

**Prepared for the Federal Communications Commission**

**Application for New License Authority for  
Earth Stations on Board Vessels**

**Harris CapRock Communications, Inc.**

**May 3, 2012**

**TABLE OF CONTENTS**

<b>INTRODUCTION</b> .....	<b>2</b>
<b>§25.222 (A)(1)(I)(A-C) SPECTRAL DENSITY LIMITS</b> .....	<b>2</b>
SPECTRAL DENSITY ENVELOPES .....	2
<b>§25.222 (A)(1)(II)(A) ANTENNA POINTING ERROR</b> .....	<b>3</b>
<b>§25.222 (A)(1)(III)(A) AUTOMATIC SHUT-OFF</b> .....	<b>3</b>
<b>§25.222 (A)(3) U.S. CONTACT INFORMATION</b> .....	<b>3</b>
<b>§ 25.222 (A)(4) VESSEL TRACKING</b> .....	<b>3</b>
FUNCTIONALITY OF VESSEL TRACKING SYSTEM.....	4
<b>§25.222 (A)(5) VESSELS OF FOREIGN REGISTRY</b> .....	<b>4</b>
<b>§25.222 (A)(6) U.S. CONTROL OF ESV HUB EARTH STATION</b> .....	<b>4</b>
<b>§25.222 (A)(7) 10.95-11.2 GHZ</b> .....	<b>5</b>
<b>§25.222 (B)(1)(I) EIRP DENSITY TABLES</b> .....	<b>5</b>
<b>§25.222 (B)(1)(II) HARRIS CAPROCK CERTIFICATION</b> .....	<b>5</b>
<b>§25.222 (B)(1)(III) MANUFACTURER CERTIFICATION</b> .....	<b>6</b>
<b>§25.222 (B)(3) ESV GEOGRAPHIC AREA OF OPERATION</b> .....	<b>6</b>
<b>§25.222 (B)(4) POINT OF CONTACT</b> .....	<b>6</b>
<b>§25.222 (B)(5) RADIATION EXPOSURE LIMITS</b> .....	<b>6</b>
<b>§25.222 (C) FREQUENCY COORDINATION</b> .....	<b>7</b>
<b>§25.222 (D) FREQUENCY COORDINATION</b> .....	<b>7</b>
<b>APPENDIX A – USE OF NON-U.S. SATELLITES</b> .....	<b>8</b>
<b>APPENDIX B – FAA NOTIFICATION</b> .....	<b>9</b>
<b>APPENDIX C – DECLARATION OF HARRIS CAPROCK</b> .....	<b>10</b>

**INTRODUCTION**

Harris CapRock Communications, Inc. ("HARRIS CAPROCK"), pursuant to 47 C.F.R. § 25.117 of the Rules and Regulations ("Regulations") of the Federal Communications Commission ("Commission"), respectfully requests the modification of an existing license to operate new Ku-Band Earth Station on Vessels ("ESVs") throughout US channels and waterways, the Gulf of Mexico, the Caribbean Sea, the Atlantic Ocean, and the Pacific Ocean. The proposed ESVs seek to operate in the 11.7-12.2 GHz and 14.0-14.5 GHz ("Ku-Band") frequency bands to communicate with already licensed hub stations located in the United States and operated by HARRIS CAPROCK.

The proposed antenna models ("Antennas") are:

- Intellian Ku 60cm model V60 ("Intellian V60") -- Manufactured by Intellian Technologies, Inc.
- Intellian Ku 83cm model V80 ("Intellian V80") -- Manufactured by Intellian Technologies, Inc.

The Antennas are capable of providing stabilized tracking. Intellian has performed tests and generated the EIRP spectral density tables and plots here presented. Furthermore, Intellian has declared that if the input power density to the feed of the Antennas is limited to the figures stated below, the Antennas will meet the requirements of Section 25.222 of the Regulations.

<u>Antenna Model</u>	<u>Maximum EIRP Spectral Density</u>
• Intellian V60	-22.30 dBW/4KHz
• Intellian V80	-20.13 dBW/4KHz

This report together with its attachments and exhibits addresses the requirements of Section 25.222 of the Regulations as well as the underlying ESV Order and Order on Reconsideration.<sup>1</sup>

**§25.222 (a)(1)(i)(A-C) SPECTRAL DENSITY LIMITS**

*"An ESV system shall not exceed the off-axis EIRP spectral-density limits and conditions defined in paragraphs (a)(1)(i)(A) through (a)(1)(i)(D) of this section." 47 C.F.R §25.222(a)(1)(i)(A).*

Spectral Density Envelopes

The spectral density envelopes specified in §25.222(a)(1)(i) are as follows:<sup>2</sup>

§25.222(a)(1)(i)(A) – Copole Azimuth

• 15 – 25log( $\theta$ )	dBW / 4KHz for	1.5° ≤ $\theta$ ≤ 7.0°
• -6	dBW / 4KHz for	7.0° ≤ $\theta$ ≤ 9.2°
• 18 – 25log( $\theta$ )	dBW / 4KHz for	9.2° ≤ $\theta$ ≤ 48°
• -24	dBW / 4KHz for	48° ≤ $\theta$ ≤ 85°
• -14	dBW / 4KHz for	85° ≤ $\theta$ ≤ 180°

*The peak EIRP of an individual sidelobe may not exceed the envelope defined above for  $\theta$  between 1.5° and 7.0°. For  $\theta > 7^\circ$ , the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the envelope by more than 3dB.*

<sup>1</sup> *In the Matter of Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, Report and Order, FCC 204-286, Adopted December 15, 2004, Released January 6, 2005; Order on Reconsideration, FCC 09-63, Adopted July 30, 2009, Released July 31, 2009.

<sup>2</sup> The actual formula in the statute includes a log(N) term which is subtracted from the spectral density. Since in this case, the system is TDMA and N=1 for TDMA, the log(1) terms goes to zero.

**§25.222(a)(1)(i)(B) – Copole in other directions**

•	18 – 25log( $\theta$ )	dBW / 4KHz for	3.0° ≤ $\theta$ ≤ 48°
•	-24	dBW / 4KHz for	48° ≤ $\theta$ ≤ 85°
•	-14	dBW / 4KHz for	85° ≤ $\theta$ ≤ 180°

*The envelope may be exceeded by no more than 10% of the sidelobes provided no individual sidelobe exceeds the gain envelope given above by more than 6dB. The region of the main reflector spillover energy is to be determined as a single lobe and shall not exceed the enveloped by more than 6dB.*

**§25.222(a)(1)(i)(C) – Crosspole Azimuth**

•	5 – 25log( $\theta$ )	dBW / 4KHz for	1.8° ≤ $\theta$ ≤ 7°
•	-16	dBW / 4KHz for	7° ≤ $\theta$ ≤ 9.2°

**§25.222 (a)(1)(ii)(A) ANTENNA POINTING ERROR**

*"Each ESV transmitter shall maintain a pointing error of less than or equal to 0.2° between the Intellian location of the target satellite and the axis of the main lobe of the ESV antenna." 47 C.F.R §25.222(a)(1)(ii)(A).*

According to Intellian, the Antennas will maintain a stabilization pointing accuracy of better than 0.2 degrees under specified ship motion conditions. See Declaration of Intellian attached to the underlying application.

**§25.222 (a)(1)(iii)(A) AUTOMATIC SHUT-OFF**

*"... all emissions from the ESV shall automatically cease within 100 milliseconds if the line angle between the Intellian location of the target satellite and the axis of the main lobe of the ESV antenna exceeds 0.5°, and transmission will not resume until such angle is less than 0.2°." 47 C.F.R §25.222(a)(1)(iii)(A).*

According to Intellian, the Antennas will automatically cease transmissions within 100 milliseconds if the pointing error should exceed 0.5 degrees and will not resume transmissions until the error drops below 0.2 degrees. See Declaration of Intellian attached to the underlying application.

**§25.222 (a)(3) U.S. CONTACT INFORMATION**

*"There shall be a point of contact in the United States, with phone number and address included with the application, available 24 hours a day, seven days of week, with authority and ability to cease all emissions from the ESVs, either directly or through the facilities of a U.S. Hub or a Hub located in another country with which the U.S. has a bilateral agreement that enables such cessation of emissions." 47 C.F.R §25.222(a)(3).*

Harris CapRock Communications, Inc.  
Network Operations Center  
4400 S. Sam Houston Pkwy. E.  
Houston, Texas 77048  
(832) 668-2300 phone

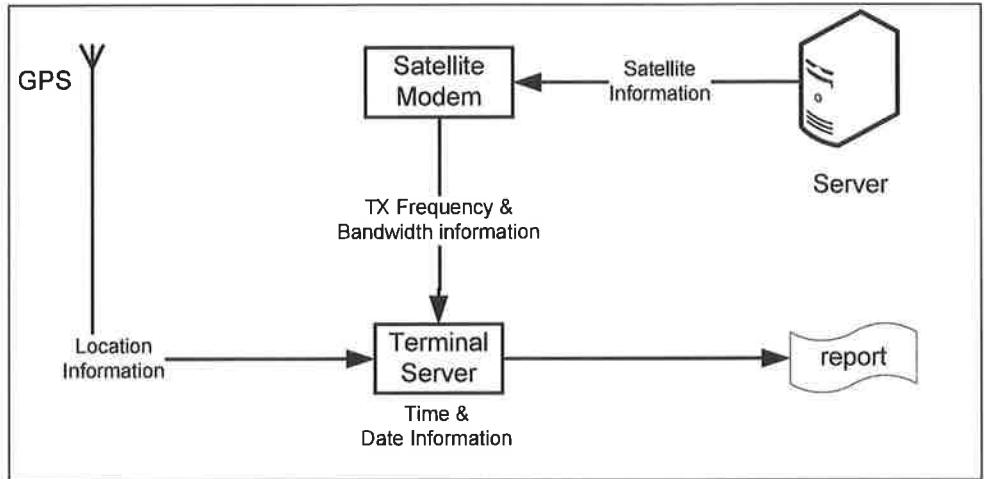
HARRIS CAPROCK personnel, either via a network port or an out-of-band management system, have the authority and capability to remotely access equipment on the ESVs to terminate emissions in case of suspected interference.

**§ 25.222 (a)(4) VESSEL TRACKING**

*"For each ESV transmitter a record of the ship location (i.e. latitude/longitude), transmit frequency, channel bandwidth and satellite used shall be time annotated and maintained for a period of not less than 1 year. Records will be recorded at time intervals no greater than every 20 minutes while the ESV is transmitting. The ESV operator will make this data available upon request to a coordinator, fixed system operator, fixed-satellite system operator, NTIA, or the Commission within 24 hours of the request." 47 C.F.R. §25.222 (a)(4).*

Functionality of Vessel Tracking System

HARRIS CAPROCK has designed a system to record the vessel's location, transmit frequency, channel bandwidth and satellite. The system records this information every 20 minutes. This data will be stored locally and will be uploaded to HARRIS CAPROCK's Network Management System (NMS) on a regular basis. HARRIS CAPROCK can make this data available within 24 hours of a request by a coordinator, fixed system operator, fixed-satellite system operator, NTIA, or the Commission.



**Figure 1. Vessel Tracking Network Configuration**

**§25.222 (a)(5) VESSELS OF FOREIGN REGISTRY**

*"ESV operators communicating with vessels of foreign registry must maintain detailed information on each vessel's country of registry and a point of contact for the relevant administration responsible for licensing ESVs." 47 C.F.R. §25.222 (a)(5).*

In the event HARRIS CAPROCK must operate foreign-registered ESVs, it will maintain detailed information on each vessel as well as a point of contact for the relevant administration responsible for licensing the ESV.

**§25.222 (a)(6) U.S. CONTROL OF ESV HUB EARTH STATION**

*"ESV operators shall control all ESVs by a Hub earth station located in the United States, except that an ESV on U.S.-registered vessels may operate under control of a Hub earth station location outside the United States provided the ESV operator maintains a point of contact within the United States that will have the capability and authority to cause an ESV on a U.S.-registered vessel to cease transmitting if necessary." 47 C.F.R. §25.222 (a)(6).*

The Antenna operated by HARRIS CAPROCK will be controlled by the earth station listed below:

Callsign	Diameter	Location	Antenna ID
E030279	13.1m	Houston, TX*	12.1M

\*4400 S. Sam Houston Pkwy. E., Houston, TX 77048

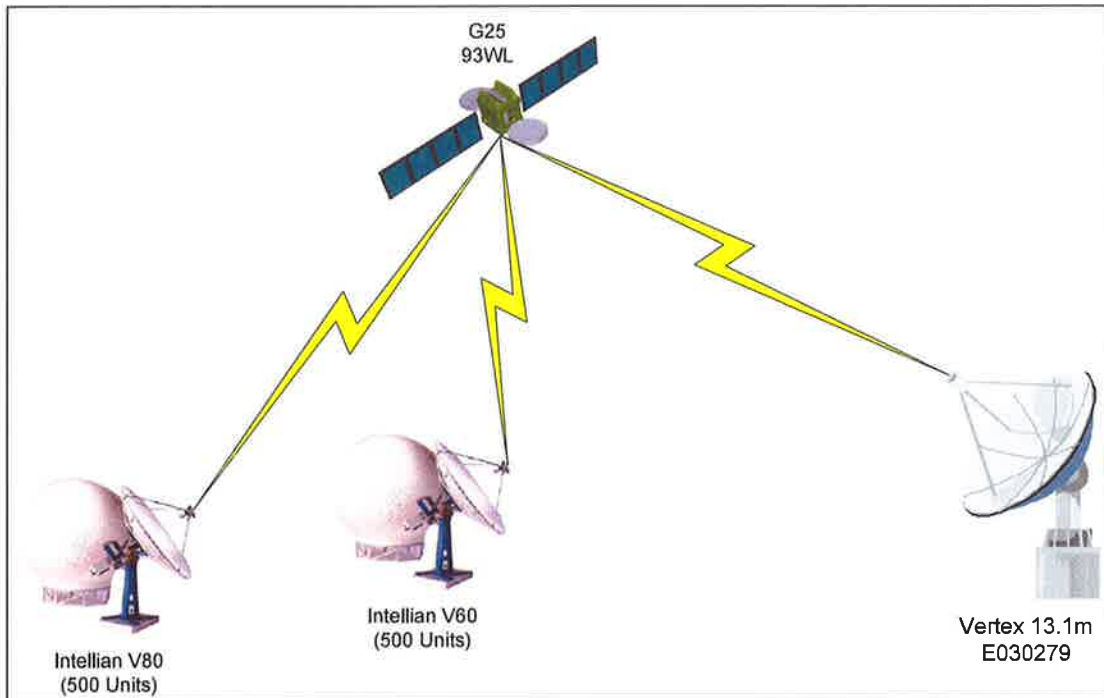


Figure 2. Network Diagram – Vertex 13.1m Hub

**§25.222 (a)(7) 10.95-11.2 GHz**

*"In the 10.95-11.2 GHz (Earth-toSpace) frequency bands ESVs shall not claim protection from interference from any authorized terrestrial stations to which frequencies are either already assigned, or may be assigned in the future."*

HARRIS CAPROCK will not claim protection from interference in the 10.95-11.2GHz from any authorized terrestrial stations to which frequencies are already assigned or may be assigned in the future.

**§25.222 (b)(1)(i) EIRP DENSITY TABLES**

*"Any ESV applicant filling an application pursuant to paragraph (a)(1) of this section must file three tables showing the off-axis EIRP level of the proposed earth station antenna in the direction of the plane of the GSO; the co-polarized EIRP in the elevation plane, that is, in the plane perpendicular to the plane of the GSO; and cross-polarized EIRP. In each table, the EIRP level must be provided at increments of 0.1° for angles between 0° and 10° off-axis, and at increments of 5° for angles between 10° and 180° off-axis. "* 47 C.F.R §25.222(b)(1)(i).

HARRIS CAPROCK has provided spectral density tables as well as charts as exhibits to Form 312 of the underlying application. Such tables and charts were generated by Intellian for the Antennas.

**§25.222 (b)(1)(ii) HARRIS CAPROCK CERTIFICATION**

*"A certification, in Schedule B, that the ESV antenna conforms to the gain pattern criteria of §25.209 (a) and (b), that, combined with the maximum input power density calculated from the EIRP density less the antenna gain, which is entered in Schedule B, demonstrates that the off-axis EIRP density envelope set forth in paragraphs (a)(1)(i)(A) through (a)(1)(i)(C) of this section will be met under the assumption that the antenna is pointed to the target satellite."* 47 C.F.R §25.222(b)(1)(ii).

See Appendix C – Certification of HARRIS CAPROCK

**§25.222 (b)(1)(iii) MANUFACTURER CERTIFICATION**

*"An ESV applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(A) of this section, must provide a certification from the equipment manufacturer stating that the antenna tracking system will maintain a pointing error of less than or equal to 0.2° between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna and the antenna tracking system is capable of ceasing emissions within 100 milliseconds in the angle between the orbital location of the satellite and the axis of the main lobe of the ESV antenna exceeds 0.5°." 47 C.F.R §25.222(b)(1)(iii).*

According to Intellian, the Antennas will automatically cease transmissions within 100 milliseconds if the pointing error should exceed 0.5 degrees and will not resume transmissions until the error drops below 0.2 degrees. See Declaration of Intellian attached to the underlying application.

**§25.222 (b)(3) ESV GEOGRAPHIC AREA OF OPERATION**

*"There shall be an exhibit included with the application describing the geographic area(s) in which the ESVs will operate." 47 C.F.R §25.222(b)(3).*

The geographic area where the ESVs will operate is in US channels and waterways, the Gulf of Mexico, Caribbean Sea, Atlantic Ocean, and Pacific Ocean.



**Figure 3. US channels and waterways, the Gulf of Mexico, Caribbean Sea, Atlantic Ocean, and Pacific Ocean**

**§25.222 (b)(4) POINT OF CONTACT**

*"The point of contact referred to in paragraph (a)(3) of this section and, if applicable paragraph (a)(6) of this section must be included in the application." 47 C.F.R §25.222(b)(4).*

Included

**§25.222 (b)(5) RADIATION EXPOSURE LIMITS**

*"ESVs that exceed the radiation guidelines of 1.1310 of this chapter, Radiofrequency radiation exposure limits, must provide, with their environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines." 47 C.F.R §25.222(b)(5).*

See Exhibit to Form 312 of the underlying application.

**§25.222 (c) FREQUENCY COORDINATION**

*"Operations of ESVs in the 14.0-14.2 GHz (Earth-to-space) frequency band within 125 Km of the NASA TDRSS facilities in Guam ... or White Sands, New Mexico... are subject to coordination through the National Telecommunications and Information Administration (NTIA) Interdependent Radio Advisory Committee (IRAC). [U]pon public notice from the Commission, all Ku-band ESV operators must cease operations..." 47 C.F.R. §25.222 (c).*

The ESVs operated by HARRIS CAPROCK will not operate within 125 Km of the NASA TDRSS facilities in Guam or White Sands, New Mexico.

**§25.222 (d) FREQUENCY COORDINATION**

*"Operations of ESVs in the 14.47-14.5 GHz (Earth-to-space) frequency band within a) 45Km of the radio observatory on St. Croix, Virgin Islands...; b) 125 Km of the radio observatory on Mauna Kea, Hawaii ...; and c) 90 Km of the Arecibo Observatory on Puerto Rico ... are subject to coordination through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee (IRAC)." 47 C.F.R. §25.222 (d).*

The ESVs operated by HARRIS CAPROCK will not operate within 48 Km of the radio observatory on St. Croix; within 125 Km of the radio observatory on Mauna Kea; or within 90 Km of the Arecibo observatory on Puerto Rico. ESVs operated by HARRIS CAPROCK will operate in the Gulf of Mexico, US channels and waterways, the Caribbean Sea, Atlantic Ocean and Pacific Ocean as described above.



## APPENDIX A – USE OF NON-U.S. SATELLITES

HARRIS CAPROCK specifies, pursuant to § 25.137(a) of the Commission's Rules, that the only non-U.S. licensed satellites to be accessed by the earth station proposed in the instant application are those included on the FCC's Permitted List and eligible for ALSAT designation.

## APPENDIX B – FAA NOTIFICATION

Pursuant to 47 C.F.R. § 17.14 (b) of the Regulations, Federal Aviation Administration (FAA) notification is not required because all the antenna structures in this application will be less than 6.1m in height.

**APPENDIX C – DECLARATION OF HARRIS CAPROCK**

I, Steve Wheelis, Chief Engineer, certify that the ESV antennas proposed in the underlying application conform to the gain pattern criteria of 47 CFR §25.209 (a) and (b), that, combined with the maximum input power density calculated from the EIRP density less the antenna gain, which is entered in Schedule B of Form 312, demonstrates that the off-axis EIRP density envelope set forth in paragraphs 47 CFR §§25.222(a)(1)(i)(A) through (a)(1)(i)(C) of this section will be met under the assumption that the antenna is pointed to the target satellite. In addition, the engineering calculations described in this report are true and correct and are satisfactory in light of 47 CFR §25.222.

Steve Wheelis

Date