4.66
40.2	39.0	3.46
40.0	38.8	3.30
39.0	37.8	2.62
37.2	36.0	1.73

(Note that the equation for the maximum Power Density in the Near Field considers a given radiated signal/ power confined-to and passing-through a physical area

corresponding to that of the antenna aperture. Along these lines, the Snf values cannot be assumed to vary with distance from the antenna, for locations within the Near Field.)

The associated Far Field radius Power Density values are as well:

Table 2 Transmit Power, EIRP and Far Field Power Density at Distance Rff

Transmit power (dBm)	EIRP (dBW)	S_{ff} (mW/cm^2)
45.0	43.8	1.49
44.5	43.3	1.33
43.2	42.0	.983
43.0	41.8	.939
42.0	40.8	.746
41.5	40.3	.664
40.2	39.0	.493
40.0	38.8	.470
39.0	37.8	.374
37.2	36.0	.247

We are considering exposure to two values of Power Density: 5 mW/cm^2 and 1 mW/cm^2.

5 mW/cm^2 Analysis

Some of the Snf values in Table 1 are greater than 5 mW/cm^2, and some are less than 5 mW/cm^2. As the Near Field analysis assumes that the Power Density in the Near Field does not vary with distance, for cases where Snf exceeds 5 mW/cm^2, there is no location in the Near Field where the Power Density is less. An individual therefore cannot be located in the Near Field anywhere whatsoever at all to avoid such an exposure level. We'll defer this analysis to the 'Transition Region' between the Near and Far Fields:

Assuming that the Power Density decreases linearly between the Near Field radius and the Far Field radius, the distance at which the Power Density will equal 5 mW/cm^2 (for the selected TX powers) is given in Table 3.

Table 3 Separation for 'Controlled Exposure' Limit (Main Beam)

Transmit power (dBm)	Separation for 'Controlled' Limit (5 mW/cm^2)	
	meters	feet
45.0	8.74	28.7
44.5	8.29	27.2
43.2	6.84	22.4
43.0	6.58	21.6
42.0	5.06	16.6

Somewhat similar to the above, applicable to cases where Snf is less than 5 mW/cm^2, in attempting to determine the location at which the Power Density may equal 5 mW/cm^2, we cannot project a location closer than Rnf.

For such cases in the Near Field, we shall adopt a precautionary stance, and will assign (Table 4) the Near Field radius of 4.72 meters (15.5 feet) as the minimum physical separation to facilitate an exposure no greater than 5 mW/cm^2.

Table 4 Separation for 'Controlled Exposure' Limit (Main Beam)

Transmit power (dBm)	Separation for 'Controlled' Limit (5 mW/cm^2)	
	meters	feet
41.5	4.72	15.5
40.2	4.72	15.5
40.0	4.72	15.5
39.0	4.72	15.5
37.2	4.72	15.5

1 mW/cm^2 Analysis

As the Snf values are each greater than 1 mW/cm^2, we need consider distances greater than Rnf where the 1 mW/cm^2 will be encountered:

The EIRP and the resulting Far Field Power Density at distance Rff are once again provided in Table 5 for each transmit power value:

Table 5 Transmit Power, EIRP and Far Field Power Density at Distance Rff

Transmit power (dBm)	EIRP (dBW)	S_{ff} (mW/cm^2)
45.0	43.8	1.49
44.5	43.3	1.33
43.2	42.0	.983
43.0	41.8	.939
42.0	40.8	.746
41.5	40.3	.664
40.2	39.0	.493
40.0	38.8	.470
39.0	37.8	.374
37.2	36.0	.247

Some Sff values exceed 1 mW/cm^2, and some do not.

For the TX levels where Sff is greater than 1 mW/cm^2, we'll use standard 'inverse-squared' analysis to identify the necessary separations listed in Table 6:

Table 6 Separation for 'Uncontrolled Exposure' Limit (Main Beam)

Transmit power (dBm)	Separation for 'Uncontrolled' Limit of 1 mW/cm^2 (m)	Separation for 'Uncontrolled' Limit of 1 mW/cm^2 (feet)
45.0	13.8	45.3
44.5	13.0	42.7

For the remaining TX levels, we need interpolate the Power Density values between Rnf and Rff to project the location at which 1 mW/cm^2 exists.

Assuming that the Power Density decreases linearly between the Near Field radius and the Far Field radius, the distances at which the Power Density equals 1 mW/cm^2 are projected according to Table 7.

Table 7 Separation for 'Uncontrolled Exposure' Limit (Main Beam)

Transmit power (dBm)	Separation for 'Uncontrolled' Limit (1 mW/cm^2)	
	meters	feet
43.2	11.3	37.1
43.0	11.3	37.1
42.0	11.0	36.1
41.5	10.8	35.4
40.2	10.2	33.5
40	10.1	33.1
39	9.49	31.1
37.2	7.98	26.2

Exposure from Antenna Beam Side-Lobes

The previous calculations assumed the individual was located in the 'sight' of the main antenna beam. (The main antenna beam is less than 10 degrees-wide in azimuth.) The following analysis provides insight into the exposure when an individual is located to-the-side or behind the antenna.

Table 8 provides Power Density values at distances R_{nf} and R_{ff} when an individual is located in the direction of the highest antenna side-lobe (which corresponds to a 12 dB gain reduction from the main beam).

Table 8 TX Power, Sidelobe Attenuation, and Power Density at Rnf and Rff

Tx power (dBm)	Sidelobe (dB)	S_{nf} (mW/cm^2)	S_{ff} (mW/cm^2)
45.0	-12	0.659	0.0939
44.5	-12	0.587	0.0837
43.2	-12	0.435	0.0620
43.0	-12	0.416	0.0592
42.0	-12	0.330	0.0470
41.5	-12	0.294	0.0419
40.2	-12	0.218	0.0311

40.0	-12	0.208	0.0297
39.0	-12	0.165	0.0236
37.2	-12	0.109	0.0156

As is obvious, neither the Snf or Sff values (at distances Rnf and Rff) exceed even the 'Uncontrolled' Limit of 1 mW/cm^2. Therefore, no minimum distance of separation will apply for individuals located in directions outside the antenna's main beam.

Summary

This document presents the radiation hazard analysis for Row 44's transmitter transmitting at EIRP values of 43.8, 43.3, 42.0, 41.8, 40.8, 40.3, 39.0, 38.8, 37.8, or 36.0 dBW. Considering the worst-case, individuals positioned in the direction of the main beam of the antenna, and in a 'Controlled Exposure' environment should be at least 8.74 meters (28.7 feet) away from the antenna aperture (for a 6 minute duration). Under the same circumstances, individuals in a 'Uncontrolled Exposure' environment should be at least 13.8 meters (45.3 feet) away from the antenna aperture (for a 30 minute duration).

For individuals located in directions which are outside the antenna's main beam, no minimum distance of separation is applicable.