

S2850 SAT-MOD-20120628-00107 IB2012001592  
Intelsat License LLC  
Intelsat 19



File # SAT-MOD-20120628-00107  
Call Sign S2850 Grant Date 01/17/13  
(or other identifier)  
Term Dates See attached  
From 01/17/13 To: conditions  
Approved: *Stephen J. Duall*  
Stephen J. Duall  
Chief, Satellite Policy Branch

Approved by OMB  
3060-0678

Date & Time Filed: Jun 28 2012 1:27:13:083PM  
File Number: SAT-MOD-20120628-00107

\*with conditions

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

APPLICANT INFORMATION

Enter a description of this application to identify it on the main menu:  
Application to Modify Authorization for Intelsat 19 (Call Sign S2850)

1-8. Legal Name of Applicant

<b>Name:</b>	Intelsat License LLC	<b>Phone Number:</b>	202-944-7848
<b>DBA Name:</b>		<b>Fax Number:</b>	202-944-7870
<b>Street:</b>	c/o Intelsat Corporation 3400 International Drive, N.W.	<b>E-Mail:</b>	susan.crandall@intelsat.com
<b>City:</b>	Washington	<b>State:</b>	DC
<b>Country:</b>	USA	<b>Zipcode:</b>	20008 -3006
<b>Attention:</b>	Susan H. Crandall		

**Intelsat License LLC**  
**IBFS File No. SAT-MOD-20120628-00107**  
**Call Sign S2850**

The application of Intelsat License LLC (Intelsat) to modify the authorization for its Intelsat 19 space station (Call Sign S2850), IBFS File No. SAT-MOD-20120628-00107, is GRANTED.<sup>1</sup> Specifically, Intelsat is authorized to operate Intelsat 19 at the 166.0° E.L. orbital location to provide Fixed-Satellite Service (FSS) in the 12.25-12.75 GHz frequency band (space-to-Earth) in International Telecommunication Union (ITU) Region 2, including portions of the United States that are within the antenna beam patterns provided by Intelsat in its application for Intelsat 19 operations at the 166.0 ° E.L. orbital location.<sup>2</sup> Operations under this authorization must be in accordance with the technical specifications contained in Intelsat's application and the Federal Communications Commission's rules not waived herein, and are subject to the following conditions:

1. Intelsat is granted a waiver of the Table of Frequency Allocations, Section 2.106 of the Commission's rules, 47 C.F.R. § 2.106, and Section 25.202(a)(1) of the Commission's rules, 47 C.F.R. § 25.202(a)(1), to provide FSS in the 12.25-12.70 GHz band in ITU Region 2, including portions of the United States that are within the antenna beam patterns provided by Intelsat in its application for Intelsat 19 operations at the 166.0° E.L. in this band. In the United States, the 12.25-12.70 GHz band is allocated to Broadcasting Satellite Service (BSS) and the Fixed Service (FS). In ITU Region 2, the 12.25-12.70 GHz band is allocated on a primary basis to BSS, FS, Mobile (except aeronautical mobile), and broadcasting service. In addition, in both the United States and ITU Region 2, the 12.25-12.70 GHz band is allocated to non-geostationary satellite orbit FSS pursuant to footnote 5.487A. There is no allocation for the type of GSO FSS that Intelsat seeks to provide in this band either in the United States or ITU Region 2. Nevertheless, a U.S.-authorized space station with a similar beam pattern has been operating in the 12.25-12.7 GHz band at the 166.0 ° E.L. orbital location for an extended time and there have been no reported instances of interference.<sup>3</sup> Further, under the ITU Region 2 BSS Plan, there is at least 18 degrees of orbital separation between Intelsat 19 at 166.0° E.L. and the nearest possible BSS network that could provide service to any portion of the ITU Region 2. Moreover, based upon the technical information in Intelsat application, we conclude that Intelsat 19's operations will comply with the PFD limits specified in Art. 21.16 of the ITU Radio Regulations.<sup>4</sup> Accordingly, we find that waiver of Section 2.106 and Section 25.202(a)(1) of the Commission's rules is justified in this instance because Intelsat 19's operations, as authorized, are unlikely to interfere with existing or future users operating in accordance with the Table of Allocations in ITU Region 2 and the Commission's rules. As a non-conforming user of the 12.25-12.7 GHz band in ITU Region 2, Intelsat must not cause harmful interference to existing and future authorized users who are operating in accordance with the Table of Allocations in ITU Region 2, and must accept interference from such authorized users. In the event Intelsat 19's operations in the 12.25-12.7 GHz band cause harmful interference to any authorized service

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<sup>1</sup> The application was placed on public notice as accepted for filing on August 3, 2012. *See Policy Branch Information, Satellite Space Applications Accepted for Filing*, Public Notice, Report No. SAT-00843, (IBFS File No. SAT-RPL-20111222-00245). No comments were received in response to the public notice.

<sup>2</sup> *See* Letter from Susan Crandall, Assistant General Counsel, Intelsat Corp., to Marlene H. Dortch, Secretary, FCC, filed Dec. 14, 2012.

<sup>3</sup> PanAmSat Licensee Corp., *Order and Authorization*, 21 FCC Rcd 36 (Sat. Div. 2006)(*PAS-5 Order*).

<sup>4</sup> ITU Radio Regulations, Art. 21.16 (2008).

**Intelsat License LLC**  
**IBFS File No. SAT-MOD-20120628-00107**  
**Call Sign S2850**

operating in accordance with the Table of Frequency Allocations in Region 2, Intelsat must immediately cease operations in that band and inform the Commission in writing within 1 business day of the interference incident.


2. Intelsat is granted a waiver of the Table of Frequency Allocations, Section 2.106 of the Commission's rules, 47 C.F.R. § 2.106, and Section 25.202(a)(1) of the Commission's rules, 47 C.F.R. § 25.202(a)(1), to use the 12.70-12.75 GHz band to provide FSS (space-to-Earth) in ITU Region 2, including portions of the United States that are within the antenna beam patterns provided by Intelsat in its application for Intelsat 19 operations at 166.0° E.L. in this band. The 12.70-12.75 GHz band is allocated to FS, FSS (Earth-to-space), and Mobile in ITU Region 2, including the United States. Nevertheless, a U.S.-authorized space station with a similar beam pattern has been operating in the 12.70-12.75 GHz band at the 166.0° E.L. orbital location for an extended time and there have been no reported instances of interference.<sup>5</sup> Accordingly, we find that waiver of Sections 2.106 and 25.202(a)(1) is justified in this instance because Intelsat 19's operations, as authorized, are unlikely to interfere with existing or future users operating in accordance with the Table of Allocations in ITU Region 2 and the Commission's rules. As a non-conforming user of the 12.7-12.75 GHz band in ITU Region 2, Intelsat must not cause harmful interference to existing and future authorized users who are operating in accordance with the Table of Allocations in ITU Region 2, and must accept interference from such authorized users. In the event Intelsat 19's operations in the 12.70-12.75 GHz band cause harmful interference to any authorized service operating in accordance with the Table of Frequency Allocations, Intelsat must immediately cease operations in that band and inform the Commission in writing within 1 business day of the interference incident.

3. Intelsat must comply with all conditions placed on the operation of Intelsat 19 at the 166.0° E.L. orbital location in IBFS File No. SAT-RPL-20111222-00245 (granted May 25, 2012), with the exception of condition 7 (excluding authority to use the 12.25-12.75 GHz frequency band in ITU Region 2). Nothing in this authorization extends the license term for this space station, Call Sign S2850, which expires on August 12, 2027.

4. Intelsat is afforded 30 days from the date of release of this authorization to decline this authorization as conditioned. Failure to respond within this period will constitute formal acceptance of the authorization as conditioned.

5. This action is issued pursuant to Section 0.261 of the Commission's rules on delegated authority, 47 C.F.R. § 0.261, and is effective immediately. Petitions for reconsideration under Section 1.106 or applications for review under Section 1.115 of the Commission's rules, 47 C.F.R. §§ 1.106, 1.115, may be filed within 30 days of the date of the public notice indicating that this action was taken.

<sup>5</sup> PAS-5 Order.

 <b>GRANTED*</b> International Bureau	<b>File #</b> <u>SAT-MOD-20120628-00107</u>
	<b>Call Sign</b> <u>S2850</u> <b>Grant Date</b> <u>01/17/13</u> (or other identifier)
	<b>Term Dates</b> <u>see attached</u>
	<b>From</b> <u>01/17/13</u> <b>To:</b> <u>conditions</u>
	<b>Approved:</b> <u>Stephen J. Duall</u> Stephen J. Duall Chief, Satellite Policy Branch

\*with conditions

9-16. Name of Contact Representative

<b>Name:</b>	Jennifer D. Hindin	<b>Phone Number:</b>	202-719-4975
<b>Company:</b>	Wiley Rein LLP	<b>Fax Number:</b>	202-719-7249
<b>Street:</b>	1776 K Street NW	<b>E-Mail:</b>	jhindin@wileyrein.com
<b>City:</b>	Washington	<b>State:</b>	DC
<b>Country:</b>	USA	<b>Zipcode:</b>	20006-
<b>Attention:</b>		<b>Relationship:</b>	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
- (N/A) b12. Application for Database Entry
- b13. Amendment to a Pending Database Entry Application
- b14. Modification of Database Entry





TYPE OF SERVICE

<p>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:</p> <p><input checked="" type="checkbox"/> a. Fixed Satellite <input type="checkbox"/> b. Mobile Satellite <input type="checkbox"/> c. Radiodetermination Satellite <input type="checkbox"/> d. Earth Exploration Satellite <input type="checkbox"/> e. Direct to Home Fixed Satellite <input type="checkbox"/> f. Digital Audio Radio Service <input type="checkbox"/> g. Other (please specify)</p>	
<p>21. STATUS: Choose the button next to the applicable status. Choose only one. <input type="radio"/> Common Carrier    <input checked="" type="radio"/> Non-Common Carrier</p>	<p>22. If earth station applicant, check all that apply. <input type="checkbox"/> Using U.S. licensed satellites <input type="checkbox"/> Using Non-U.S. licensed satellites</p>
<p>23. If applicant is providing INTERNATIONAL COMMON CARRIER service, see instructions regarding Sec. 214 filings. Choose one. Are these facilities: <input type="radio"/> Connected to a Public Switched Network    <input type="radio"/> Not connected to a Public Switched Network    <input checked="" type="radio"/> N/A</p>	
<p>24. FREQUENCY BAND(S): Place an 'X' in the box(es) next to all applicable frequency band(s). <input checked="" type="checkbox"/> a. C-Band (4/6 GHz)    <input checked="" type="checkbox"/> b. Ku-Band (12/14 GHz) <input type="checkbox"/> c. Other (Please specify upper and lower frequencies in MHz.) Frequency Lower:    Frequency Upper: (Please specify additional frequencies in an attachment)</p>	

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 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.	<input type="radio"/> Yes <input checked="" type="radio"/> No
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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?	<input type="radio"/> Yes <input checked="" type="radio"/> No
30. Is the applicant an alien or the representative of an alien?	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
31. Is the applicant a corporation organized under the laws of any foreign government?	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> 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?	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> 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 explanation 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 explanation 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 attempting 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 exhibit, 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

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). (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.)

Intelsat License LLC, pursuant to Section 25.117 of the rules of the Federal Communications Commission, hereby seeks to modify the authorization for the Intelsat 19 (Call Sign S2850) satellite. Specifically, this modification application seeks a waiver of Section 2.106 (the U.S. Table of Frequency Allocations) to permit Intelsat to operate

Narrative & Exhibits

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

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  
Susan H. Crandall

-->

46. Title of Person Signing  
Asst. General Counsel, Intelsat Corporation

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).

**FCC NOTICE REQUIRED BY THE PAPERWORK REDUCTION ACT**

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**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.**



**43. Description. (Summarize the nature of the application and the services to be provided).**

Intelsat License LLC, pursuant to Section 25.117 of the rules of the Federal Communications Commission, hereby seeks to modify the authorization for the Intelsat 19 (Call Sign S2850) satellite. Specifically, this modification application seeks a waiver of Section 2.106 (the U.S. Table of Frequency Allocations) to permit Intelsat to operate Intelsat 19 in the 12250-12750 MHz frequency band (space-to-Earth) for commercial Fixed-Satellite Service on a non-interference, non-protected basis in International Telecommunication Union Region 2.

December 14, 2012

Ms. Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 12<sup>th</sup> Street, S.W.  
Washington, DC 20554



Re: Supplement to Application for Modification of Authority for Intelsat 19  
Call Sign S2850; SAT-MOD-20120628-00107

Dear Ms. Dortch:

In response to a request from the FCC staff, Intelsat License LLC (“Intelsat”) hereby clarifies Intelsat’s waiver request in the above referenced application to operate Intelsat 19 at 166.0° E.L. in the 12250-12750 MHz frequency band. Specifically, Intelsat’s request to transmit in these frequencies “to its Napa, California, earth station, as well as in the visible portion of ITU Region 2”<sup>1</sup> means that Intelsat seeks authority to operate in the 12250-12750 MHz frequency band in the entirety of the coverage area of the following Intelsat 19 downlink beams: South West Pacific, North West Pacific, North East Pacific, Ku-band ULPC, and Global Telemetry beams. The coverage of these beams -- each of which includes at least part of ITU Region 2 -- is set forth in Exhibits 5A-14 through 5A-18, Exhibits 5B-4 through 5B-6, and Exhibit 5C-3 at pages 45-49, pages 53-55, and page 58, respectively, of the Engineering Statement included in the application SAT-RPL-20111222-00245<sup>2</sup> and attached hereto for the Commission’s convenience. These beam patterns show that Intelsat 19 will operate in a small portion of the United States in the 12250 – 12750 MHz frequency band – specifically, only in Hawaii, Alaska and the far western United States. Intelsat 19 will transmit to multiple earth stations within these beams, including to mobile antennas.

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<sup>1</sup> See *Policy Branch Information; Satellite Space Applications Accepted for Filing*, Report No. SAT-00888, File No. SAT-MOD-20120628-00107 (Aug. 3, 2012) (Public Notice) at 3.

<sup>2</sup> See *Policy Branch Information; Actions Taken*, Report No. SAT-00871, File No. SAT-RPL-20111222-00245 (June 1, 2012) (Public Notice).

Ms. Marlene H. Dortch  
December 14, 2012  
Page 2

Please direct any questions to the undersigned at (202) 944-7848.

Sincerely,

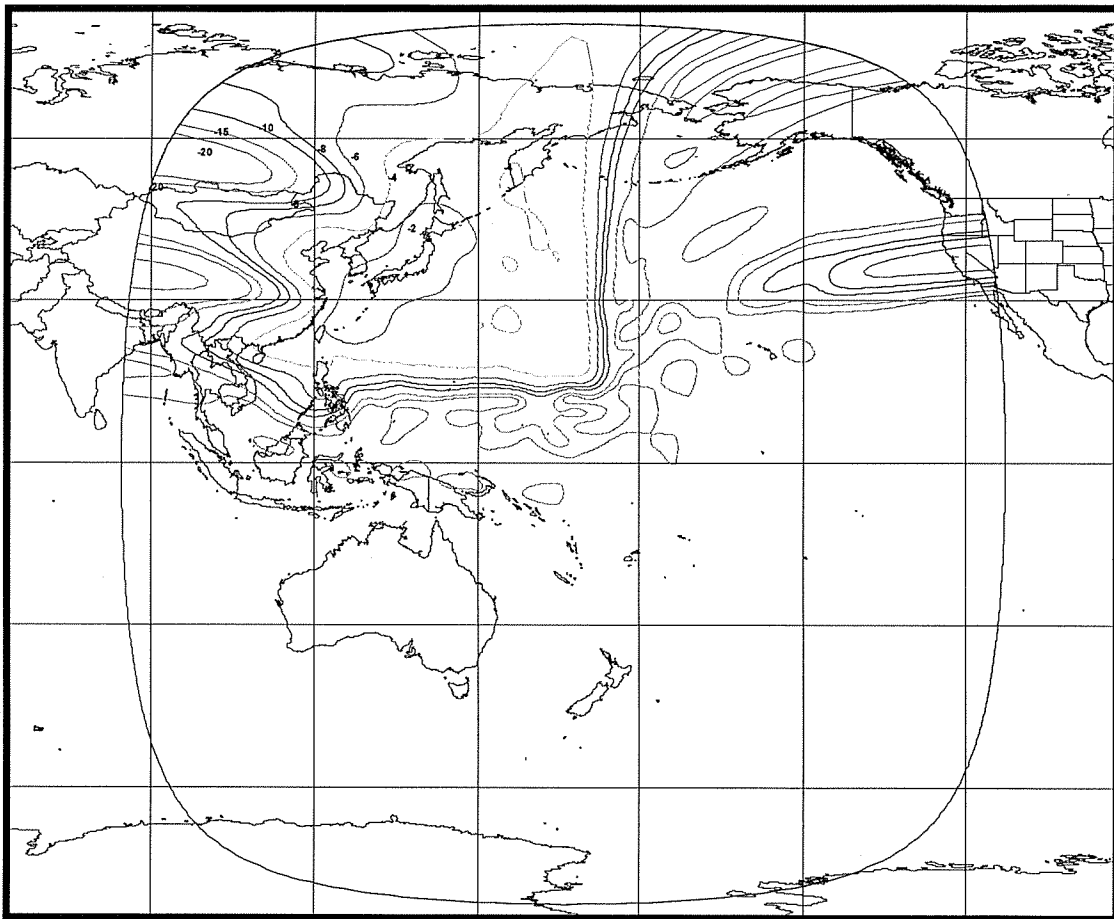
A handwritten signature in black ink, appearing to read "Susan H. Crandall". The signature is fluid and cursive, with a large initial "S" and "C".

Susan H. Crandall  
Assistant General Counsel  
Intelsat Corporation

cc: Andrea Kelly  
Stephen Duall  
Jay Whaley  
Cindy Spiers

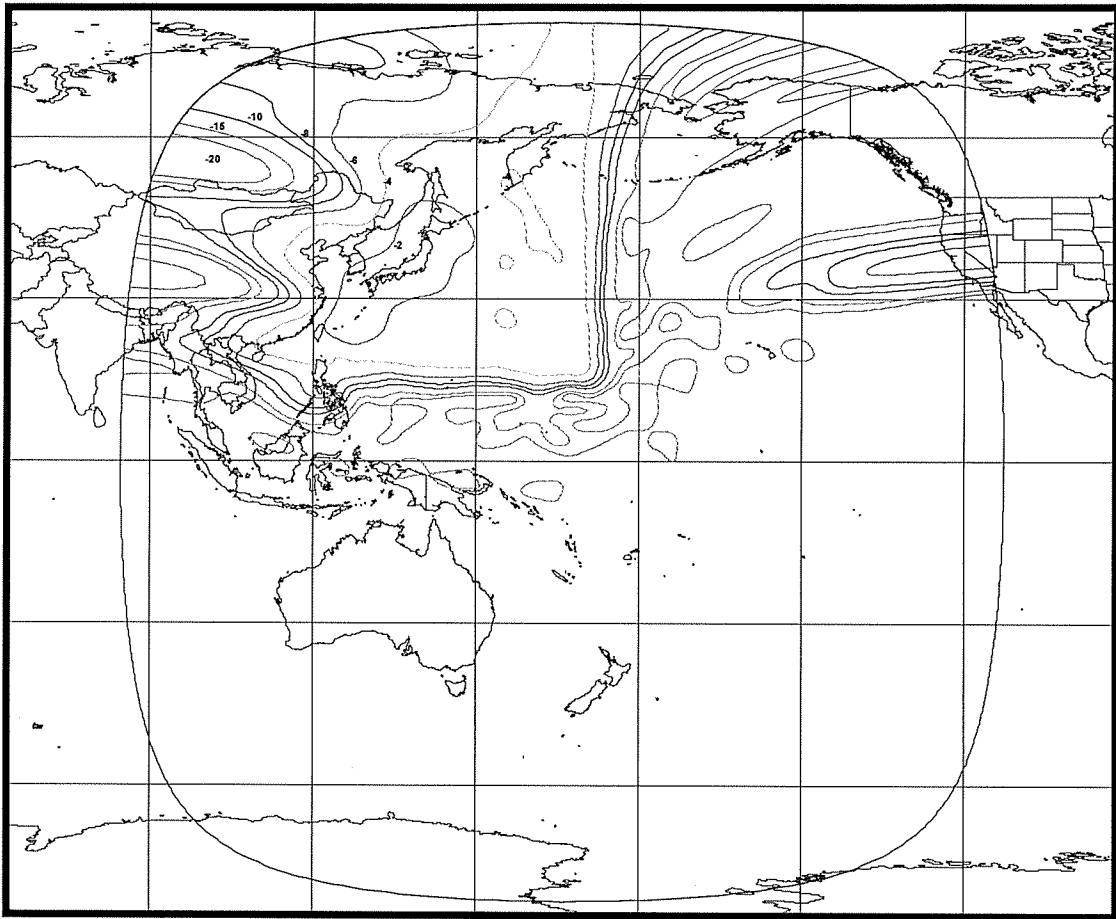
**EXHIBIT 5A-14: NORTH WEST PACIFIC TRANSMIT BEAM**  
**(Schedule S Beam ID: NWHD)**

Beam Polarization: Horizontal  
Peak Beam Gain: 31.5 dBi  
Peak Beam EIRP: 51.1 dBW



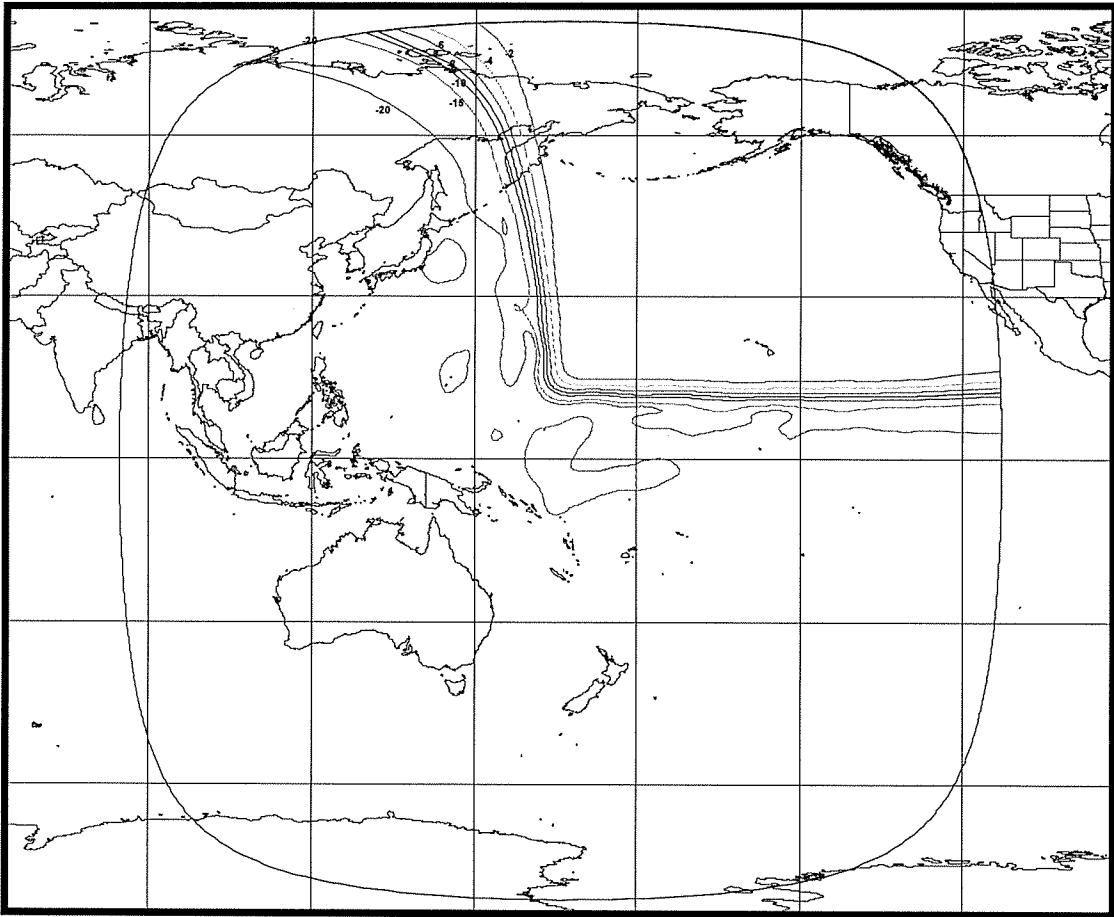
**EXHIBIT 5A-15: NORTH WEST PACIFIC TRANSMIT BEAM**  
**(Schedule S Beam ID: NWVD)**

Beam Polarization: Vertical  
Peak Beam Gain: 31.4 dBi  
Peak Beam EIRP: 51.1 dBW



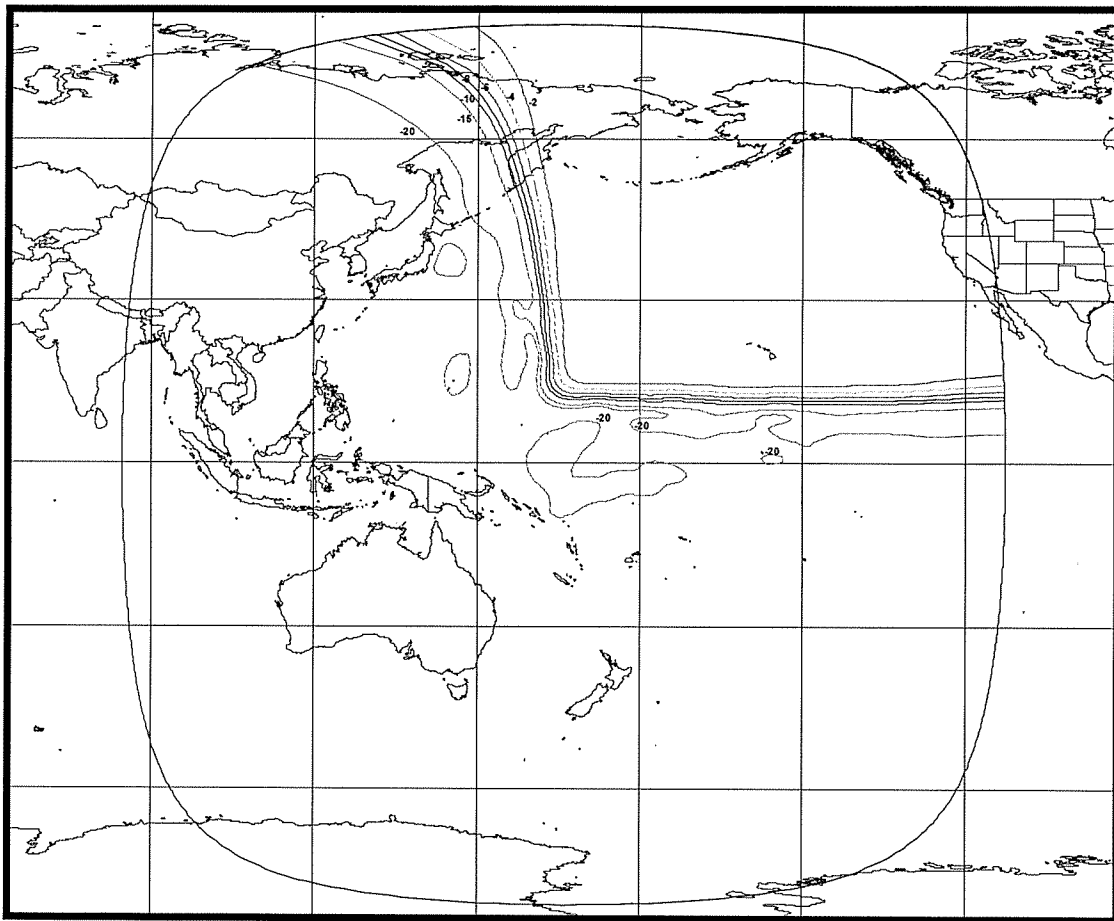
**EXHIBIT 5A-16: NORTH EAST PACIFIC TRANSMIT BEAM**  
**(Schedule S Beam ID: NEHD)**

Beam Polarization: Horizontal  
Peak Beam Gain: 28.9 dBi  
Peak Beam EIRP: 48.5 dBW



**EXHIBIT 5A-17: NORTH EAST PACIFIC TRANSMIT BEAM**  
**(Schedule S Beam ID: NEVD)**

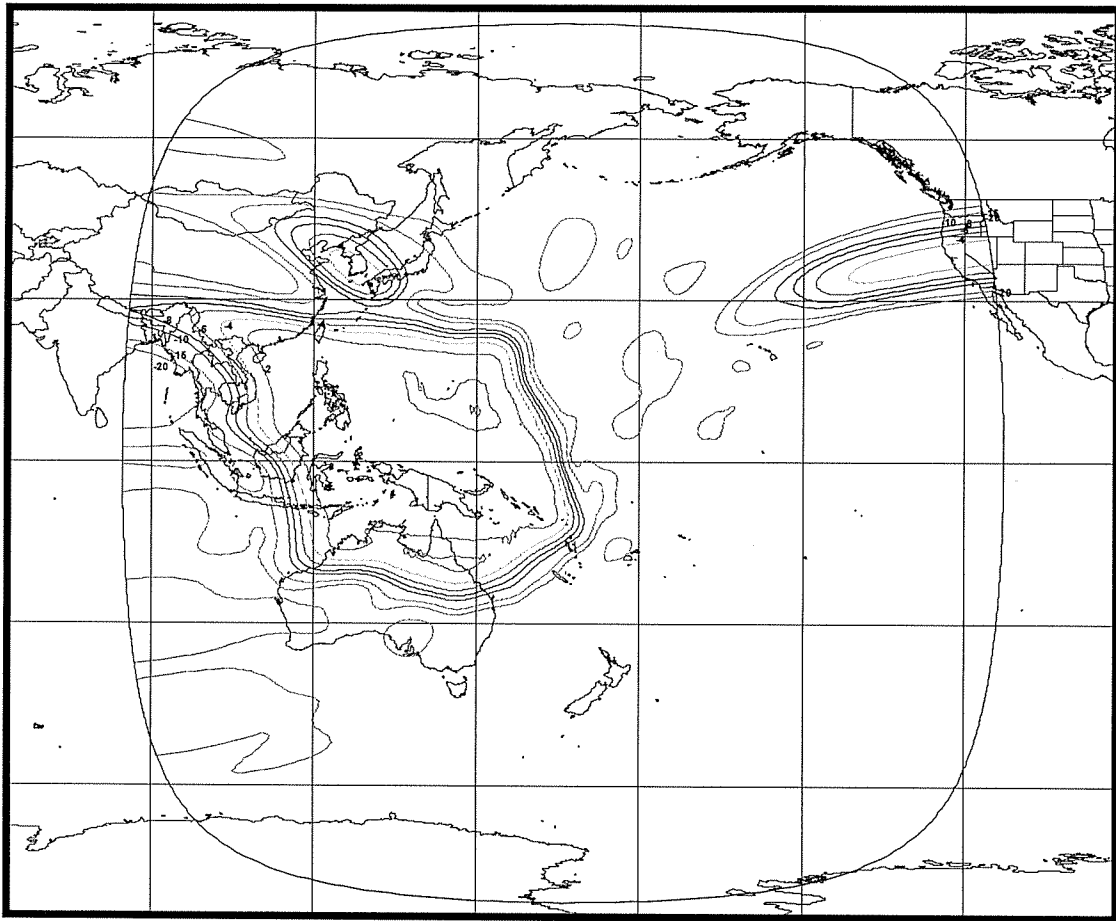
Beam Polarization: Vertical  
Peak Beam Gain: 28.8 dBi  
Peak Beam EIRP: 48.5 dBW





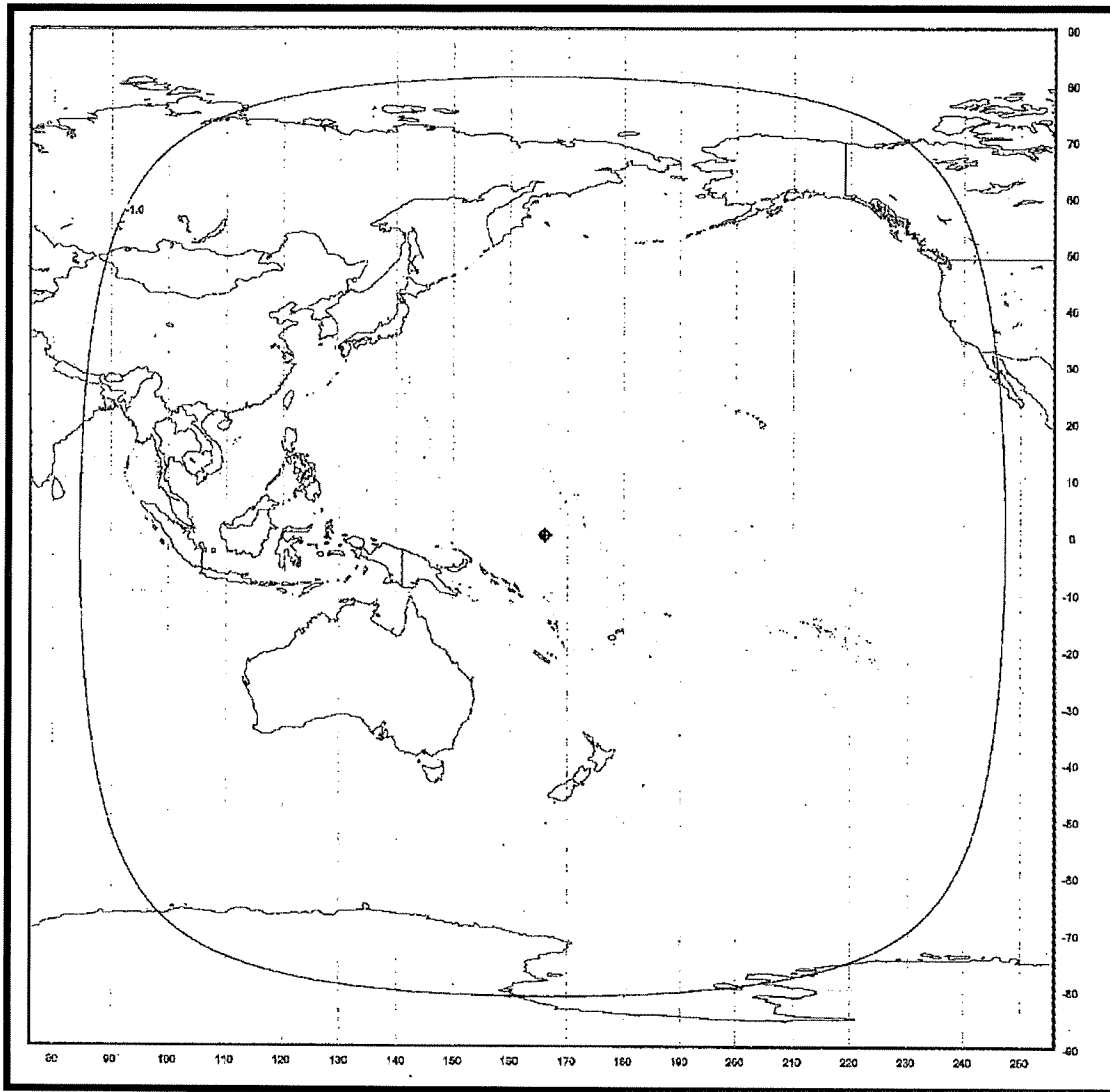
**EXHIBIT 5A-18: SOUTH WEST TRANSMIT BEAM**  
**(Schedule S Beam ID: SWVD)**

Beam Polarization: Vertical  
Peak Beam Gain: 29.3 dBi  
Peak Beam EIRP: 48.6 dBW



**EXHIBIT 5B-4: TELEMETRY TRANSMIT BEAM (on-station)**  
**(Schedule S Beam ID: TLMO)**

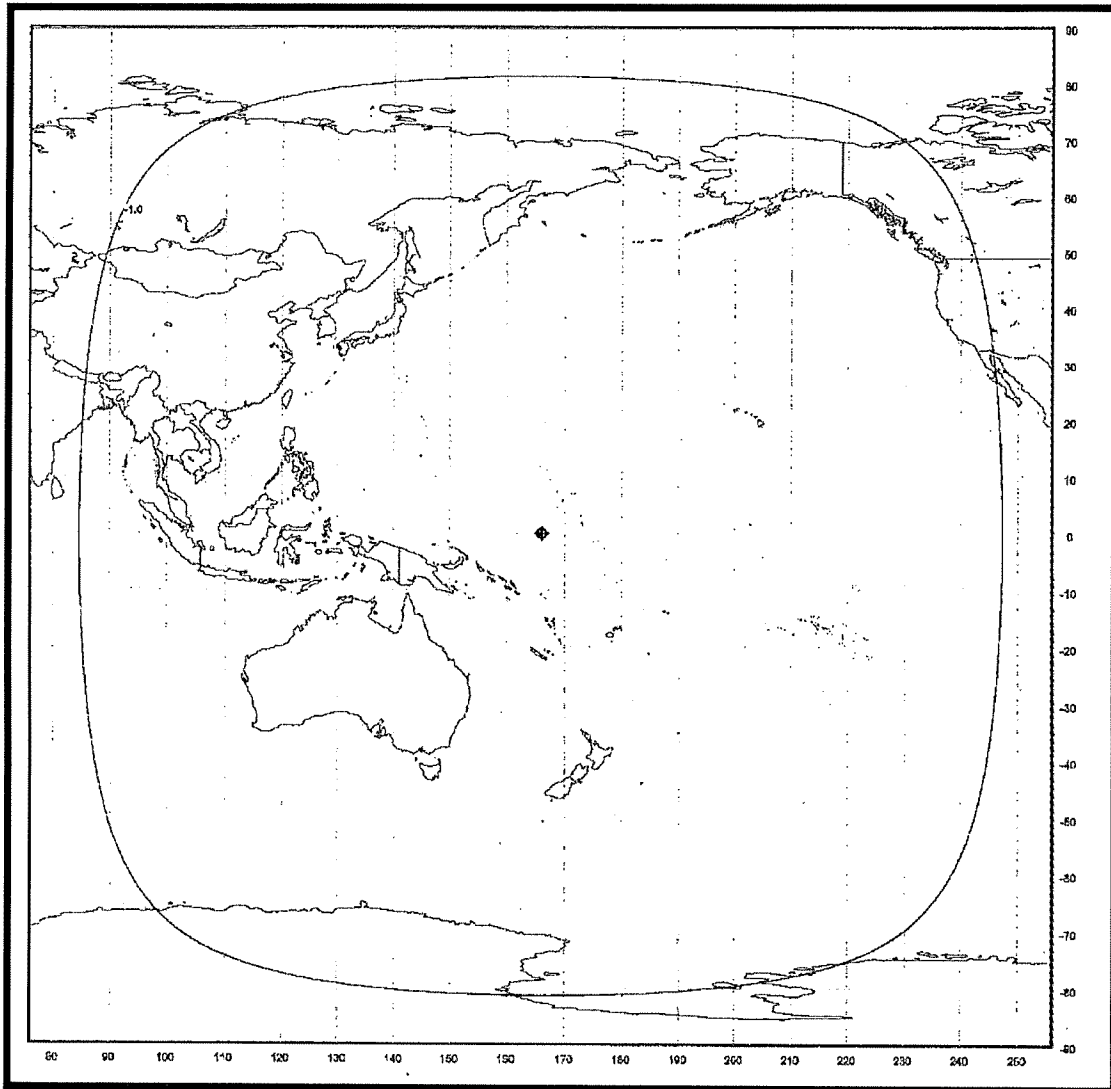
Beam Polarization: Vertical  
Peak Beam Gain: 21 dBi  
Peak Beam EIRP: 12.4 dBW



Relative Gain Contours Shown: -1 dB.

**EXHIBIT 5B-5: TELEMETRY TRANSMIT BEAM (back-up)**  
**(+Z Pipe Antenna)**  
**(Schedule S Beam ID: TLMF)**

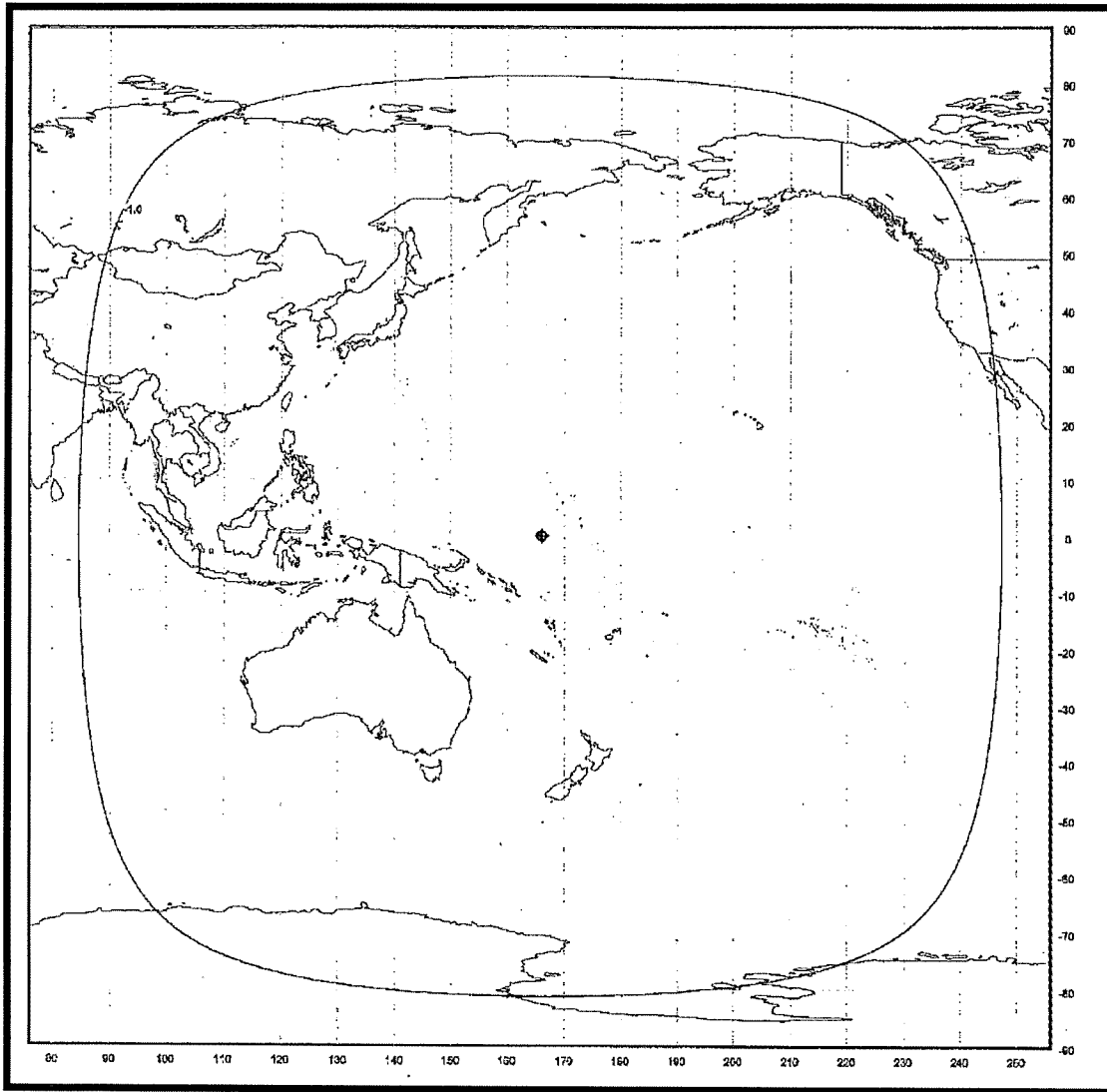
Beam Polarization: Left Hand Circular  
Peak Beam Gain: 3.0 dBi  
Peak Beam EIRP: 15.2 dBW



Relative Gain Contours Shown: -1 dB.

**EXHIBIT 5B-6: TELEMETRY TRANSMIT BEAM (back-up)**  
**(-Z Pipe Antenna)**  
**(Schedule S Beam ID: TLMA)**

Beam Polarization: Left Hand Circular  
Peak Beam Gain: 8.0 dBi  
Peak Beam EIRP: 15.5 dBW



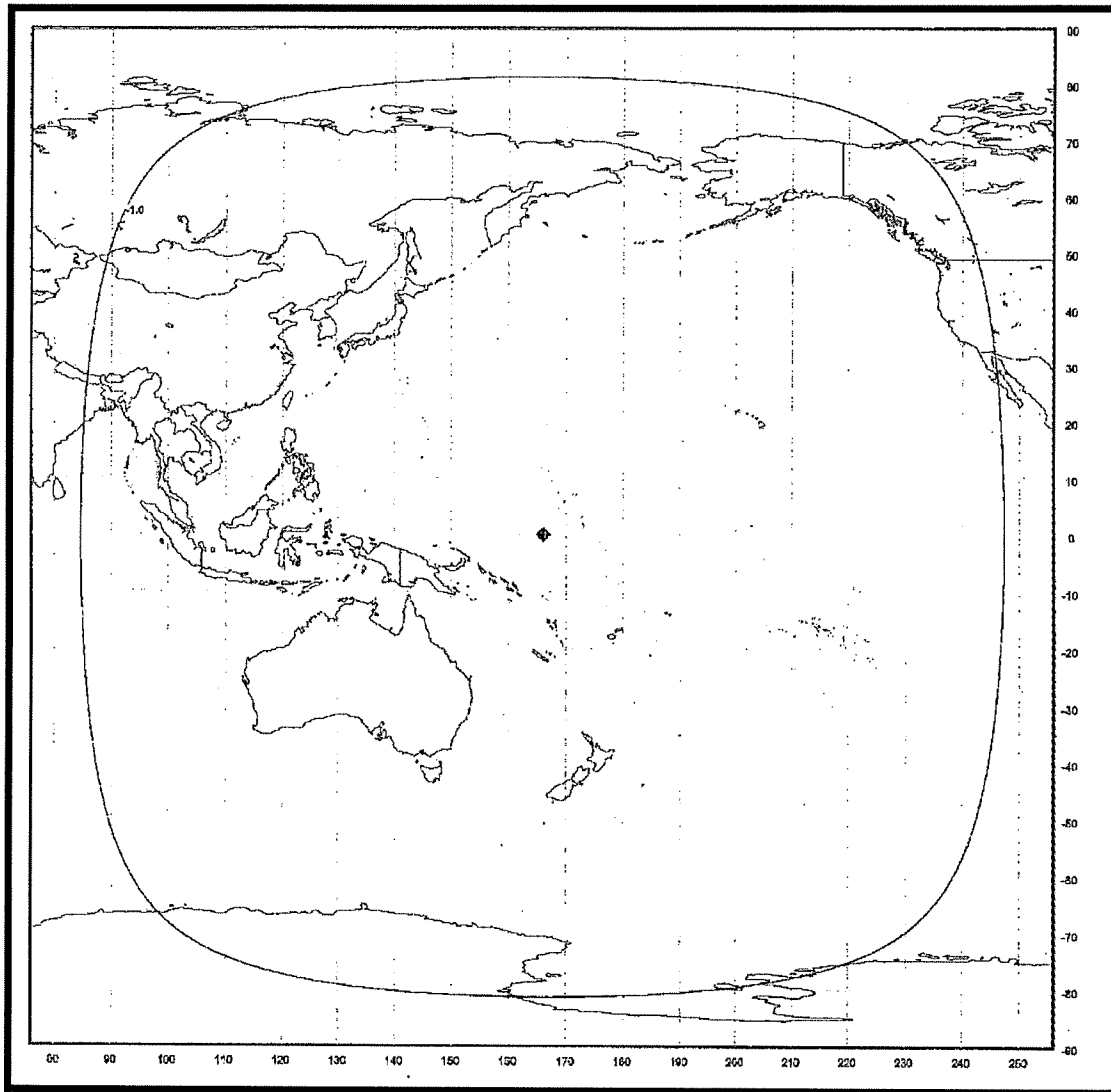
Relative Gain Contours Shown: -1 dB.

**EXHIBIT 5C-3: KU-BAND ULPC TRANSMIT BEAM**  
**(Schedule S Beam ID: UPKR)**

Beam Polarization: Right Hand Circular

Peak Beam Gain: 24.0 dBi

Peak Beam EIRP: 18.2 dBW



Relative Gain Contours Shown: -1 dB.