

Approved by OMB
3060-0678

APPLICATION FOR EARTH STATION SPECIAL TEMPORARY AUTHORITY

APPLICANT INFORMATION Enter a description of this application to identify it on the main menu:
STA Application (Melbourne, FL)

1. Applicant

Name:	Harris CapRock Communications, Inc.	Phone Number:	832-668-2753
DBA Name:		Fax Number:	832-668-2780
Street:	4400 S. Sam Houston Parkway Ea		
City:	Houston	State:	TX
Country:	USA	Zipcode:	77048
Attention:	Ms. EllenAnn Sands		

with conditions.

File # SES-SFA-20150501-00283

Call Sign None Grant Date 5/4/2015
(or other identifier)

Term Dates
From 5/5/2015 To: 6/4/2015

Approved: Paul E. Hackett



Applicant: Harris CapRock Communications, Inc
Call Sign: None
File No.: SES-STA-SES-STA-20150501-00283

Harris CapRock Communications, Inc., (Harris CapRock) is granted special temporary authority for 30 days, to test a fixed earth station, consisting of three 2.4 meter antennas in Melbourne FL with the O3b (S2935) satellite system in the 28.32-28.4 GHz (Earth-to-space) and 18.3-18.6 (space-to-Earth) frequency bands.

1. All transmissions must not exceed the power densities identified in attachments to this application or the O3b (S2935) satellite system authorization.
2. All operations shall be on an unprotected and non-harmful interference basis. Operations must cease transmission(s) immediately upon notice of such interference. In the event that there is a report of interference, Harris CapRock must immediately terminate transmissions and notify the FCC in writing.
3. Harris CapRock must cease operations if the following Stop Buzzer Contact is unavailable: Mike Horn, Harris CapRock Communications, Phone: 321-724-3384, Mobile: 321-258-4414, Text: 3212584414@text.att.net, E-mail: mhorn01@harris.com
4. Harris CapRock must take all reasonable and customary measures to ensure that the mobile earth station does not create a potential for harmful non-ionizing radiation to persons who may be in the vicinity of the earth station when it is in operation. At a minimum, permanent warning labels shall be fixed to the earth station and its housing warning of the radiation hazard and including a diagram showing the regions around the earth station where radiation levels could exceed 1.0mW/cm². The earth station operator shall be responsible for assuring that individuals do not stray into the regions around the earth station where there is a potential for exceeding the maximum permissible exposure limits required by 47 C.F.R. § 1.1310. This shall be accomplished by means of signs, caution tape, verbal warnings, placement of the earth station so as to minimize access to the hazardous region, and/or other appropriate means, including muting the transmitter upon loss of the downlink signal and an enabling feature that only permits transmissions after the downlink signal is received, the operator is able to verify that the antenna is properly pointed at the target satellite, and the link is unobstructed.
5. Grant of this authorization is without prejudice to any determination that the Commission may make regarding pending or future Harris CapRock or O3b Limited applications.
6. 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.



File # SES-STA-20150501-00283

Call Sign none Grant Date 5/4/2015
(or other identifier)

Term Dates
From 5/5/2015 To: 6/4/2015

Approved: Paul E. Miles

2. Contact	
Name: Carlos Nalda	Phone Number: 571-332-5626
Company: LMI Advisors	Fax Number:
Street: 8601 James Creek Drive	E-Mail: cnalda@lmiadvisors.com
City: Springfield	State: VA
Country: USA	Zipcode: 22201 -
Attention:	Relationship: Other
(If your application is related to an application filed with the Commission, enter either the file number or the IB Submission ID of the related application. Please enter only one.)	
3. Reference File Number or Submission ID	
4a. Is a fee submitted with this application?	
<input checked="" type="radio"/> If Yes, complete and attach FCC Form 159. If No, indicate reason for fee exemption (see 47 C.F.R. Section 1.1114).	
<input type="radio"/> Governmental Entity <input type="radio"/> Noncommercial educational licensee	
<input type="radio"/> Other (please explain):	
4b. Fee Classification CGX - Fixed Satellite Transmit/Receive Earth Station	
5. Type Request	
<input checked="" type="radio"/> Use Prior to Grant <input type="radio"/> Change Station Location <input type="radio"/> Other	
6. Requested Use Prior Date	
05/04/2015	
7. City/Melbourne	
8. Latitude (dd mm ss.s h) 28 5 15.5 N	

9. State FL	10. Longitude (dd mm ss.s h) 80 38 10.2 W
11. Please supply any need attachments. Attachment 1: STA Request Attachment 2: Form 312/Schedule B Attachment 3:	
12. Description. (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.) <div style="border: 1px solid black; padding: 5px;">Application for an experimental STA for a period of thirty (30) days, commencing on 5/4/15, to test and demonstrate terminal uplink transmission in the 28.35-28.4 GHz band and downlink transmission in the 18.3-18.6 GHz band.</div>	
13. 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 <input checked="" type="radio"/> No <input type="radio"/>	
14. Name of Person Signing EllenAnn Sands	15. Title of Person Signing Legal Counsel
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

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.

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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.

Approved by OMB
3060-0678

Date & Time Filed:
File Number: ---
Callsign/Satellite ID:

APPLICATION FOR EARTH STATION AUTHORIZATIONS	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:
STA Request (Melbourne, FL)

1-8. Legal Name of Applicant	
Name: Harris CapRock Communications, Inc.	Phone Number: 832-668-2753
DBA Name:	Fax Number: 832-668-2780
Street: 4400 S. Sam Houston Parkway Ea	E-Mail:
City: Houston	State: TX
Country: USA	Zipcode: 77048 -
Attention: Ms. EllenAnn Sands	

9-16. Name of Contact Representative	
Name: Carlos Nalda	Phone Number: 571-332-5626
Company: LMI Advisors	Fax Number:
Street: 8601 James Creek Drive	E-Mail: cnalda@lmiadvisors.com
City: Springfield	State: VA
Country: USA	Zipcode: 22152-
Attention: Mr. Carlos Nalda	Relationship: Other

CLASSIFICATION OF FILING

<p>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.</p> <p>a.</p> <p><input checked="" type="radio"/> a1. Earth Station (N/A) a2. Space Station</p>	<p>b.</p> <p><input type="radio"/> b1. Application for License of New Station</p> <p><input type="radio"/> b2. Application for Registration of New Domestic Receive-Only Station (N/A) b3. Amendment to a Pending Application (N/A) b4. Modification of License or Registration (N/A) b5. Assignment of License or Registration (N/A) b6. Transfer of Control of License or Registration (N/A) 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</p> <p><input checked="" type="radio"/> b10. Other (Please specify)</p> <p><input type="radio"/> 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.</p>
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<p>17c. Is a fee submitted with this application?</p> <p><input checked="" type="radio"/> If Yes, complete and attach FCC Form 159.</p> <p>If No, indicate reason for fee exemption (see 47 C.F.R. Section 1.1114).</p> <p><input type="radio"/> Governmental Entity <input type="radio"/> Noncommercial educational licensee</p> <p><input type="radio"/> Other (please explain):</p>

17d.

Fee Classification BAX - Fixed Satellite Transmit/Receive Earth Station

18. If this filing is in reference to an existing station, enter:

(a) Call sign of station:
Not Applicable

19. If this filing is an amendment to a pending application enter:

(a) Date pending application was filed:

(b) File number of pending application:

Not Applicable

Not Applicable

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)

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 providing 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: 18.3 Frequency Upper: 28.4

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
- (N/A) e. Geostationary Space Station
- (N/A) f. Non-Geostationary Space Station
- g. Other (please specify)

26. TYPE OF EARTH STATION FACILITY: Choose only one.

- Transmit/Receive
- Transmit-Only
- Receive-Only
- 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.)

Not Applicable

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. Yes No

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? Yes No
If Yes, attach as an exhibit, copies of the requests for waivers or exceptions with supporting documents.

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). Harris CapRock requests special temporary authority (

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
EllenAnn Sands

46. Title of Person Signing
Legal Counsel

47. Please supply any need attachments.

Attachment 1:

Attachment 2:

Attachment 3:

**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:	Melbourne	E5. Call Sign:	
E2. Contact Name	Mike Horn	E6. Phone Number:	321-724-3384
E3. Street:	1025 West NASA Blvd	E7. City:	Melbourne
E4. State	FL	E8. County:	Brevard
E10. Area of Operation:		E9. Zip Code	32919
E11. Latitude:	28 ° 5 ' 15.5 " N	Limited to Melbourne facility	
E12. Longitude:	80 ° 38 ' 10.2 " W		
E13. Lat/Lon Coordinates are:		<input type="radio"/> NAD-27	<input checked="" type="radio"/> NAD-83
E14. Site Elevation (AMSL):	0.0 meters		<input type="radio"/> N/A

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 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	<input checked="" type="radio"/> Yes <input type="radio"/> No
E19. Is coordination with another country required? If YES, attach the name of the country(ies) and plot of coordination contours as	<input type="radio"/> Yes <input checked="" type="radio"/> 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.	<input type="radio"/> Yes <input checked="" type="radio"/> No

POINTS OF COMMUNICATION

Satellite Name: OTHER OTHER If you selected OTHER, please enter the following:	
E21. Common Name: O3b constellation	E22. ITU Name:
E23. Orbit Location: NGSO	E24. Country: USA

POINTS OF COMMUNICATION (Destination Points)

E25. Site Identifier:	
E26. Common Name:	E27. Country:

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)
Melbourne	ST5000	3	Harris CapRock	ST5000-2.4	2.4	51.6 dBi at 19.163
						54.7 dBi at 28.020

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)
ST5000	0.0/0.0	0.0	0.0	0.0	40.0	0.0	68.9

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)
ST5000	18300 18600	R	Horizontal and Vertical	1M00G7D	0.0	0.0

E50. Modulation and Services Digital						
ST5000	18300 18600	R	Horizontal and Vertical	216MG7D	0.0	0.0

E50. Modulation and Services Digital						
ST5000	28350 28400	T	Horizontal and Vertical	1M00G7D	68.9	46.4

E50. Modulation and Services Digital						
ST5000	28350 28400	T	Horizontal and Vertical	216MG7D	68.9	46.4

E50. Modulation and Services Digital						
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FREQUENCY COORDINATION

E28. Antenna Id	E51. Satellite Orbit Type	E52/53. Frequency Limits(MHz)	E54/55. Range of Satellite	E56. Earth Station Azimuth	E57. Antenna Elevation Angle	E58. Earth Station Azimuth	E59. Antenna Elevation Angle	E60. Maximum EIRP Density toward the Horizon(dBW/4kHz)
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			Arc E/W Limit	Angle Eastern Limit	Eastern Limit	Angle Western Limit	Western Limit	
ST5000	Non-Geostationary	18300 18600	180.0/ 180.0	130.0	28.0	240.0	24.0	0.0
	Non-Geostationary	28350 28400	180.0/ 180.0	130.0	28.0	240.0	24.0	-15.5

REMOTE CONTROL POINT LOCATION
REMOTE CONTROL POINT LOCATION

E61. Call Sign NOTE: Please enter the callsign of the controlling station, not the callsign for which this application is being filed.		E65. Phone Number 832-668-2775	
E62. Street Address 4400 S. Sam Houston Pkwy			
E63. City Houston	E67. County Harris	E64/68. State/Country TX/ USA	E66. Zip Code 77046

FCC NOTICE REQUIRED BY THE PAPERWORK REDUCTION ACT

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Harris CapRock Corporation
STA Request and Public Interest Statement

REQUEST FOR SPECIAL TEMPORARY AUTHORITY

Pursuant to Section 25.120 of the Commission's rules, 47 C.F.R. §25.120, Harris CapRock Communications, Inc. ("Harris CapRock") respectfully requests special temporary authority ("STA") to operate a total of up to three (3) earth station terminals (Model ST5000-2.4) at a test location in Melbourne, Florida. Harris CapRock is developing and testing new earth station terminals to communicate with the Ka-band non-geostationary satellite orbit ("NGSO") fixed-satellite service ("FSS") system operated by O3b Limited ("O3b"), which has been previously authorized by the FCC to communicate with earth stations located in the United States.¹ Harris CapRock respectfully requests grant of STA authority at the earliest practicable time.

Proposed Terminal Testing. Harris CapRock seeks an STA for a period of 30 days, commencing on Monday, May 4, 2015, or the earliest practicable thereafter, to test terminal uplink transmissions in the 28.35-28.4 GHz band (part of O3b Channel 3 uplink band) and downlink receive operations in the 18.3-18.6 GHz band (together, "Channel 3 Spectrum"). O3b has already been granted an STA to operate in Channel 3 Spectrum at the very same location in Melbourne, Florida using similar 2.2m antenna terminals² and there have been no reported cases of interference in connection with O3b's use of this spectrum.

Harris CapRock's larger 2.4m antenna has essentially equivalent (if not superior) gain and off-axis discrimination as the smaller authorized antenna.³ In addition, the terminal uses a well-proven positioner from Harris CapRock's SpaceTrack series of terminals that has pointing accuracy equivalent to that of the O3b terminal and other stabilized earth station onboard vessel

¹ For example, in September 2012, the Commission granted O3b a license to operate a gateway earth station in Haleiwa, Hawaii, to communicate with its NGSO FSS system (see File No. SES-LIC- 20100723-00952, granted September 25, 2012). In June 2013, the Commission granted O3b a license to operate a second gateway in the United States, located in Vernon, Texas (see File No. SES LIC- 20130124-00089, granted June 20, 2013). In May 2014, the Commission granted O3b a blanket license to operate maritime earth stations (see File No. SES-LIC-20130528-00455, granted May 13, 2014).

² See File No. SES-STA-20141212- 00896 (granted April 14, 2015) ("*O3b STA*").

³ See Technical Appendix at Annex 1 (attached hereto).

Harris CapRock Corporation
STA Request and Public Interest Statement

(“ESV”) terminals.⁴ Thus, there is no material operational difference or increased interference risk from Harris CapRock’s proposed temporary operations.

The Harris CapRock terminals will be mounted on a temporary fixed platform in a controlled test area where general public access is prohibited. Although the pointing angle of the antennas will change as O3b’s in-orbit satellites are tracked, the platform will remain stationary during the demonstration. Only trained operators and technicians will be permitted to access the terminals, and specific instruction will be provided with respect to radiofrequency hazard characteristics of the antenna. As described in the attached narrative, the minimum elevation angle for the proposed operations during satellite tracking is 24° (towards the southwest on rising) and 28° (towards the southeast on setting).⁵

Harris CapRock seeks independent authority for temporary operation of this new terminal at the Melbourne site. The requested STA may be considered on an expedited basis because, among other things, the proposed operations are effectively equivalent to O3b’s existing operations at the Melbourne site. Grant of the STA will further the public interest by facilitating Harris CapRock’s intensive terminal development efforts, conducted in cooperation with O3b, and by allowing the new terminal to be expeditiously tested at a location where the subject frequencies have already been used without interference incident.

Proposed Site. Harris CapRock is proposes to test uplink transmission in the 28.35-28.4 GHz band and downlink receive operations in the 18.3-18.6 GHz band at the Melbourne, Florida location currently used by O3b for terminal operations (28°5’15.5” N, 80°38’10.2” W).⁶ Harris CapRock was recently granted an experimental STA to test the subject terminals at a nearby site at 28°01’51” N, 80°35’56” W, and has actually completed coordination of the Channel 3 Spectrum and other bands at this location.⁷

⁴ See Technical Appendix at Annex 4.

⁵ See Technical Appendix (Application Narrative).

⁶ See *O3b STA*.

⁷ See File No. 1105-EX-ST-2014; *see also* Technical Appendix (Comsearch Coordination Report).

Harris CapRock Corporation
STA Request and Public Interest Statement

Harris CapRock agrees to accept all interference from other authorized spectrum users and will immediately suspend operations in the event of interference to other systems and services. Harris CapRock also acknowledges and accepts the conditions imposed on O3b's grant of STA authority to conduct similar terminal operations at the Melbourne location.⁸

Proposed Spectrum Use. Harris CapRock's proposed earth station operations in Channel 3 Spectrum are consistent with the Commission's rules and policies. Harris CapRock first notes that O3b has completed all necessary coordination with U.S. government satellite networks operating in the Ka-band, including GSO and NGSO networks, as well as their associated specific earth stations filed under 9.7A and 9.7B of the ITU Radio Regulations through other administrations. O3b has also completed coordination, according to U.S. footnote 334 of the FCC Table of Frequency Allocations, with the U.S. government, and this US334 coordination agreement provides for additional earth stations in U.S. territory operating with O3b's satellites.

Under the Commission's Ka-band plan, the 28.35-28.4 GHz band may be used by NGSO FSS systems,⁹ although Harris CapRock recognizes that operations under the brief, requested STA will be on a non-harmful interference basis vis-à-vis other spectrum users. The proposed operations will not cause any interference into or require protection from any co-frequency GSO satellites. O3b's prior use of the Channel 3 Spectrum at the same location and Harris CapRock's coordination efforts in the immediate area will ensure that its brief STA operations have no adverse impact on other spectrum users.

Expedited Consideration under Section 25.120. Harris CapRock respectfully requests expedited processing of this STA request under Section 25.120. Section 25.120(a) provides that STA requests should be filed at least three business days prior to commence of proposed

⁸ See *O3b STA* at Special Conditions (attached hereto).

⁹ See *In the Matter of Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, 11 FCC Rcd. 19005, ¶¶ 59-62 and 79 (1996). See also *In the Matter of Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use*, 15 FCC Rcd. 13430, ¶ 28 (2000).

Harris CapRock Corporation
STA Request and Public Interest Statement

operations absent a finding of extraordinary reasons for the delay in submitting the request which could not have been earlier foreseen by the applicant. Harris CapRock received only yesterday confirmation of the specific frequency bands for testing and that O3b has moved a beam to Melbourne for testing purposes. As discussed more fully below, expedited consideration of this STA request is warranted given the unique circumstances of the present situation, including the Commission's prior consent for virtually identical operations by O3b and the benefits of allowing Harris CapRock to proceed expeditiously with its new antenna development program.

Section 25.120(b)(4) provides that the Commission may grant a temporary authorization for a period not to exceed 30 days, if the STA request has not been placed on public notice, and an application for regular authority is not contemplated. Harris CapRock does not contemplate filing an application for regulatory authority in connection with the proposed Melbourne test operations. Instead, Harris CapRock has filed a request for experimental STA for the Channel 3 Spectrum and other O3b bands, which it expects will be granted in due course.¹⁰ Thus, this STA request is a unique, one-time request necessitated by late notice of final test parameters.

Unfortunately, the ordinary time frame for processing an experimental STA, including coordination with Commission Bureaus, will not permit commencement of operations in the required time frame. In addition, the International Bureau's extensive earth station engineering expertise and recent grant of virtually identical STA authority at the subject location make it the only potential source near-term authority for the subject testing. Harris CapRock anticipates that grant of a 30-day STA will afford sufficient time for testing and the requested experimental STA will cover future terminal testing.

Harris CapRock has expended considerable effort in preparing equipment and personnel for testing in Melbourne and will have its engineering team onsite for the commencement of testing on May 4th. Grant of the requested authority will serve the public interest by allowing continued development of a new line of antennas that could greatly benefit government and commercial customers and accelerate the expansion of Ka-band services. In addition, authorizing near-term development of this terminal will ensure that Harris CapRock (a U.S. equipment manufacturer and service provider) and other U.S. interests can participate more fully in the development of these important new services.

¹⁰ See File No. 0454-EX-ST-2015.

Harris CapRock Corporation
STA Request and Public Interest Statement

Finally, the circumstances of the instant STA request are unique because the Commission has already authorized O3b to operate an antenna with essentially equivalent performance on the same frequencies at the same location as the instant request. However, Harris CapRock cannot rely on existing O3b authority in connection with the proposed antenna testing operations. Although the Harris CapRock terminal will operate within the same general envelope as the O3b terminal, independent authority for the new antenna is still required.

Harris CapRock respectfully submits that the public interest will be served by grant of the requested STA commencing May 4th. However, in the event that the Commission concludes that it is not possible to grant the STA in the requested time frame, Harris CapRock requests that the Commission grant the STA at the earliest practicable time.


Conclusion. The requested experimental STA will allow Harris CapRock, in partnership with O3b, to continue development of a new 2.4m terminal to communicate with the innovative O3b system, and will not result in harmful interference to or require protection from other authorized spectrum users. Therefore, the proposed operations are consistent with Commission's rules and policies, and with the public interest. Harris CapRock respectfully requests that the experimental STA be granted for a thirty (30) day period commencing on May 4, 2015 or as soon as practicable thereafter.

Applicant: O3b Limited
Call Sign: None
File No. SES-STA-20141212-00896
Special Temporary Authority (STA)

O3b Limited (O3b) is granted an extension Special Temporary Authority (STA) for 180 days, to continue testing three 2.2 meter antennas in Melbourne, FL, as described in its application. Operations under this STA must be in accordance with the terms and conditions contained in O3b's application, the Federal Communication Commission's rules not waived herein, and are subject to the following conditions.

- 1) Operations under this STA shall not cause harmful interference to, and shall not claim protection from, interference caused to it by any other lawfully operating station and it shall cease transmission(s) immediately upon notice of such interference.
- 2) Grant of this STA is without prejudice to any determination that the Commission may make regarding other pending applications or future STA requests.
- 3) Any action taken or expense incurred as a result of operations pursuant to this STA is solely at the applicant's risk.
- 4) 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.

180 days *"Extension with conditions"*

 GRANTED International Bureau	File# <u>SES-STA-20141212-00896</u>
	Call Sign <u>N/A</u> Issue Date <u>04/14/2015</u> (or other identifier)
	Term Dates From <u>04/14/2015</u> To: <u>10/12/2015</u>
	Approved: <u>Paul E. Blalock</u>

5) Operations of this station during the period from expiration of SES-STA-20140429-00314 to the grant of this special temporary authority was authorized pursuant to Section 1.62 of the Commission's rules, 47 C.F.R. § 1.62. *PEH*

O3b Limited

Approved by OMB
3060-0678

APPLICATION FOR EARTH STATION SPECIAL TEMPORARY AUTHORITY

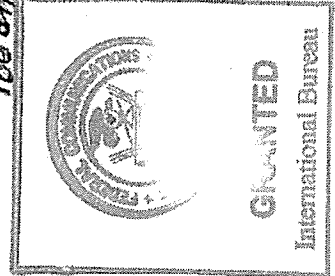
APPLICANT INFORMATION Enter a description of this application to identify it on the main menu:
O3b STA to operate at Melbourne to include GSO frequencies (Dec 2014) - 180 days

1. Applicant

Name:	O3b Limited	Phone Number:	202-813-4026
DBA Name:		Fax Number:	
Street:	900 17th Street, NW, #300	E-Mail:	suzanne.malloy@o3bnetworks.com
City:	Washington	State:	
Country:	USA	Zipcode:	
Attention:	Ms Suzanne Malloy		

180 days

File # SES-STA-20141212-00896



Call Sign N/A Date 04/14/2015
(or other identifier)

Term Dates
From 04/14/2015 To: 10/24/2015

Approved: Paul E. Hales

2. Contact

Name: Joseph A. Godles **Phone Number:** 202-429-4900
Company: Goldberg Godles Wiener & Wright LLP **Fax Number:** 202-429-4912
Street: 1229 19th St., NW **E-Mail:** jgodles@g2w2.com
City: Washington **State:** DC
Country: USA **Zipcode:** 20036 -2413
Attention: **Relationship:** Legal Counsel

(If your application is related to an application filed with the Commission, enter either the file number or the IB Submission ID of the related application. Please enter only one.)

3. Reference File Number SESSTA2014042900314 or Submission ID

4a. 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):

4b. Fee Classification CGX – Fixed Satellite Transmit/Receive Earth Station

5. Type Request

Use Prior to Grant

Change Station Location

Other

6. Requested Use Prior Date

12/31/2014

7. City Melbourne	8. Latitude (dd mm ss.s h) 28 5 15.5 N 28.0876°
9. State FL	10. Longitude (dd mm ss.s h) 80 38 10.2 W 80.6028°
11. Please supply any need attachments. Attachment 1: STA extension Attachment 2: Attachment 3:	
12. Description. (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.) <div style="border: 1px solid black; padding: 5px;">Pursuant to Section 25.120 of the Commission's rules, 03b hereby requests an STA extension enabling it to continue testing during the 180-day period between December 31, 2014, and June 29, 2015, in accordance with the attached description.</div>	
13. 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"; party to the application; for these purposes. Yes <input checked="" type="radio"/> No <input type="radio"/>	
14. Name of Person Signing Suzanne Malloy	15. Title of Person Signing Vice-President, Regulatory Affairs
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.

Request for Extension of Special Temporary Authority

The International Bureau previously granted the request filed by O3b Limited ("O3b") for special temporary authority ("STA") to conduct earth station antenna tests via the O3b satellite system using up to three 2.2m earth station antennas at a facility in Melbourne, Florida¹ and extended the STA through December 30, 2014.²

Pursuant to Section 25.120 of the Commission's rules,³ O3b hereby requests an STA extension enabling it to continue the earth station antenna tests during the 180-day period between December 31, 2014, and June 29, 2015.

O3b's extension request is supported by good cause. An extension will enable O3b to continue its testing so that it may establish performance standards and operational requirements for its earth stations. By granting O3b's prior STA requests, the Bureau already has found that facilitating these activities is in the public interest.

Accordingly, and for good cause shown, O3b respectfully requests that its STA extension request be granted.

¹ See FCC File No. SES-STA-20140403-00233.

² See FCC File No. SES-STA-20140429-00314.

³ 47 C.F.R. § 25.120.

HARRIS CAPROCK
REQUEST FOR SPECIAL
TEMPORARY AUTHORITY

TECHNICAL APPENDIX

REQUEST FOR EXPERIMENTAL SPECIAL TEMPORARY AUTHORITY

Harris CapRock Communications, Inc. (“Harris CapRock”) hereby respectfully requests experimental special temporary authority (“STA”) to operate a total of up to six (6) earth stations at two separate test sites located in Palm Bay (Melbourne), Florida and Houston, Texas, with a maximum of three (3) earth stations at each test site. Harris CapRock is developing and testing new earth stations to communicate with the Ka-band non-geostationary satellite orbit (“NGSO”) fixed-satellite service (“FSS”) system operated by O3b Limited (“O3b”), which has been previously authorized by the FCC to communicate with earth stations located in the United States. In this filing, Harris CapRock seeks an experimental STA for the period between January 6, 2015 and June 30, 2015.

Harris CapRock will operate the new circular 2.4m Ka-band terminal (Model ST5000-2.4) for non-commercial development, testing and demonstration purposes with the O3b system at the Melbourne and Houston test locations. Harris CapRock will evaluate antenna performance, including tracking characteristics, throughput, link analyses and potential applications of the antenna with the O3b system, including interactive video teleconferencing, interactive access to complex web content from the Internet and very large file transfers.

Grant of the requested authority would serve the public interest by allowing Harris CapRock to develop a new line of O3b antennas that could greatly benefit government and commercial customers. Moreover, the proposed experimental operations raise no concern regarding potential interference to co-frequency systems and services, will be conducted on an unprotected, non-interference basis and will otherwise comply with Part 5 of the FCC Rules.

The O3b Satellite System

The new 2.4m earth stations will communicate with O3b’s UK-authorized, Ka-band NGSO FSS system.¹ The Commission has granted O3b authority for gateway and other earth station operations in the United States.² O3b has filed a Letter of Intent (“LOI”) to access the

¹ O3b’s system includes four satellites launched on June 25, 2013, and a second tranche of four satellites launched on July 10, 2014. O3b’s third tranche of satellites is scheduled for launch on December 18, 2014.

² For example, in September 2012, the Commission granted O3b a license to operate a gateway earth station in Haleiwa, Hawaii, to communicate with its NGSO FSS system. *See* FCC File No. SES-LIC-20100723-00952 (granted September 25, 2012). In June 2013, the Commission granted O3b a license to operate a second gateway in the United States, located in Vernon, Texas. *See* FCC File No. SES-LIC-20130124-00089 (granted June 20, 2013). In May 2014, the Commission granted O3b a blanket license to operate maritime earth stations. *See* FCC File No. SES-LIC-20130528-00455 (granted May 13, 2014).

U.S. market with its third tranche of satellites and to consolidate its market access authority.³ O3b has also been granted numerous STAs for earth stations to communicate with the O3b system, including specifically in Houston, Texas, and Melbourne, Florida, using the frequencies requested herein.⁴

Because this application requests experimental authority for antenna development purposes only, Harris CapRock hereby incorporates by reference the relevant satellite and market access-related information supporting these prior grants.⁵ As a result, although general background information is provided, this application focuses on the technical characteristics of the new ST5000-2.4 terminal and confirmation that the antenna will be operated for test purposes on an unprotected, non-interference basis under Part 5 of the Rules.

Proposed Test Sites

The Palm Bay (Melbourne), Florida, test site is located at N 28.0309° and W -80.5988°. The Houston, Texas, test site is located at N 29.5984° and W -95.3471°. As noted above, earth stations have been previously authorized to communicate with the O3b system at these locations. In addition, as discussed in the following section, no coordination with other co-frequency systems or services is required. Nonetheless, given the experimental nature of the operations proposed herein, Harris CapRock agrees to accept all interference from co-frequency operations and will immediately suspend operations in the event of interference to other systems and services.

The 2.4m antenna terminals will be mounted on a temporary fixed platform in a controlled test area where general public access is prohibited. Although the pointing angle of the antennas will change as O3b's in-orbit satellites are tracked, the platform will remain stationary during the demonstration. Only trained operators and technicians will be permitted to access the terminals, and specific instruction will be provided with respect to radiofrequency hazard characteristics of the antenna.

Proposed Spectrum Use

Harris CapRock's proposed earth station operations in shared bands are consistent with the Commission's rules and policies. Harris CapRock first notes that O3b has completed all necessary coordination with U.S. government satellite networks operating in the Ka-band, including GSO and NGSO networks, as well as their associated specific earth stations filed under

³ See O3b Limited, Call Sign S2935, File No. SAT-LOI-20141029-00118.

⁴ See, e.g., O3b Limited, File Nos. SES-STA-20140819-00666 (Houston, TX), SES-STA-20140731-00627, SES-STA-20140429-00314 and SES-STA-20130620-00515 (Melbourne, FL).

⁵ See, e.g., *id.* and related file numbers. Harris CapRock respectfully requests leave to supplement this filing with O3b satellite or market access information should the FCC deem such information necessary or appropriate to support grant of this experimental STA application.

9.7A and 9.7B of the ITU Radio Regulations through other administrations. O3b has also completed coordination, according to U.S. footnote 334 of the FCC Table of Frequency Allocations, with the U.S. government, and this US334 coordination agreement specifically provides for additional earth stations in U.S. territory operating with O3b's satellites.

Harris CapRock will limit terminal uplink transmission to the 28.6-29.1 GHz band. Under the Commission's Ka-band plan, this band may be used on a primary basis by NGSO FSS systems.⁶ Harris CapRock recognizes, however, that operations under the requested STA will be on an unprotected, non-harmful interference basis. The experimental development, test and demonstration operations will adequately protect allocated services operating in this band.

The proposed demonstrations will not cause any interference into or require protection from any co-frequency GSO satellites. As previously shown by O3b,⁷ there is an inherent angular separation between the O3b system orbit and the GSO arc from the perspective of earth stations located away from the equator. The Houston, Texas, and Melbourne, Florida, test sites are located further north in latitude than the O3b Hawaii gateway, which results in an even greater angular separation between the O3b and geostationary orbits as viewed from the Earth. This means that the angular separation between the O3b satellites and GSO arc from these locations will be greater than the 7° separation accepted by the Commission when it approved O3b's Hawaii gateway. This ensures that GSO FSS systems will be adequately protected.

Potential interference from the proposed operations into U.S. terrestrial fixed service ("FS") receivers in the 28.6-29.1 GHz band is a non-issue because there is no allocation in the Commission's Ka-band plan for FS stations operating in this band in the United States.

With respect to sharing with other Ka-band NGSO systems, Harris CapRock notes that there are no planned NGSO systems contemplated for deployment throughout the duration of the contemplated operations. Moreover, the O3b system is capable of sharing with future NGSO networks operating in the same frequency bands and, therefore, will not preclude additional entry by future NGSO licensees.⁸ Thus, the proposed experimental operations can be authorized on an unprotected, non-interference basis under Part 5 of the Rules.

⁶ See *In the Matter of Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, 11 FCC Rcd. 19005, ¶¶ 59-62 and 79 (1996). See also *In the Matter of Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use*, 15 FCC Rcd. 13430, ¶ 28 (2000).

⁷ See O3b Hawaii License Application, FCC File No. SES-LIC-20100723-00952, Technical Attachment at A.10.1.

⁸ First, the entire O3b constellation will occupy a single circular orbit above the Earth's Equator, which enables an angular separation to be maintained between O3b communications links and the links of other NGSO systems using different orbits. Second, the O3b satellite system uses a

Although not part of the requested experimental authority, Harris CapRock notes that its proposed receive operations are also on an unprotected, non-interference basis only. Under the Commission's Ka-band plan, the 18.8-19.3 GHz band may be used on a primary basis by licensed NGSO FSS systems.⁹ This band is not allocated for GSO FSS networks.¹⁰ Nevertheless, the proposed demonstrations will not cause any interference into, or require protection from, any co-frequency GSO satellites. Furthermore, FS stations operating in the 18.8-19.3 GHz band are no longer co-primary with FSS users in this band.¹¹ However, because the experimental operations proposed herein will be conducted on an unprotected, non-interference basis, Harris CapRock agrees to accept any interference that its terminals may receive from FS transmissions in the 18.8-19.3 GHz band.

Earth Station Technical Parameters

The new ST5000-2.4 terminal is comprised of a 2.4m circular reflector antenna, an antenna positioner, and an antenna control module. The antenna positioner and control module are the same as those used in Harris CapRock's SpaceTrack 4000 series of stabilized antennas. The SpaceTrack 4000 has been previously licensed by the FCC in C-band and Ku-band ESV configurations and has years of proven experience in the field. Not only has the SpaceTrack 4000 been deployed in 2.4m configurations, but the operating environment in the ESV maritime context is far harsher than the proposed fixed temporary operations – with higher scan rates, torque, jarring, etc. – and there have been no reported cases of interference due to antenna misalignment or similar factors. Thus, the FCC can be assured that ST5000-2.4 will operate as designed to avoid potential interference to adjacent satellites.

Tracking the predictable O3b satellites as they fly in their equatorial path from fixed locations is quite straightforward. Although the ST5000-2.4 terminal is a full-motion stabilized antenna, the operational range for communications is towards the southern sky. For example, for the Melbourne, FL test site, the O3b satellites rise at approximately 240° azimuth and set at approximately 130° azimuth. The elevation angle for communications range from 24° on the rising satellite to 43.5° at zenith and then down to 28° for the setting satellite. Thus, a minimum elevation angle of 20° is a conservative assumption. The operational values for the Houston, Texas, test site are similar to those for the Melbourne, Florida, site.

combination of multiple tracking antennas and satellite diversity to avoid interference from its system into other NGSO systems and from other NGSO systems into O3b. This further enables the use of angular discrimination to facilitate spectrum sharing, while providing a mechanism for interference avoidance in the rare event that an O3b earth station is pointed at an O3b satellite that is in-line with a satellite of another NGSO system.

⁹ *See supra* n. 6.

¹⁰ *See id.*

¹¹ *See* 47 C.F.R. § 101.85(b)(2).

Harris CapRock's ST5000-2.4 terminal is designed to meet the FCC's ESV operational requirements, which have been extended by analogy to full-motion antennas communicating with the O3b system. These parameters include: (i) maintaining off-axis EIRP to the levels set forth in the applicable FCC mask (in the case of Ka-band, Section 25.138); (ii) pointing accuracy of 0.2° or better; (iii) automatic cessation of emissions within 100 ms if pointing offset exceeds 0.5°; and (iv) transmissions will not resume until pointing accuracy is within 0.2°. The technical characteristics of the terminal are set forth in the follow tables.

SUMMARY OF TECHNICAL PARAMETERS – ST5000-2.4

Antenna diameter	2.4m
Type of Antenna	2.4m circular reflector
Peak Power (SSPA)	40 watts
Transmit Bandwidth	1 MHz to 216 MHz
Transmit Gain	54.7 dBi
EIRP	68.9 dBW
Data Rate	160 Mbps Tx/ 300 Mbps Rx
Emission Designators	1M00G7D to 216MG7D
Transmit Polarization	Horizontal or Vertical
Transmit Max PSD	46.4 dBW/4kHz
Transmit Beamwidth	.14 degrees
Receive G/T	26.5 dB/K
Receive Bandwidth	Up to 216 MHz
Receive Polarization	LHCP and RHCP

ANTENNA CONTROL PARAMETERS - ST5000-2.4

Azimuth	Continuous coverage over 360°
Elevation	0 to 90° antenna elevation
Position accuracy	0.2° (auto-disable at 0.5 ° offset)
Tracking capability	8°/sec

Additional information regarding the ST5000-2.4 terminal, including antenna performance plots (compliance with the FCC's off-axis EIRP mask), link budgets, and a radiofrequency hazard assessment are included as attachments hereto.

Stop Buzzer Contact and Other Information

Although Harris CapRock will coordinate closely with O3b in the context of antenna development, testing, and demonstration, the proposed experimental operations will be subject to the ultimate direction and control of Harris CapRock. The Harris CapRock point of contact with the authority to suspend immediately the proposed ST5000-2.4 terminal operations is:

Mike Horn
Harris CapRock Communications
1025 West NASA Blvd.
Melbourne, FL USA 32919
Phone: 321-724-3384
Mobile: 321-258-4414
Text: [3212584414@text.att.net](tel:3212584414)
E-mail: mhorn01@harris.com

The secondary point of contact for the proposed experimental operations is:

Harris CapRock Network Control Center
Managed Network Services 24x7 support
4400 S. Sam Houston Pkwy, E.
Houston, Texas 77046
Office: (832) 668-2775
Fax: (713) 987-2894
Email Address: hcc-hou-csc@harris.com

The following annexes contain additional technical information relating to the proposed experimental operations:

- Annex 1 – Antenna Performance Plots (demonstrating compliance with the FCC's Ka-band, off-axis EIRP spectral density mask, including co-pol and cross-pol at +/- 180°, +/-30°, +/-10° and various transmit frequencies).
- Annex 2 - Link Budgets (various forward and return link budgets for the ST5000-2.4 terminal).
- Annex 3: Radiation Hazard Study (establishing near-field and far-field region distances). Harris CapRock will follow standard industry procedures to mitigate potential radiation hazards to personnel in controlled environments. (The terminals do not transmit in uncontrolled areas at Harris CapRock test facilities.)
- Annex 4 – SpaceTrack 4000 Product Brochure (outlining technical characteristics of the proven 4000 series of stabilized antennas).

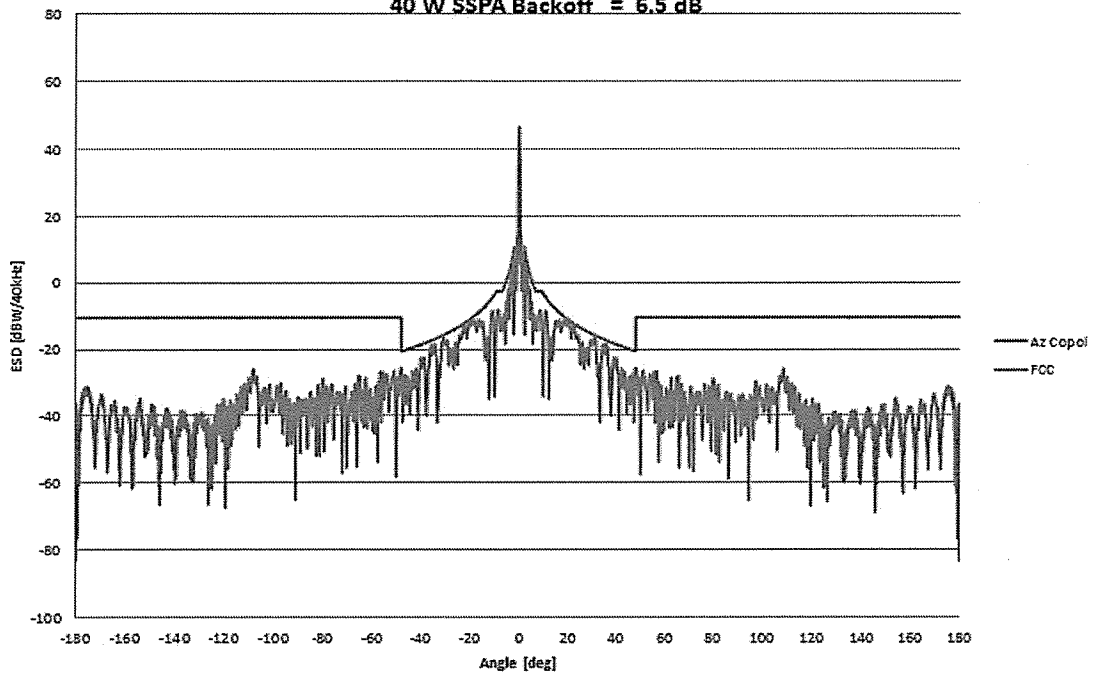
Conclusion

The requested experimental STA will allow Harris CapRock to develop, test and demonstrate the operational capabilities of its new 2.4m terminal with the O3b system, and will not result in harmful interference to or require protection from other authorized spectrum users. Accordingly, the proposed operations are consistent with Part 5 of the FCC's rules and within the public interest. Harris CapRock respectfully requests that the experimental STA be granted for the period from January 6, 2015 to June 30, 2015.

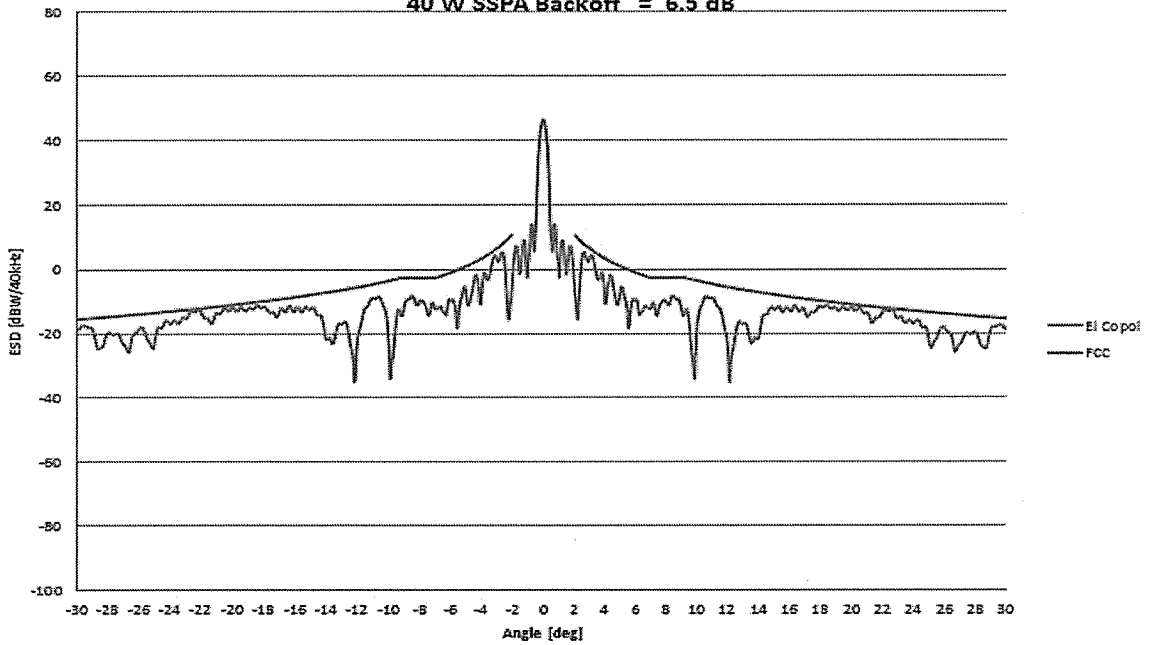
Annex 1 – Antenna Performance Plots

Demonstration of Compliance with FCC Ka-band Off-Axis EIRP Mask (Co-pol and Cross-pol)

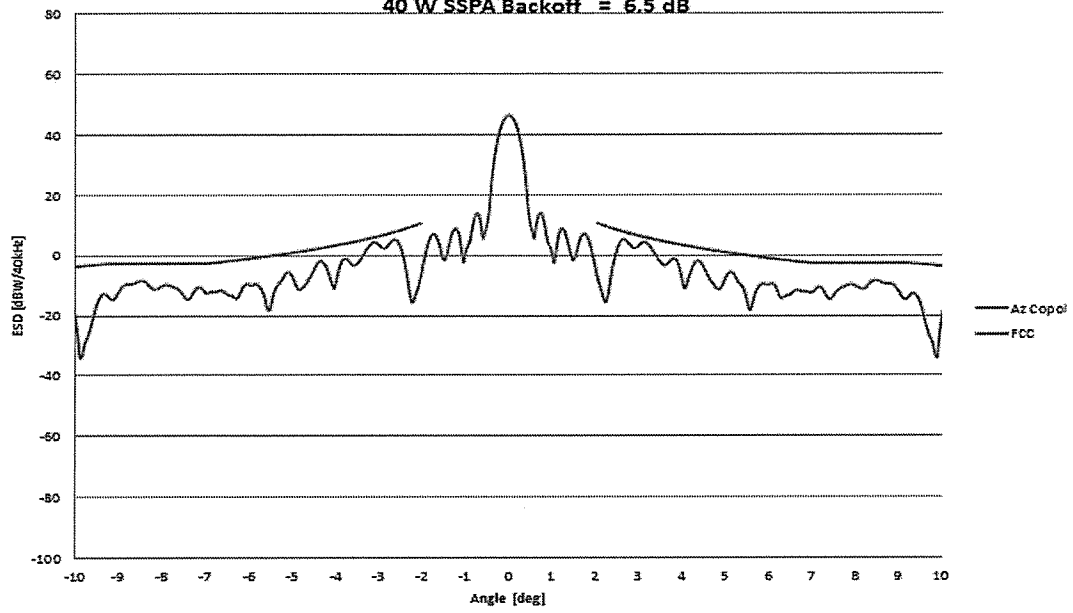
MUAP Predicted ESD: Copol/Az/29.071 GHz
Max Copol EIRP = 46.4488 dBW/4kHz
40 W SSPA Backoff = 6.5 dB



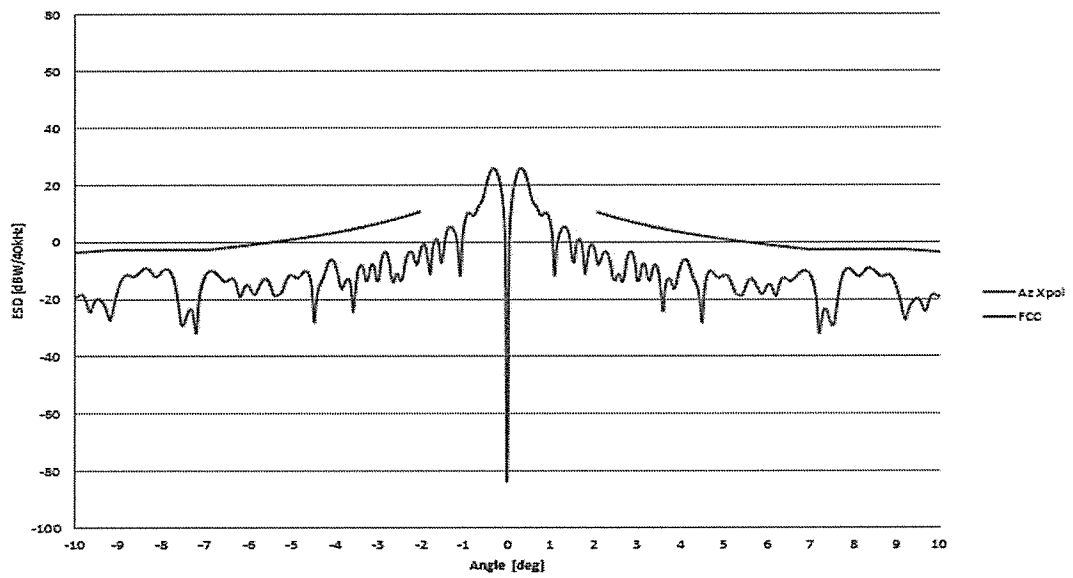
MUAP Predicted ESD: Copol/EI/29.071 GHz
Max Copol EIRP = 46.4488 dBW/4kHz
40 W SSPA Backoff = 6.5 dB



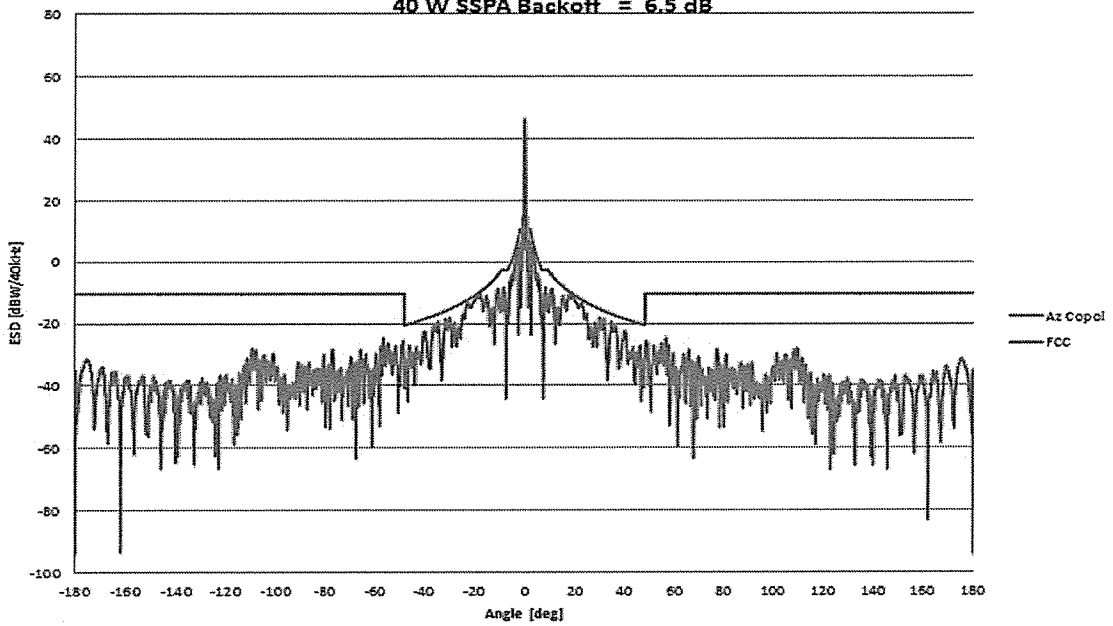
MUAP Predicted ESD: Copol/Az/29.071 GHz
Max Copol EIRP = 46.4488 dBW/4kHz
40 W SSPA Backoff = 6.5 dB



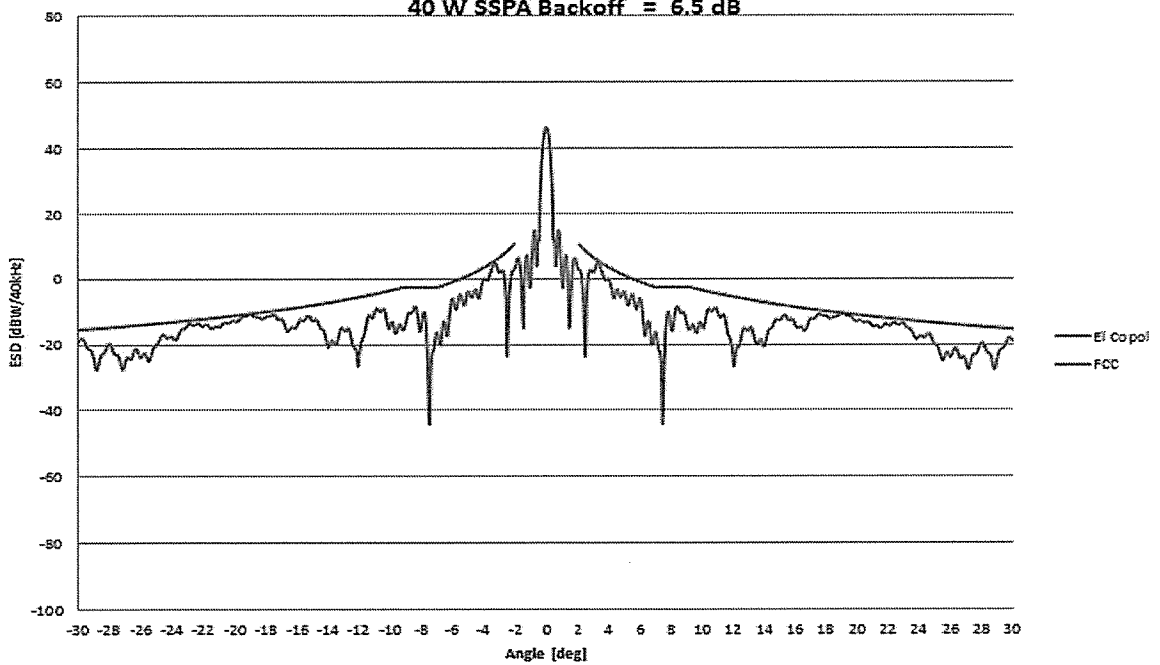
MUAP Predicted ESD: Xpol/EI/29.071 GHz



MUAP Predicted ESD: Copol/Az/28.3615 GHz
Max Copol EIRP = 46.3962 dBW/4kHz
40 W SSPA Backoff = 6.5 dB



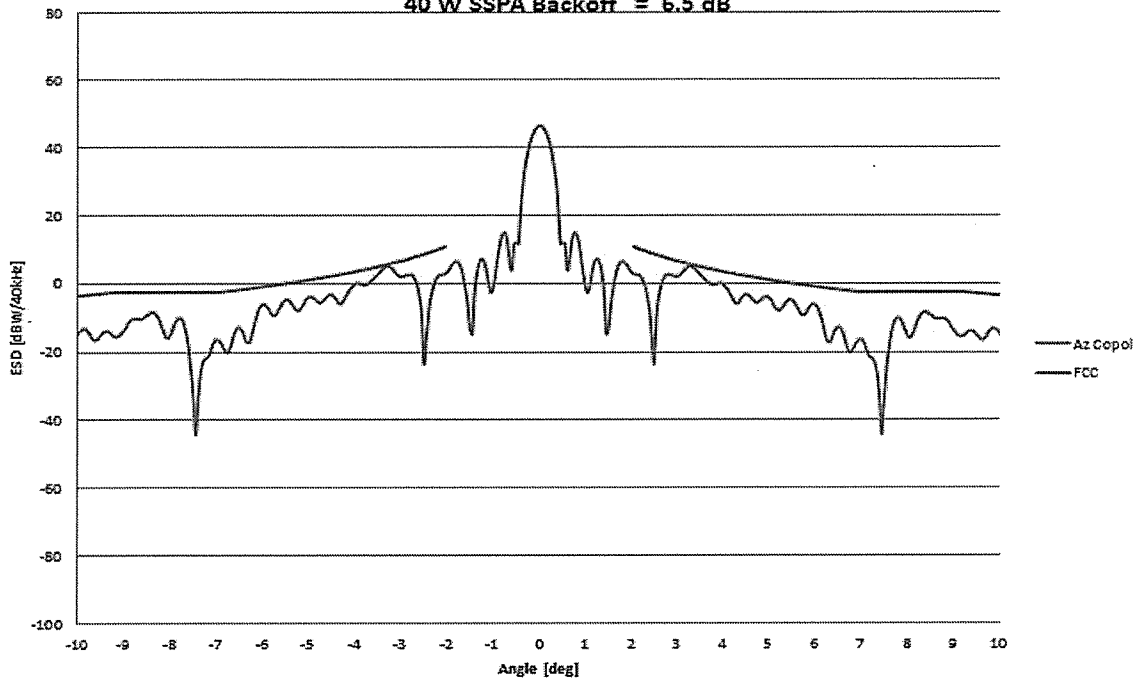
MUAP Predicted ESD: Copol/EI/28.3615 GHz
Max Copol EIRP = 46.3962 dBW/4kHz
40 W SSPA Backoff = 6.5 dB



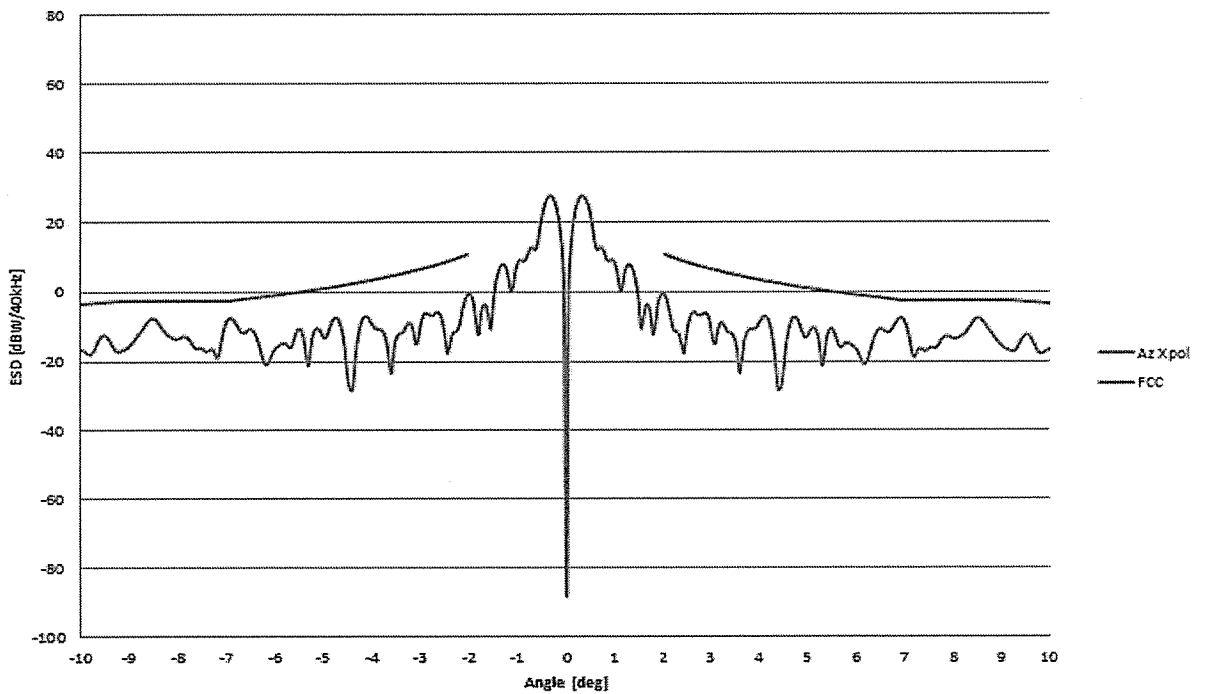
MUAP Predicted ESD: Copol/Az/28.3615 GHz

Max Copol EIRP = 46.3962 dBW/4kHz

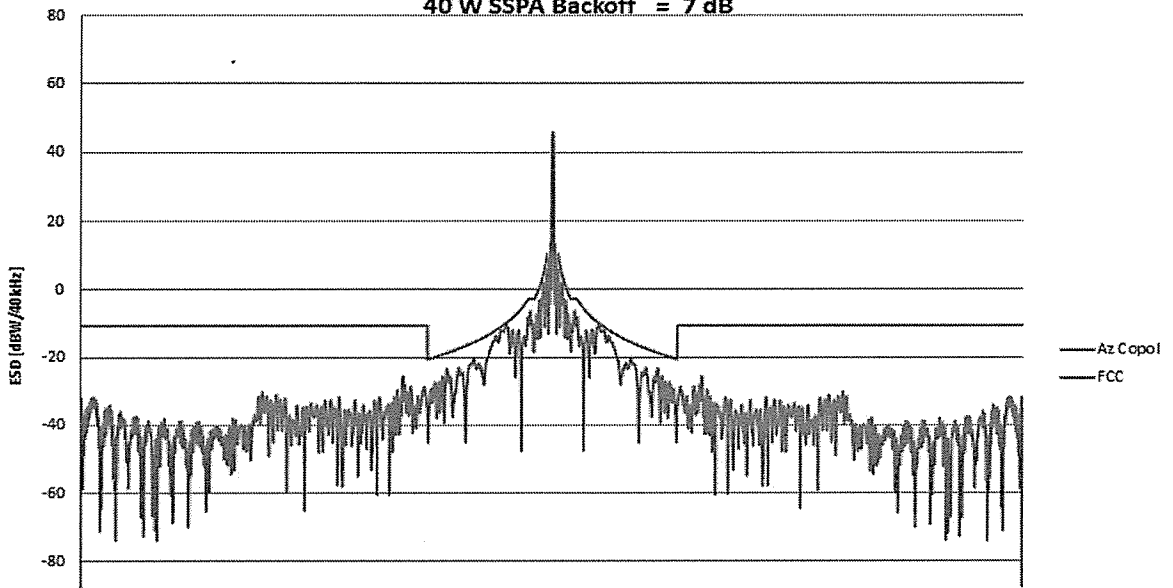
40 W SSPA Backoff = 6.5 dB



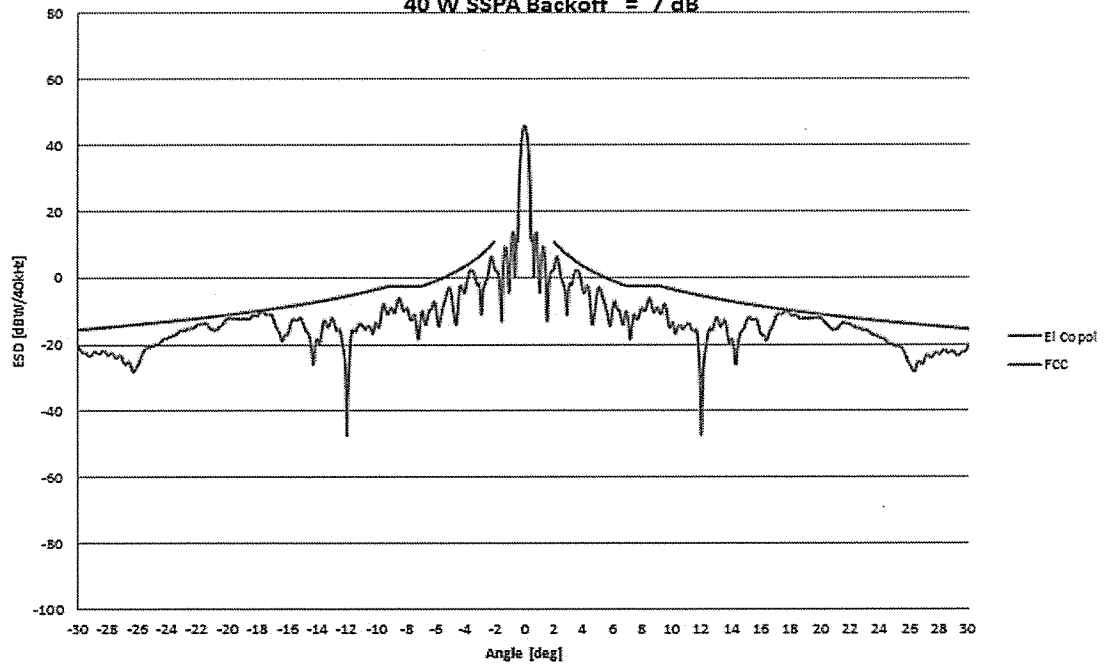
MUAP Predicted ESD: Xpol/Az/28.3615 GHz



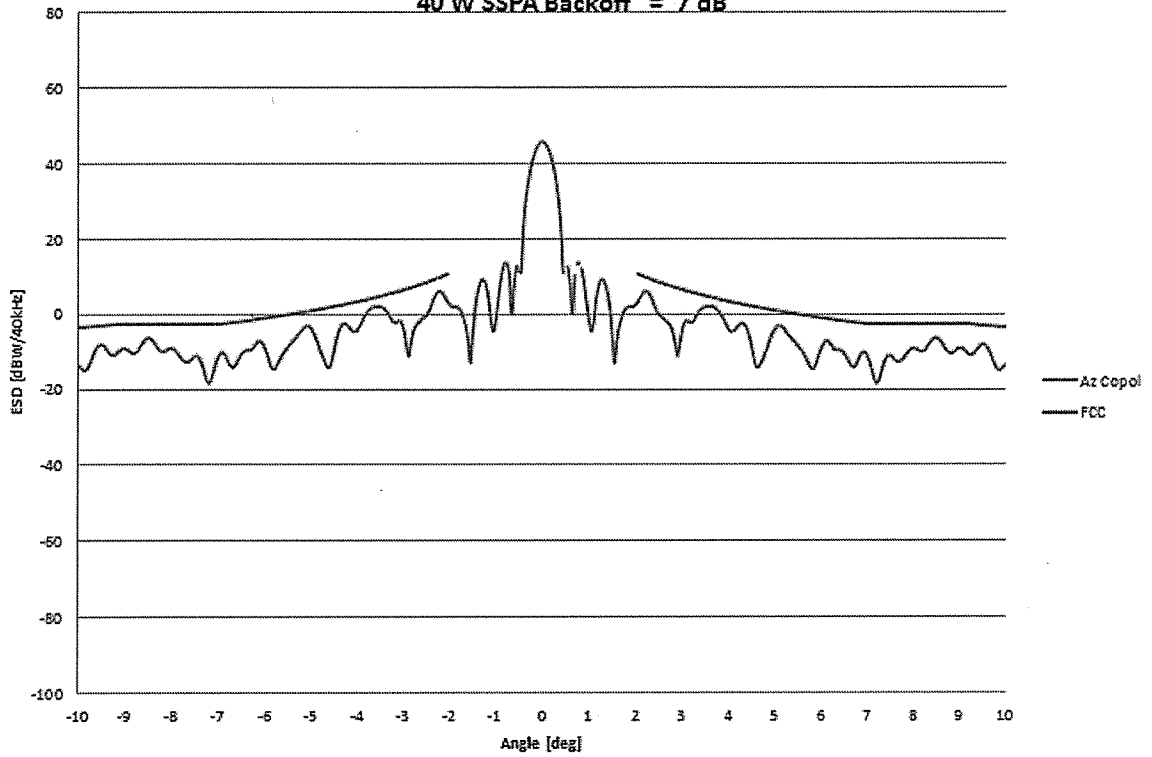
MUAP Predicted ESD: Copol/Az/27.652 GHz
Max Copol EIRP = 45.761 dBW/4kHz
40 W SSPA Backoff = 7 dB



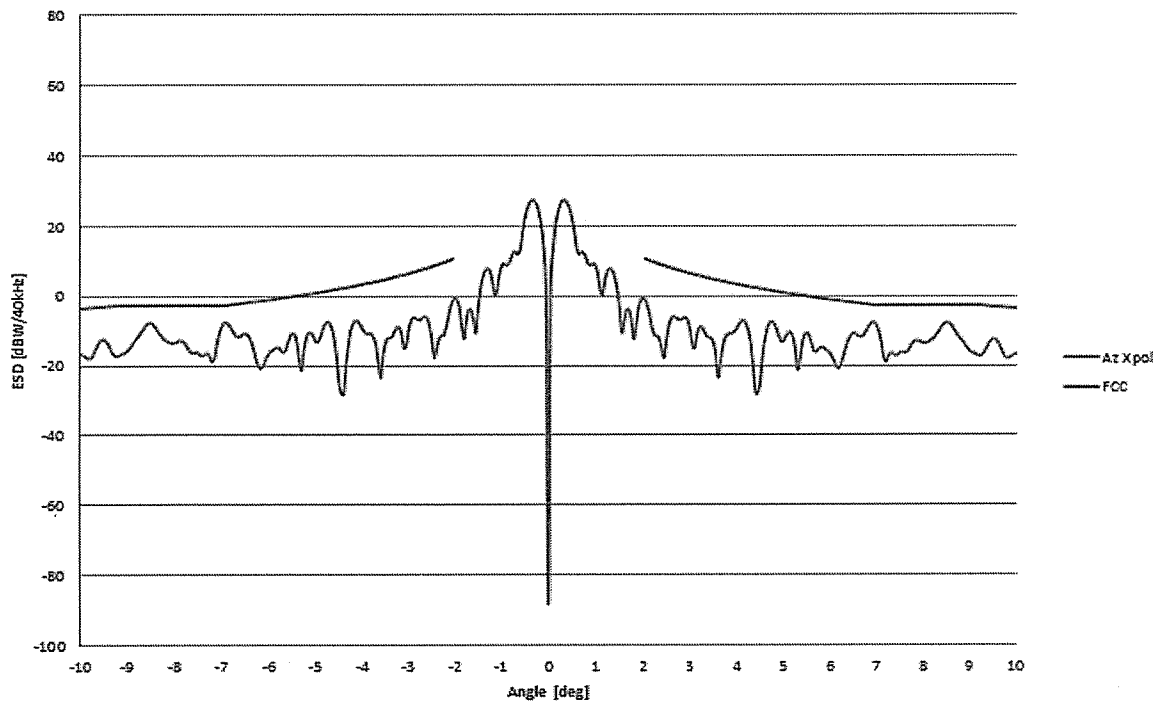
MUAP Predicted ESD: Copol/EI/27.652 GHz
Max Copol EIRP = 45.761 dBW/4kHz
40 W SSPA Backoff = 7 dB



MUAP Predicted ESD: Copol/Az/27.652 GHz
Max Copol EIRP = 45.761 dBW/4kHz
40 W SSPA Backoff = 7 dB



MUAP Predicted ESD: Xpol/Az/28.3615 GHz



ANNEX 2 – Link Budgets

Link Budget: Return (Clear Sky)

O3b Networks Link Analysis - Tier2 Service for Melbourne Beach/U.S.A.			
ECM Link Budget Rpt - 11/19/2014		Tier2	Tier2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	Melbourne Beach/U.S.A.
Latitude	(deg)	34.16	28.09
Longitude (East)	(deg)	260.71	279.39
E/S Range to SV	(km)	10166.69	9311.20
E/S Elevation to SV	(deg)	29.99	43.30
E/S Altitude	(km)	0.00	0.00
SV Beam Identifier	(#)	12	
Telco Offset to Beam Center	(km)	0.27	
Modulation Parameters		Return	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	50%	
Allocated Bandwidth	(MHz)	108	
Channel Symbol Rate	(Msps)	90	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.60	
Channel Throughput	(Mbps)	159.60	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	28020	
E/S Tx HPA Power Level	(W)	40	
E/S Tx OBO	(dB)	-9	
E/S Tx Antenna Gain (2.4m)	(dB)	54.67	
E/S Tx EIRP Per Channel	(dBW)	58.80	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.13	
Satellite		Return	
SV Rx G/T	(dB/K)	5.57	
SV Tx OBO	(dB)	-15.81	
SV Tx EIRP Per Channel/Carrier	dBW	32.44	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	18220	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.91	
E/S Rx Effective G/T	(dB/K)	40.44	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	45.00	
Carrier/Noise Uplink	(dB)	11.19	
Carrier/Noise Downlink	(dB)	23.08	
Carrier/Intermodulation Im (C/Im)	(dB)	25.00	
(C/N)- Total Actual (Es/No)	(dB)	10.39	
(C/N)-Total Required	(dB)	6.89	
(Eb/No)-Total Actual	(dB)	8.48	
(Eb/No)-Total Required	(dB)	8.48	
Excess Margin	(dB)	3.50	
Fade Margin	(dB)	12.65	

Link Budget: Return (Rain)

O3b Networks Link Analysis - Tier2 Service for Melbourne Beach/U.S.A.			
ECM Link Budget Rpt - 11/19/2014		Tier2	Tier2
Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	Melbourne Beach/U.S.A.
Latitude	(deg)	34.16	28.09
Longitude (East)	(deg)	260.71	279.39
E/S Range to SV	(km)	10166.69	9311.20
E/S Elevation to SV	(deg)	29.99	43.30
E/S Altitude	(km)	0.00	0.00
SV Beam Identifier	(#)	12	
Telco Offset to Beam Center	(km)	0.27	
Modulation Parameters		Return	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	50%	
Allocated Bandwidth	(MHz)	108	
Channel Symbol Rate	(Msps)	90	
Channel Modulation Type		QPSK	
Channel FEC Rate		0.66	
Channel Throughput	(Mbps)	118.37	
Uplink		Return	
E/S Carrier Frequencies	(MHz)	28020	
E/S Tx HPA Power Level	(W)	40	
E/S Tx OBO	(dB)	-3	
E/S Tx Antenna Gain (2.4m)	(dB)	54.67	
E/S Tx EIRP Per Channel	(dBW)	64.80	
E/S Tx RF Link Availability	(%)	99.254%	
E/S Tx Spreading Loss	(dB)	-151.13	
Satellite		Return	
SV Rx G/T	(dB/K)	5.57	
SV Tx OBO	(dB)	-19.42	
SV Tx EIRP Per Channel/Carrier	dBW	28.83	
Downlink		Return	
E/S Rx Carrier Frequency	(MHz)	18220	
E/S Rx Rf Link Availability	(%)	Clear	
E/S Rx Antenna Gain (7.3m)	(dBi)	61.91	
E/S Rx Effective G/T	(dB/K)	40.44	
Total Link		Return	
Carrier/Noise Bandwidth	(dB)	45.00	
Carrier/Noise Uplink	(dB)	7.59	
Carrier/Noise Downlink	(dB)	19.48	
Carrier/Intermodulation Im (C/Im)	(dB)	21.39	
(C/N)- Total Actual (Es/No)	(dB)	6.87	
(C/N)-Total Required	(dB)	4.34	
(Eb/No)-Total Actual	(dB)	6.38	
(Eb/No)-Total Required	(dB)	6.38	
Excess Margin	(dB)	2.53	
Fade Margin	(dB)	9.13	

Link Budget: Forward (1)

O3b Networks Link Analysis - Tier2 Service for Melbourne Beach/U.S.A.			
ECM Link Budget Rpt - 11/19/2014		Tier2	Tier2
Parameters	Unit	Rain Up	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	Melbourne Beach/U.S.A.
Latitude	(deg)	34.16	28.09
Longitude (East)	(deg)	260.71	279.39
E/S Range to SV	(km)	10166.69	9311.20
E/S Elevation to SV	(deg)	29.99	43.30
E/S Altitude	(km)	0.00	0.00
SV Beam Identifier	(#)	15	
Telco Offset to Beam Center	(km)	0.27	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	100%	
Allocated Bandwidth	(MHz)	216	
Channel Symbol Rate	(MSPS)	180	
Channel Modulation Type		QPSK	
Channel FEC Rate		0.83	
Channel Throughput	(Mbps)	296.15	
Uplink		Forward	
E/S Carrier Frequencies	(MHz)	28963	
E/S Tx HPA Power Level	(W)	500	
E/S Tx OBO	(dB)	-4	
E/S Tx Antenna Gain (7.3m)	(dB)	65.60	
E/S Tx EIRP Per Channel	(dBW)	81.40	
E/S Tx RF Link Availability	(%)	99.856%	
E/S Tx Spreading Loss	(dB)	-151.13	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.54	
SV Tx OBO	(dB)	-3.80	
SV Tx EIRP Per Channel/Carrier	(dBW)	45.45	
Downlink		Forward	
E/S Rx Carrier Frequency	(MHz)	19163	
E/S Rx RF Link Availability	(%)	Clear	
E/S Rx Antenna Gain (2.4m)	(dBi)	51.65	
E/S Rx Effective G/T	(dB/K)	26.49	
Total Link		Forward	
Carrier/Noise Bandwidth	(dB)	51.93	
Carrier/Noise Uplink	(dB)	11.86	
Carrier/Noise Downlink	(dB)	19.48	
Carrier/Intermodulation Im (C/Im)	(dB)	30.00	
(C/N)- Total Actual (Es/No)	(dB)	10.58	
(C/N)-Total Required	(dB)	6.33	
(Eb/No)-Total Actual	(dB)	10.08	
(Eb/No)-Total Required	(dB)	10.08	
Excess Margin	(dB)	4.24	
Fade Margin	(dB)	12.83	

Link Budget: Forward (2)

O3b Networks Link Analysis - Tier2 Service for Melbourne Beach/U.S.A.			
ECM Link Budget Rpt - 11/19/2014		Tier2	Tier2
Parameters	Unit	Clear Sky	
Ground parameters		Teleport	Telco
Location		Vernon/U.S.A.	Melbourne Beach/U.S.A.
Latitude	(deg)	34.16	28.09
Longitude (East)	(deg)	260.71	279.39
E/S Range to SV	(km)	10166.69	9311.20
E/S Elevation to SV	(deg)	29.99	43.30
E/S Altitude	(km)	0.00	0.00
SV Beam Identifier	(#)	15	
Telco Offset to Beam Center	(km)	0.27	
Modulation Parameters		Forward	
Enter Receiver	Type	MEOLink	
Percentage of Bandwidth	(%)	100%	
Allocated Bandwidth	(MHz)	216	
Channel Symbol Rate	(Msps)	180	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.66	
Channel Throughput	(Mbps)	473.49	
Uplink		Forward	
E/S Carrier Frequencies	(MHz)	28963	
E/S Tx HPA Power Level	(W)	500	
E/S Tx OBO	(dB)	-10	
E/S Tx Antenna Gain (7.3m)	(dB)	65.60	
E/S Tx EIRP Per Channel	(dBW)	75.40	
E/S Tx RF Link Availability	(%)	Clear	
E/S Tx Spreading Loss	(dB)	-151.13	
Satellite		Forward	
SV Rx G/T	(dB/K)	5.54	
SV Tx OBO	(dB)	-3.80	
SV Tx EIRP Per Channel/Carrier	(dBW)	45.45	
Downlink		Forward	
E/S Rx Carrier Frequency	(MHz)	19163	
E/S Rx RF Link Availability	(%)	Clear	
E/S Rx Antenna Gain (2.4m)	(dBi)	51.65	
E/S Rx Effective G/T	(dB/K)	26.49	
Total Link		Forward	
Carrier/Noise Bandwidth	(dB)	51.93	
Carrier/Noise Uplink	(dB)	23.74	
Carrier/Noise Downlink	(dB)	19.48	
Carrier/Intermodulation Im (C/Im)	(dB)	25.00	
(C/N)- Total Actual (Es/No)	(dB)	16.56	
(C/N)-Total Required	(dB)	11.01	
(Eb/No)-Total Actual	(dB)	14.19	
(Eb/No)-Total Required	(dB)	14.19	
Excess Margin	(dB)	5.55	
Fade Margin	(dB)	18.81	

Annex 3 – Radiation Hazard Study

Radiation Hazard Study

ST5000-2.4m

This study analyzes the potential Radio Frequency (RF) human exposure levels caused by the Electro Magnetic (EM) fields of the above-captioned antenna. The mathematical analysis performed below complies with the methods described in the Federal Communications Commission Office of Engineering and Technology Bulletin No. 65 (1985 rev. 1997) R&O 96-326.

Maximum Permissible Exposure

There are two separate levels of exposure limits. The first applies to persons in the general population who are in an uncontrolled environment. The second applies to trained personnel in a controlled environment. According to 47 C.F.R. § 1.1310, the Maximum Permissible Exposure (MPE) limits for frequencies above 1.5 GHz are as follows:

- General Population / Uncontrolled Exposure 1.0 mW/cm²
- Occupational / Controlled Exposure 5.0 mW/cm²

The purpose of this study is to determine the power flux density levels for the earth station under study as compared with the MPE limits. This comparison is done in each of the following regions:

1. Far-field region
2. Near-field region
3. Transition region
4. The region between the feed and the antenna surface
5. The main reflector region
6. The region between the antenna edge and the ground

Input Parameters

The following input parameters were used in the calculations:

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>
Antenna Diameter:	2.4	m	<i>D</i>
Antenna Transmit Gain:	54.67	dBi	<i>G</i>
Transmit Frequency:	28360	MHz	<i>f</i>
Feed Flange Diameter:	6.00	cm	<i>d</i>
Power Input to the Antenna:	40.00	W	<i>P</i>

Calculated Parameters

The following values were calculated using the above input parameters and the corresponding formulas.

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
Antenna Surface Area:	4.52	m ²	<i>A</i>	$\pi D^2/4$
Area of Feed Flange:	28.27	cm ²	<i>a</i>	$\pi d^2/4$
Antenna Efficiency:	0.58		η	$G\lambda^2/(\pi^2 D^2)$
Gain Factor:	293001.00		<i>g</i>	$10^{G/10}$
Wavelength:	0.0106	m	λ	$300/f$

Behavior of EM Fields as a Function of Distance

The behavior of the characteristics of EM fields varies depending on the distance from the radiating antenna. These characteristics are analyzed in three primary regions: the near-field region, the far-field region and the transition region. Of interest also are the region between the antenna main reflector and the subreflector, the region of the main reflector area and the region between the main reflector and ground.

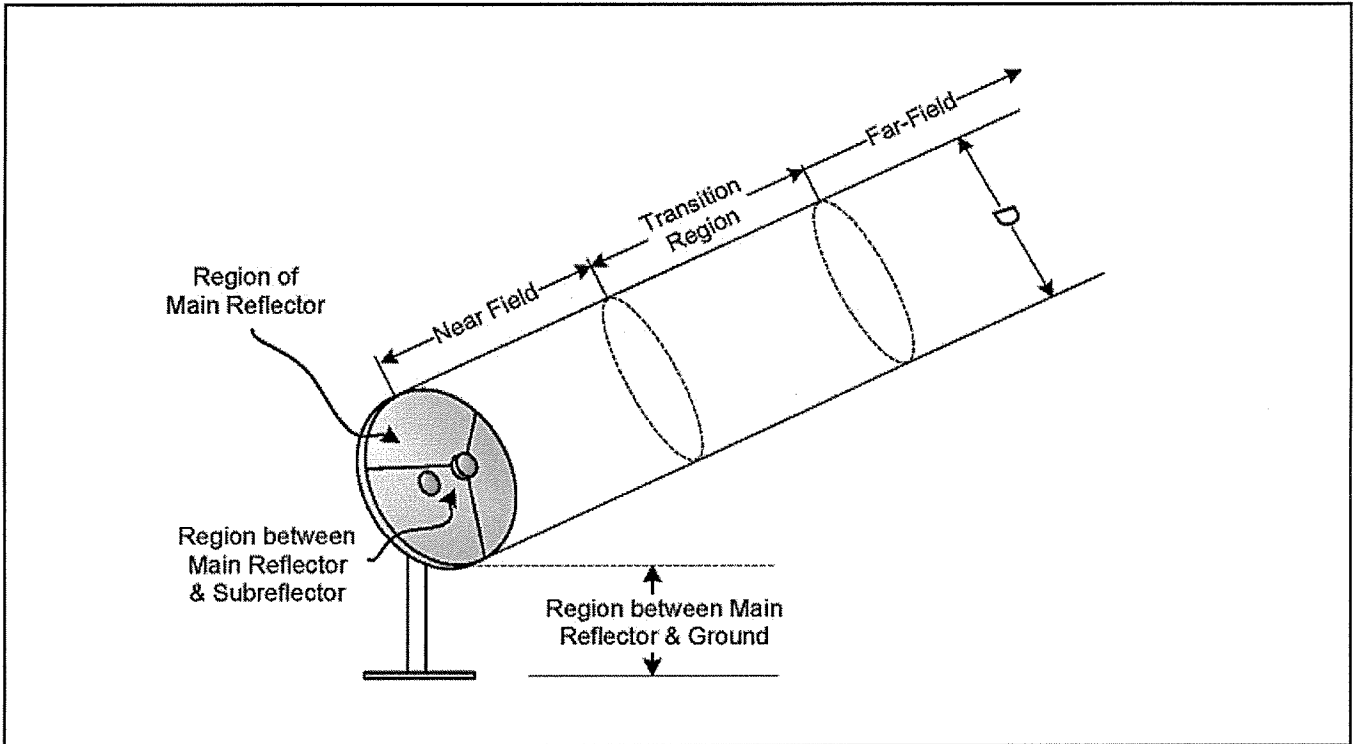


Figure 1. EM Fields as a Function of Distance

For parabolic aperture antennas with circular cross sections, such as the antenna under study, the near-field, far-field and transition region distances are calculated as follows:

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Formula</u>
Near Field Distance:	136.128	m	$R_{nf} = D^2/(4\lambda)$
Distance to Far Field:	326.707	m	$R_{ff} = 0.60D^2/(\lambda)$
Distance of Transition Region	136.128	m	$R_t = R_{nf}$

The distance in the transition region is between the near and far fields. Thus, $R_{nf} \leq R_t \leq R_{ff}$. However, the power density in the transition region will not exceed the power density in the near-field. Therefore, for purposes of the present analysis, the distance of the transition region can equate the distance to the near-field.

Power Flux Density Calculations

The power flux density is considered to be at a maximum through the entire length of the near-field. This region is contained within a cylindrical volume with a diameter, D, equal to the diameter of the antenna. In the transition region and the far-field, the power density decreases inversely with the square of the distance. The following equations are used to calculate power density in these regions.

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
Power Density in the Near-Field	2.040	mW/cm ²	S_{nf}	$16.0 \eta P / (\pi D^2)$
Power Density in the Far-Field	0.874	mW/cm ²	S_{ff}	$GP / (4\pi R_{ff}^2)$
Power Density in the Trans. Region	2.040	mW/cm ²	S_t	$S_{nf} R_{nf} / (R_t)$

The region between the main reflector and the subreflector is confined within a conical shape defined by the feed assembly. The most common feed assemblies are waveguide flanges. This energy is determined as follows:

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
Power Density at the Feed Flange	5658.8	mW/cm ²	S_{fa}	$4P / a$

The power density in the main reflector is determined similarly to the power density at the feed flange; except that the area of the reflector is used.

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
Power Density at Main Reflector	3.537	mW/cm ²	$S_{surface}$	$4P / A$

The power density between the reflector and ground, assuming uniform illumination of the reflector surface, is calculated as follows:

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
Power Density between Reflector and Ground	0.884	mW/cm ²	S_g	P / A

Table 1 summarizes the calculated power flux density values for each region. In a controlled environment, the only regions that exceed FCC limitations are shown below. These regions are only accessible by trained technicians who, as a matter of procedure, turn off transmit power before performing any work in these areas.

Power Densities	mW/cm2	Controlled Environment (5 mW/cm2)
Far Field Calculation	0.874	Satisfies FCC Requirements
Near Field Calculation	2.040	Satisfies FCC Requirements
Transition Region	2.040	Satisfies FCC Requirements
Region between Main and Subreflector	5658.8	Exceeds Limitations
Main Reflector Region	3.537	Satisfies FCC Requirements
Region between Main Reflector and Ground	0.884	Satisfies FCC Requirements

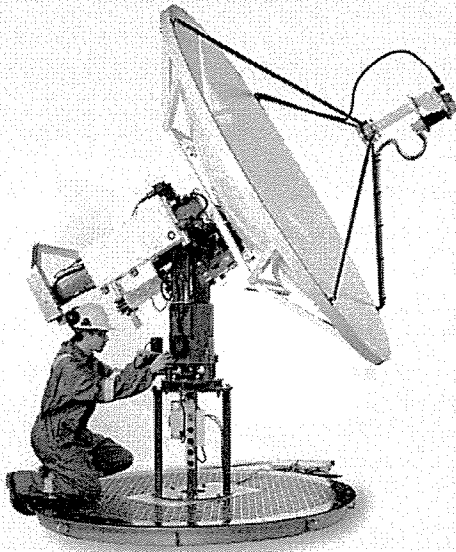
Table 1. Power Flux Density for Each Region

In conclusion, the results show that the antenna, in a controlled environment, and under the proper mitigation procedures, meets the guidelines specified in 47 C.F.R. § 1.1310.

Annex 4 – SpaceTrack 4000 Product Brochure

SpaceTrack 4000

Reliability Never Reached So Far™



Designed to meet the communications requirements of at-sea operations, Harris CapRock's SpaceTrack 4000 stabilized antennas are specifically engineered for offshore platforms, FPSOs, semisubmersibles and survey and seismic vessels. The SpaceTrack 4000 range of antennas support both C and Ku-band coverage, delivering the most reliable communications for global operations.

BENEFITS

- > Guaranteed pointing accuracy
- > Secure and reliable transmission
- > Cost-efficient, high-performance networks

Certifications and Approvals

CE certified
Brazil Anatel certified
Compliant with MIL-STD 167-1A
Compliant with FCC 25.221 and FCC 25.222
Compliant with ITU and ETSI ESV specifications
Approved by Intelsat
Meets Eutelsat standards
Meets MIL-STD901 and MIL-STD461 standards

FEATURES

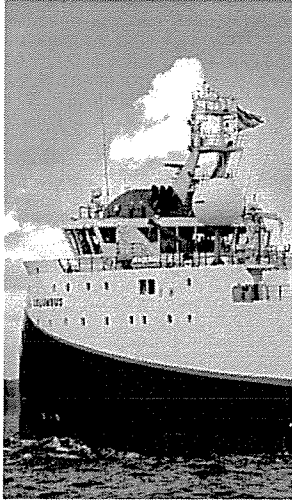
- > Automatic satellite acquisition
- > Quick and easy conversion between C and Ku-band footprints
- > Supports standard GPS and Compass interfaces
- > Remote diagnostics and built-in tests
- > Radome air conditioning optional

Advanced Satellite Technology

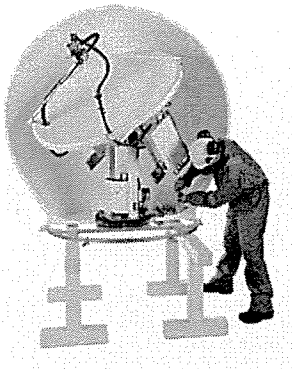
The satellite technology used in SpaceTrack 4000 results in the optimum pointing of the antenna. This feature ensures that the signal is maintained despite conditions at sea and the location and direction of the vessel. Once the system is deployed, the antenna automatically locks on the appropriate signal, guaranteeing continuous and reliable transmission.

SpaceTrack 4000

Reliability Never Reached So Far™



SpaceTrack 4000 technology supports all types of seagoing vessels, resolving the challenges of geography and distance.



Technical specifications

Antenna

4012K	1.2 m diameter, Ku band, symmetrical, prime focus		
	Tx 13.75–14.5 GHz	Midband gain	Tx ~43.0 dBi
	Rx 10.95–12.75 GHz	Midband gain	Rx ~41.2 dBi
		G/T (typical)	20.0 dB/k
4012C	1.2 m diameter, C band, symmetrical, prime focus		
	Tx 5850–6425 MHz	Midband gain	Tx ~35.2 dBi
	Rx 3625–4200 MHz	Midband gain	Rx ~31.7 dBi
		G/T (typical)	11.5 dB/k
4018K	1.8 m diameter, Ku band, symmetrical, prime focus		
	Tx 13.75–14.5 GHz	Midband gain	Tx ~45.5 dBi
	Rx 10.95–12.75 GHz	Midband gain	Rx ~44.2 dBi
		G/T (typical)	22.4 dB/k
4024K	2.4 m diameter, Ku band, symmetrical, prime focus		
	Tx 13.75–14.5 GHz	Midband gain	Tx ~50.1 dBi
	Rx 10.95–12.75 GHz	Midband gain	Rx ~47.7 dBi
		G/T (typical)	25.5 dB/k
4024C	2.4 m diameter, C band, symmetrical, prime focus		
	Tx 5850–6425 MHz	Midband gain	Tx ~42.1 dBi
	Rx 3625–4200 MHz	Midband gain	Rx ~38.2 dBi
		G/T (typical)	18.5 dB/k

Pointing accuracy

For all systems	≤ 0.2° peak
Max. vessel motion roll/pitch/yaw	8°/sec

Dimensions and weights

4012K	Radome size 1.8 m (H) × 1.8 m (D)	Antenna weight 230 kg
4012C Linear feed	Radome size 1.9 m (H) × 1.9 m (D)	Antenna weight 400 kg
4012C Circular feed	Radome size 2.7 m (H) × 2.55 m (D)	Antenna weight 400 kg
4018K	Radome size 2.7 m (H) × 2.55 m (D)	Antenna weight 450 kg
4024K	Radome size 3.75 m (H) × 3.6 m (D)	Antenna weight 750 kg
4024C	Radome size 3.75 m (H) × 3.6 m (D)	Antenna weight 750 kg

Application notes

4012K	Typical data rates [†] : 9.6–512 Kbit/sec	- Suitable for small vessels with space constraints - Minimal equipment costs - Rapid deployment version: SpaceTrack FR
4012C	Typical data rates [†] : 9.6–512 Kbit/sec	- Suitable for small vessels with space constraints - C-band operation provides global service options
4018K	Typical data rates [†] : 9.6–1024 Kbit/sec	- Suitable for small- to medium-sized vessels - Higher data rate
4024K	Typical data rates [†] : 9.6–4096 Kbit/sec	- Suitable for medium to large vessels - Large antenna size supports highest potential bit rates while minimizing space segment costs
4024C	Typical data rates [†] : 9.6–4096 Kbit/sec	- Suitable for medium to large vessels - C-band operation provides global service options - Linear or circular polarization options available

Ka-Band Earth Station – Melbourne, FL

Frequency Coordination Report

28 GHz



Prepared on Behalf of
Harris CapRock
Communications

January 7, 2015





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1. Summary of Results

On behalf of Harris CapRock Communications, Comsearch performed a coordination notice for all existing and proposed terrestrial licenses within the coordination contours of their proposed Ka-Band earth station in Melbourne, Florida, which will transmit at 28 GHz¹. Prior-notification letters were sent to the licensees and a copy of the notification data is provided in section four of this report. The earth station coordination was finalized on January 5, 2015.

No objections were received from any of the incumbent 28 GHz licensees. Our notification to the LMDS incumbents was performed under the assumption that the earth station would be operating on a secondary basis to LMDS Block A operations and a contact at Harris CapRock Communications has been provided in case any concerns may arise in the future.

2. 28 GHz Common Carrier and LTTS Coordination

In accordance with FCC Rules and Regulations, the Ka-Band earth station in Melbourne, Florida was prior-coordinated by Comsearch. A notification letter and datasheets for this earth station were sent to the following 28 GHz common carrier fixed microwave licensee on December 5, 2014. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Verizon	Continental US

A notification letter and datasheets for the Ka-Band earth station in Melbourne, Florida were also sent to the following 28 GHz local television transmission licensee on December 5, 2014. This licensee is authorized to operate temporary fixed operations from 27.5 to 29.5 GHz on a nationwide basis.

Licensee	Authorized Geographic Area
Information Super Station, LLC	Continental US

No objections were received from the common carrier or local television transmission service incumbents.

¹ The proposed earth station will operate in the 27.6 – 29.1 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

A Notification letter was sent to the following 28 GHz LMDS licensees on December 5, 2014. The proposed earth station will operate on frequencies that overlap Block A of the LMDS service. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name
Wireless Distribution Services	BTA239	Lakeland-Winter Haven, FL
Rainier Connect	BTA326	Ocala, FL
Straight Path Spectrum	BTA336	Orlando, FL
T-Mobile ²	BTA336	Orlando, FL
Nextlink/XO	BTA440	Tampa-St. Petersburg-Clearwater, FL
T-Mobile ³	BTA440	Tampa-St. Petersburg-Clearwater, FL
Nextlink/XO	BTA469	West Palm Beach-Boca Raton, FL
T-Mobile ⁴	BTA469	West Palm Beach-Boca Raton, FL

No objections were received from the LMDS incumbents.

² T-Mobile has acquired LMDS spectrum from Straight Path in the Orlando, FL Basic Trading Area (BTA).

³ T-Mobile has acquired LMDS spectrum from Nextlink Wireless / XO in the Tampa-St. Petersburg-Clearwater, FL BTA.

⁴ T-Mobile has acquired LMDS spectrum from Nextlink Wireless / XO in the West Palm Beach-Boca Raton, FL BTA.



4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band earth station in Melbourne, Florida. This data was circulated to all incumbent licensees in the shared 28 GHz frequency ranges.

COMSEARCH
Earth Station Data Sheet
 19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Date: 12/01/2014
 Job Number: <PCNJobCode>

Administrative Information

Status ENGINEER PROPOSAL
 Call Sign <PCNCallSign>
 Licensee Code SPACKL
 Licensee Name Harris CapRock Communications

Site Information**MELBOURNE, FL**

Venue Name
 Latitude (NAD 83) 28° 1' 51.2" N
 Longitude (NAD 83) 80° 35' 55.7" W
 Climate Zone B
 Rain Zone 1
 Ground Elevation (AMSL) 5.76 m / 18.9 ft

Link Information

Satellite Type Medium Earth Orbit
 Mode TO - Transmit-Only
 Modulation Digital
 Minimum Elevation Angle 10.0°
 Azimuth Range 0.0° to 360°
 Antenna Centerline (AGL) 2.74 m / 9.0 ft

Antenna Information**Transmit - FCC32**

Manufacturer Harris
 Model ST5000-2.4
 Gain / Diameter 54.7 dBi / 2.4 m
 3-dB / 15-dB Beamwidth 0.14° / 0.32°

Max Available RF Power (dBW/4 kHz) -9.8
 (dBW/MHz) 14.2

Maximum EIRP (dBW/4 kHz) 44.9
 (dBW/MHz) 68.9

Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%

Frequency Information**Transmit 28.0 GHz**

Emission / Frequency Range (MHz)
 1M00G7D - 216MG7D / 27652.0 - 27868.0
 1M00G7D - 216MG7D / 27912.0 - 28128.0
 1M00G7D - 216MG7D / 28172.0 - 28388.0
 1M00G7D - 216MG7D / 28601.0 - 28817.0
 1M00G7D - 216MG7D / 28855.0 - 29071.0

Max Great Circle Coordination Distance 168.6 km / 104.8 mi
 Precipitation Scatter Contour Radius 100.0 km / 62.1 mi

COMSEARCH**Earth Station Data Sheet**

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Coordination Values**MELBOURNE, FL**

Licensee Name Harris CapRock Communications
 Latitude (NAD 83) 28° 1' 51.2" N
 Longitude (NAD 83) 80° 35' 55.7" W
 Ground Elevation (AMSL) 5.76 m / 18.9 ft
 Antenna Centerline (AGL) 2.74 m / 9.0 ft
 Antenna Model Harris 2.4 Meter
 Antenna Mode Transmit 28.0 GHz
 Interference Objectives: Long Term -151.0 dBW/4 kHz 20%
 Short Term -128.0 dBW/4 kHz 0.0025%
 Max Available RF Power -9.8 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	94.45	-10.00	112.26
5	0.00	89.45	-10.00	112.26
10	0.00	84.45	-10.00	112.26
15	0.00	79.45	-10.00	112.26
20	0.00	74.45	-10.00	112.26
25	0.00	69.45	-10.00	112.26
30	0.00	64.45	-10.00	112.26
35	0.00	59.45	-10.00	112.26
40	0.00	54.45	-10.00	112.26
45	0.00	49.45	-10.00	112.26
50	0.00	44.45	-10.00	112.26
55	0.00	39.45	-9.65	113.45
60	0.00	34.45	-8.45	117.36
65	0.00	29.45	-7.12	121.56
70	0.00	24.45	-5.61	126.08
75	0.00	19.46	-3.90	130.96
80	0.00	14.46	-1.93	133.35
85	0.00	9.46	0.35	139.71
90	0.00	4.47	2.91	147.68
95	0.00	0.68	5.41	156.29
100	0.00	5.56	6.74	163.72
105	0.00	10.56	5.78	157.61
110	0.00	15.55	3.37	149.20
115	0.00	20.55	0.78	141.00
120	0.00	25.55	-1.53	134.41
125	0.00	30.55	-3.43	132.24
130	0.00	35.55	-5.02	127.80
135	0.00	40.55	-6.37	123.82
140	0.00	45.55	-7.54	120.24
145	0.00	50.55	-8.55	117.04
150	0.00	55.55	-9.42	114.18
155	0.00	60.55	-10.00	112.26
160	0.00	65.55	-10.00	112.26
165	0.00	70.55	-10.00	112.26
170	0.00	75.55	-10.00	112.26
175	0.00	80.55	-10.00	112.26
180	0.00	85.55	-10.00	112.26
185	0.00	90.55	-10.00	112.26

COMSEARCH**Earth Station Data Sheet**

19700 Janelia Farm Boulevard, Ashburn, VA 20147
 (703)726-5662 <http://www.comsearch.com>

Coordination Values	MELBOURNE, FL
Licensee Name	Harris CapRock Communications
Latitude (NAD 83)	28° 1' 51.2" N
Longitude (NAD 83)	80° 35' 55.7" W
Ground Elevation (AMSL)	5.76 m / 18.9 ft
Antenna Centerline (AGL)	2.74 m / 9.0 ft
Antenna Model	Harris 2.4 Meter
Antenna Mode	Transmit 28.0 GHz
Interference Objectives: Long Term	-151.0 dBW/4 kHz 20%
Short Term	-128.0 dBW/4 kHz 0.0025%
Max Available RF Power	-9.8 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Transmit 28.0 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	95.55	-10.00	112.26
195	0.00	100.55	-10.00	112.26
200	0.00	105.55	-10.00	112.26
205	0.00	110.55	-10.00	112.26
210	0.00	115.55	-9.42	114.18
215	0.00	120.55	-8.55	117.04
220	0.00	125.55	-7.54	120.24
225	0.00	130.55	-6.37	123.82
230	0.00	135.55	-5.02	127.80
235	0.00	140.55	-3.43	132.24
240	0.00	145.55	-1.53	134.41
245	0.00	150.55	0.81	141.08
250	0.00	155.55	3.54	149.76
255	0.00	160.54	6.24	159.30
260	0.00	165.54	7.54	168.61
265	0.00	170.54	6.22	159.23
270	0.00	175.53	3.52	149.69
275	0.00	179.32	0.79	141.02
280	0.00	174.44	-1.60	134.22
285	0.00	169.44	-3.65	131.66
290	0.00	164.45	-5.41	126.68
295	0.00	159.45	-6.95	122.08
300	0.00	154.45	-8.31	117.82
305	0.00	149.45	-9.52	113.86
310	0.00	144.45	-10.00	112.26
315	0.00	139.45	-10.00	112.26
320	0.00	134.45	-10.00	112.26
325	0.00	129.45	-10.00	112.26
330	0.00	124.45	-10.00	112.26
335	0.00	119.45	-10.00	112.26
340	0.00	114.45	-10.00	112.26
345	0.00	109.45	-10.00	112.26
350	0.00	104.45	-10.00	112.26
355	0.00	99.45	-10.00	112.26



5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person: Joanna Lynch
Title: Manager, Spectrum & Data Solutions
Company: Comsearch
Address: 19700 Janelia Farm Blvd., Ashburn, VA 20147
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