

Prepared for the Federal Communications Commission

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

Ship Equip, Inc.

October 24, 2011

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INTRODUCTION

Ship Equip, Inc. ("SHIP EQUIP"), pursuant to 47 C.F.R. § 25.115 of the Rules and Regulations ("Regulations") of the Federal Communications Commission ("Commission"), respectfully requests authority to operate up to 500 Ku-band Earth Stations on Vessels ("ESVs") throughout U.S. 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 an already licensed hub station located in the United States.

The proposed antenna model is the Ku-band 125cm linear antenna, model SE125 ("SE125"), manufactured by Azimuth Unlimited, LLC ("Azimuth"). This antenna is capable of providing stabilized tracking. Azimuth has performed tests and generated the EIRP spectral density tables and plots here presented. Furthermore, Azimuth has declared that if the input power density to the feed of the Antennas is limited to -15dBW/4KHz, the SE125 will meet the requirements of Section 25.222 of the Regulations.

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.¹

§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:²

§25.222(a)(1)(i)(A) – Copole Azimuth

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

The peak EIRP of an individual sidelobe may not exceed the envelope defined above for θ 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.

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

•	$18 - 25\log(\theta)$	dBW / 4KHz for	$3.0^\circ \leq \theta \leq 48^\circ$
•	-24	dBW / 4KHz for	$48^\circ \leq \theta \leq 85^\circ$
•	-14	dBW / 4KHz for	$85^\circ \leq \theta \leq 180^\circ$

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.

¹ *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.

² 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)(C) – Crosspole Azimuth

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

Operational Carriers

SHIP EQUIP plans to operate its network with the following carriers:

Emission Designator	907KG7W	1M81G7W	3M52G7W	1M60G7W
Direction of Carrier	Transmit	Transmit	Receive	Receive
Polarization	Linear	Linear	Linear	Linear
Carrier EIRP (dBW)	46.10	49.1	0	0
EIRP Density (dBW/4KHz)	22.55	22.55	0	0

Carriers will operate with a 22.55dBW/4KHz eirp density. Subtracting the antenna gain of 42.5dBi, the eirp density at the feed is -19.95dBW/4KHz which is 4.95dB lower than the maximum -15dBW/4KHz certified by Azimuth.

§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 orbital 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 Azimuth, the SE125 will maintain a stabilization pointing accuracy of better than 0.2 degrees under specified ship motion conditions. See Appendix A – Declaration of Azimuth Unlimited, LLC, Paragraph 4.

§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 orbital 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 Azimuth, the SE125 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 Appendix A – Declaration of Azimuth Unlimited, LLC., Paragraph 5.

§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).

Ship Equip, Inc.
 Attn: Mr. Esben Flo
 12807 Royal Drive
 Stafford, Texas 77477
 (281) 690-5600 phone

SHIP EQUIP personnel, either via a network port or an out-of-band management system, have the authority and capability to remotely access equipment on the ESV 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).

SHIP EQUIP designed a system to record the vessel's location, transmit frequency, channel bandwidth and satellite. The vessel's Global Positioning System (GPS) signal is sent simultaneously to an iDirect satellite modem, to the SE125 antenna controller, and to an onboard industrial server. The GPS location and other information is stored two different ways:

1. *Database.* The information is stored in a proprietary database developed by iDirect. This database resides on a centralized server that stores data to a Network Management Servers (NMS) on all teleports at least every 5 minutes. GPS position is sent to the NMS from each vessel via the satellite link. The database stores this information for at least one year. Database information is replicated to a second database fully controlled by SHIP EQUIP.
2. *Local Industrial Server.* The information is stored in a local SHIP EQUIP industrial server. Proprietary SHIP EQUIP software logs GPS and other information on a local file every 20 minutes. Information on the server is sent automatically via the satellite link to a SHIP EQUIP ground management server. Information is stored for at least one year.

SHIP EQUIP 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.

§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 SHIP EQUIP 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 Antennas operated by SHIP EQUIP will be controlled by the following earth station:

<u>Callsign</u>	<u>Diameter</u>	<u>Location</u>	<u>Antenna ID</u>
KA399 ³	9.0m	Shanondoa, VA*	LMA4T11N

*1305 Industrial Park Road, Mount Jackson, Shenandoah, VA

³ This 9.0m antenna is licensed for Ku ESV operations. See file number SES-MOD-20110415-00459.

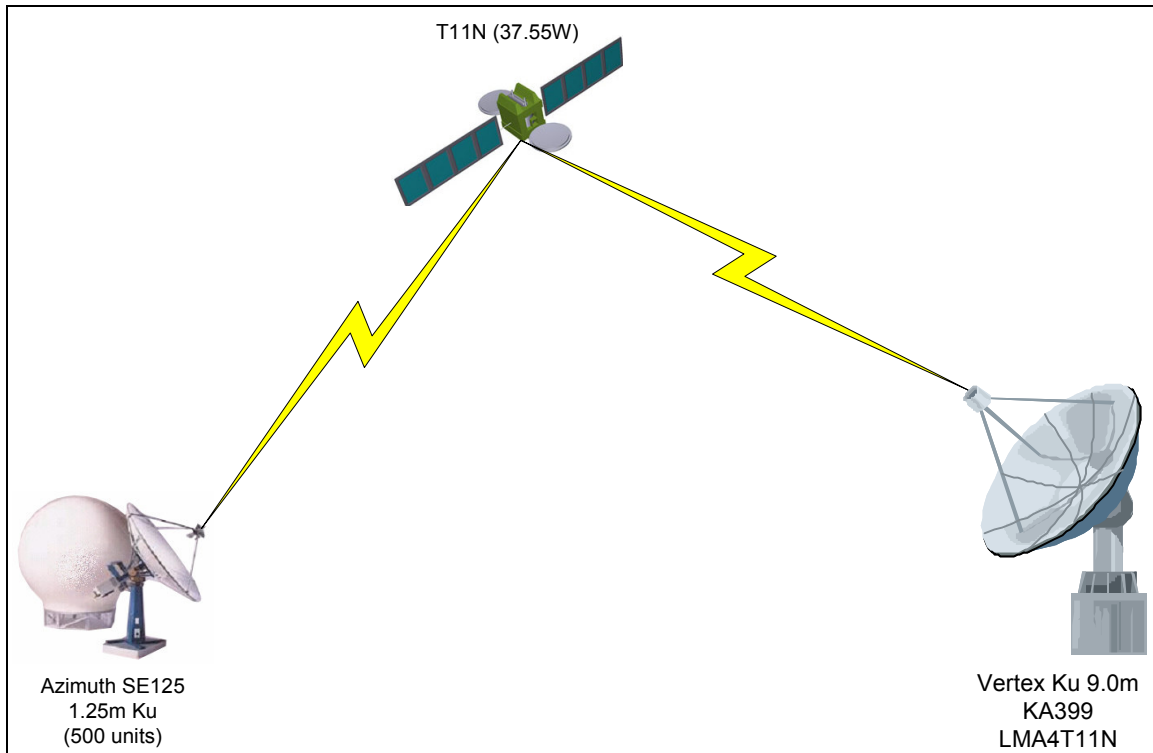


Figure 1. Network Diagram

§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.”

SHIP EQUIP 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).

SHIP EQUIP 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 Azimuth for the SE125 antenna.

§25.222 (b)(1)(ii) SHIP EQUIP 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 D– Certification of SHIP EQUIP

§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 Azimuth, the SE125 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 Appendix A – Declaration of Azimuth Unlimited, LLC, Paragraph 5.

§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.

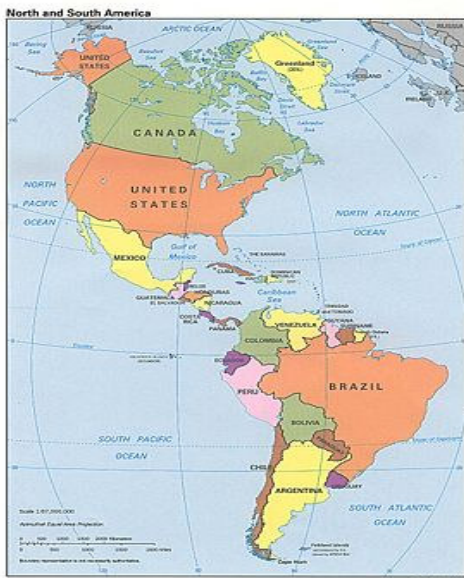


Figure 2. US channels and waterways, the Gulf of Mexico, Caribbean Sea, Atlantic Ocean, and Pacific Ocean

§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 A of Form 312.

§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 Antennas operated by SHIP EQUIP 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 SHIP EQUIP 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 SHIP EQUIP will operate in the Gulf of Mexico, US channels and waterways, the Caribbean Sea, Atlantic Ocean and Pacific Ocean as described above.

APPENDIX A – DECLARATION OF AZIMUTH UNLIMITED, LLC



Declaration of Azimuth Unlimited, LLC

- 1) Azimuth Unlimited, LLC designs, manufactures, and resells/distributes stabilized VSAT terminals, which are then used by our customers for their ESV networks.
- 2) This declaration is for 47 C.F.R §25.222 for blanket licensing of ESV antenna operating in Ku-band. It covers the requirement of §25.222(a)(1) and the rest of requirement in §25.222 are left to the applicant who operates ESV networks with our product.
- 3) Azimuth Unlimited hereby declares the antenna listed below will meet §25.222(a)(1)(i) with the specified operating condition with demonstration of (b)(1)(i) and (b)(1)(iii).

Model	Operating condition
1.25 Meter Ku-band, Model SE125	N=1 Max. input power spectral density = -15 dBW/4KHz

- 4) Azimuth Unlimited hereby declares a pointing error will be less than or equal to 0.2 degree between the orbital location of the target satellite and the axis of the main lobe of the antenna referenced in paragraph 3) above, thus meeting the requirements of § 25.222(a)(1)(ii).
- 5) Azimuth Unlimited hereby declares all emission from the antenna referenced in paragraph 3) above will automatically be ceased within 100 milliseconds if the pointing error exceeds 0.5 degrees for any reason and will not be resumed until the error is less than or equal to 0.2 degree, thus meeting the requirements of § 25.222(a)(1)(iii).

Date: 07-26-2011

By: 
Jongsoo Kim
Chief Executive Officer
Azimuth Unlimited, LLC

Digitally signed by Jongsoo Kim
DN: cn=Jongsoo Kim, o=Azimuth
Unlimited, LLC, ou=email-jongsoo.
kim@azul.com, c=US
Date: 2011.07.26 11:10:14 -0400

APPENDIX B – USE OF NON-U.S. SATELLITES

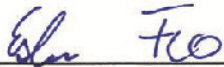
SHIP EQUIP specifies, pursuant to § 25.137(a) of the Commission's Rules, that the only non-U.S. licensed satellites to be accessed by the earth station proposed in the instant application are those included on the FCC's Permitted List and eligible for ALSAT designation.

APPENDIX C – FAA NOTIFICATION

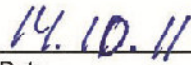
Pursuant to 47 C.F.R. § 17.14 (b) of the Regulations, Federal Aviation Administration (FAA) notification is not required because all the antenna structures in this application will be less than 6.1m in height.

APPENDIX D – DECLARATION OF SHIP EQUIP

I, Esben Flo, COO of Ship Equip, Inc., certify that the ESV antenna 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.



Esben Flo



Date