

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
Application of KVH Industries, Inc. for)	File No.
License to Operate a Network of Earth)	
Stations Onboard Vessels (“ESVs”) in the)	
5925-6425 MHz (Transmit) and 3700-4200)	Call Sign
MHz (Receive) Frequency Bands)	
)	
)	

APPLICATION FOR ESV NETWORK LICENSE

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March 28, 2012

SUMMARY

KVH Industries, Inc. (“KVH”) hereby submits this application for a license to operate up to 500 V11 terminals in C-band frequencies. The V11 is a new ESV model that uses a 1m antenna and complies with the Commission’s ESV rules and policies. Like KVH’s other ESV terminals, the V11 is highly efficient and affordable, and permitting operation in the C-band will further extend the reach of maritime broadband communications to smaller private, commercial, and government vessels operating in ocean regions around the world.

Importantly, the V11 terminal will operate in C-band frequencies only outside 200km from the U.S. coastline and off-shore 6 GHz fixed microwave stations. As a result, there is no possibility of interference from V11 uplink transmissions into fixed service operations and no reason to restrict V11 deployment to vessels larger than 300 gross tons. Thus, KVH respectfully requests waiver of the vessel size limitation imposed on C-band ESVs.

Grant of the instant application will enhance competition in the maritime broadband services market and help maintain U.S. leadership in advanced, satellite-based communications services. Accordingly, KVH respectfully requests that the Commission grant the instant application at the earliest practicable time.

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Onboard Vessels (“ESVs”) in the 5925-6425)	
MHz (Transmit) and 3700-4200 MHz)	Call Sign
(Receive) Frequency Bands)	
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APPLICATION FOR ESV NETWORK LICENSE

KVH Industries, Inc. (“KVH”), by its attorneys and pursuant to Sections 25.115 and 25.221 of the Commission’s rules, 47 C.F.R. §§ 25.115 and 25.221, hereby submits this application for a license to operate up to 500 V11 terminals in the C-band. The V11 terminal, a dual C/Ku-band terminal,¹ will provide greater flexibility in satellite-based broadband access for various maritime communications applications to private, commercial and government vessels.

KVH seeks authority to operate in the 5925-6425 MHz (transmit) and 3700-4200 MHz (receive) frequency bands only in international waters beyond 200km from the coastline of the continental United States and off-shore 6 GHz fixed microwave stations. As a result, no coordination with licensed terrestrial microwave stations is necessary and the Commission may authorize the operation of the V11 on vessels of any size. Because the V11 terminal will

¹ Given the distinct operational and regulatory requirements, the authority for V11 Ku-band operations is the subject of a separate application proceeding. See Call Sign E090001, File No. SES-MOD-20120104-00005.

otherwise operate in full compliance with the Commission's C-band ESV rules and policies, KVH respectfully requests grant of the instant application at the earliest practicable time.

I. GRANT OF AUTHORITY TO OPERATE THE V11 TERMINAL IN THE C-BAND WILL SERVE THE PUBLIC INTEREST

A. Description of the Service

The V11 terminal will operate with new C-band satellites added to KVH's global broadband maritime network, which has been authorized to operate in Ku-band frequencies by the Commission for many years.² KVH is seeking authority to operate at C-band in international waters beyond 200km from the coastline of the continental United States and off-shore C-band terrestrial stations within the satellite coverage zones.

KVH seeks to operate the V11 terminal with the following satellites: Intelsat IS-18 at 180° W.L. and IS-707 at 53° W.L. The ESVs will communicate with existing hub earth stations in Riverside, CA.³ KVH will control all V11 operations using its standard network control capabilities and network management services.

² See File No. SES-LIC-20060824-01502 (Call Sign E060335); File No. SES-LIC- 20070504-00563 (Call Sign E070085); and File No. SES-LIC-20081104-01450 (Call Sign E090001).

³ Call Signs E020314 and E060388.

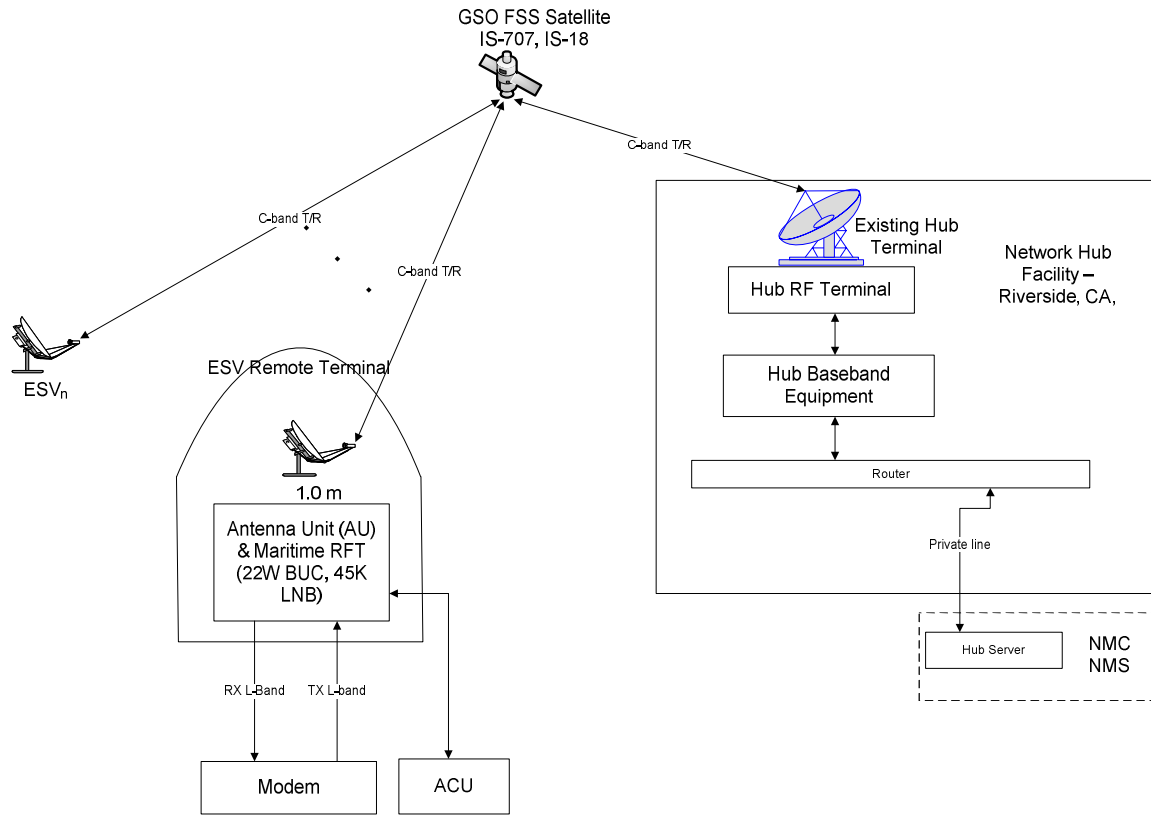
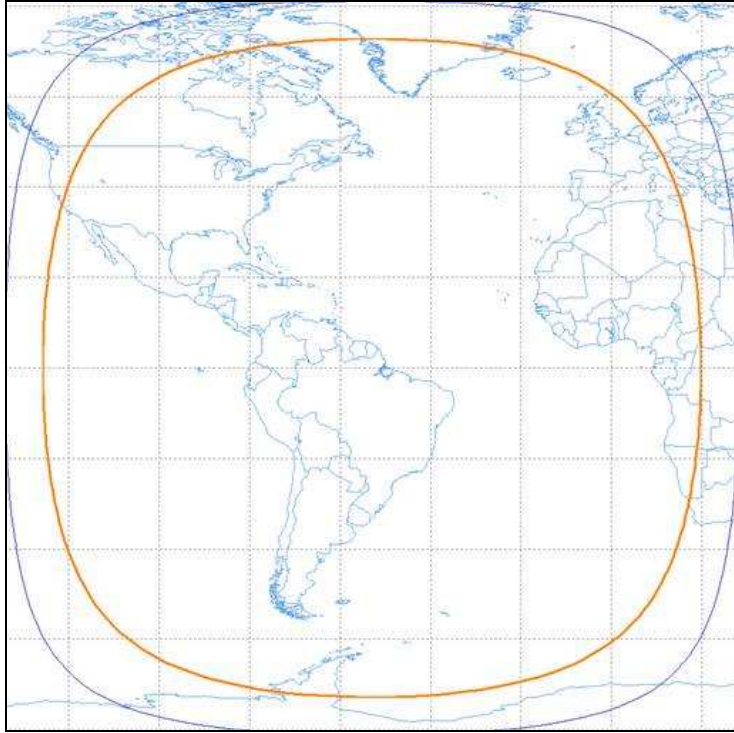
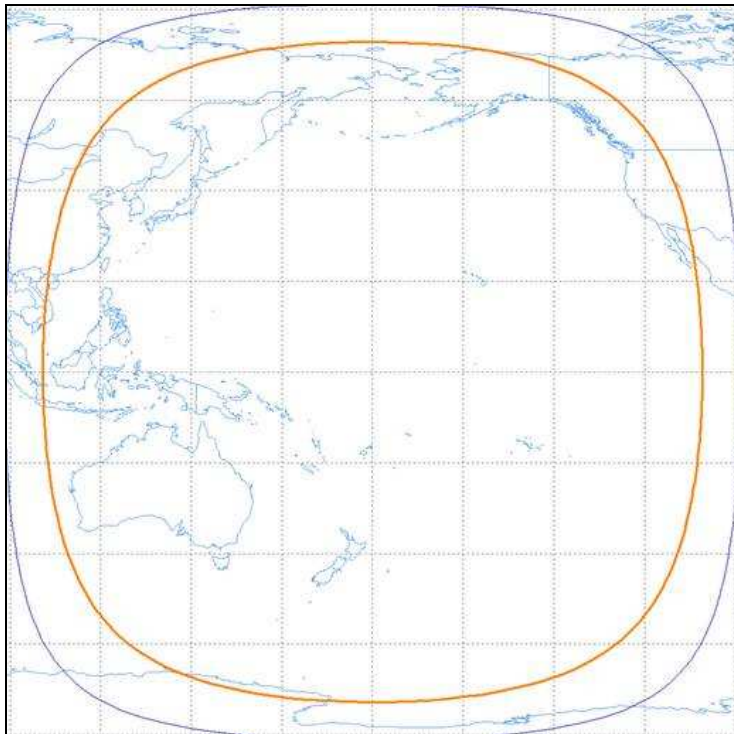


Figure 1 – ESV Network Architecture

The service is designed as an oceanic service, covering the Atlantic and Pacific regions (see Figures 2a and 2b, below) to complement KVH’s Ku-band coverage.



**Figure 2a – IS-707 at 53° W.L., ESV Coverage Area
(8.6 degree lower limit is shown in orange)**



**Figure 2b – IS-18 at 180 ° W.L., ESV Coverage Area,
(8.6 degree lower limit is shown in orange)**

B. Description of the V11 Terminal

The target end users of this terminal are vessels operated by private, commercial and government customers, including leisure vessels, fishing boats, cargo ships and United States Coast Guard and military vessels. The V11 terminal provides high-speed connectivity for a range of maritime communications applications such as e-mail, Internet access and voice services.

The V11 terminal employs a 1m parabolic reflector with a rear-fed sub-reflector feed assembly design. The terminal will automatically search for and acquire the designated satellite and maintain precise pointing via automatic control of the azimuth, elevation and polarization angles. The associated RF equipment is integrated into the base of the terminal and includes a 22W block upconverter.

The ESV uplink return transmission (inbound from the ESV to the hub earth station) channel supports data rates of 32 kbps, 64 kbps, 128 kbps, 256 kbps and 512 kbps. The forward channel (outbound from the hub earth station to the ESV) will be between 3-10 Mbps aggregate with individual end-user rates at 0.5-1 Mbps. The forward channel is also spread over the 18 MHz or 36 MHz channel and is overlaid onto the same transponder spectrum using a technique called PCMA.⁴

The V11 terminal's principal operating characteristics are set forth in Tables 1 and 2, below.

⁴ Paired Carrier Multiple Access ("PCMA") is a proprietary technique developed by ViaSat for its spread spectrum ArcLight service.

Antenna Diameter	1	meter	
Antenna Centerline (typical)	10	m, AMSL	
Antenna Gain	34.5	dBi	6.175 GHz
	31.3	dBi	3.95 GHz
RF Power Max	22	Watts	
Line Loss	1	dB	
Power at Feed Flange	12.42	dBW	
	17.46	Watts	
Maximum EIRP	46.92	dBW	
Data Rates	32 to 512	kbps Tx	
	to 1000	kbps Rx	
Emission Designators	1	2	
	36M0G7D	18M0G7D	
Bandwidth	36000	18000	kHz
RF Power/4kHz	-27.1	-24.1	dBW/4kHz
EIRP/4kHz	7.4	10.4	dBW/4kHz
Worst Case Horizon EIRP	-18.73	-15.73	dBW/4kHz
Minimum Elevation	8.6	degrees	

Table 1. V11 Terminal Operating Parameters

Azimuth	Continuous coverage over full 360°
Elevation	8.6° to 90° antenna elevation
Position accuracy (AZ)	Conscan 0.38° RMS; .2° RMS in-motion accuracy; Declared Maximum Pointing Error: .58°

Table 2. V11 Terminal Antenna Control Parameters

C. Compliance with the C-band ESV Rules

The V11 terminal complies with Commission rules and policies designed to protect other users of the C-band from harmful interference from ESV transmit operations.

1. Off-Axis EIRP Spectral Density Limits

The V11 will operate in accordance with the off-axis EIRP spectral density limits established for C-band ESV terminals.⁵ The data rates transmitted from the terminal will vary from 32 kbps to 512 kbps. Additionally, the ESVs will transmit using CRMA spreading⁶ over 18 MHz and 36 MHz channel bandwidths.⁷ The co-polarized off-axis EIRP spectral density levels of the 18 MHz emission are shown in Figures 3 and 4 below at +/-10 degrees and +/- 180 degrees off-axis angle. Figure 5 shows the cross-polarized off-axis EIRP spectral density levels. Note that a calculated worst case aggregate EIRP occurs when N=8 users for an 18 MHz channel bandwidth.

⁵ See 47 C.F.R. § 25.221(a)(1)(i). The V11 terminal complies with off-axis EIRP spectral density limits in both the azimuth and elevation planes.

⁶ CRMA, or Code Reuse Multiple Access, is a ViaSat proprietary spread spectrum technique, similar to CDMA, used in the ArcLight satellite system.

⁷ For the off-axis EIRP calculations, patterns and supporting information for the 36 MHz channel, see Technical Exhibit, Section 3.

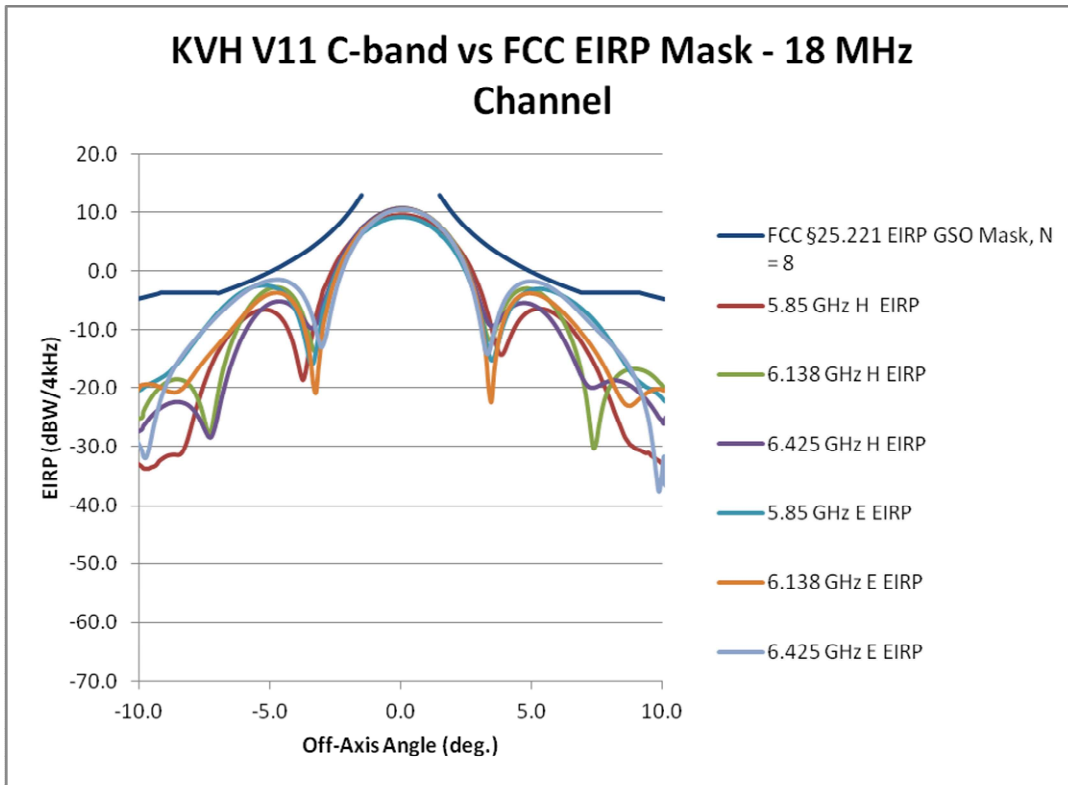


Figure 3 – C-band ESV Antenna EIRP vs 25.221 mask, +/- 10 degrees

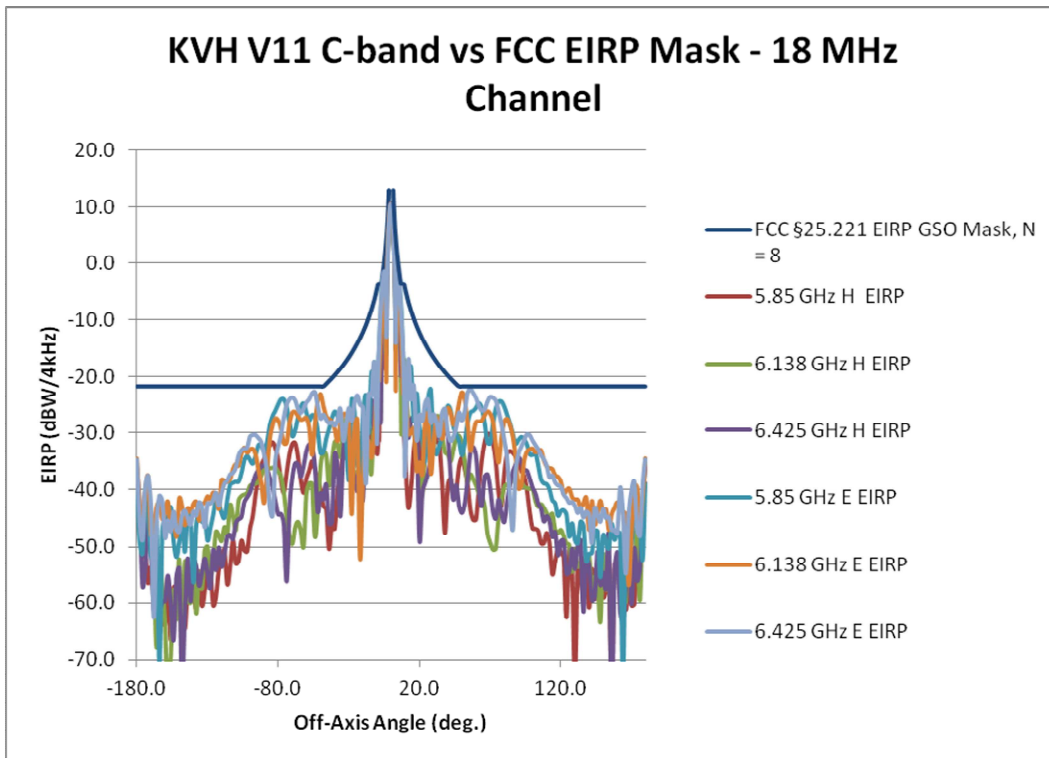


Figure 4 – C-band ESV Antenna EIRP vs 25.221 mask, +/- 180 degrees

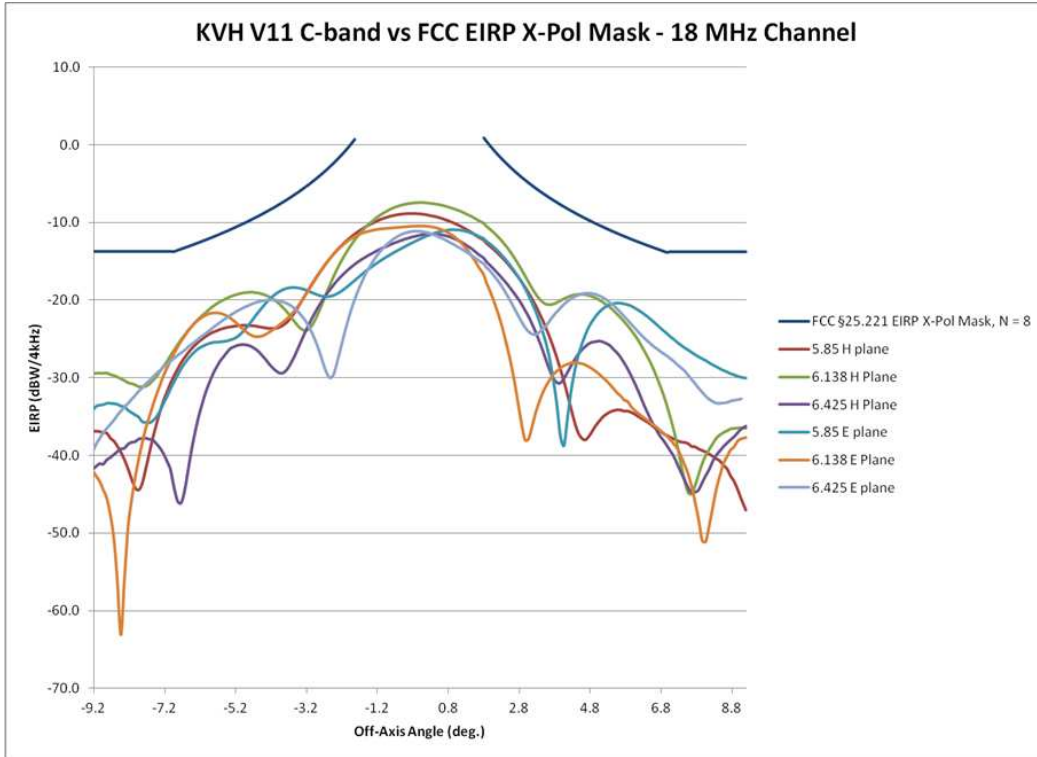


Figure 5 – C-band ESV Antenna EIRP vs 25.221 X-pol mask

In addition, pursuant to Section 25.221(a)(1)(i) and (b)(1), KVH has included in Exhibit 1 Tables 3, 4 and 5 which contain the co-polarized E and H plane antenna gain patterns for the parabolic antenna, the E and H plane off-axis EIRP charts, and the Commission’s GSO and elevation masks.⁸

The foregoing off-axis EIRP spectral density plots, and the attached antenna gain plots and tables, demonstrate that the V11 terminal complies with the spectral density levels set forth in Section 25.221(a)(1) of the rules and the Commission’s two-degree spacing policies.

⁸ See Exhibit 1, Section 3.

2. V11 Terminal Antenna Pointing Control

The antenna system utilizes a conical scanning function and rate gyros to stabilize the antenna and keep it pointed properly at the desired satellite. The conscan is currently set to worst case 0.38° from boresight. The additional dynamic pointing error for the vessel accelerations during operation is expected to be approximately .2°. Thus the total declared maximum antenna mispointing for the terminal while a vessel is underway, including both conscan and dynamic error, is .58°. Upon reaching mispointing of .58°, the terminal will inhibit transmission within 100 milliseconds and, out of an abundance of caution, will not resume until the pointing error value is back to within .38°.⁹

The ESV V11 terminal will utilize a motion stabilized tracking antenna and a direct sequence spread spectrum (“DSSS”) burst modem manufactured by ViaSat to access the satellite. Each terminal will use the CRMA common spreading code and a random access method to access the satellite.¹⁰ The KVH ESV network uses a spread spectrum multiple access technique that enables the individual off-axis EIRP density of each ESV terminal to be well below the maximum aggregate network limit. Thus, each antenna individually will not generate harmful levels of interference – even if the antenna were pointed directly at an adjacent satellite. Further, random pointing errors across this ESV fleet will not cause objectionable levels of adjacent

⁹ See 47 C.F.R. § 25.221(b)(1)(iv)(B). Although KVH could resume transmission upon bringing pointing offset within the declared maximum pointing error of .58°, its system is conservatively designed to recommence transmissions when the pointing offset reaches the expected conscan value of .38°.

¹⁰ CRMA is closely analogous to the more generally understood code division multiple access (“CDMA”) multiple access method, but differs in that all terminals use a common spreading code rather than a number of individual codes for each transmitter.

satellite interference because the antenna on each ESV will be pointing in a different direction with a different error component.¹¹

As described in Exhibit 1, Section 4 (Pointing Accuracy), KVH has analyzed the off-axis EIRP spectral density associated with an ESV transmitting at the worst-case pointing offsets and has concluded that its network will operate well below the permissible mask. In particular, Figure 6 (below) shows the effect of a transmitting ESV at a pointing offset of 1.0 degrees, which is almost double the stated worst case excursion for this terminal. Like the presently authorized V7 and V3 terminals, the V11 operates in the C-band consistent with the Commission's two-degree spacing policies and will not cause harmful interference to other C-band operations.

¹¹ There is an extremely low probability that multiple antennas will be mispointed at an adjacent satellite at the same time in such a way that results in harmful interference. Because the pointing error is random and momentary, when deliberate conscan is taken into account each ESV antenna actually has a higher likelihood of being pointed away from the geostationary satellite arc than towards an adjacent satellite.

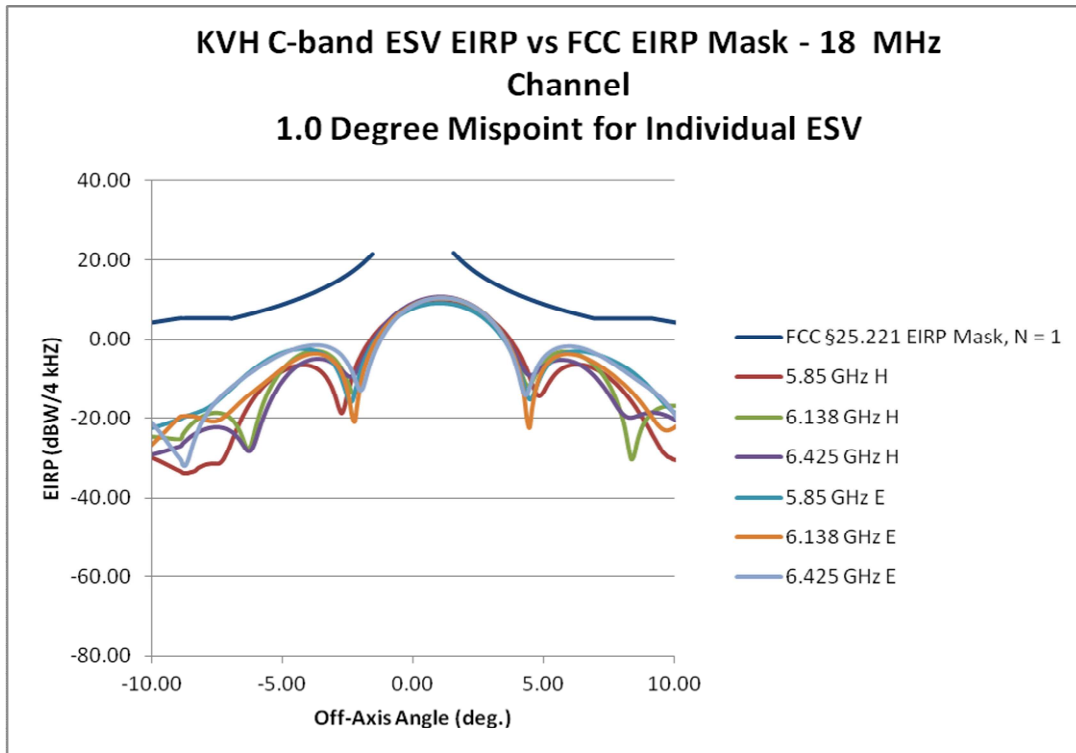


Figure 6 – C-band ESV Antenna EIRP vs 25.221 X-pol mask, +/- 10 degrees

3. Compliance With Additional ESV Requirements

KVH will comply with the additional requirements for C-band ESV applicants.

Section 25.221(a)(3), (b)(4) Points of Contact and Section 25.221(a)(6) Hub Earth Station in the United States. The KVH points of contact for the proposed ESV operations, available 24 hours, 7 days a week, with authority to cease all emissions from the ESVs, are:

Robert Bourget
KVH Industries, Inc.
Phone: 401.851.3830
Mobile: 401.864.8458
Email: rbourget@kvh.com

The KVH contact information for its network control station in Riverside, California is:

22401 Juniper Flats Road
Nuevo, Riverside County, CA 92567
Phone: 909-929-3507
Contact: John Hatem

For filing issues involving this authorization request please contact:

Carlos Nalda
Squire Sanders (US) LLP
1200 19th Street, NW
Suite 300
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Office: (202) 626-6659
Fax: (202) 626-6780
Cell: (571) 332-5626
Email: carlos.nalda@squiresanders.com

For technical issues involving this authorization request:

Kenneth G. Ryan, P.E.
Skjei Telecom, Inc.
Regulatory Engineering Consultant
Office: (703) 917-4020
Fax: (703) 917-0098
Cell: (703) 919-0361
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Section 25.221(a)(4) Recordkeeping. KVH will maintain, for each ESV transmitter, a time-annotated record of the ship location, transmit frequency, channel bandwidth and satellite used for at least one year. The location and time of all transmissions, at time intervals no greater than every 20 minutes while the ESV is transmitting, will be stored on a server at the hub. This information will be sent to KVH's network control facility. It will be available, as required by

the Commission rules, to a coordinator, fixed system operator, FSS operator, the NTIA or the Commission within 24 hours of the request.

Section 25.221(a)(5) Communications With Vessels of Foreign Registry. Records of communications with vessels of foreign registry will be downloaded to the ESV hub earth station and forwarded to the network control facility in Carlsbad, California for storage and retrieval.

Section 25.221(a)(10) Protection Claims. KVH will not claim protection from interference from any authorized terrestrial stations to which frequencies are already assigned or may be assigned in the future, in the 3700-4200 MHz frequency bands.

Section 25.221(a)(11) Coordination. As envisioned by Section 25.221(a)(11), no coordination with U.S.-licensed terrestrial fixed stations is necessary because KVH will operate the V11 terminals in C-band frequencies only outside the 200km coordination distance from the U.S. coastline and off-shore fixed microwave stations.

Section 25.221(b)(3) Geographic Area of Service. KVH is seeking authorization to operate in international waters outside 200km of the U.S. coastline and off-shore 6 GHz microwave stations within the satellite coverage zones. *See* Figures 2a and 2b, above. The service is designed as a oceanic service, covering the Atlantic and Pacific regions to complement KVH's existing Ku-band network.

Section 25.221(b)(5) Radiation Hazard. KVH has included a radiation hazard analysis with this application as Exhibit 2.

D. Compliance With International Requirements

Although the Commission's ESV rules are consistent with the conclusions of ITU-R World Radiocommunication Conference ("WRC-03") and the intent of international ESV operational standards, including ITU-R Resolution 902, there are certain inconsistencies between U.S. and international provisions governing C-band ESV operations. Specifically, the U.S. rules do not contain 0.2° pointing accuracy and antenna size specifications.¹² Although the V11 terminal complies with the Commission's ESV rules and other international requirements, it does not strictly comply with the pointing accuracy and antenna size provisions of Resolution 902. As a result, it is appropriate for the Commission to authorize V11 operations pursuant to Article 4.4 of the ITU Radio Regulations to support operations in international waters with respect to pointing accuracy and antenna size.¹³

Resolution 902 explicitly recognizes that ESVs can be authorized pursuant to Article 4.4 of the Radio Regulations if they do not claim protection from, nor cause interference to, other

¹² In particular, the Commission permits ESV operators to specify a declared maximum pointing error, subject to compliance with the off-axis EIRP spectral density limits or alternative levels established in satellite operator coordination agreements. *See 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*, Order on Reconsideration, FCC 09-63 ¶¶ 22-27 and n.59 (*ESV Order on Reconsideration*); *see also* 47 C.F.R. § 25.221(a)(1)(ii)(B).

¹³ Some administrations may view the 0.2° antenna pointing accuracy and antenna size values as "hard limits." Article 4.4 provides that administrations of member states should not authorize a station in derogation of the Regulations, "except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations." Because KVH will operate in C-band frequencies outside the minimum distance from foreign coastlines and complies with applicable off-axis EIRP spectral density limits and other requirements, there is no potential for interference from V11 C-band operations.

services having allocations in the band.¹⁴ The Commission has also explicitly recognized this avenue to authorization for foreign-licensed ESVs.¹⁵ In fact, the Commission has stated that it “expects[s] some administrations to authorize ESV operations on its registered vessels based solely on ITU RR 4.4.”¹⁶ U.S.-licensed ESVs should have similar opportunity to operate under Article 4.4, particularly where the proposed ESV operations are fully compliant with U.S. rules and the off-axis EIRP spectral density limits and limits towards the horizon (the parameters associated with potential interference to adjacent satellite and terrestrial networks, respectively) embodied in Resolution 902.

1. Pointing Accuracy

The Commission has determined that its off-axis EIRP spectral density limits will adequately protect adjacent satellites,¹⁷ and has authorized larger pointing accuracy values than contemplated in Resolution 902. In fact, the currently authorized V7 and V3 terminals utilize conscan (rotation around boresight to the target satellite) in excess of 0.2° to peak signal strength and maintain consistent pointing towards their serving satellites. The Commission included a condition in KVH’s Ku-band ESV license to afford authority to operate under Article 4.4.¹⁸

¹⁴ See Resolution 902 at 1.

¹⁵ See *ESV Report and Order*, n.330; see also *ESV NPRM* at ¶ 103.

¹⁶ See *id.* at ¶ 127.

¹⁷ In the instant application, KVH has declared a maximum antenna pointing error for the V11 terminal of 0.58° and has shown how the V11 will comply with the Commission’s ESV spectral density limits to protect adjacent satellites. See *supra* Section I.C.1-2 and Technical Appendix Section 4.

¹⁸ See KVH Industries, Inc., Radio Station Authorization, Call Sign E090001, File No. SES-MOD-20110126-00062 at Special Condition 300 (addressing antenna size and pointing accuracy: “With respect to antenna size and pointing accuracy, licensee is authorized to operate in accordance with Article 4.4 of the ITU Radio Regulations. The operations authorized herein shall not cause harmful interference to, and shall not claim protection from harmful interference

2. Antenna Size

The V11 otherwise complies with all of the requirements of Resolution 902 adopted by the Commission and the Commission's ESV rules. The Commission explicitly declined to adopt a minimum antenna size requirement because its off-axis EIRP spectral density requirements would adequately protect adjacent satellites,¹⁹ and power limits towards the horizon would protect land-based networks.²⁰ This is consistent with the goals of Resolution 902. Because V11 operations will not cause interference to other services in the 5924-6425 MHz band and KVH will not claim protection from other services in the band for the V11, it can be authorized pursuant to Article 4.4.

Because V11 C-band operations will neither cause harmful interference nor claim protection from other users in the band, the Commission may, consistent with this precedent, authorize the V11's operations in the C-band pursuant to Article 4.4 with respect to pointing accuracy and antenna size.

3. Other International Requirements

The V11 terminal will operate no lower than 8.6° elevation and has a maximum EIRP towards the horizon of 20.8 dBW, and a maximum EIRP spectral density towards the horizon of 8.25 dBW/MHz. These values are compliant with the values adopted by the Commission and

caused by, a station operating in accordance with the provisions of the ITU Constitution, the ITU Convention, and the ITU Radio Regulations. The operations authorized herein are otherwise consistent with ITU provisions.”).

¹⁹ See *id.* at ¶ 103 (“We decline to adopt our proposal, set forth in the ESV NPRM, to require a minimum antenna size for Ku-band ESVs. [citation omitted] We are satisfied that the off-axis EIRP limits in this Order adequately protect adjacent satellite systems and ensure that ESVs do not cause harmful interference to adjacent FSS satellite operators.”).

²⁰ See *id.* at ¶ 102.

embodied in Resolution 902, and V11 operations are otherwise compliant with international requirements.

II. REQUEST FOR WAIVER OF THE 300 GROSS TON WEIGHT LIMIT

KVH requests a waiver of the 300 gross ton weight limit adopted in the Commission's original ESV Order.²¹ Waiver is appropriate because the V11 does not operate within 200km of the U.S. coastline or off-shore fixed microwave stations operating in the 6 GHz band, thereby avoiding any possibility of harmful interference to fixed service stations.

The 300 gross ton weight limit was adopted to protect fixed microwave links in the 6 GHz band.²² The weight limit not only reduces the number of vessels permitted to operate C-band ESVs, but also restricts access to certain waterways thereby reducing the risk of harmful interference from C-band ESV operations.²³ In addition, C-band ESV operators are required to coordinate their operations with fixed service stations within 200km of the U.S. coastline.²⁴

The Commission sought to limit C-band ESV operations to prevent harmful interference and facilitate sharing in the 5925-6425 band.²⁵ The V11's proposed C-band operations are

²¹ *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*, IB Docket No. 02-10, Report and Order, FCC 04-286, 20 FCC Rcd 674 (2005) (*ESV Order*).

²² *Id.* at ¶ 61.

²³ *Id.* at ¶ 59 citing *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*, IB Docket No. 02-10, Notice of Proposed Rulemaking, FCC 03-286, ¶ 70 (2003) (*ESV NPRM*).

²⁴ *Id.* at ¶¶ 20-24. This coordination is subject to caps on the total amount of spectrum that may be coordinated by individual operators. A coordination limit of 36 MHz on each of two satellites, plus the 180 MHz aggregate coordination limit, was imposed as a further measure to ensure that adequate spectrum remained available for fixed services regardless of the number of ESVs present in a given coordination area. *Id.*

²⁵ *Id.* at ¶ 40.

consistent with the Commission's objectives because they will be conducted only outside of 200km, and thus will present no risk of harmful interference to terrestrial microwave stations.²⁶ Moreover, the proposed operations will have no impact on the availability of spectrum within the coordination zone, ensuring that C-band ESV spectrum remains available for coordination by larger vessels operating in ports, coastal areas and other navigable waterways.

By ceasing transmission within 200km of the coastline, the V11 ensures that its C-band operations will not cause harmful interference to fixed services consistent with underlying purpose of the rule. In addition, a waiver would serve the public interest by expanding access to novel dual-band ESVs, as well as C-band oceanic coverage, to smaller vessels. For these reasons, the Commission may grant a waiver of the 300 gross ton requirement for the V11 terminal.

III. CONCLUSION


For the reasons set forth herein, the Commission should grant an ESV network license authorizing KVH to operate up to 500 V11 terminals in the C-band as part of KVH's global broadband maritime network. In addition, because the V11 terminal will not operate using C-band frequencies within 200km of the U.S. coastline and off-shore terrestrial microwave stations, the Commission should waive the 300 gross ton vessel size limitation otherwise applicable to C-band ESVs to extend the significant benefits of the V11 terminal to the widest possible range of users. The V11 terminal otherwise complies with the Commission's ESV rules and policies, and can be authorized pursuant to ITU Radio Regulation Article 4.4 to facilitate operations in international waters.

²⁶ The V11 terminal will automatically switch to Ku-band frequencies to support operations within the C-band "minimum distances," thereby obviating the need for any coordination.

Grant of this modification would strongly serve the public interest by enhancing competition in broadband maritime services and maintaining U.S. leadership in advanced communications connectivity. Because the requested modification is consistent with the Commission's ESV rules and policies, KVH respectfully requests action on this application at the earliest practicable time.

**CERTIFICATION OF PERSON RESPONSIBLE
FOR PREPARING ENGINEERING INFORMATION
SUBMITTED IN THIS APPLICATION FOR
EXPERIMENTAL AUTHORIZATION**

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this Experimental Authorization request. I am familiar with Parts 2, 5, 25, 76, 78, and 101 of the Commission's Rules (47 CFR), that I have either prepared or reviewed the engineering information submitted in this application, and that it is complete and accurate to the best of my knowledge.

By:  _____

Date: 03/28/2012

Kenneth G. Ryan, P.E.
Vice President
Skjei Telecom, Inc.



Exhibit 1

V11 C-band ESV Terminal Technical Appendix

1. Introduction

KVH Industries, Inc. (“KVH”) has developed a new, small-aperture, broadband, highly efficient and affordable earth stations onboard vessels (“ESV”) terminal for use with its global maritime communications network. This ESV – the KVH V11 terminal – operates in C-band FSS frequencies (5.925.0–6.425 GHz transmit, 3.7–4.2 GHz receive), as well as Ku-band FSS frequencies (14.0-14.5 GHz transmit, 11.7-12.2 GHz receive, 10.95-11.2 GHz and 11.45-11.7 GHz receive).¹ The V11 terminal will automatically search for and acquire the designated satellite and maintain precise pointing via automatic control of the azimuth, elevation and polarization angles. Importantly, the V11 terminal will operate in C-band frequencies only outside 200km from the U.S. coastline and offshore 6 GHz microwave stations, and switches to Ku-band within this distance.

The antenna being used in this ESV terminal is 1 meter in diameter, and its main lobe does not conform to the standards specified in Section §25.209(a) and (b). In order to compensate for this performance, KVH will operate with a spread spectrum modulation technique that will bring the off-axis EIRP spectral density of the terminal well within the spectral density limits specified in Section §25.221 of the Commission’s rules. This technical exhibit provides the showing required pursuant to Section §25.221, including detailed information regarding the ESV antenna patterns and off-axis emissions, and a summary of the remote ESV to hub link analysis.

2. Description of Antenna

KVH has developed the small aperture, broadband, highly efficient and affordable V11 ESV terminal for use with its global ESV network. The ESV terminal operates in the C-band FSS frequencies (5.925–6.425 GHz transmit and 3.7–4.2 GHz receive). The antenna is a 1 meter parabolic reflector with a rear-fed sub-reflector feed assembly design. The ESV terminal will automatically search for and acquire the designated satellite and maintain precise pointing via automatic control of the azimuth, elevation and polarization angles. The RF equipment is integrated into the base of the terminal and includes a 22 watt block upconverter.

The proposed ESV uplink return transmission (inbound) channel supports data rates of 32 kbit/s, 64 kbps, 128 kbps, 256 kbps, and 512 kbps. The ESV uplink transmission utilizes a spread spectrum modulation. This authorization will require channel bandwidths of 18 MHz and 36 MHz. The forward channel (outbound from the hub earth station to the ESV) will be between 3-10 Mbps aggregate with individual end user rates at 0.5-1 Mbps.

¹ An application for authority for the V-11 to operate at Ku-band frequencies is the subject of a separate application proceeding. See Call Sign E090001, File No. SES-MOD-20120104-00005.

The forward channel is also spread over the 18 MHz or 36 MHz channel and is overlaid onto the same transponder spectrum using a technique called PCMA.²

Table 1: KVH TracPhone V11 Technical Parameters

Antenna Diameter	1	meter	
Antenna Centerline (typical)	10	m, AMSL	
Antenna Gain	34.5	dBi	6.175 GHz
	31.3	dBi	3.95 GHz
RF Power Max	22	Watts	
Line Loss	1	dB	
Power at FF	12.42	dBW	
	17.46	Watts	
Maximum EIRP	46.92	dBW	
Data Rates	32 to 512	kbps Tx	
	to 1000	kbps Rx	
Emission Designators	1	2	
	36M0G7D	18M0G7D	
Bandwidth	36000	18000	kHz
RF Power/4kHz	-27.1	-24.1	dBW/4kHz
EIRP/4kHz	7.4	10.4	dBW/4kHz
Worst Case Hor EIRP	-18.73	-15.73	dBW/4kHz
Minimum Elevation	8.6	degrees	

3. C-band ESV Antenna Pattern and Off-Axis EIRP Analysis

Data rates transmitted from the terminal will vary from 32 kbps to 512 kbps. Additionally, the ESVs will transmit using CRMA spreading over an 18 MHz channel bandwidth. The small diameter C-band ESV antenna does not meet the Section 25.209 antenna pattern (*see* antenna gain patterns in Figures 1 and 2), however, KVH certifies that the aggregate EIRP levels do not exceed the limits specified for C-band ESVs in Section 25.221 of the Commission’s rules.

The co-pol off-axis EIRP spectral density levels of the KVH ESV terminal spreading over an 18 MHz channel are shown in Figures 3 and 4 below. Note that a calculated worst case aggregate EIRP would occur when N=8 users for an 18 MHz channel. Table 2, below, summarizes the channel power and off-axis EIRP calculations for an 18 MHz channel. Figure 5 shows the cross-pol EIRP patterns compared to the Section 25.221 mask. The details of all these charts are included in Tables 3, 4, and 5 below.

Following the data for the 18 MHz channel, off-axis EIRP calculations, patterns, and supporting details have been performed for the 36 MHz channel.

² Paired Carrier Multiple Access is a proprietary technique developed by ViaSat for their spread spectrum ArcLight service.

Table 2: 18 MHz (Worst Case) Transmission

18 MHz Channel Calculations		
Power a feed Flange	17.46	W
Power a feed Flange	12.42	dBW
Channel; Bandwidth	18	MHz
RF Power Density at Flange	-24.1	dBW/4 kHz
RF Power Density at Flange	-0.1	dBW/ MHz
Maximum Horizon EIRP Density	8.25	dBW/MHz ³
Maximum Horizon EIRP	20.80	dBW
at Angle	8.6	deg
Maximum Number Simultaneous Users N	8	
Worst Case Antenna Gain Exceedance	-11.98	dB
at angle	56.19	deg.
For Antenna Pattern	6.425 GHz E	
EIRP Exceedance Limited by Pattern	6.425 GHz E	
at angle	56.19000	deg.
Gain Exceedance between +/-7 degrees	-11.33	dB
at angle	-5.47	degree
# Simultaneous Users N - worst case exceedance between +/-7 deg	8	

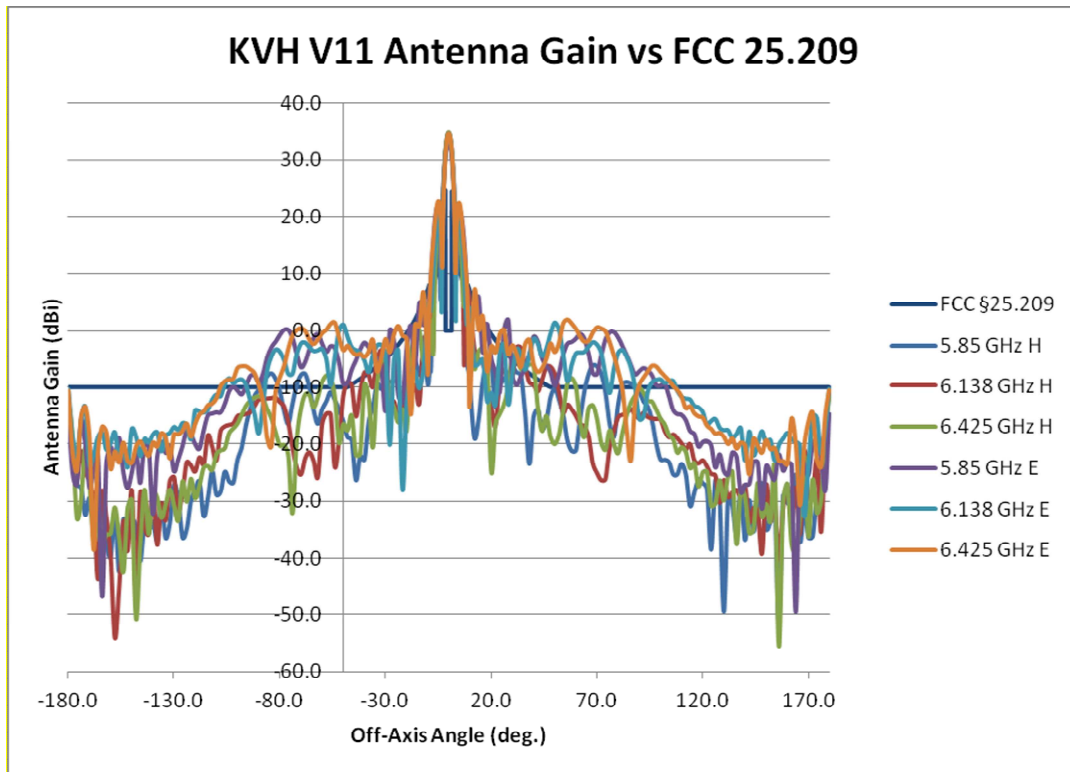


Figure 1 – C-Band ESV Antenna Pattern vs 25.209 mask, +/- 180 degrees

³ Resolution 902 sets C-band limits for maximum horizon EIRP at 20.8 dBW and maximum horizon EIRP density at 17 dBW/MHz.

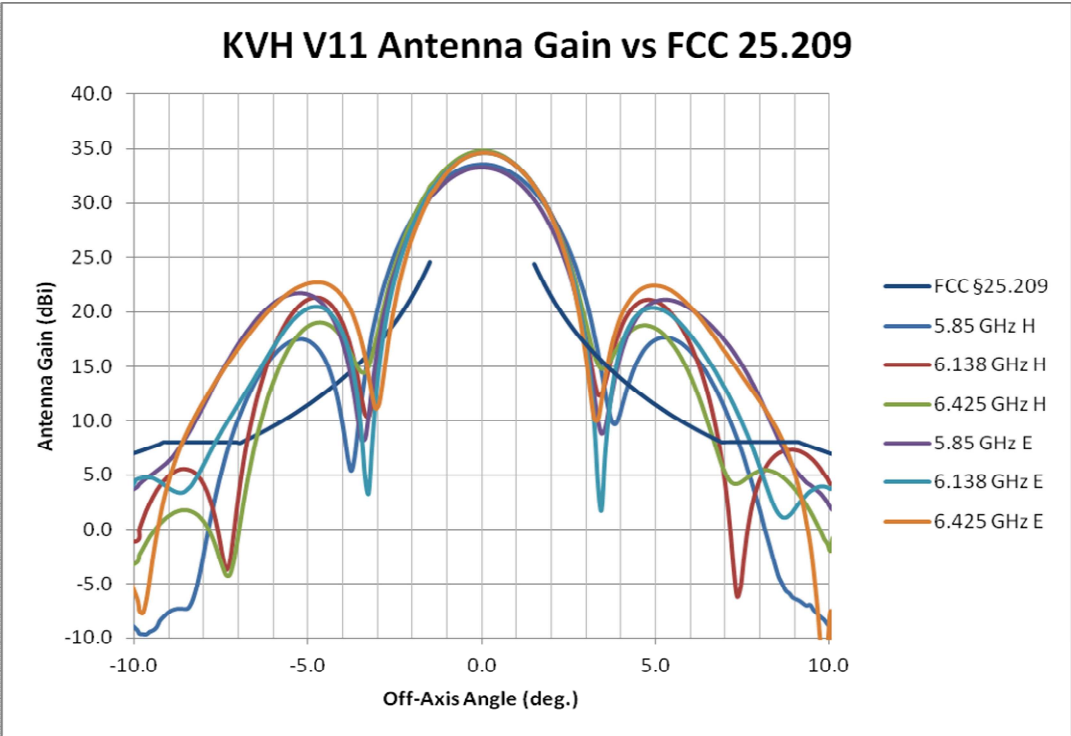


Figure 2 – C-band ESV Antenna Pattern vs 25.209 mask, +/- 10 degrees

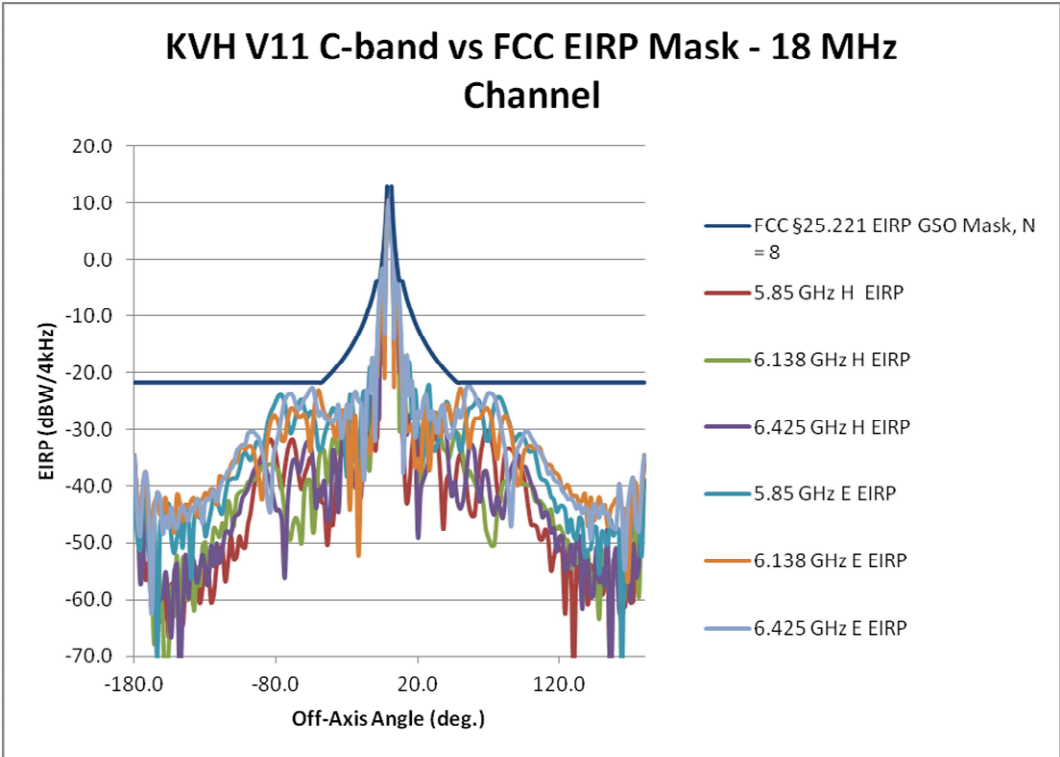


Figure 3 – C-band ESV Antenna EIRP vs 25.221 mask, +/- 180 degrees

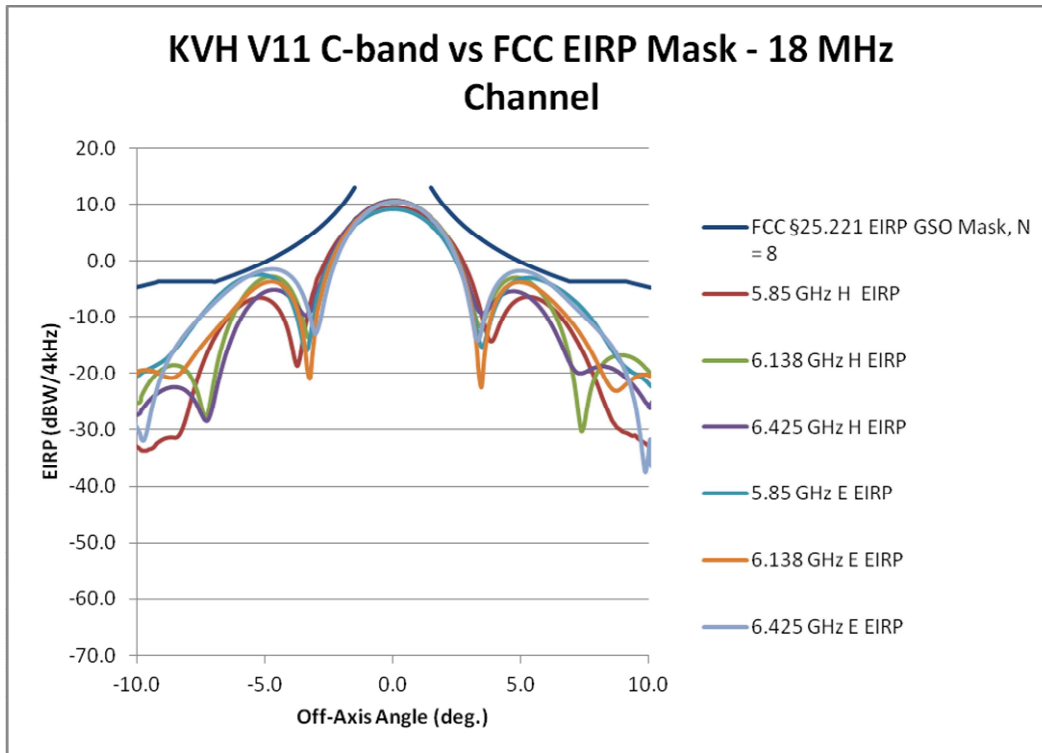


Figure 4 – C-band ESV Antenna EIRP vs 25.221 mask, +/- 10 degrees

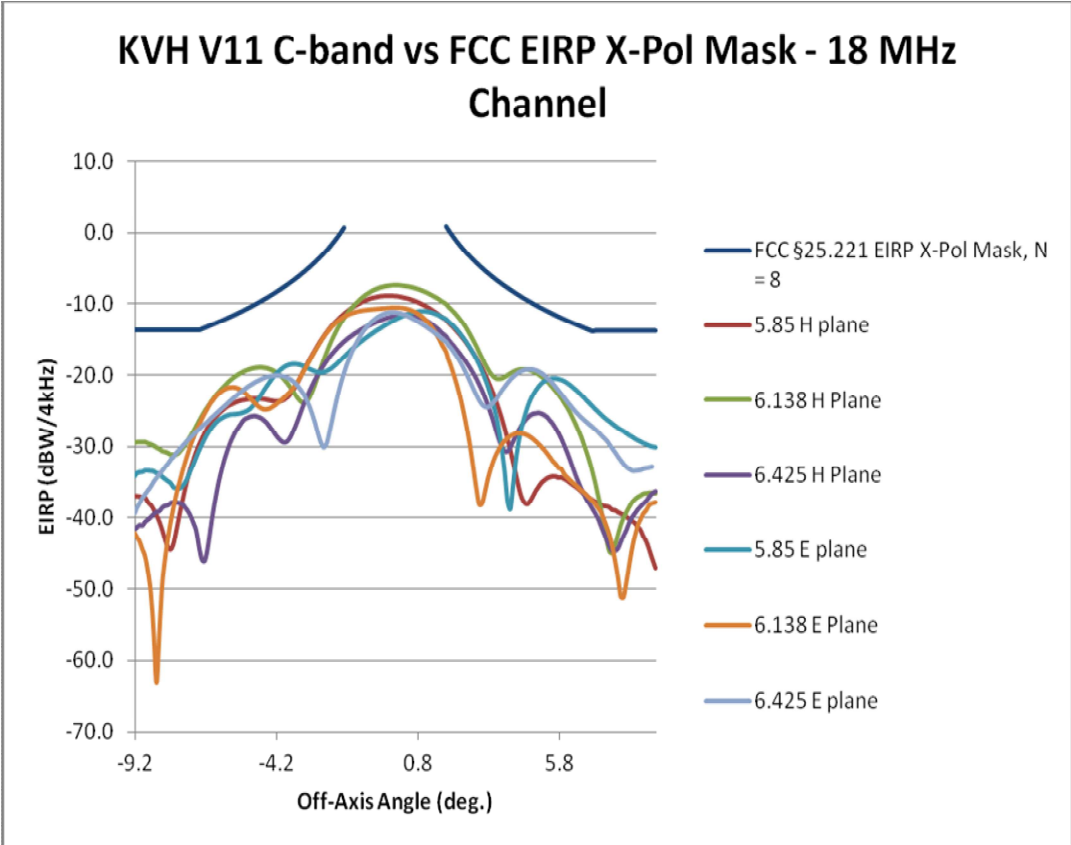


Figure 5 – C-band ESV Antenna EIRP vs 25.221 X-pol mask

Table 3 - V11 ESV Off-Axis EIRP vs FCC §25. 221 Masks – 18 MHz Channel

Table 4 - V11 ESV Co-Pol EIRP in the Elevation Plane – 18 MHz Channel

8 MHz	Co-Pol Antenna Gain (dBi)									Co-Pol ESV EIRP (dBW/4 kHz)							
Off Axis Angle (degree)	5.85 GHz H	6.138 GHz H	6.425 GHz H	5.85 GHz E	6.138 GHz E	6.425 GHz E	Off Axis Angle (degree)	FCC §25.209	FCC §25.221 EIRP GSO Mask, N = 8	FCC §25.221 EIRP Elevation Mask, N = 8	5.85 GHz H EIRP	6.138 GHz H EIRP	6.425 GHz H EIRP	5.85 GHz E EIRP	6.138 GHz E EIRP	6.425 GHz E EIRP	Meets Mask
-179.8	-14.9	-11.3	-11.9	-14.8	-10.3	-10.6	-179.8	-10.0	-21.7	-21.7	-42.0	-38.4	-39.0	-41.9	-37.5	-37.7	Y
-177.8	-22.2	-23.3	-18.7	-25.1	-18.5	-21.5	-177.8	-10.0	-21.7	-21.7	-49.3	-50.5	-45.8	-52.2	-45.7	-48.6	Y
-175.8	-27.1	-26.3	-32.8	-27.0	-22.1	-24.7	-175.8	-10.0	-21.7	-21.7	-54.2	-53.5	-59.9	-54.1	-49.2	-51.8	Y
-173.8	-27.6	-21.3	-29.8	-15.8	-15.8	-15.2	-173.8	-10.0	-21.7	-21.7	-54.7	-48.4	-56.9	-42.9	-42.9	-42.3	Y
-171.8	-32.4	-25.0	-20.5	-20.0	-13.5	-13.4	-171.8	-10.0	-21.7	-21.7	-59.5	-52.1	-47.7	-47.1	-40.7	-40.5	Y
-169.8	-29.5	-26.5	-27.0	-27.5	-23.7	-18.8	-169.8	-10.0	-21.7	-21.7	-56.6	-53.7	-54.1	-54.7	-50.8	-46.0	Y
-167.8	-34.5	-30.1	-37.3	-24.5	-21.8	-38.5	-167.8	-10.0	-21.7	-21.7	-61.6	-57.2	-64.4	-51.6	-48.9	-65.6	Y
-165.8	-32.4	-43.8	-32.1	-21.6	-18.8	-21.3	-165.8	-10.0	-21.7	-21.7	-59.5	-70.9	-59.2	-48.7	-45.9	-48.4	Y
-163.8	-30.0	-28.6	-36.9	-46.8	-18.0	-16.9	-163.8	-10.0	-21.7	-21.7	-57.2	-55.7	-64.0	-73.9	-45.1	-44.0	Y
-161.8	-37.1	-32.9	-35.7	-23.1	-21.0	-17.9	-161.8	-10.0	-21.7	-21.7	-64.3	-60.0	-62.9	-50.2	-48.1	-45.0	Y
-159.8	-39.7	-39.8	-35.6	-20.5	-19.8	-24.3	-159.8	-10.0	-21.7	-21.7	-66.8	-67.0	-62.7	-47.6	-47.0	-51.4	Y
-157.8	-31.5	-54.1	-31.0	-22.4	-17.9	-21.3	-157.8	-10.0	-21.7	-21.7	-58.6	-81.2	-58.2	-49.6	-45.0	-48.4	Y
-155.8	-42.4	-45.4	-36.3	-18.9	-22.7	-23.2	-155.8	-10.0	-21.7	-21.7	-69.5	-72.5	-63.4	-46.0	-49.8	-50.3	Y
-153.8	-33.2	-33.6	-42.4	-24.9	-20.0	-19.7	-153.8	-10.0	-21.7	-21.7	-60.4	-60.7	-69.5	-52.0	-47.1	-46.8	Y
-151.8	-35.6	-38.8	-31.2	-27.6	-24.1	-22.8	-151.8	-10.0	-21.7	-21.7	-62.8	-65.9	-58.3	-54.8	-51.2	-49.9	Y
-149.8	-33.1	-28.2	-29.8	-25.0	-17.4	-23.2	-149.8	-10.0	-21.7	-21.7	-60.2	-55.3	-56.9	-52.1	-44.5	-50.3	Y
-147.8	-34.5	-46.8	-50.7	-21.4	-18.7	-20.4	-147.8	-10.0	-21.7	-21.7	-61.6	-73.9	-77.8	-48.5	-45.8	-47.5	Y
-145.8	-40.5	-28.7	-37.6	-26.7	-22.0	-19.5	-145.8	-10.0	-21.7	-21.7	-67.6	-55.8	-64.8	-53.9	-49.2	-46.6	Y
-143.8	-33.9	-34.6	-27.9	-19.7	-19.1	-20.9	-143.8	-10.0	-21.7	-21.7	-61.0	-61.8	-55.1	-46.9	-46.2	-48.0	Y
-141.8	-35.2	-35.8	-35.7	-20.5	-19.7	-22.0	-141.8	-10.0	-21.7	-21.7	-62.3	-62.9	-62.8	-47.7	-46.8	-49.1	Y
-139.8	-33.6	-28.0	-28.3	-32.2	-18.3	-19.7	-139.8	-10.0	-21.7	-21.7	-60.7	-55.1	-55.4	-59.3	-45.4	-46.8	Y
-137.8	-36.8	-37.7	-29.4	-22.1	-17.9	-20.4	-137.8	-10.0	-21.7	-21.7	-63.9	-64.8	-56.5	-49.2	-45.1	-47.5	Y
-135.8	-30.3	-30.4	-32.9	-19.6	-21.2	-18.0	-135.8	-10.0	-21.7	-21.7	-57.4	-57.6	-60.0	-46.7	-48.4	-45.2	Y
-133.8	-36.4	-33.4	-30.5	-21.5	-18.6	-18.8	-133.8	-10.0	-21.7	-21.7	-63.5	-60.6	-57.7	-48.6	-45.7	-46.0	Y
-131.8	-33.8	-26.5	-27.9	-20.5	-18.0	-22.4	-131.8	-10.0	-21.7	-21.7	-60.9	-53.6	-55.1	-47.6	-45.1	-49.6	Y
-129.8	-27.1	-25.9	-30.7	-24.8	-17.0	-18.2	-129.8	-10.0	-21.7	-21.7	-54.2	-53.0	-57.8	-51.9	-44.1	-45.4	Y

-127.8	-29.9	-31.7	-33.3	-22.6	-17.5	-18.3	-127.8	-10.0	-21.7	-21.7	-57.0	-58.8	-60.5	-49.7	-44.6	-45.4	Y
-125.8	-36.3	-28.3	-26.5	-20.3	-16.3	-17.6	-125.8	-10.0	-21.7	-21.7	-63.4	-55.4	-53.6	-47.4	-43.4	-44.7	Y
-123.8	-34.9	-23.2	-30.1	-17.5	-16.6	-16.4	-123.8	-10.0	-21.7	-21.7	-62.0	-50.4	-57.2	-44.7	-43.7	-43.5	Y
-121.8	-29.9	-23.8	-26.0	-18.3	-19.2	-18.7	-121.8	-10.0	-21.7	-21.7	-57.1	-51.0	-53.2	-45.4	-46.3	-45.8	Y
-119.8	-28.1	-24.9	-29.5	-20.0	-14.1	-16.4	-119.8	-10.0	-21.7	-21.7	-55.2	-52.0	-56.6	-47.1	-41.2	-43.5	Y
-117.8	-26.6	-22.4	-27.2	-20.8	-14.3	-14.8	-117.8	-10.0	-21.7	-21.7	-53.7	-49.5	-54.3	-47.9	-41.4	-41.9	Y
-115.8	-32.6	-23.6	-24.1	-17.5	-14.5	-14.2	-115.8	-10.0	-21.7	-21.7	-59.7	-50.7	-51.2	-44.7	-41.6	-41.3	Y
-113.8	-29.4	-18.5	-23.8	-15.0	-13.9	-13.2	-113.8	-10.0	-21.7	-21.7	-56.6	-45.7	-50.9	-42.1	-41.0	-40.3	Y
-111.8	-24.8	-20.5	-24.5	-14.7	-12.2	-12.9	-111.8	-10.0	-21.7	-21.7	-51.9	-47.6	-51.6	-41.8	-39.3	-40.0	Y
-109.8	-28.8	-22.9	-21.8	-14.4	-11.3	-11.9	-109.8	-10.0	-21.7	-21.7	-56.0	-50.1	-48.9	-41.5	-38.5	-39.1	Y
-107.8	-28.4	-17.8	-21.1	-14.4	-11.6	-9.9	-107.8	-10.0	-21.7	-21.7	-55.5	-44.9	-48.2	-41.6	-38.7	-37.0	Y
-105.8	-24.9	-17.0	-20.7	-12.9	-9.5	-8.9	-105.8	-10.0	-21.7	-21.7	-52.0	-44.1	-47.8	-40.0	-36.6	-36.1	Y
-103.8	-26.5	-16.7	-18.1	-10.7	-8.4	-8.6	-103.8	-10.0	-21.7	-21.7	-53.6	-43.8	-45.2	-37.9	-35.5	-35.8	Y
-101.8	-26.7	-16.4	-17.2	-9.9	-9.3	-8.5	-101.8	-10.0	-21.7	-21.7	-53.8	-43.6	-44.3	-37.1	-36.5	-35.6	Y
-99.8	-22.7	-15.2	-16.4	-10.6	-8.8	-6.6	-99.8	-10.0	-21.7	-21.7	-49.9	-42.3	-43.5	-37.8	-35.9	-33.7	Y
-97.8	-20.6	-15.0	-14.8	-11.3	-8.6	-6.2	-97.8	-10.0	-21.7	-21.7	-47.7	-42.1	-41.9	-38.4	-35.8	-33.4	Y
-95.8	-16.7	-14.8	-13.3	-9.9	-9.6	-6.3	-95.8	-10.0	-21.7	-21.7	-43.8	-41.9	-40.4	-37.0	-36.7	-33.4	Y
-93.8	-13.9	-14.5	-12.4	-8.0	-12.3	-6.8	-93.8	-10.0	-21.7	-21.7	-41.0	-41.6	-39.5	-35.2	-39.4	-33.9	Y
-91.8	-11.6	-13.4	-11.8	-7.9	-14.6	-7.5	-91.8	-10.0	-21.7	-21.7	-38.8	-40.6	-39.0	-35.0	-41.7	-34.6	Y
-89.8	-10.5	-12.3	-11.6	-9.1	-18.1	-9.6	-89.8	-10.0	-21.7	-21.7	-37.6	-39.4	-38.7	-36.2	-45.3	-36.7	Y
-87.8	-9.0	-12.2	-12.0	-7.6	-13.2	-12.4	-87.8	-10.0	-21.7	-21.7	-36.2	-39.4	-39.1	-34.8	-40.3	-39.6	Y
-85.8	-8.1	-12.1	-13.8	-4.7	-7.1	-18.8	-85.8	-10.0	-21.7	-21.7	-35.2	-39.2	-40.9	-31.8	-34.2	-46.0	Y
-83.8	-7.6	-12.0	-15.5	-2.9	-4.5	-20.4	-83.8	-10.0	-21.7	-21.7	-34.7	-39.1	-42.6	-30.0	-31.6	-47.5	Y
-81.8	-8.6	-12.0	-17.9	-1.9	-3.3	-10.8	-81.8	-10.0	-21.7	-21.7	-35.7	-39.1	-45.0	-29.0	-30.4	-37.9	Y
-79.8	-10.7	-12.7	-20.2	-0.8	-3.6	-8.3	-79.8	-10.0	-21.7	-21.7	-37.8	-39.8	-47.4	-27.9	-30.8	-35.4	Y
-77.8	-14.2	-13.5	-20.1	0.2	-5.1	-6.2	-77.8	-10.0	-21.7	-21.7	-41.3	-40.6	-47.3	-27.0	-32.3	-33.3	Y
-75.8	-16.4	-16.3	-21.9	0.2	-7.6	-3.1	-75.8	-10.0	-21.7	-21.7	-43.6	-43.4	-49.0	-27.0	-34.8	-30.3	Y
-73.8	-13.0	-20.6	-32.1	-1.2	-7.6	-0.9	-73.8	-10.0	-21.7	-21.7	-40.1	-47.8	-59.2	-28.4	-34.7	-28.0	Y
-71.8	-9.7	-24.2	-19.2	-4.0	-4.1	0.2	-71.8	-10.0	-21.7	-21.7	-36.8	-51.3	-46.3	-31.2	-31.2	-27.0	Y
-69.8	-7.9	-25.4	-13.8	-6.5	-2.2	0.5	-69.8	-10.0	-21.7	-21.7	-35.0	-52.5	-40.9	-33.6	-29.3	-26.7	Y
-67.8	-7.7	-22.6	-11.3	-5.5	-2.1	0.0	-67.8	-10.0	-21.7	-21.7	-34.8	-49.7	-38.4	-32.6	-29.2	-27.1	Y
-65.8	-10.1	-21.5	-11.4	-3.2	-2.9	-1.6	-65.8	-10.0	-21.7	-21.7	-37.2	-48.6	-38.6	-30.3	-30.0	-28.7	Y

-63.8	-14.1	-23.0	-13.6	-1.3	-3.5	-2.3	-63.8	-10.0	-21.7	-21.7	-41.2	-50.1	-40.7	-28.4	-30.6	-29.4	Y
-61.8	-16.4	-25.8	-11.7	-0.6	-3.4	-1.5	-61.8	-10.0	-21.7	-21.7	-43.6	-53.0	-38.8	-27.7	-30.5	-28.6	Y
-59.8	-14.0	-16.6	-9.1	-2.2	-3.1	-0.4	-59.8	-10.0	-21.7	-21.7	-41.1	-43.7	-36.2	-29.3	-30.3	-27.5	Y
-57.8	-12.5	-14.8	-7.9	-3.7	-5.0	0.2	-57.8	-10.0	-21.7	-21.7	-39.7	-41.9	-35.0	-30.8	-32.1	-26.9	Y
-55.8	-10.9	-14.8	-8.3	-2.7	-9.7	1.2	-55.8	-10.0	-21.7	-21.7	-38.0	-42.0	-35.5	-29.8	-36.8	-25.9	Y
-53.8	-12.3	-24.1	-11.7	-3.0	-4.5	1.5	-53.8	-10.0	-21.7	-21.7	-39.4	-51.2	-38.9	-30.1	-31.6	-25.7	Y
-51.8	-14.0	-19.5	-19.8	-5.6	0.0	-1.1	-51.8	-10.0	-21.7	-21.7	-41.1	-46.6	-46.9	-32.7	-27.1	-28.3	Y
-49.8	-16.0	-11.6	-16.5	-9.4	1.1	-3.4	-49.8	-10.0	-21.7	-21.7	-43.1	-38.8	-43.6	-36.6	-26.0	-30.5	Y
-47.8	-18.8	-9.2	-17.6	-9.2	-1.0	-2.6	-47.8	-10.0	-21.7	-21.7	-45.9	-36.3	-44.7	-36.4	-28.2	-29.7	Y
-45.8	-19.3	-9.8	-15.0	-6.9	-2.8	-3.5	-45.8	-9.5	-21.3	-21.3	-46.5	-36.9	-42.1	-34.0	-30.0	-30.6	Y
-43.8	-26.3	-15.2	-21.9	-5.2	-3.4	-4.2	-43.8	-9.0	-20.8	-20.8	-53.4	-42.4	-49.0	-32.3	-30.5	-31.3	Y
-41.8	-22.1	-10.9	-21.6	-3.3	-3.8	-4.0	-41.8	-8.5	-20.3	-20.3	-49.2	-38.0	-48.8	-30.4	-31.0	-31.1	Y
-39.8	-22.7	-7.5	-9.7	-2.1	-5.2	-4.6	-39.8	-8.0	-19.7	-19.7	-49.9	-34.6	-36.8	-29.2	-32.3	-31.7	Y
-37.8	-16.3	-7.9	-11.9	-2.9	-7.3	-3.6	-37.8	-7.4	-19.2	-19.2	-43.4	-35.1	-39.0	-30.0	-34.4	-30.7	Y
-35.8	-13.4	-10.1	-20.6	-3.9	-4.3	-1.6	-35.8	-6.8	-18.6	-18.6	-40.6	-37.2	-47.7	-31.0	-31.4	-28.7	Y
-33.8	-9.6	-5.2	-9.3	-5.0	-2.6	-7.2	-33.8	-6.2	-18.0	-18.0	-36.7	-32.3	-36.4	-32.1	-29.7	-34.3	Y
-31.8	-10.4	-3.5	-5.3	-6.5	-2.5	-4.6	-31.8	-5.6	-17.3	-17.3	-37.5	-30.6	-32.5	-33.6	-29.6	-31.7	Y
-29.8	-9.5	-7.4	-4.9	-14.1	-4.2	-1.4	-29.8	-4.9	-16.6	-16.6	-36.6	-34.6	-32.0	-41.3	-31.3	-28.6	Y
-27.8	-9.1	-13.6	-11.6	0.0	-20.1	-3.8	-27.8	-4.1	-15.8	-15.8	-36.2	-40.7	-38.7	-27.1	-47.2	-30.9	Y
-25.8	-9.0	-12.6	-13.6	-1.9	-5.2	-0.6	-25.8	-3.3	-15.0	-15.0	-36.1	-39.7	-40.7	-29.0	-32.3	-27.7	Y
-23.8	-9.3	-15.2	-16.2	-11.4	-3.5	0.9	-23.8	-2.4	-14.1	-14.1	-36.4	-42.4	-43.3	-38.5	-30.6	-26.3	Y
-21.8	-15.2	-12.7	-13.9	-12.7	-27.9	-0.8	-21.8	-1.5	-13.2	-13.2	-42.4	-39.8	-41.0	-39.8	-55.0	-28.0	Y
-19.8	-6.7	-7.7	-17.5	-2.9	-13.2	-1.4	-19.8	-0.4	-12.1	-12.1	-33.8	-34.8	-44.6	-30.0	-40.3	-28.5	Y
-17.8	-3.7	-11.1	-4.2	0.9	-7.0	-14.8	-17.8	0.7	-11.0	-11.0	-30.9	-38.2	-31.3	-26.2	-34.1	-41.9	Y
-15.8	-5.2	-9.7	-0.4	-6.0	-7.3	1.2	-15.8	2.0	-9.7	-9.7	-32.3	-36.8	-27.5	-33.1	-34.4	-26.0	Y
-13.8	-7.8	-12.9	0.0	4.9	-10.2	0.7	-13.8	3.5	-8.2	-8.2	-35.0	-40.0	-27.1	-22.3	-37.4	-26.4	Y
-11.8	-4.5	-1.4	-5.5	1.0	-6.4	6.7	-11.8	5.2	-6.5	-6.5	-31.6	-28.5	-32.6	-26.1	-33.5	-20.5	Y
-10.0	-9.1	-1.1	-3.1	3.8	4.5	-6.0	-10.0	7.0	-4.7	-4.7	-36.2	-28.2	-30.2	-23.3	-22.6	-33.1	Y
-9.9	-9.6	0.0	-2.3	4.1	4.7	-7.5	-9.9	7.1	-4.6	-4.6	-36.7	-27.1	-29.5	-23.0	-22.4	-34.6	Y
-9.8	-9.6	0.9	-1.8	4.4	4.8	-7.8	-9.8	7.3	-4.5	-4.5	-36.8	-26.2	-28.9	-22.7	-22.4	-34.9	Y
-9.7	-9.7	1.7	-1.2	4.7	4.8	-6.6	-9.7	7.4	-4.4	-4.4	-36.8	-25.4	-28.3	-22.5	-22.3	-33.8	Y
-9.6	-9.4	2.4	-0.7	4.9	4.8	-4.6	-9.6	7.5	-4.3	-4.3	-36.5	-24.7	-27.8	-22.2	-22.4	-31.7	Y

-9.5	-9.3	3.0	-0.2	5.1	4.7	-2.4	-9.5	7.6	-4.1	-4.1	-36.4	-24.1	-27.4	-22.0	-22.4	-29.6	Y
-9.4	-9.0	3.5	0.2	5.3	4.5	-0.6	-9.4	7.7	-4.0	-4.0	-36.1	-23.6	-26.9	-21.8	-22.6	-27.7	Y
-9.3	-8.4	4.0	0.5	5.6	4.4	1.1	-9.3	7.8	-3.9	-3.9	-35.5	-23.1	-26.6	-21.5	-22.8	-26.0	Y
-9.2	-8.1	4.4	0.9	5.8	4.1	2.6	-9.2	8.0	-3.7	-3.8	-35.2	-22.7	-26.3	-21.3	-23.0	-24.5	Y
-9.1	-7.8	4.8	1.1	6.1	3.9	3.8	-9.1	8.0	-3.7	-3.7	-34.9	-22.4	-26.0	-21.0	-23.2	-23.3	Y
-9.0	-7.5	5.0	1.3	6.4	3.7	4.9	-9.0	8.0	-3.7	-3.6	-34.6	-22.1	-25.8	-20.7	-23.4	-22.2	Y
-8.9	-7.4	5.3	1.5	6.8	3.5	5.9	-8.9	8.0	-3.7	-3.4	-34.5	-21.9	-25.6	-20.4	-23.6	-21.2	Y
-8.8	-7.3	5.4	1.7	7.2	3.4	6.8	-8.8	8.0	-3.7	-3.3	-34.4	-21.7	-25.5	-19.9	-23.7	-20.3	Y
-8.7	-7.3	5.5	1.8	7.7	3.4	7.6	-8.7	8.0	-3.7	-3.2	-34.4	-21.6	-25.4	-19.5	-23.8	-19.5	Y
-8.6	-7.3	5.5	1.8	8.2	3.5	8.4	-8.6	8.0	-3.7	-3.1	-34.4	-21.6	-25.3	-18.9	-23.7	-18.7	Y
-8.5	-7.3	5.5	1.8	8.7	3.7	9.1	-8.5	8.0	-3.7	-2.9	-34.4	-21.6	-25.4	-18.4	-23.4	-18.0	Y
-8.4	-6.8	5.4	1.7	9.3	4.0	9.7	-8.4	8.0	-3.7	-2.8	-33.9	-21.7	-25.5	-17.8	-23.1	-17.4	Y
-8.3	-5.9	5.2	1.5	9.9	4.5	10.4	-8.3	8.0	-3.7	-2.7	-33.0	-21.9	-25.6	-17.2	-22.6	-16.8	Y
-8.2	-4.6	4.9	1.3	10.5	5.0	10.9	-8.2	8.0	-3.7	-2.5	-31.7	-22.3	-25.8	-16.6	-22.1	-16.2	Y
-8.1	-3.1	4.4	1.0	11.1	5.6	11.5	-8.1	8.0	-3.7	-2.4	-30.3	-22.7	-26.2	-16.0	-21.5	-15.6	Y
-8.0	-1.5	3.8	0.5	11.7	6.2	12.0	-8.0	8.0	-3.7	-2.3	-28.6	-23.3	-26.6	-15.4	-20.9	-15.1	Y
-7.9	0.2	3.1	0.0	12.3	6.8	12.6	-7.9	8.0	-3.7	-2.1	-26.9	-24.1	-27.1	-14.9	-20.3	-14.6	Y
-7.8	1.7	2.1	-0.7	12.9	7.5	13.1	-7.8	8.0	-3.7	-2.0	-25.5	-25.0	-27.8	-14.2	-19.7	-14.1	Y
-7.7	3.1	0.9	-1.5	13.5	8.1	13.6	-7.7	8.0	-3.7	-1.9	-24.0	-26.3	-28.6	-13.6	-19.0	-13.5	Y
-7.6	4.5	-0.7	-2.5	14.1	8.6	14.1	-7.6	8.0	-3.7	-1.7	-22.7	-27.8	-29.6	-13.0	-18.5	-13.1	Y
-7.5	5.7	-2.5	-3.4	14.7	9.2	14.5	-7.5	8.0	-3.7	-1.6	-21.4	-29.6	-30.5	-12.5	-17.9	-12.6	Y
-7.4	6.8	-3.7	-4.2	15.2	9.8	15.0	-7.4	8.0	-3.7	-1.4	-20.3	-30.8	-31.3	-11.9	-17.4	-12.1	Y
-7.3	7.9	-3.1	-4.2	15.7	10.3	15.5	-7.3	8.0	-3.7	-1.3	-19.2	-30.2	-31.3	-11.4	-16.8	-11.6	Y
-7.2	8.9	-0.9	-3.2	16.3	10.8	15.9	-7.2	8.0	-3.7	-1.1	-18.2	-28.0	-30.3	-10.9	-16.3	-11.2	Y
-7.1	9.8	1.7	-1.5	16.8	11.3	16.4	-7.1	8.0	-3.7	-1.0	-17.3	-25.4	-28.6	-10.4	-15.8	-10.8	Y
-7.0	10.6	4.1	0.5	17.2	11.8	16.8	-7.0	7.9	-3.8	-0.8	-16.5	-23.0	-26.6	-9.9	-15.3	-10.3	Y
-6.9	11.4	6.2	2.5	17.7	12.3	17.2	-6.9	8.1	-3.7	-0.7	-15.7	-20.9	-24.6	-9.4	-14.8	-9.9	Y
-6.8	12.1	8.0	4.2	18.2	12.8	17.7	-6.8	8.2	-3.5	-0.5	-15.0	-19.1	-22.9	-9.0	-14.3	-9.5	Y
-6.7	12.8	9.6	5.9	18.6	13.4	18.1	-6.7	8.4	-3.3	-0.3	-14.4	-17.6	-21.3	-8.6	-13.8	-9.0	Y
-6.6	13.4	11.0	7.4	19.0	13.9	18.5	-6.6	8.6	-3.2	-0.2	-13.7	-16.1	-19.7	-8.1	-13.3	-8.6	Y
-6.5	14.0	12.2	8.7	19.4	14.4	18.9	-6.5	8.7	-3.0	0.0	-13.2	-14.9	-18.4	-7.8	-12.7	-8.3	Y
-6.4	14.5	13.3	9.9	19.7	14.9	19.2	-6.4	8.9	-2.8	0.2	-12.7	-13.8	-17.2	-7.4	-12.2	-7.9	Y

-6.3	14.9	14.4	11.1	20.0	15.5	19.6	-6.3	9.1	-2.7	0.3	-12.2	-12.7	-16.0	-7.1	-11.7	-7.5	Y
-6.2	15.4	15.4	12.2	20.3	16.0	19.9	-6.2	9.2	-2.5	0.5	-11.7	-11.7	-14.9	-6.8	-11.2	-7.2	Y
-6.1	15.8	16.2	13.1	20.6	16.5	20.3	-6.1	9.4	-2.3	0.7	-11.3	-10.9	-14.0	-6.5	-10.6	-6.9	Y
-6.0	16.2	17.0	13.9	20.8	17.0	20.6	-6.0	9.6	-2.1	0.9	-11.0	-10.2	-13.2	-6.3	-10.1	-6.5	Y
-5.9	16.5	17.7	14.7	21.0	17.5	20.9	-5.9	9.8	-1.9	1.1	-10.6	-9.5	-12.4	-6.1	-9.7	-6.2	Y
-5.8	16.8	18.3	15.4	21.2	17.9	21.2	-5.8	10.0	-1.8	1.2	-10.4	-8.8	-11.7	-5.9	-9.2	-6.0	Y
-5.7	17.0	18.9	16.1	21.4	18.4	21.4	-5.7	10.2	-1.6	1.4	-10.1	-8.3	-11.1	-5.7	-8.7	-5.7	Y
-5.6	17.2	19.4	16.7	21.5	18.8	21.7	-5.6	10.4	-1.4	1.6	-9.9	-7.7	-10.5	-5.6	-8.3	-5.5	Y
-5.5	17.4	19.8	17.1	21.6	19.2	21.9	-5.5	10.6	-1.2	1.8	-9.8	-7.3	-10.0	-5.5	-7.9	-5.2	Y
-5.4	17.5	20.2	17.6	21.6	19.5	22.1	-5.4	10.8	-1.0	2.0	-9.7	-6.9	-9.5	-5.5	-7.6	-5.1	Y
-5.3	17.5	20.5	18.0	21.7	19.8	22.2	-5.3	11.0	-0.8	2.2	-9.6	-6.6	-9.2	-5.5	-7.3	-4.9	Y
-5.2	17.5	20.8	18.3	21.7	20.0	22.4	-5.2	11.2	-0.6	2.4	-9.6	-6.3	-8.8	-5.5	-7.1	-4.8	Y
-5.1	17.4	21.0	18.5	21.6	20.2	22.5	-5.1	11.4	-0.4	2.6	-9.7	-6.1	-8.6	-5.5	-6.9	-4.6	Y
-5.0	17.3	21.2	18.8	21.5	20.4	22.6	-5.0	11.6	-0.1	2.9	-9.8	-5.9	-8.4	-5.6	-6.7	-4.6	Y
-4.9	17.1	21.3	18.9	21.4	20.5	22.6	-4.9	11.8	0.1	3.1	-10.0	-5.8	-8.2	-5.8	-6.7	-4.5	Y
-4.8	16.8	21.3	19.0	21.2	20.5	22.6	-4.8	12.0	0.3	3.3	-10.3	-5.8	-8.1	-6.0	-6.6	-4.5	Y
-4.7	16.4	21.3	19.0	20.9	20.5	22.6	-4.7	12.3	0.5	3.5	-10.7	-5.9	-8.1	-6.2	-6.7	-4.5	Y
-4.6	15.9	21.1	19.0	20.6	20.4	22.6	-4.6	12.5	0.8	3.8	-11.2	-6.0	-8.1	-6.5	-6.8	-4.5	Y
-4.5	15.3	21.0	18.9	20.2	20.2	22.5	-4.5	12.7	1.0	4.0	-11.8	-6.2	-8.2	-6.9	-7.0	-4.6	Y
-4.4	14.5	20.7	18.7	19.7	19.9	22.3	-4.4	13.0	1.3	4.3	-12.6	-6.4	-8.4	-7.4	-7.2	-4.8	Y
-4.3	13.5	20.3	18.5	19.2	19.5	22.1	-4.3	13.2	1.5	4.5	-13.7	-6.8	-8.6	-7.9	-7.6	-5.0	Y
-4.2	12.2	19.9	18.2	18.5	19.0	21.9	-4.2	13.5	1.8	4.8	-14.9	-7.3	-9.0	-8.6	-8.1	-5.2	Y
-4.1	10.6	19.3	17.8	17.7	18.4	21.5	-4.1	13.8	2.0	5.0	-16.5	-7.8	-9.3	-9.5	-8.7	-5.6	Y
-4.0	8.7	18.6	17.3	16.6	17.7	21.2	-4.0	14.0	2.3	5.3	-18.4	-8.6	-9.8	-10.5	-9.4	-6.0	Y
-3.9	6.6	17.7	16.7	15.4	16.7	20.7	-3.9	14.3	2.6	5.6	-20.5	-9.5	-10.4	-11.7	-10.4	-6.5	Y
-3.8	5.4	16.6	16.1	13.9	15.5	20.0	-3.8	14.6	2.9	5.9	-21.7	-10.5	-11.0	-13.3	-11.6	-7.1	Y
-3.7	6.7	15.3	15.4	12.0	13.8	19.2	-3.7	14.9	3.2	6.2	-20.4	-11.8	-11.7	-15.1	-13.3	-7.9	Y
-3.6	9.4	13.8	14.8	10.0	11.7	18.3	-3.6	15.2	3.5	6.5	-17.7	-13.4	-12.3	-17.2	-15.4	-8.8	Y
-3.5	12.0	12.0	14.5	8.2	8.6	17.2	-3.5	15.5	3.8	6.8	-15.1	-15.1	-12.7	-18.9	-18.5	-10.0	Y
-3.4	14.3	10.6	14.5	8.3	4.7	15.8	-3.4	15.8	4.1	7.1	-12.8	-16.5	-12.6	-18.8	-22.4	-11.3	Y
-3.3	16.3	10.4	15.0	10.4	3.3	14.1	-3.3	16.1	4.4	7.4	-10.9	-16.7	-12.1	-16.7	-23.8	-13.0	Y
-3.2	18.1	11.8	16.0	13.1	7.7	12.3	-3.2	16.5	4.7	7.7	-9.0	-15.3	-11.1	-14.0	-19.4	-14.8	Y

-3.1	19.5	14.0	17.3	15.4	11.9	11.1	-3.1	16.8	5.1	8.1	-7.6	-13.2	-9.8	-11.7	-15.2	-16.0	Y
-3.0	20.8	16.1	18.6	17.4	14.9	11.5	-3.0	17.2	5.5		-6.3	-11.0	-8.5	-9.7	-12.2	-15.6	Y
-2.9	22.0	18.1	20.0	19.1	17.3	13.4	-2.9	17.6	5.8		-5.2	-9.1	-7.1	-8.0	-9.8	-13.7	Y
-2.8	23.0	19.7	21.3	20.5	19.3	15.7	-2.8	17.9	6.2		-4.1	-7.4	-5.8	-6.6	-7.8	-11.4	Y
-2.7	24.0	21.3	22.6	21.9	21.0	17.9	-2.7	18.3	6.6		-3.2	-5.8	-4.6	-5.2	-6.2	-9.2	Y
-2.6	24.9	22.6	23.6	23.1	22.4	19.8	-2.6	18.8	7.0		-2.2	-4.5	-3.5	-4.1	-4.8	-7.3	Y
-2.5	25.7	23.8	24.7	24.0	23.6	21.4	-2.5	19.2	7.5		-1.4	-3.3	-2.5	-3.1	-3.5	-5.7	Y
-2.4	26.4	24.9	25.6	25.0	24.7	22.8	-2.4	19.6	7.9		-0.7	-2.2	-1.5	-2.1	-2.4	-4.3	Y
-2.3	27.1	25.9	26.6	25.8	25.7	24.1	-2.3	20.1	8.4		0.0	-1.2	-0.6	-1.3	-1.4	-3.0	Y
-2.2	27.8	26.8	27.4	26.6	26.6	25.3	-2.2	20.6	8.9		0.6	-0.3	0.2	-0.5	-0.5	-1.9	Y
-2.1	28.3	27.6	28.1	27.3	27.5	26.3	-2.1	21.1	9.4		1.2	0.5	1.0	0.2	0.4	-0.8	Y
-2.0	28.9	28.4	28.8	28.0	28.2	27.2	-2.0	21.6	9.9		1.8	1.2	1.7	0.9	1.1	0.1	Y
-1.9	29.4	29.1	29.5	28.6	28.9	28.0	-1.9	22.2	10.5		2.3	1.9	2.3	1.5	1.8	0.9	Y
-1.8	29.9	29.7	30.1	29.1	29.6	28.8	-1.8	22.8	11.1		2.8	2.6	2.9	2.0	2.4	1.7	Y
-1.7	30.3	30.3	30.6	29.6	30.1	29.5	-1.7	23.4	11.7		3.2	3.2	3.5	2.5	3.0	2.4	Y
-1.6	30.7	30.8	31.1	30.1	30.7	30.1	-1.6	24.1	12.4		3.6	3.7	4.0	3.0	3.6	3.0	Y
-1.5	31.1	31.3	31.6	30.5	31.2	30.7	-1.5				4.0	4.2	4.4	3.4	4.1	3.6	Y
-1.4	31.4	31.8	32.0	30.9	31.6	31.2	-1.4				4.3	4.7	4.9	3.8	4.5	4.1	Y
-1.3	31.8	32.2	32.4	31.2	32.0	31.7	-1.3				4.6	5.1	5.3	4.1	4.9	4.6	Y
-1.2	32.1	32.6	32.8	31.6	32.4	32.1	-1.2				4.9	5.5	5.6	4.5	5.3	5.0	Y
-1.1	32.3	33.0	33.1	31.9	32.8	32.6	-1.1				5.2	5.9	6.0	4.7	5.7	5.4	Y
-1.0	32.5	33.3	33.4	32.1	33.1	32.9	-1.0				5.4	6.2	6.3	5.0	6.0	5.8	Y
-0.9	32.7	33.6	33.7	32.3	33.4	33.2	-0.9				5.6	6.5	6.5	5.2	6.3	6.1	Y
-0.8	32.9	33.8	33.9	32.6	33.6	33.5	-0.8				5.8	6.7	6.8	5.4	6.5	6.4	Y
-0.7	33.1	34.0	34.1	32.7	33.9	33.8	-0.7				6.0	6.9	7.0	5.6	6.8	6.6	Y
-0.6	33.2	34.2	34.3	32.9	34.1	34.0	-0.6				6.1	7.1	7.2	5.7	6.9	6.9	Y
-0.5	33.3	34.4	34.4	33.0	34.2	34.1	-0.5				6.2	7.3	7.3	5.9	7.1	7.0	Y
-0.4	33.4	34.5	34.6	33.1	34.4	34.3	-0.4				6.3	7.4	7.4	6.0	7.2	7.2	Y
-0.3	33.5	34.6	34.7	33.2	34.5	34.4	-0.3				6.4	7.5	7.6	6.1	7.3	7.3	Y
-0.2	33.5	34.7	34.7	33.2	34.6	34.5	-0.2				6.4	7.5	7.6	6.1	7.4	7.4	Y
-0.1	33.6	34.7	34.8	33.2	34.6	34.5	-0.1				6.5	7.6	7.7	6.1	7.5	7.4	Y
0.0	33.6	34.7	34.8	33.2	34.6	34.6	0.0				6.5	7.6	7.7	6.1	7.5	7.4	Y

0.1	33.6	34.7	34.8	33.2	34.6	34.6	0.1				6.5	7.6	7.7	6.1	7.5	7.4	Y
0.2	33.5	34.6	34.7	33.2	34.6	34.5	0.2				6.4	7.5	7.6	6.0	7.5	7.4	Y
0.3	33.5	34.6	34.7	33.1	34.5	34.5	0.3				6.4	7.4	7.5	6.0	7.4	7.3	Y
0.4	33.4	34.5	34.6	33.0	34.5	34.4	0.4				6.3	7.3	7.4	5.9	7.3	7.3	Y
0.5	33.3	34.3	34.4	32.9	34.4	34.3	0.5				6.2	7.2	7.3	5.8	7.2	7.2	Y
0.6	33.2	34.2	34.3	32.7	34.2	34.1	0.6				6.0	7.1	7.1	5.6	7.1	7.0	Y
0.7	33.0	34.0	34.1	32.6	34.1	34.0	0.7				5.9	6.9	6.9	5.5	6.9	6.8	Y
0.8	32.8	33.8	33.8	32.4	33.8	33.8	0.8				5.7	6.7	6.7	5.3	6.7	6.6	Y
0.9	32.6	33.5	33.6	32.1	33.6	33.5	0.9				5.5	6.4	6.5	5.0	6.5	6.4	Y
1.0	32.4	33.3	33.3	31.9	33.3	33.3	1.0				5.3	6.1	6.2	4.8	6.2	6.1	Y
1.1	32.2	33.0	33.0	31.6	33.0	32.9	1.1				5.1	5.8	5.9	4.5	5.9	5.8	Y
1.2	31.9	32.6	32.6	31.3	32.7	32.6	1.2				4.8	5.5	5.5	4.2	5.6	5.5	Y
1.3	31.6	32.3	32.3	31.0	32.3	32.2	1.3				4.5	5.2	5.2	3.8	5.2	5.1	Y
1.4	31.3	31.9	31.9	30.6	31.9	31.8	1.4				4.2	4.8	4.7	3.4	4.8	4.7	Y
1.5	31.0	31.5	31.4	30.1	31.5	31.4	1.5	24.4	12.7		3.8	4.3	4.3	3.0	4.3	4.2	Y
1.6	30.6	31.0	30.9	29.7	31.0	30.9	1.6	23.7	12.0		3.5	3.9	3.8	2.5	3.8	3.8	Y
1.7	30.2	30.5	30.4	29.2	30.4	30.3	1.7	23.0	11.3		3.1	3.4	3.3	2.1	3.3	3.2	Y
1.8	29.7	29.9	29.8	28.6	29.9	29.8	1.8	22.4	10.7		2.6	2.8	2.7	1.5	2.7	2.6	Y
1.9	29.3	29.3	29.2	28.1	29.2	29.1	1.9	21.9	10.1		2.2	2.2	2.1	0.9	2.1	2.0	Y
2.0	28.7	28.7	28.5	27.4	28.6	28.4	2.0	21.3	9.6		1.6	1.6	1.4	0.3	1.5	1.3	Y
2.1	28.2	28.0	27.8	26.7	27.8	27.6	2.1	20.8	9.1		1.1	0.8	0.7	-0.4	0.7	0.5	Y
2.2	27.6	27.2	27.0	26.0	27.0	26.8	2.2	20.3	8.6		0.5	0.1	-0.1	-1.1	-0.1	-0.4	Y
2.3	26.9	26.3	26.2	25.1	26.1	25.8	2.3	19.8	8.1		-0.2	-0.8	-0.9	-2.0	-1.0	-1.3	Y
2.4	26.3	25.4	25.3	24.2	25.1	24.7	2.4	19.4	7.6		-0.9	-1.7	-1.9	-2.9	-2.0	-2.4	Y
2.5	25.5	24.4	24.3	23.3	24.0	23.6	2.5	18.9	7.2		-1.6	-2.8	-2.8	-3.9	-3.1	-3.6	Y
2.6	24.7	23.3	23.3	22.1	22.8	22.2	2.6	18.5	6.8		-2.4	-3.9	-3.8	-5.0	-4.3	-4.9	Y
2.7	23.8	22.0	22.1	20.9	21.5	20.7	2.7	18.1	6.4		-3.3	-5.1	-5.0	-6.2	-5.6	-6.4	Y
2.8	22.7	20.5	20.9	19.6	19.9	19.0	2.8	17.7	6.0		-4.4	-6.6	-6.2	-7.6	-7.2	-8.1	Y
2.9	21.7	19.0	19.6	18.1	18.0	16.9	2.9	17.3	5.6		-5.4	-8.2	-7.5	-9.0	-9.1	-10.2	Y
3.0	20.6	17.2	18.3	16.3	15.9	14.7	3.0	17.0	5.2	8.2	-6.6	-9.9	-8.8	-10.8	-11.2	-12.4	Y
3.1	19.3	15.3	17.0	14.4	13.1	12.1	3.1	16.6	4.9	7.9	-7.9	-11.9	-10.1	-12.7	-14.0	-15.1	Y
3.2	17.8	13.6	16.0	12.1	9.4	10.1	3.2	16.3	4.5	7.5	-9.4	-13.6	-11.2	-15.0	-17.8	-17.0	Y

3.3	16.3	12.4	15.2	10.0	4.0	10.1	3.3	15.9	4.2	7.2	-10.8	-14.7	-11.9	-17.1	-23.1	-17.0	Y
3.4	14.6	12.4	14.8	8.8	1.8	11.8	3.4	15.6	3.9	6.9	-12.5	-14.7	-12.3	-18.3	-25.4	-15.4	Y
3.5	12.8	13.4	14.9	9.2	6.7	13.8	3.5	15.3	3.6	6.6	-14.3	-13.7	-12.2	-17.9	-20.4	-13.3	Y
3.6	11.1	14.7	15.2	10.8	10.3	15.5	3.6	15.0	3.3	6.3	-16.0	-12.4	-11.9	-16.3	-16.8	-11.6	Y
3.7	10.0	15.9	15.8	12.5	12.9	17.0	3.7	14.7	3.0	6.0	-17.2	-11.2	-11.3	-14.6	-14.2	-10.2	Y
3.8	9.7	17.2	16.4	14.1	14.7	18.1	3.8	14.4	2.7	5.7	-17.4	-10.0	-10.7	-13.0	-12.4	-9.0	Y
3.9	10.4	18.0	16.9	15.5	16.1	19.1	3.9	14.1	2.4	5.4	-16.7	-9.1	-10.2	-11.7	-11.0	-8.1	Y
4.0	11.5	18.8	17.4	16.5	17.2	19.8	4.0	13.9	2.1	5.1	-15.6	-8.3	-9.7	-10.6	-9.9	-7.3	Y
4.1	12.6	19.5	17.8	17.5	18.1	20.5	4.1	13.6	1.9	4.9	-14.5	-7.7	-9.3	-9.7	-9.1	-6.7	Y
4.2	13.6	20.0	18.1	18.2	18.7	20.9	4.2	13.3	1.6	4.6	-13.5	-7.1	-9.0	-8.9	-8.4	-6.2	Y
4.3	14.5	20.4	18.4	18.8	19.2	21.4	4.3	13.1	1.4	4.4	-12.6	-6.8	-8.7	-8.3	-7.9	-5.8	Y
4.4	15.3	20.7	18.6	19.4	19.6	21.7	4.4	12.8	1.1	4.1	-11.8	-6.4	-8.5	-7.8	-7.5	-5.4	Y
4.5	15.9	20.9	18.7	19.8	19.9	21.9	4.5	12.6	0.9	3.9	-11.2	-6.2	-8.4	-7.3	-7.2	-5.2	Y
4.6	16.4	21.0	18.7	20.1	20.2	22.1	4.6	12.4	0.6	3.6	-10.7	-6.1	-8.4	-7.0	-7.0	-5.0	Y
4.7	16.8	21.1	18.7	20.4	20.3	22.3	4.7	12.1	0.4	3.4	-10.3	-6.0	-8.4	-6.7	-6.8	-4.9	Y
4.8	17.1	21.1	18.7	20.7	20.4	22.3	4.8	11.9	0.2	3.2	-10.0	-6.0	-8.5	-6.5	-6.8	-4.8	Y
4.9	17.4	21.0	18.6	20.8	20.4	22.4	4.9	11.7	-0.1	2.9	-9.8	-6.1	-8.6	-6.3	-6.7	-4.8	Y
5.0	17.5	20.9	18.4	21.0	20.3	22.3	5.0	11.5	-0.3	2.7	-9.6	-6.2	-8.7	-6.2	-6.8	-4.8	Y
5.1	17.6	20.7	18.2	21.0	20.2	22.3	5.1	11.2	-0.5	2.5	-9.5	-6.4	-8.9	-6.1	-6.9	-4.8	Y
5.2	17.7	20.5	17.9	21.1	20.1	22.2	5.2	11.0	-0.7	2.3	-9.5	-6.6	-9.2	-6.0	-7.0	-4.9	Y
5.3	17.6	20.2	17.6	21.1	19.9	22.1	5.3	10.8	-0.9	2.1	-9.5	-6.9	-9.6	-6.1	-7.2	-5.1	Y
5.4	17.6	19.9	17.2	21.0	19.7	21.9	5.4	10.6	-1.1	1.9	-9.5	-7.3	-10.0	-6.1	-7.4	-5.2	Y
5.5	17.5	19.5	16.8	20.9	19.5	21.7	5.5	10.4	-1.3	1.7	-9.6	-7.6	-10.4	-6.2	-7.7	-5.4	Y
5.6	17.3	19.1	16.3	20.8	19.2	21.5	5.6	10.2	-1.5	1.5	-9.8	-8.1	-10.8	-6.3	-8.0	-5.7	Y
5.7	17.1	18.6	15.8	20.7	18.8	21.2	5.7	10.0	-1.7	1.3	-10.0	-8.6	-11.4	-6.4	-8.3	-5.9	Y
5.8	16.9	18.0	15.2	20.5	18.5	20.9	5.8	9.9	-1.9	1.1	-10.2	-9.1	-12.0	-6.6	-8.6	-6.2	Y
5.9	16.6	17.4	14.5	20.4	18.1	20.6	5.9	9.7	-2.1	0.9	-10.5	-9.7	-12.6	-6.8	-9.0	-6.5	Y
6.0	16.2	16.7	13.8	20.2	17.7	20.3	6.0	9.5	-2.2	0.8	-10.9	-10.4	-13.3	-7.0	-9.4	-6.9	Y
6.1	15.9	15.9	13.0	19.9	17.3	19.9	6.1	9.3	-2.4	0.6	-11.2	-11.2	-14.1	-7.2	-9.8	-7.2	Y
6.2	15.5	15.1	12.2	19.7	16.9	19.5	6.2	9.1	-2.6	0.4	-11.7	-12.0	-14.9	-7.4	-10.2	-7.6	Y
6.3	15.1	14.2	11.4	19.4	16.4	19.1	6.3	9.0	-2.8	0.2	-12.1	-12.9	-15.8	-7.7	-10.7	-8.0	Y
6.4	14.6	13.2	10.4	19.2	15.9	18.7	6.4	8.8	-2.9	0.1	-12.5	-13.9	-16.7	-8.0	-11.2	-8.4	Y

6.5	14.0	12.0	9.4	18.9	15.4	18.3	6.5	8.6	-3.1	-0.1	-13.1	-15.1	-17.7	-8.3	-11.7	-8.8	Y
6.6	13.5	10.7	8.5	18.6	15.0	17.9	6.6	8.5	-3.3	-0.3	-13.7	-16.4	-18.7	-8.6	-12.2	-9.3	Y
6.7	12.9	9.2	7.4	18.2	14.4	17.4	6.7	8.3	-3.4	-0.4	-14.2	-17.9	-19.7	-8.9	-12.7	-9.7	Y
6.8	12.2	7.5	6.5	17.9	13.9	17.0	6.8	8.1	-3.6	-0.6	-14.9	-19.6	-20.7	-9.2	-13.3	-10.2	Y
6.9	11.6	5.5	5.6	17.5	13.3	16.5	6.9	8.0	-3.7	-0.7	-15.6	-21.6	-21.5	-9.6	-13.8	-10.6	Y
7.0	10.8	3.1	4.9	17.1	12.8	16.1	7.0	8.0	-3.7	-0.9	-16.3	-24.0	-22.2	-10.0	-14.4	-11.0	Y
7.1	10.0	0.1	4.4	16.7	12.2	15.6	7.1	8.0	-3.7	-1.1	-17.1	-27.0	-22.7	-10.4	-15.0	-11.5	Y
7.2	9.2	-3.5	4.2	16.3	11.5	15.2	7.2	8.0	-3.7	-1.2	-17.9	-30.6	-22.9	-10.8	-15.6	-11.9	Y
7.3	8.4	-6.2	4.2	15.8	10.9	14.7	7.3	8.0	-3.7	-1.4	-18.7	-33.3	-22.9	-11.3	-16.3	-12.4	Y
7.4	7.5	-5.3	4.3	15.3	10.2	14.3	7.4	8.0	-3.7	-1.5	-19.6	-32.4	-22.8	-11.8	-16.9	-12.9	Y
7.5	6.6	-2.6	4.5	14.8	9.4	13.8	7.5	8.0	-3.7	-1.7	-20.5	-29.7	-22.6	-12.3	-17.7	-13.3	Y
7.6	5.5	-0.1	4.8	14.3	8.7	13.4	7.6	8.0	-3.7	-1.8	-21.6	-27.3	-22.4	-12.8	-18.4	-13.8	Y
7.7	4.6	1.7	5.0	13.7	7.9	12.9	7.7	8.0	-3.7	-1.9	-22.6	-25.4	-22.2	-13.4	-19.2	-14.2	Y
7.8	3.5	3.0	5.2	13.1	7.1	12.5	7.8	8.0	-3.7	-2.1	-23.6	-24.1	-22.0	-14.0	-20.0	-14.6	Y
7.9	2.4	4.1	5.3	12.5	6.2	12.0	7.9	8.0	-3.7	-2.2	-24.7	-23.0	-21.8	-14.7	-20.9	-15.1	Y
8.0	1.3	4.9	5.4	11.8	5.3	11.6	8.0	8.0	-3.7	-2.3	-25.9	-22.2	-21.7	-15.3	-21.8	-15.6	Y
8.1	0.0	5.6	5.4	11.1	4.4	11.1	8.1	8.0	-3.7	-2.5	-27.1	-21.6	-21.7	-16.0	-22.8	-16.1	Y
8.2	-1.1	6.1	5.4	10.4	3.5	10.6	8.2	8.0	-3.7	-2.6	-28.2	-21.0	-21.7	-16.7	-23.6	-16.5	Y
8.3	-2.2	6.5	5.3	9.7	2.6	10.0	8.3	8.0	-3.7	-2.7	-29.3	-20.7	-21.8	-17.5	-24.5	-17.1	Y
8.4	-3.3	6.8	5.2	9.0	1.9	9.5	8.4	8.0	-3.7	-2.9	-30.4	-20.4	-21.9	-18.2	-25.2	-17.7	Y
8.5	-4.3	7.0	5.0	8.2	1.4	8.9	8.5	8.0	-3.7	-3.0	-31.4	-20.1	-22.1	-18.9	-25.7	-18.3	Y
8.6	-4.9	7.1	4.8	7.6	1.1	8.2	8.6	8.0	-3.7	-3.1	-32.1	-20.0	-22.3	-19.6	-26.0	-18.9	Y
8.7	-5.6	7.2	4.6	6.9	1.1	7.4	8.7	8.0	-3.7	-3.3	-32.7	-19.9	-22.6	-20.2	-26.0	-19.7	Y
8.8	-5.8	7.3	4.3	6.3	1.3	6.6	8.8	8.0	-3.7	-3.4	-33.0	-19.8	-22.9	-20.8	-25.8	-20.5	Y
8.9	-6.2	7.3	3.9	5.8	1.6	5.7	8.9	8.0	-3.7	-3.5	-33.4	-19.8	-23.2	-21.4	-25.5	-21.4	Y
9.0	-6.4	7.3	3.6	5.3	2.1	4.7	9.0	8.0	-3.7	-3.6	-33.5	-19.9	-23.6	-21.8	-25.1	-22.5	Y
9.1	-6.6	7.2	3.1	4.9	2.5	3.5	9.1	8.0	-3.7	-3.7	-33.7	-20.0	-24.0	-22.2	-24.6	-23.6	Y
9.2	-6.8	7.0	2.7	4.6	2.8	2.2	9.2	7.9	-3.9	-3.9	-33.9	-20.1	-24.4	-22.5	-24.3	-24.9	Y
9.3	-7.0	6.8	2.2	4.3	3.2	0.5	9.3	7.8	-4.0	-4.0	-34.1	-20.3	-24.9	-22.8	-23.9	-26.6	Y
9.4	-6.9	6.6	1.7	4.1	3.5	-1.2	9.4	7.6	-4.1	-4.1	-34.0	-20.5	-25.4	-23.1	-23.6	-28.4	Y
9.5	-7.4	6.3	1.1	3.8	3.7	-3.7	9.5	7.5	-4.2	-4.2	-34.5	-20.8	-26.0	-23.3	-23.5	-30.9	Y
9.6	-7.7	6.0	0.5	3.5	3.9	-6.8	9.6	7.4	-4.3	-4.3	-34.8	-21.2	-26.6	-23.6	-23.3	-33.9	Y

9.7	-8.1	5.6	-0.1	3.3	3.9	-10.6	9.7	7.3	-4.4	-4.4	-35.2	-21.6	-27.2	-23.8	-23.2	-37.7	Y
9.8	-8.3	5.1	-0.8	2.9	3.9	-13.5	9.8	7.2	-4.5	-4.5	-35.4	-22.1	-27.9	-24.2	-23.2	-40.6	Y
9.9	-8.7	4.7	-1.3	2.5	3.9	-11.0	9.9	7.1	-4.7	-4.7	-35.8	-22.5	-28.4	-24.6	-23.3	-38.2	Y
10.0	-9.1	4.1	-1.9	1.9	3.7	-7.6	10.0	7.0	-4.8	-4.8	-36.2	-23.0	-29.1	-25.2	-23.4	-34.7	Y
10.2	-10.3	4.0	-0.7	1.6	4.0	-12.2	10.2	6.8	-4.9	-4.9	-37.4	-23.2	-27.8	-25.5	-23.1	-39.3	Y
12.2	-18.9	-3.2	-6.7	4.1	-6.1	6.9	12.2	4.8	-6.9	-6.9	-46.1	-30.3	-33.8	-23.0	-33.2	-20.2	Y
14.2	-15.7	-5.2	-3.6	5.8	-5.8	0.2	14.2	3.2	-8.5	-8.5	-42.9	-32.4	-30.7	-21.3	-33.0	-26.9	Y
16.2	-8.9	-5.8	-3.0	-3.8	-5.0	2.5	16.2	1.8	-10.0	-10.0	-36.0	-32.9	-30.2	-30.9	-32.2	-24.6	Y
18.2	-4.9	-9.6	-4.7	1.2	-12.5	-7.1	18.2	0.5	-11.2	-11.2	-32.1	-36.8	-31.9	-25.9	-39.6	-34.2	Y
20.2	-5.7	-13.7	-24.8	-4.8	-11.0	-2.7	20.2	-0.6	-12.4	-12.4	-32.8	-40.8	-51.9	-32.0	-38.1	-29.8	Y
22.2	-13.5	-16.8	-16.4	-7.3	-13.1	-3.8	22.2	-1.7	-13.4	-13.4	-40.6	-43.9	-43.5	-34.5	-40.2	-30.9	Y
24.2	-9.9	-8.2	-14.7	-10.8	-3.8	-0.6	24.2	-2.6	-14.3	-14.3	-37.0	-35.3	-41.8	-38.0	-30.9	-27.7	Y
26.2	-8.6	-6.9	-13.0	0.0	-2.4	0.1	26.2	-3.5	-15.2	-15.2	-35.7	-34.0	-40.1	-27.1	-29.5	-27.0	Y
28.2	-7.6	-9.2	-10.0	1.9	-13.0	-4.1	28.2	-4.3	-16.0	-16.0	-34.8	-36.3	-37.1	-25.2	-40.1	-31.2	Y
30.2	-6.5	-8.1	-4.5	-8.1	-7.5	-2.5	30.2	-5.0	-16.7	-16.7	-33.6	-35.3	-31.6	-35.2	-34.7	-29.6	Y
32.2	-7.4	-3.0	-4.3	-9.7	-3.2	-4.1	32.2	-5.7	-17.4	-17.4	-34.5	-30.1	-31.4	-36.8	-30.3	-31.2	Y
34.2	-7.9	-3.0	-6.7	-8.1	-4.2	-6.4	34.2	-6.4	-18.1	-18.1	-35.0	-30.2	-33.9	-35.2	-31.4	-33.5	Y
36.2	-14.6	-6.3	-6.3	-6.6	-6.9	-2.3	36.2	-7.0	-18.7	-18.7	-41.7	-33.5	-33.4	-33.7	-34.0	-29.4	Y
38.2	-23.5	-9.3	-5.9	-4.0	-4.3	-1.6	38.2	-7.6	-19.3	-19.3	-50.6	-36.4	-33.1	-31.1	-31.4	-28.7	Y
40.2	-15.2	-9.7	-6.2	-1.1	-1.4	-5.9	40.2	-8.1	-19.8	-19.8	-42.4	-36.8	-33.3	-28.2	-28.5	-33.0	Y
42.2	-13.9	-10.9	-13.4	-1.9	-2.2	-7.3	42.2	-8.6	-20.4	-20.4	-41.0	-38.0	-40.5	-29.0	-29.3	-34.4	Y
44.2	-17.4	-8.8	-17.6	-4.8	-4.4	-6.6	44.2	-9.1	-20.9	-20.9	-44.5	-36.0	-44.8	-31.9	-31.5	-33.7	Y
46.2	-15.9	-6.5	-15.1	-6.1	-3.1	-4.9	46.2	-9.6	-21.3	-21.3	-43.1	-33.6	-42.2	-33.3	-30.2	-32.0	Y
48.2	-11.8	-6.4	-18.7	-7.3	-0.5	-2.2	48.2	-10.0	-21.7	-21.7	-39.0	-33.5	-45.8	-34.4	-27.6	-29.3	Y
50.2	-10.3	-7.7	-20.0	-9.8	1.5	-3.7	50.2	-10.0	-21.7	-21.7	-37.4	-34.9	-47.1	-36.9	-25.6	-30.8	Y
52.2	-12.2	-10.9	-18.4	-7.6	0.3	-2.1	52.2	-10.0	-21.7	-21.7	-39.3	-38.0	-45.5	-34.7	-26.9	-29.3	Y
54.2	-15.0	-14.5	-14.2	-4.2	-4.1	1.3	54.2	-10.0	-21.7	-21.7	-42.1	-41.7	-41.3	-31.3	-31.2	-25.8	Y
56.2	-19.4	-13.2	-9.4	-2.3	-9.0	2.0	56.2	-10.0	-21.7	-21.7	-46.5	-40.3	-36.5	-29.4	-36.1	-25.1	Y
58.2	-21.2	-14.0	-8.4	-1.9	-6.0	1.3	58.2	-10.0	-21.7	-21.7	-48.3	-41.1	-35.5	-29.1	-33.2	-25.8	Y
60.2	-21.1	-15.1	-9.9	-1.4	-3.9	0.4	60.2	-10.0	-21.7	-21.7	-48.2	-42.2	-37.0	-28.5	-31.1	-26.7	Y
62.2	-15.7	-16.5	-16.0	-0.5	-3.8	-1.0	62.2	-10.0	-21.7	-21.7	-42.8	-43.7	-43.1	-27.7	-30.9	-28.1	Y
64.2	-10.9	-17.0	-18.8	-1.4	-3.7	-1.9	64.2	-10.0	-21.7	-21.7	-38.0	-44.1	-45.9	-28.5	-30.8	-29.0	Y

66.2	-7.7	-18.7	-13.8	-3.9	-2.8	-1.7	66.2	-10.0	-21.7	-21.7	-34.9	-45.8	-40.9	-31.1	-29.9	-28.8	Y
68.2	-6.1	-23.4	-13.2	-7.5	-2.0	-0.3	68.2	-10.0	-21.7	-21.7	-33.2	-50.6	-40.3	-34.6	-29.1	-27.5	Y
70.2	-6.4	-25.2	-15.6	-7.7	-2.4	0.6	70.2	-10.0	-21.7	-21.7	-33.5	-52.3	-42.7	-34.8	-29.5	-26.5	Y
72.2	-7.7	-26.4	-19.8	-4.3	-3.9	0.4	72.2	-10.0	-21.7	-21.7	-34.8	-53.5	-46.9	-31.4	-31.0	-26.7	Y
74.2	-11.0	-26.2	-21.0	-1.5	-7.8	-0.1	74.2	-10.0	-21.7	-21.7	-38.1	-53.3	-48.1	-28.6	-35.0	-27.2	Y
76.2	-16.5	-20.7	-17.6	-0.3	-11.1	-2.0	76.2	-10.0	-21.7	-21.7	-43.6	-47.8	-44.7	-27.4	-38.2	-29.1	Y
78.2	-18.7	-17.7	-20.0	-0.2	-6.7	-4.3	78.2	-10.0	-21.7	-21.7	-45.9	-44.9	-47.1	-27.3	-33.8	-31.4	Y
80.2	-13.0	-15.4	-21.5	-1.2	-3.8	-7.1	80.2	-10.0	-21.7	-21.7	-40.1	-42.5	-48.7	-28.3	-31.0	-34.2	Y
82.2	-9.6	-15.0	-18.1	-2.6	-3.3	-10.3	82.2	-10.0	-21.7	-21.7	-36.7	-42.1	-45.2	-29.7	-30.4	-37.5	Y
84.2	-9.1	-14.7	-14.9	-4.2	-4.6	-17.4	84.2	-10.0	-21.7	-21.7	-36.2	-41.8	-42.1	-31.3	-31.7	-44.5	Y
86.2	-9.4	-13.9	-12.7	-6.0	-6.5	-22.9	86.2	-10.0	-21.7	-21.7	-36.5	-41.0	-39.8	-33.2	-33.6	-50.0	Y
88.2	-10.1	-15.0	-11.5	-7.8	-10.1	-12.7	88.2	-10.0	-21.7	-21.7	-37.2	-42.1	-38.6	-34.9	-37.2	-39.8	Y
90.2	-10.9	-15.5	-10.2	-7.1	-15.6	-9.6	90.2	-10.0	-21.7	-21.7	-38.0	-42.7	-37.3	-34.3	-42.7	-36.7	Y
92.2	-12.5	-14.6	-11.0	-6.6	-15.2	-8.3	92.2	-10.0	-21.7	-21.7	-39.6	-41.7	-38.1	-33.7	-42.3	-35.4	Y
94.2	-13.5	-15.4	-12.4	-7.0	-10.8	-7.2	94.2	-10.0	-21.7	-21.7	-40.6	-42.5	-39.5	-34.1	-37.9	-34.3	Y
96.2	-15.9	-15.6	-12.5	-7.9	-9.2	-6.2	96.2	-10.0	-21.7	-21.7	-43.0	-42.7	-39.7	-35.0	-36.3	-33.3	Y
98.2	-19.8	-15.7	-13.9	-9.6	-8.7	-6.3	98.2	-10.0	-21.7	-21.7	-47.0	-42.8	-41.0	-36.8	-35.8	-33.4	Y
100.2	-22.7	-15.7	-15.5	-9.8	-8.6	-7.2	100.2	-10.0	-21.7	-21.7	-49.8	-42.8	-42.6	-36.9	-35.7	-34.3	Y
102.2	-22.7	-17.7	-16.5	-9.4	-9.3	-8.0	102.2	-10.0	-21.7	-21.7	-49.9	-44.9	-43.7	-36.5	-36.4	-35.1	Y
104.2	-23.1	-18.9	-18.3	-11.6	-8.9	-8.8	104.2	-10.0	-21.7	-21.7	-50.3	-46.0	-45.5	-38.7	-36.1	-35.9	Y
106.2	-25.3	-18.4	-19.2	-14.0	-8.9	-9.8	106.2	-10.0	-21.7	-21.7	-52.4	-45.5	-46.3	-41.2	-36.0	-36.9	Y
108.2	-25.3	-19.0	-21.4	-14.7	-10.7	-10.5	108.2	-10.0	-21.7	-21.7	-52.4	-46.2	-48.6	-41.9	-37.8	-37.7	Y
110.2	-23.5	-19.9	-20.5	-14.9	-11.7	-11.7	110.2	-10.0	-21.7	-21.7	-50.6	-47.1	-47.7	-42.0	-38.8	-38.8	Y
112.2	-25.3	-21.0	-21.3	-15.8	-12.0	-13.7	112.2	-10.0	-21.7	-21.7	-52.4	-48.1	-48.4	-42.9	-39.1	-40.8	Y
114.2	-30.8	-20.1	-24.2	-17.7	-12.2	-13.3	114.2	-10.0	-21.7	-21.7	-57.9	-47.2	-51.3	-44.8	-39.3	-40.5	Y
116.2	-28.5	-22.9	-23.3	-18.2	-13.3	-14.6	116.2	-10.0	-21.7	-21.7	-55.6	-50.0	-50.5	-45.3	-40.4	-41.7	Y
118.2	-26.1	-23.5	-27.4	-20.4	-13.6	-15.1	118.2	-10.0	-21.7	-21.7	-53.3	-50.6	-54.5	-47.6	-40.7	-42.2	Y
120.2	-26.8	-22.9	-24.9	-19.6	-14.4	-15.3	120.2	-10.0	-21.7	-21.7	-53.9	-50.0	-52.0	-46.7	-41.5	-42.5	Y
122.2	-27.8	-24.0	-24.8	-19.5	-16.5	-16.7	122.2	-10.0	-21.7	-21.7	-54.9	-51.1	-52.0	-46.6	-43.6	-43.8	Y
124.2	-38.5	-25.3	-30.7	-20.2	-15.9	-17.3	124.2	-10.0	-21.7	-21.7	-65.6	-52.4	-57.8	-47.4	-43.1	-44.4	Y
126.2	-26.3	-25.6	-30.3	-24.1	-15.6	-18.1	126.2	-10.0	-21.7	-21.7	-53.4	-52.7	-57.4	-51.2	-42.7	-45.3	Y
128.2	-29.7	-30.3	-26.3	-21.7	-17.1	-18.0	128.2	-10.0	-21.7	-21.7	-56.8	-57.5	-53.4	-48.9	-44.2	-45.1	Y

130.2	-49.4	-26.3	-29.8	-24.7	-17.6	-18.7	130.2	-10.0	-21.7	-21.7	-76.5	-53.5	-57.0	-51.8	-44.7	-45.8	Y
132.2	-29.1	-29.4	-25.6	-25.2	-17.6	-19.9	132.2	-10.0	-21.7	-21.7	-56.3	-56.5	-52.7	-52.4	-44.7	-47.1	Y
134.2	-30.7	-28.5	-24.8	-21.4	-18.9	-19.0	134.2	-10.0	-21.7	-21.7	-57.9	-55.6	-51.9	-48.6	-46.0	-46.1	Y
136.2	-35.7	-28.1	-37.5	-22.1	-18.2	-20.7	136.2	-10.0	-21.7	-21.7	-62.8	-55.2	-64.6	-49.3	-45.3	-47.8	Y
138.2	-28.2	-29.3	-27.9	-28.4	-17.2	-19.7	138.2	-10.0	-21.7	-21.7	-55.3	-56.5	-55.0	-55.5	-44.3	-46.8	Y
140.2	-36.7	-27.4	-29.3	-27.1	-22.8	-20.2	140.2	-10.0	-21.7	-21.7	-63.9	-54.5	-56.4	-54.2	-50.0	-47.3	Y
142.2	-29.8	-33.7	-35.5	-26.9	-17.8	-25.3	142.2	-10.0	-21.7	-21.7	-56.9	-60.8	-62.6	-54.1	-44.9	-52.4	Y
144.2	-35.3	-31.2	-34.9	-23.1	-21.9	-19.1	144.2	-10.0	-21.7	-21.7	-62.4	-58.3	-62.0	-50.2	-49.1	-46.2	Y
146.2	-30.6	-31.6	-26.7	-23.1	-19.9	-20.2	146.2	-10.0	-21.7	-21.7	-57.7	-58.7	-53.9	-50.2	-47.1	-47.4	Y
148.2	-26.9	-39.3	-32.7	-31.3	-17.7	-21.5	148.2	-10.0	-21.7	-21.7	-54.0	-66.4	-59.8	-58.4	-44.9	-48.6	Y
150.2	-34.9	-27.2	-30.5	-23.8	-19.9	-19.3	150.2	-10.0	-21.7	-21.7	-62.0	-54.3	-57.6	-51.0	-47.0	-46.4	Y
152.2	-33.5	-33.7	-33.5	-25.0	-19.3	-20.8	152.2	-10.0	-21.7	-21.7	-60.7	-60.8	-60.6	-52.2	-46.4	-48.0	Y
154.2	-29.8	-30.0	-24.1	-26.1	-22.8	-20.7	154.2	-10.0	-21.7	-21.7	-56.9	-57.1	-51.2	-53.2	-50.0	-47.8	Y
156.2	-51.8	-40.4	-55.5	-21.8	-20.2	-22.9	156.2	-10.0	-21.7	-21.7	-78.9	-67.5	-82.6	-48.9	-47.3	-50.0	Y
158.2	-29.0	-31.3	-30.1	-24.6	-19.0	-22.9	158.2	-10.0	-21.7	-21.7	-56.2	-58.4	-57.2	-51.8	-46.2	-50.0	Y
160.2	-30.3	-27.3	-26.9	-23.2	-18.0	-23.5	160.2	-10.0	-21.7	-21.7	-57.4	-54.5	-54.0	-50.3	-45.1	-50.6	Y
162.2	-30.6	-32.6	-37.5	-23.6	-19.2	-15.5	162.2	-10.0	-21.7	-21.7	-57.7	-59.7	-64.7	-50.7	-46.3	-42.6	Y
164.2	-25.5	-27.7	-39.2	-49.5	-19.6	-20.0	164.2	-10.0	-21.7	-21.7	-52.6	-54.8	-66.4	-76.6	-46.7	-47.1	Y
166.2	-37.0	-35.8	-32.6	-21.7	-20.3	-30.6	166.2	-10.0	-21.7	-21.7	-64.2	-62.9	-59.7	-48.8	-47.4	-57.7	Y
168.2	-31.4	-21.2	-22.0	-23.5	-32.7	-20.4	168.2	-10.0	-21.7	-21.7	-58.5	-48.3	-49.1	-50.7	-59.8	-47.5	Y
170.2	-36.4	-29.5	-36.1	-25.4	-23.4	-16.1	170.2	-10.0	-21.7	-21.7	-63.5	-56.6	-63.3	-52.5	-50.5	-43.2	Y
172.2	-36.1	-29.4	-26.2	-19.7	-15.0	-14.5	172.2	-10.0	-21.7	-21.7	-63.2	-56.5	-53.3	-46.9	-42.1	-41.6	Y
174.2	-29.4	-22.7	-32.0	-19.4	-15.4	-22.7	174.2	-10.0	-21.7	-21.7	-56.5	-49.8	-59.1	-46.5	-42.5	-49.8	Y
176.2	-30.3	-35.4	-29.9	-22.6	-21.7	-23.9	176.2	-10.0	-21.7	-21.7	-57.5	-62.6	-57.0	-49.7	-48.8	-51.0	Y
178.2	-19.2	-18.5	-17.9	-28.0	-17.0	-14.9	178.2	-10.0	-21.7	-21.7	-46.3	-45.6	-45.1	-55.2	-44.2	-42.0	Y
180.0	-14.8	-11.1	-11.7	-14.8	-10.3	-10.5	180.0	-10.0	-21.7	-21.7	-41.9	-38.2	-38.9	-41.9	-37.4	-37.7	Y

Table 5 - V11 ESV X-Pol EIRP – 18 MHz Channel

18 MHz	Antenna Gain X-Pol									ESV EIRP X-Pol						
Off Axis Angle (degree)	5.85 H plane	6.138 H Plane	6.425 H Plane	5.85 E plane	6.138 E Plane	6.425 E plane	Off Axis Angle (degree)	FCC 25.209(b)(1)	FCC §25.221 EIRP X-Pol Mask, N = 8	5.85 H plane	6.138 H Plane	6.425 H Plane	5.85 E plane	6.138 E Plane	6.425 E plane	Meets Mask
-9.2	-12.8	-5.3	-17.6	-10.0	-18.0	-15.2	-9.2	9.3	-13.7	-36.9	-29.4	-41.7	-34.1	-42.1	-39.3	Y
-9.1	-12.8	-5.3	-17.3	-9.6	-18.5	-14.4	-9.1	9.3	-13.7	-36.9	-29.4	-41.4	-33.7	-42.7	-38.5	Y
-9.0	-12.8	-5.3	-16.9	-9.4	-19.2	-13.7	-9.0	9.3	-13.7	-36.9	-29.4	-41.1	-33.5	-43.3	-37.8	Y
-8.9	-13.0	-5.3	-17.0	-9.4	-20.3	-12.9	-8.9	9.3	-13.7	-37.1	-29.4	-41.1	-33.5	-44.4	-37.1	Y
-8.8	-13.0	-5.2	-16.5	-9.2	-21.4	-12.4	-8.8	9.3	-13.7	-37.1	-29.4	-40.6	-33.3	-45.5	-36.5	Y
-8.7	-13.7	-5.4	-16.2	-9.2	-23.5	-11.9	-8.7	9.3	-13.7	-37.8	-29.6	-40.3	-33.3	-47.6	-36.0	Y
-8.6	-14.0	-5.6	-15.8	-9.2	-26.5	-11.4	-8.6	9.3	-13.7	-38.1	-29.7	-39.9	-33.3	-50.6	-35.5	Y
-8.5	-14.7	-5.8	-15.4	-9.3	-32.0	-10.7	-8.5	9.3	-13.7	-38.8	-29.9	-39.5	-33.4	-56.1	-34.8	Y
-8.4	-15.5	-6.0	-15.0	-9.5	-39.0	-10.2	-8.4	9.3	-13.7	-39.6	-30.1	-39.2	-33.7	-63.1	-34.3	Y
-8.3	-16.4	-6.2	-15.0	-9.6	-31.9	-9.7	-8.3	9.3	-13.7	-40.5	-30.3	-39.1	-33.7	-56.0	-33.8	Y
-8.2	-17.6	-6.5	-14.4	-10.1	-25.3	-9.2	-8.2	9.3	-13.7	-41.7	-30.6	-38.6	-34.2	-49.4	-33.3	Y
-8.1	-18.9	-6.6	-14.2	-10.4	-21.7	-8.6	-8.1	9.3	-13.7	-43.0	-30.7	-38.3	-34.5	-45.8	-32.8	Y
-8.0	-20.0	-6.8	-14.1	-10.7	-18.8	-8.2	-8.0	9.3	-13.7	-44.1	-30.9	-38.2	-34.8	-42.9	-32.3	Y
-7.9	-20.4	-7.0	-13.8	-10.9	-16.4	-7.6	-7.9	9.3	-13.7	-44.5	-31.1	-37.9	-35.1	-40.5	-31.7	Y
-7.8	-19.5	-7.0	-13.7	-11.5	-14.3	-7.2	-7.8	9.3	-13.7	-43.7	-31.1	-37.8	-35.6	-38.5	-31.3	Y
-7.7	-17.7	-7.0	-13.7	-11.6	-12.4	-6.7	-7.7	9.3	-13.7	-41.8	-31.1	-37.8	-35.7	-36.5	-30.8	Y
-7.6	-15.7	-6.7	-13.8	-11.7	-11.0	-6.3	-7.6	9.3	-13.7	-39.8	-30.8	-37.9	-35.8	-35.1	-30.4	Y
-7.5	-13.7	-6.2	-13.9	-11.4	-9.5	-5.8	-7.5	9.3	-13.7	-37.8	-30.3	-38.0	-35.5	-33.6	-29.9	Y
-7.4	-11.9	-5.7	-14.4	-10.9	-8.1	-5.3	-7.4	9.3	-13.7	-36.1	-29.8	-38.5	-35.0	-32.2	-29.5	Y
-7.3	-10.3	-5.0	-14.9	-10.2	-6.9	-4.9	-7.3	9.3	-13.7	-34.4	-29.1	-39.0	-34.3	-31.0	-29.1	Y
-7.2	-8.9	-4.4	-15.6	-9.2	-5.6	-4.5	-7.2	9.3	-13.7	-33.0	-28.5	-39.7	-33.3	-29.8	-28.6	Y
-7.1	-7.7	-3.8	-16.6	-8.3	-4.7	-4.1	-7.1	9.3	-13.7	-31.9	-27.9	-40.7	-32.4	-28.8	-28.3	Y
-7.0	-6.6	-3.0	-17.7	-7.3	-3.7	-3.7	-7.0	9.3	-13.7	-30.7	-27.1	-41.8	-31.4	-27.8	-27.8	Y
-6.9	-5.7	-2.3	-20.0	-6.4	-2.8	-3.4	-6.9	9.3	-13.7	-29.8	-26.4	-44.1	-30.5	-26.9	-27.5	Y
-6.8	-4.8	-1.6	-21.8	-5.6	-1.9	-3.0	-6.8	9.4	-13.6	-28.9	-25.7	-45.9	-29.7	-26.1	-27.1	Y

-6.7	-4.0	-0.9	-22.0	-4.7	-1.2	-2.7	-6.7	9.6	-13.4	-28.1	-25.0	-46.1	-28.9	-25.3	-26.8	Y
-6.6	-3.3	-0.3	-20.4	-4.0	-0.5	-2.3	-6.6	9.8	-13.3	-27.4	-24.5	-44.5	-28.1	-24.6	-26.4	Y
-6.5	-2.7	0.2	-17.7	-3.4	0.2	-1.9	-6.5	9.9	-13.1	-26.8	-23.9	-41.8	-27.5	-23.9	-26.0	Y
-6.4	-2.1	0.8	-15.0	-2.9	0.7	-1.6	-6.4	10.1	-12.9	-26.2	-23.3	-39.1	-27.0	-23.4	-25.7	Y
-6.3	-1.7	1.3	-12.7	-2.5	1.2	-1.2	-6.3	10.3	-12.8	-25.8	-22.8	-36.9	-26.6	-22.9	-25.3	Y
-6.2	-1.2	1.8	-10.8	-2.1	1.6	-0.8	-6.2	10.4	-12.6	-25.4	-22.3	-34.9	-26.2	-22.5	-25.0	Y
-6.1	-0.9	2.2	-9.1	-1.9	1.9	-0.5	-6.1	10.6	-12.4	-25.0	-21.9	-33.2	-26.0	-22.2	-24.6	Y
-6.0	-0.6	2.6	-7.6	-1.6	2.2	-0.2	-6.0	10.8	-12.2	-24.7	-21.5	-31.8	-25.7	-21.9	-24.3	Y
-5.9	-0.3	3.0	-6.5	-1.5	2.4	0.2	-5.9	11.0	-12.1	-24.4	-21.1	-30.6	-25.6	-21.8	-23.9	Y
-5.8	0.0	3.3	-5.4	-1.3	2.4	0.6	-5.8	11.2	-11.9	-24.1	-20.8	-29.5	-25.5	-21.7	-23.5	Y
-5.7	0.1	3.7	-4.5	-1.3	2.5	0.9	-5.7	11.3	-11.7	-24.0	-20.4	-28.6	-25.4	-21.7	-23.2	Y
-5.6	0.3	4.0	-3.7	-1.3	2.4	1.2	-5.6	11.5	-11.5	-23.8	-20.2	-27.8	-25.4	-21.7	-22.9	Y
-5.5	0.5	4.2	-3.1	-1.2	2.3	1.6	-5.5	11.7	-11.3	-23.6	-19.9	-27.3	-25.3	-21.9	-22.5	Y
-5.4	0.6	4.4	-2.5	-1.2	2.0	1.9	-5.4	11.9	-11.1	-23.5	-19.7	-26.7	-25.3	-22.1	-22.2	Y
-5.3	0.7	4.6	-2.1	-1.0	1.7	2.2	-5.3	12.1	-10.9	-23.5	-19.5	-26.2	-25.1	-22.4	-21.9	Y
-5.2	0.7	4.8	-1.9	-0.8	1.4	2.5	-5.2	12.3	-10.7	-23.4	-19.3	-26.0	-25.0	-22.7	-21.6	Y
-5.1	0.8	4.9	-1.7	-0.6	1.0	2.8	-5.1	12.5	-10.5	-23.3	-19.2	-25.8	-24.7	-23.1	-21.4	Y
-5.0	0.8	5.0	-1.6	-0.2	0.5	3.0	-5.0	12.8	-10.3	-23.3	-19.1	-25.7	-24.3	-23.6	-21.1	Y
-4.9	0.8	5.1	-1.6	0.3	0.1	3.2	-4.9	13.0	-10.1	-23.3	-19.0	-25.7	-23.8	-24.0	-20.9	Y
-4.8	0.8	5.1	-1.7	0.9	-0.2	3.4	-4.8	13.2	-9.8	-23.3	-19.0	-25.8	-23.2	-24.3	-20.7	Y
-4.7	0.8	5.2	-1.9	1.5	-0.5	3.6	-4.7	13.4	-9.6	-23.3	-18.9	-26.0	-22.7	-24.6	-20.5	Y
-4.6	0.8	5.1	-2.2	2.1	-0.6	3.8	-4.6	13.7	-9.4	-23.4	-19.0	-26.3	-22.0	-24.7	-20.3	Y
-4.5	0.7	5.0	-2.6	2.7	-0.6	3.9	-4.5	13.9	-9.1	-23.4	-19.1	-26.7	-21.4	-24.7	-20.2	Y
-4.4	0.6	4.9	-3.1	3.2	-0.5	4.0	-4.4	14.1	-8.9	-23.5	-19.2	-27.2	-20.9	-24.6	-20.1	Y
-4.3	0.5	4.8	-3.6	3.8	-0.3	4.1	-4.3	14.4	-8.6	-23.6	-19.4	-27.7	-20.4	-24.4	-20.0	Y
-4.2	0.4	4.5	-4.2	4.2	0.0	4.1	-4.2	14.6	-8.4	-23.7	-19.6	-28.3	-19.9	-24.1	-20.0	Y
-4.1	0.4	4.2	-4.7	4.6	0.3	4.1	-4.1	14.9	-8.1	-23.7	-19.9	-28.8	-19.5	-23.8	-20.0	Y
-4.0	0.5	3.9	-5.1	5.0	0.7	4.1	-4.0	15.2	-7.8	-23.6	-20.2	-29.2	-19.1	-23.4	-20.0	Y
-3.9	0.7	3.5	-5.3	5.3	1.0	4.0	-3.9	15.4	-7.6	-23.4	-20.6	-29.4	-18.8	-23.1	-20.1	Y
-3.8	0.9	3.1	-5.2	5.5	1.4	3.8	-3.8	15.7	-7.3	-23.2	-21.1	-29.3	-18.6	-22.7	-20.3	Y
-3.7	1.3	2.5	-4.7	5.6	1.8	3.6	-3.7	16.0	-7.0	-22.8	-21.6	-28.8	-18.5	-22.4	-20.5	Y
-3.6	1.9	2.0	-4.0	5.7	2.2	3.4	-3.6	16.3	-6.7	-22.2	-22.1	-28.1	-18.4	-21.9	-20.7	Y

-3.5	2.5	1.4	-3.1	5.7	2.8	3.0	-3.5	16.6	-6.4	-21.6	-22.7	-27.2	-18.4	-21.4	-21.1	Y
-3.4	3.2	0.8	-2.1	5.7	3.3	2.6	-3.4	16.9	-6.1	-20.9	-23.3	-26.2	-18.4	-20.8	-21.5	Y
-3.3	4.0	0.4	-1.0	5.6	4.0	2.1	-3.3	17.2	-5.8	-20.1	-23.7	-25.1	-18.5	-20.1	-22.1	Y
-3.2	4.7	0.2	0.0	5.4	4.7	1.5	-3.2	17.6	-5.5	-19.4	-23.9	-24.1	-18.7	-19.4	-22.6	Y
-3.1	5.5	0.4	1.0	5.2	5.4	0.7	-3.1	17.9	-5.1	-18.6	-23.7	-23.2	-18.9	-18.7	-23.4	Y
-3.0	6.2	0.9	1.9	5.0	6.1	-0.2	-3.0	18.3	-4.8	-17.9	-23.2	-22.2	-19.1	-18.0	-24.3	Y
-2.9	7.0	1.8	2.7	4.9	6.8	-1.3	-2.9	18.6	-4.4	-17.2	-22.3	-21.4	-19.3	-17.3	-25.4	Y
-2.8	7.6	2.8	3.5	4.7	7.6	-2.5	-2.8	19.0	-4.0	-16.5	-21.3	-20.6	-19.4	-16.6	-26.7	Y
-2.7	8.3	3.9	4.2	4.6	8.2	-4.0	-2.7	19.4	-3.6	-15.8	-20.2	-19.9	-19.5	-15.9	-28.1	Y
-2.6	8.9	5.1	4.9	4.5	8.9	-5.2	-2.6	19.8	-3.2	-15.2	-19.0	-19.2	-19.6	-15.3	-29.3	Y
-2.5	9.5	6.1	5.5	4.6	9.5	-5.9	-2.5	20.2	-2.8	-14.6	-18.0	-18.6	-19.5	-14.7	-30.0	Y
-2.4	10.0	7.2	6.1	4.7	10.0	-5.4	-2.4	20.7	-2.4	-14.1	-16.9	-18.0	-19.4	-14.1	-29.5	Y
-2.3	10.5	8.2	6.6	4.9	10.5	-3.9	-2.3	21.1	-1.9	-13.6	-16.0	-17.5	-19.2	-13.6	-28.0	Y
-2.2	11.0	9.0	7.1	5.2	10.9	-2.1	-2.2	21.6	-1.4	-13.1	-15.1	-17.0	-18.9	-13.2	-26.2	Y
-2.1	11.5	9.8	7.6	5.5	11.3	-0.3	-2.1	22.1	-0.9	-12.7	-14.3	-16.5	-18.6	-12.8	-24.4	Y
-2.0	11.9	10.6	8.0	5.9	11.7	1.4	-2.0	22.6	-0.4	-12.2	-13.5	-16.1	-18.2	-12.4	-22.7	Y
-1.9	12.2	11.3	8.4	6.2	12.0	2.9	-1.9	23.2	0.1	-11.9	-12.8	-15.7	-17.9	-12.1	-21.2	Y
-1.8	12.6	11.9	8.8	6.6	12.3	4.3	-1.8	23.7	0.7	-11.5	-12.2	-15.3	-17.5	-11.8	-19.9	Y
-1.7	12.9	12.5	9.1	7.0	12.5	5.5	-1.7			-11.2	-11.6	-15.0	-17.1	-11.6	-18.7	Y
-1.6	13.2	13.0	9.4	7.4	12.7	6.5	-1.6			-10.9	-11.1	-14.7	-16.7	-11.4	-17.6	Y
-1.5	13.5	13.5	9.7	7.8	12.8	7.5	-1.5			-10.6	-10.6	-14.4	-16.3	-11.3	-16.6	Y
-1.4	13.8	14.0	10.0	8.1	13.0	8.3	-1.4			-10.3	-10.1	-14.2	-16.0	-11.1	-15.9	Y
-1.3	14.0	14.3	10.2	8.5	13.1	9.0	-1.3			-10.1	-9.8	-13.9	-15.7	-11.0	-15.1	Y
-1.2	14.2	14.7	10.4	8.8	13.2	9.7	-1.2			-9.9	-9.4	-13.7	-15.3	-10.9	-14.4	Y
-1.1	14.4	15.1	10.7	9.1	13.2	10.3	-1.1			-9.7	-9.0	-13.4	-15.0	-10.9	-13.8	Y
-1.0	14.6	15.4	10.9	9.4	13.3	10.8	-1.0			-9.5	-8.7	-13.2	-14.7	-10.8	-13.3	Y
-0.9	14.8	15.6	11.1	9.7	13.3	11.3	-0.9			-9.4	-8.5	-13.0	-14.4	-10.8	-12.8	Y
-0.8	14.9	15.9	11.3	9.9	13.4	11.7	-0.8			-9.2	-8.2	-12.8	-14.2	-10.7	-12.4	Y
-0.7	15.0	16.1	11.5	10.2	13.4	12.0	-0.7			-9.1	-8.0	-12.6	-13.9	-10.7	-12.1	Y
-0.6	15.1	16.2	11.6	10.5	13.4	12.3	-0.6			-9.0	-7.9	-12.5	-13.7	-10.7	-11.8	Y
-0.5	15.2	16.4	11.8	10.7	13.5	12.5	-0.5			-8.9	-7.7	-12.3	-13.4	-10.6	-11.6	Y
-0.4	15.2	16.5	12.0	10.9	13.5	12.7	-0.4			-8.9	-7.6	-12.1	-13.2	-10.6	-11.4	Y

-0.3	15.2	16.6	12.1	11.2	13.5	12.8	-0.3			-8.9	-7.5	-12.0	-12.9	-10.6	-11.3	Y
-0.2	15.2	16.6	12.2	11.4	13.6	12.9	-0.2			-8.9	-7.5	-11.9	-12.7	-10.5	-11.2	Y
-0.1	15.2	16.7	12.4	11.6	13.6	13.0	-0.1			-8.9	-7.4	-11.8	-12.5	-10.5	-11.1	Y
0.0	15.2	16.7	12.5	11.9	13.6	13.0	0.0			-8.9	-7.4	-11.6	-12.3	-10.5	-11.1	Y
0.1	15.2	16.7	12.6	12.1	13.6	12.9	0.1			-8.9	-7.4	-11.5	-12.0	-10.5	-11.2	Y
0.2	15.1	16.7	12.6	12.3	13.6	12.8	0.2			-9.0	-7.4	-11.5	-11.8	-10.5	-11.3	Y
0.3	15.0	16.6	12.6	12.5	13.6	12.7	0.3			-9.1	-7.5	-11.5	-11.6	-10.5	-11.4	Y
0.4	14.9	16.6	12.6	12.6	13.5	12.6	0.4			-9.2	-7.5	-11.5	-11.5	-10.6	-11.6	Y
0.5	14.8	16.5	12.6	12.8	13.4	12.4	0.5			-9.3	-7.6	-11.5	-11.3	-10.7	-11.7	Y
0.6	14.7	16.4	12.6	12.9	13.2	12.2	0.6			-9.4	-7.7	-11.5	-11.2	-10.9	-11.9	Y
0.7	14.5	16.3	12.5	13.0	13.1	11.9	0.7			-9.6	-7.8	-11.6	-11.1	-11.0	-12.2	Y
0.8	14.4	16.2	12.4	13.1	12.8	11.7	0.8			-9.7	-7.9	-11.7	-11.0	-11.3	-12.4	Y
0.9	14.2	16.1	12.3	13.1	12.6	11.5	0.9			-9.9	-8.0	-11.9	-11.0	-11.5	-12.6	Y
1.0	14.0	15.9	12.1	13.1	12.3	11.2	1.0			-10.1	-8.2	-12.0	-11.0	-11.8	-12.9	Y
1.1	13.8	15.7	11.9	13.1	11.9	11.0	1.1			-10.3	-8.4	-12.2	-11.0	-12.2	-13.1	Y
1.2	13.6	15.6	11.6	13.1	11.5	10.7	1.2			-10.5	-8.5	-12.5	-11.0	-12.6	-13.4	Y
1.3	13.3	15.3	11.4	13.0	11.0	10.4	1.3			-10.8	-8.8	-12.8	-11.1	-13.2	-13.7	Y
1.4	13.1	15.1	11.0	12.8	10.4	10.1	1.4			-11.1	-9.0	-13.1	-11.3	-13.7	-14.0	Y
1.5	12.8	14.9	10.8	12.7	9.7	9.8	1.5			-11.3	-9.2	-13.4	-11.4	-14.4	-14.3	Y
1.6	12.5	14.6	10.4	12.5	9.1	9.5	1.6			-11.6	-9.5	-13.7	-11.6	-15.0	-14.6	Y
1.7	12.2	14.4	10.0	12.3	8.3	9.2	1.7			-11.9	-9.7	-14.1	-11.8	-15.8	-14.9	Y
1.8	11.8	14.1	9.6	12.0	7.4	8.8	1.8	23.9	0.9	-12.3	-10.0	-14.5	-12.1	-16.7	-15.3	Y
1.9	11.5	13.7	9.2	11.7	6.5	8.4	1.9	23.5	0.5	-12.6	-10.4	-15.0	-12.4	-17.6	-15.8	Y
2.0	11.1	13.3	8.7	11.4	5.4	7.9	2.0	22.9	-0.1	-13.0	-10.8	-15.4	-12.8	-18.7	-16.2	Y
2.1	10.7	12.9	8.2	11.0	4.2	7.4	2.1	22.4	-0.6	-13.4	-11.2	-15.9	-13.1	-19.9	-16.7	Y
2.2	10.3	12.5	7.7	10.6	3.0	6.8	2.2	21.9	-1.1	-13.8	-11.6	-16.4	-13.6	-21.2	-17.3	Y
2.3	9.8	12.0	7.2	10.1	1.5	6.2	2.3	21.4	-1.6	-14.3	-12.1	-16.9	-14.0	-22.6	-17.9	Y
2.4	9.4	11.5	6.7	9.6	-0.1	5.5	2.4	20.9	-2.1	-14.8	-12.6	-17.4	-14.5	-24.2	-18.7	Y
2.5	8.9	10.9	6.2	9.0	-2.0	4.7	2.5	20.5	-2.5	-15.3	-13.2	-17.9	-15.1	-26.1	-19.4	Y
2.6	8.3	10.3	5.6	8.5	-4.0	3.9	2.6	20.1	-3.0	-15.8	-13.8	-18.5	-15.7	-28.1	-20.2	Y
2.7	7.7	9.6	5.0	7.8	-6.3	3.0	2.7	19.6	-3.4	-16.4	-14.5	-19.1	-16.3	-30.4	-21.1	Y
2.8	7.1	8.9	4.3	7.2	-9.0	2.1	2.8	19.2	-3.8	-17.0	-15.3	-19.8	-17.0	-33.1	-22.0	Y

2.9	6.5	8.1	3.7	6.4	-11.7	1.3	2.9	18.9	-4.2	-17.6	-16.0	-20.5	-17.7	-35.8	-22.8	Y
3.0	5.8	7.3	2.8	5.6	-13.9	0.6	3.0	18.5	-4.5	-18.3	-16.8	-21.3	-18.5	-38.0	-23.5	Y
3.1	5.1	6.5	2.0	4.7	-13.8	0.0	3.1	18.1	-4.9	-19.0	-17.6	-22.1	-19.4	-37.9	-24.1	Y
3.2	4.2	5.7	1.1	3.7	-12.2	-0.3	3.2	17.8	-5.3	-19.9	-18.4	-23.1	-20.4	-36.3	-24.4	Y
3.3	3.4	5.0	0.0	2.7	-10.4	-0.3	3.3	17.4	-5.6	-20.7	-19.1	-24.1	-21.4	-34.5	-24.4	Y
3.4	2.5	4.3	-1.1	1.5	-9.0	0.0	3.4	17.1	-5.9	-21.6	-19.8	-25.2	-22.7	-33.1	-24.1	Y
3.5	1.5	3.9	-2.3	0.0	-7.8	0.4	3.5	16.8	-6.2	-22.6	-20.2	-26.4	-24.1	-31.9	-23.7	Y
3.6	0.4	3.6	-3.7	-1.6	-6.9	0.9	3.6	16.5	-6.5	-23.7	-20.5	-27.8	-25.7	-31.0	-23.3	Y
3.7	-0.7	3.6	-4.9	-3.6	-6.1	1.5	3.7	16.2	-6.8	-24.8	-20.6	-29.0	-27.7	-30.3	-22.6	Y
3.8	-2.0	3.6	-5.9	-6.2	-5.5	2.1	3.8	15.9	-7.1	-26.1	-20.5	-30.1	-30.3	-29.6	-22.0	Y
3.9	-3.3	3.8	-6.5	-9.4	-5.0	2.6	3.9	15.6	-7.4	-27.4	-20.3	-30.6	-33.5	-29.2	-21.5	Y
4.0	-4.8	4.1	-6.5	-13.4	-4.6	3.1	4.0	15.3	-7.7	-28.9	-20.0	-30.7	-37.5	-28.7	-21.0	Y
4.1	-6.4	4.3	-6.0	-14.6	-4.3	3.6	4.1	15.1	-8.0	-30.5	-19.8	-30.1	-38.7	-28.4	-20.5	Y
4.2	-8.1	4.5	-5.2	-11.1	-4.2	4.0	4.2	14.8	-8.2	-32.2	-19.6	-29.3	-35.2	-28.3	-20.1	Y
4.3	-9.9	4.7	-4.3	-7.6	-4.0	4.3	4.3	14.5	-8.5	-34.0	-19.4	-28.4	-31.7	-28.1	-19.8	Y
4.4	-11.6	4.8	-3.5	-5.1	-4.0	4.6	4.4	14.3	-8.7	-35.7	-19.3	-27.7	-29.2	-28.1	-19.5	Y
4.5	-13.0	4.9	-2.9	-3.1	-4.0	4.8	4.5	14.0	-9.0	-37.1	-19.2	-27.0	-27.2	-28.1	-19.4	Y
4.6	-13.7	4.9	-2.3	-1.6	-4.1	4.9	4.6	13.8	-9.2	-37.8	-19.2	-26.4	-25.8	-28.2	-19.2	Y
4.7	-13.9	4.9	-1.9	-0.4	-4.2	5.0	4.7	13.6	-9.5	-38.0	-19.3	-26.0	-24.5	-28.3	-19.1	Y
4.8	-13.5	4.8	-1.5	0.6	-4.5	5.0	4.8	13.3	-9.7	-37.6	-19.4	-25.6	-23.5	-28.6	-19.1	Y
4.9	-12.8	4.6	-1.3	1.4	-4.8	4.9	4.9	13.1	-9.9	-36.9	-19.5	-25.4	-22.7	-28.9	-19.2	Y
5.0	-12.0	4.4	-1.2	2.0	-5.1	4.8	5.0	12.9	-10.1	-36.2	-19.7	-25.3	-22.1	-29.2	-19.3	Y
5.1	-11.5	4.2	-1.1	2.6	-5.5	4.7	5.1	12.7	-10.4	-35.6	-19.9	-25.3	-21.5	-29.6	-19.5	Y
5.2	-10.9	3.9	-1.3	3.0	-5.9	4.4	5.2	12.5	-10.6	-35.0	-20.2	-25.4	-21.1	-30.0	-19.7	Y
5.3	-10.6	3.6	-1.5	3.3	-6.3	4.1	5.3	12.3	-10.8	-34.7	-20.6	-25.6	-20.8	-30.4	-20.0	Y
5.4	-10.3	3.2	-1.7	3.5	-6.8	3.7	5.4	12.1	-11.0	-34.4	-20.9	-25.8	-20.6	-30.9	-20.4	Y
5.5	-10.1	2.8	-2.2	3.6	-7.3	3.4	5.5	11.9	-11.2	-34.2	-21.3	-26.3	-20.5	-31.4	-20.7	Y
5.6	-10.0	2.3	-2.7	3.7	-7.8	3.0	5.6	11.7	-11.4	-34.1	-21.8	-26.8	-20.4	-32.0	-21.2	Y
5.7	-10.1	1.9	-3.3	3.7	-8.2	2.5	5.7	11.5	-11.6	-34.2	-22.2	-27.4	-20.4	-32.3	-21.6	Y
5.8	-10.2	1.4	-4.0	3.6	-8.8	2.0	5.8	11.3	-11.8	-34.3	-22.7	-28.1	-20.5	-32.9	-22.1	Y
5.9	-10.2	0.8	-4.8	3.5	-9.0	1.5	5.9	11.1	-11.9	-34.3	-23.3	-28.9	-20.6	-33.1	-22.6	Y
6.0	-10.4	0.2	-5.7	3.3	-9.7	1.0	6.0	10.9	-12.1	-34.5	-23.9	-29.8	-20.8	-33.8	-23.1	Y

6.1	-10.6	-0.4	-6.6	3.1	-10.1	0.5	6.1	10.7	-12.3	-34.7	-24.5	-30.7	-21.0	-34.2	-23.6	Y
6.2	-10.9	-1.1	-7.6	2.8	-10.5	0.0	6.2	10.5	-12.5	-35.0	-25.2	-31.7	-21.3	-34.6	-24.1	Y
6.3	-11.2	-1.9	-8.7	2.5	-10.9	-0.5	6.3	10.4	-12.7	-35.3	-26.0	-32.8	-21.6	-35.0	-24.6	Y
6.4	-11.5	-2.7	-9.8	2.2	-11.2	-0.9	6.4	10.2	-12.8	-35.6	-26.8	-33.9	-22.0	-35.3	-25.1	Y
6.5	-11.7	-3.5	-10.8	1.8	-11.5	-1.4	6.5	10.0	-13.0	-35.9	-27.7	-34.9	-22.3	-35.6	-25.5	Y
6.6	-12.1	-4.5	-11.7	1.4	-11.9	-1.7	6.6	9.9	-13.2	-36.2	-28.6	-35.9	-22.7	-36.0	-25.9	Y
6.7	-12.5	-5.6	-12.5	1.0	-12.2	-2.1	6.7	9.7	-13.3	-36.6	-29.7	-36.6	-23.1	-36.3	-26.2	Y
6.8	-12.7	-6.7	-13.3	0.6	-12.6	-2.4	6.8	9.5	-13.5	-36.8	-30.9	-37.4	-23.5	-36.7	-26.6	Y
6.9	-13.1	-8.0	-13.9	0.2	-13.0	-2.8	6.9	9.4	-13.7	-37.2	-32.1	-38.0	-23.9	-37.1	-26.9	Y
7.0	-13.3	-9.4	-14.6	-0.2	-13.4	-3.1	7.0	9.2	-13.8	-37.4	-33.5	-38.7	-24.3	-37.5	-27.2	Y
7.1	-13.6	-10.9	-15.3	-0.6	-13.9	-3.4	7.1	9.3	-13.7	-37.7	-35.1	-39.4	-24.7	-38.0	-27.5	Y
7.2	-13.8	-12.7	-16.0	-1.0	-14.4	-3.8	7.2	9.3	-13.7	-37.9	-36.8	-40.1	-25.1	-38.6	-27.9	Y
7.3	-14.0	-14.6	-17.0	-1.3	-15.0	-4.2	7.3	9.3	-13.7	-38.1	-38.7	-41.1	-25.5	-39.1	-28.3	Y
7.4	-14.2	-17.0	-18.0	-1.7	-16.0	-4.6	7.4	9.3	-13.7	-38.3	-41.1	-42.1	-25.8	-40.1	-28.7	Y
7.5	-14.2	-19.1	-19.0	-2.0	-17.1	-5.0	7.5	9.3	-13.7	-38.3	-43.2	-43.1	-26.1	-41.2	-29.1	Y
7.6	-14.4	-20.6	-20.0	-2.3	-18.3	-5.6	7.6	9.3	-13.7	-38.5	-44.7	-44.1	-26.4	-42.4	-29.7	Y
7.7	-14.7	-20.8	-20.7	-2.6	-19.8	-6.1	7.7	9.3	-13.7	-38.8	-44.9	-44.8	-26.7	-44.0	-30.2	Y
7.8	-14.8	-19.7	-20.6	-2.9	-21.9	-6.7	7.8	9.3	-13.7	-38.9	-43.9	-44.7	-27.0	-46.0	-30.8	Y
7.9	-15.1	-18.3	-20.3	-3.2	-24.2	-7.3	7.9	9.3	-13.7	-39.2	-42.4	-44.4	-27.3	-48.3	-31.4	Y
8.0	-15.3	-16.9	-19.4	-3.4	-26.8	-7.8	8.0	9.3	-13.7	-39.4	-41.0	-43.5	-27.6	-51.0	-31.9	Y
8.1	-15.5	-15.9	-18.5	-3.7	-27.0	-8.3	8.1	9.3	-13.7	-39.6	-40.0	-42.6	-27.8	-51.1	-32.4	Y
8.2	-15.7	-15.1	-17.7	-4.0	-24.9	-8.7	8.2	9.3	-13.7	-39.9	-39.2	-41.8	-28.1	-49.0	-32.8	Y
8.3	-16.0	-14.3	-16.6	-4.2	-22.5	-8.9	8.3	9.3	-13.7	-40.1	-38.4	-40.7	-28.4	-46.6	-33.1	Y
8.4	-16.3	-13.6	-15.8	-4.5	-20.2	-9.2	8.4	9.3	-13.7	-40.4	-37.7	-39.9	-28.6	-44.3	-33.3	Y
8.5	-16.6	-13.2	-15.3	-4.7	-18.5	-9.2	8.5	9.3	-13.7	-40.7	-37.3	-39.4	-28.8	-42.6	-33.3	Y
8.6	-17.2	-12.9	-14.7	-4.9	-17.0	-9.1	8.6	9.3	-13.7	-41.3	-37.0	-38.8	-29.1	-41.1	-33.2	Y
8.7	-17.6	-12.7	-14.3	-5.1	-16.0	-9.0	8.7	9.3	-13.7	-41.7	-36.8	-38.4	-29.2	-40.1	-33.2	Y
8.8	-18.5	-12.4	-13.9	-5.4	-15.2	-8.9	8.8	9.3	-13.7	-42.7	-36.6	-38.0	-29.5	-39.3	-33.0	Y
8.9	-19.2	-12.4	-13.5	-5.5	-14.8	-8.8	8.9	9.3	-13.7	-43.3	-36.5	-37.6	-29.6	-38.9	-32.9	Y
9.0	-20.3	-12.3	-13.0	-5.7	-14.0	-8.7	9.0	9.3	-13.7	-44.4	-36.4	-37.1	-29.8	-38.1	-32.8	Y
9.1	-21.5	-12.3	-12.5	-5.8	-13.7	-8.6	9.1	9.3	-13.7	-45.6	-36.4	-36.6	-29.9	-37.9	-32.7	Y
9.2	-22.9	-12.4	-12.1	-5.9	-13.6	-8.5	9.2	9.3	-13.7	-47.1	-36.5	-36.2	-30.0	-37.7	-32.7	Y

In addition to the data for the 18 MHz channel, off-axis EIRP calculations, patterns, and supporting details been performed for the 36 MHz channel. The power density for this carrier is 3 dB lower than the power density for the 18 MHz channel. The multiple simultaneous carriers in operation for this channel can be doubled to 16, N=16. The following charts and table show these results.

The co-pol off-axis EIRP spectral density levels of the KVH ESV terminal spreading over a 36 MHz channel are shown in Figures 6 and 7 below. Note that a calculated worst case aggregate EIRP would occur when N=16 users for a 36 MHz channel. Table 6, below, summarizes the channel power and off-axis EIRP calculations for a 36 MHz channel. Figure 8 shows the cross-pol EIRP patterns compared to the Section 25.221 mask. The details of all these charts are included in Tables 7, 8 and 9 below.

Table 6: 36 MHz Transmission

36 MHz Channel Calculations		
Power a feed Flange	17.46	W
Power a feed Flange	12.42	dBW
Channel; Bandwidth	3.60E+01	MHz
RF Power Density at Flange	-27.1	dBW/4 kHz
RF Power Density at Flange	-3.1	dBW/ MHz
Maximum Horizon EIRP Density (@6.2° Elevation Angle)	17.00	dBW/MHz*
Maximum Horizon EIRP	20.80	dBW*
at Angle	8.60	deg
Maximum Number Simultaneous Users N	16	
Worst Case Antenna Gain Exceedance	-11.98	dB
At Angle	56.19	deg.
For Antenna Pattern	6.425 GHz E	
EIRP Exceedance Limited by Pattern	6.425 GHz E	
At Angle	56.19000	
* Resolution 902 sets C-band Limits at 20.8 dBW maximum horizon EIRP and 17 dBW/MHz maximum EIRP density		
Gain Exceedance between +/- 7 degrees	-11.33	dB
at angle	-5.47	degree
# Simultaneous Users N - worst case exceedance between +/-7 deg	16	

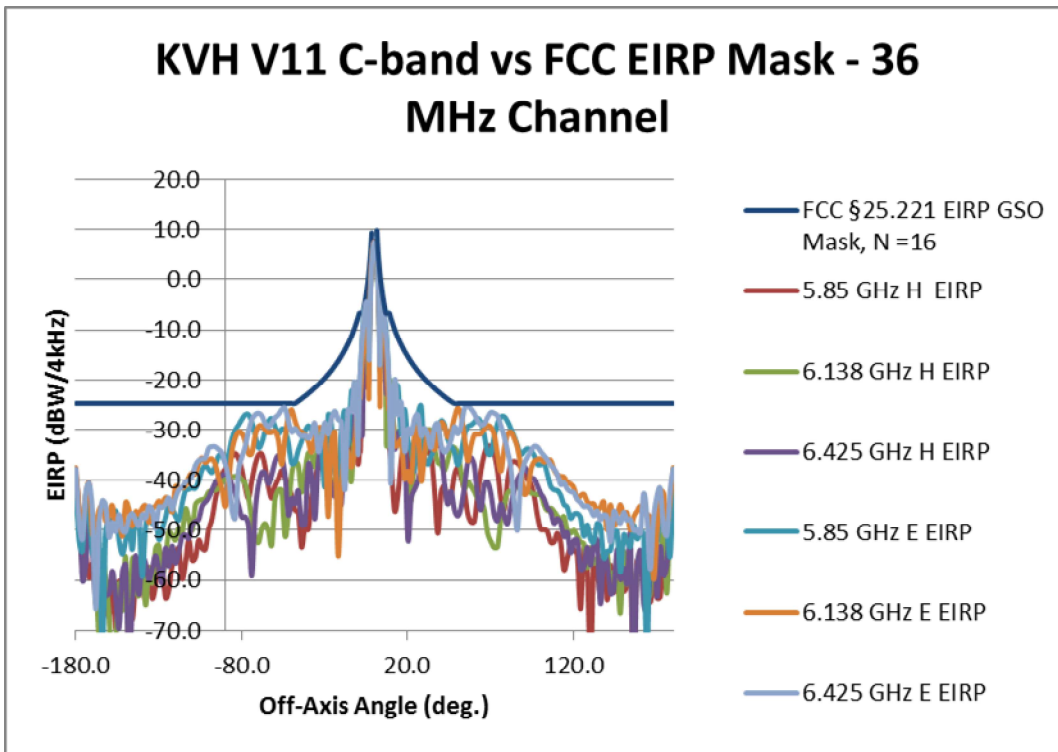


Figure 6 – V11 Off-Axis EIRP Co-Pol vs FCC Mask, 36 MHz Channel +/- 180 deg

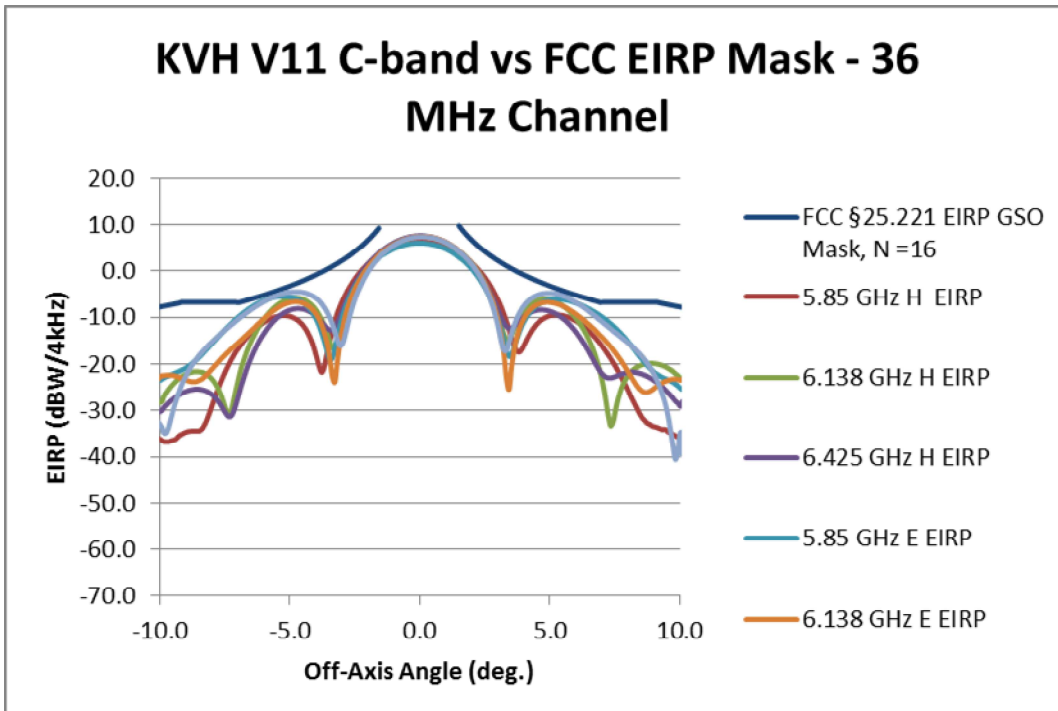


Figure 7 – V11 Off-Axis EIRP Co-Pol vs FCC Mask, 36 MHz Channel, +/- 10 deg

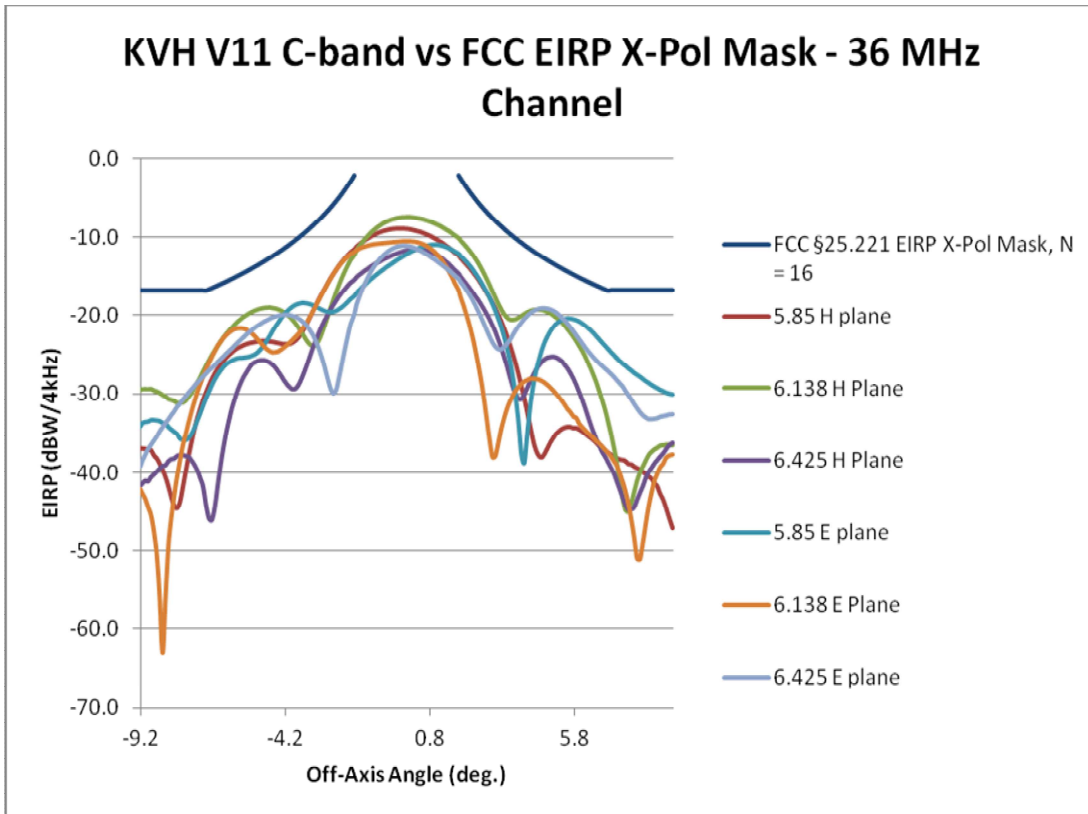


Figure 8 – Off-Axis EIRP Cross-Pol, 36 MHz Channel

Table 7 - V11 ESV Off-Axis EIRP vs FCC §25.221 Masks – 36 MHz Channel

Table 8 - V11 ESV Co-Pol EIRP in the Elevation Plane – 36 MHz Channel

36 MHz	Antenna Gain (dBi)									ESV EIRP (dBW/4 kHz)							
Off Axis Angle (degree)	5.85 GHz H	6.138 GHz H	6.425 GHz H	5.85 GHz E	6.138 GHz E	6.425 GHz E	Off Axis Angle (degree)	FCC §25.209	FCC §25.221 EIRP GSO Mask, N =16	FCC §25.221 EIRP Elevation Mask, N = 16	5.85 GHz H EIRP	6.138 GHz H EIRP	6.425 GHz H EIRP	5.85 GHz E EIRP	6.138 GHz E EIRP	6.425 GHz E EIRP	Meets Mask
-179.8	-14.9	-11.3	-11.9	-14.8	-10.3	-10.6	-179.8	-10.0	-24.7	-24.7	-42.0	-38.4	-39.0	-41.9	-37.5	-37.7	Y
-177.8	-22.2	-23.3	-18.7	-25.1	-18.5	-21.5	-177.8	-10.0	-24.7	-24.7	-49.3	-50.5	-45.8	-52.2	-45.7	-48.6	Y
-175.8	-27.1	-26.3	-32.8	-27.0	-22.1	-24.7	-175.8	-10.0	-24.7	-24.7	-54.2	-53.5	-59.9	-54.1	-49.2	-51.8	Y
-173.8	-27.6	-21.3	-29.8	-15.8	-15.8	-15.2	-173.8	-10.0	-24.7	-24.7	-54.7	-48.4	-56.9	-42.9	-42.9	-42.3	Y
-171.8	-32.4	-25.0	-20.5	-20.0	-13.5	-13.4	-171.8	-10.0	-24.7	-24.7	-59.5	-52.1	-47.7	-47.1	-40.7	-40.5	Y
-169.8	-29.5	-26.5	-27.0	-27.5	-23.7	-18.8	-169.8	-10.0	-24.7	-24.7	-56.6	-53.7	-54.1	-54.7	-50.8	-46.0	Y
-167.8	-34.5	-30.1	-37.3	-24.5	-21.8	-38.5	-167.8	-10.0	-24.7	-24.7	-61.6	-57.2	-64.4	-51.6	-48.9	-65.6	Y
-165.8	-32.4	-43.8	-32.1	-21.6	-18.8	-21.3	-165.8	-10.0	-24.7	-24.7	-59.5	-70.9	-59.2	-48.7	-45.9	-48.4	Y
-163.8	-30.0	-28.6	-36.9	-46.8	-18.0	-16.9	-163.8	-10.0	-24.7	-24.7	-57.2	-55.7	-64.0	-73.9	-45.1	-44.0	Y
-161.8	-37.1	-32.9	-35.7	-23.1	-21.0	-17.9	-161.8	-10.0	-24.7	-24.7	-64.3	-60.0	-62.9	-50.2	-48.1	-45.0	Y
-159.8	-39.7	-39.8	-35.6	-20.5	-19.8	-24.3	-159.8	-10.0	-24.7	-24.7	-66.8	-67.0	-62.7	-47.6	-47.0	-51.4	Y
-157.8	-31.5	-54.1	-31.0	-22.4	-17.9	-21.3	-157.8	-10.0	-24.7	-24.7	-58.6	-81.2	-58.2	-49.6	-45.0	-48.4	Y
-155.8	-42.4	-45.4	-36.3	-18.9	-22.7	-23.2	-155.8	-10.0	-24.7	-24.7	-69.5	-72.5	-63.4	-46.0	-49.8	-50.3	Y
-153.8	-33.2	-33.6	-42.4	-24.9	-20.0	-19.7	-153.8	-10.0	-24.7	-24.7	-60.4	-60.7	-69.5	-52.0	-47.1	-46.8	Y
-151.8	-35.6	-38.8	-31.2	-27.6	-24.1	-22.8	-151.8	-10.0	-24.7	-24.7	-62.8	-65.9	-58.3	-54.8	-51.2	-49.9	Y
-149.8	-33.1	-28.2	-29.8	-25.0	-17.4	-23.2	-149.8	-10.0	-24.7	-24.7	-60.2	-55.3	-56.9	-52.1	-44.5	-50.3	Y
-147.8	-34.5	-46.8	-50.7	-21.4	-18.7	-20.4	-147.8	-10.0	-24.7	-24.7	-61.6	-73.9	-77.8	-48.5	-45.8	-47.5	Y
-145.8	-40.5	-28.7	-37.6	-26.7	-22.0	-19.5	-145.8	-10.0	-24.7	-24.7	-67.6	-55.8	-64.8	-53.9	-49.2	-46.6	Y
-143.8	-33.9	-34.6	-27.9	-19.7	-19.1	-20.9	-143.8	-10.0	-24.7	-24.7	-61.0	-61.8	-55.1	-46.9	-46.2	-48.0	Y
-141.8	-35.2	-35.8	-35.7	-20.5	-19.7	-22.0	-141.8	-10.0	-24.7	-24.7	-62.3	-62.9	-62.8	-47.7	-46.8	-49.1	Y
-139.8	-33.6	-28.0	-28.3	-32.2	-18.3	-19.7	-139.8	-10.0	-24.7	-24.7	-60.7	-55.1	-55.4	-59.3	-45.4	-46.8	Y
-137.8	-36.8	-37.7	-29.4	-22.1	-17.9	-20.4	-137.8	-10.0	-24.7	-24.7	-63.9	-64.8	-56.5	-49.2	-45.1	-47.5	Y
-135.8	-30.3	-30.4	-32.9	-19.6	-21.2	-18.0	-135.8	-10.0	-24.7	-24.7	-57.4	-57.6	-60.0	-46.7	-48.4	-45.2	Y
-133.8	-36.4	-33.4	-30.5	-21.5	-18.6	-18.8	-133.8	-10.0	-24.7	-24.7	-63.5	-60.6	-57.7	-48.6	-45.7	-46.0	Y
-131.8	-33.8	-26.5	-27.9	-20.5	-18.0	-22.4	-131.8	-10.0	-24.7	-24.7	-60.9	-53.6	-55.1	-47.6	-45.1	-49.6	Y

-129.8	-27.1	-25.9	-30.7	-24.8	-17.0	-18.2	-129.8	-10.0	-24.7	-24.7	-54.2	-53.0	-57.8	-51.9	-44.1	-45.4	Y
-127.8	-29.9	-31.7	-33.3	-22.6	-17.5	-18.3	-127.8	-10.0	-24.7	-24.7	-57.0	-58.8	-60.5	-49.7	-44.6	-45.4	Y
-125.8	-36.3	-28.3	-26.5	-20.3	-16.3	-17.6	-125.8	-10.0	-24.7	-24.7	-63.4	-55.4	-53.6	-47.4	-43.4	-44.7	Y
-123.8	-34.9	-23.2	-30.1	-17.5	-16.6	-16.4	-123.8	-10.0	-24.7	-24.7	-62.0	-50.4	-57.2	-44.7	-43.7	-43.5	Y
-121.8	-29.9	-23.8	-26.0	-18.3	-19.2	-18.7	-121.8	-10.0	-24.7	-24.7	-57.1	-51.0	-53.2	-45.4	-46.3	-45.8	Y
-119.8	-28.1	-24.9	-29.5	-20.0	-14.1	-16.4	-119.8	-10.0	-24.7	-24.7	-55.2	-52.0	-56.6	-47.1	-41.2	-43.5	Y
-117.8	-26.6	-22.4	-27.2	-20.8	-14.3	-14.8	-117.8	-10.0	-24.7	-24.7	-53.7	-49.5	-54.3	-47.9	-41.4	-41.9	Y
-115.8	-32.6	-23.6	-24.1	-17.5	-14.5	-14.2	-115.8	-10.0	-24.7	-24.7	-59.7	-50.7	-51.2	-44.7	-41.6	-41.3	Y
-113.8	-29.4	-18.5	-23.8	-15.0	-13.9	-13.2	-113.8	-10.0	-24.7	-24.7	-56.6	-45.7	-50.9	-42.1	-41.0	-40.3	Y
-111.8	-24.8	-20.5	-24.5	-14.7	-12.2	-12.9	-111.8	-10.0	-24.7	-24.7	-51.9	-47.6	-51.6	-41.8	-39.3	-40.0	Y
-109.8	-28.8	-22.9	-21.8	-14.4	-11.3	-11.9	-109.8	-10.0	-24.7	-24.7	-56.0	-50.1	-48.9	-41.5	-38.5	-39.1	Y
-107.8	-28.4	-17.8	-21.1	-14.4	-11.6	-9.9	-107.8	-10.0	-24.7	-24.7	-55.5	-44.9	-48.2	-41.6	-38.7	-37.0	Y
-105.8	-24.9	-17.0	-20.7	-12.9	-9.5	-8.9	-105.8	-10.0	-24.7	-24.7	-52.0	-44.1	-47.8	-40.0	-36.6	-36.1	Y
-103.8	-26.5	-16.7	-18.1	-10.7	-8.4	-8.6	-103.8	-10.0	-24.7	-24.7	-53.6	-43.8	-45.2	-37.9	-35.5	-35.8	Y
-101.8	-26.7	-16.4	-17.2	-9.9	-9.3	-8.5	-101.8	-10.0	-24.7	-24.7	-53.8	-43.6	-44.3	-37.1	-36.5	-35.6	Y
-99.8	-22.7	-15.2	-16.4	-10.6	-8.8	-6.6	-99.8	-10.0	-24.7	-24.7	-49.9	-42.3	-43.5	-37.8	-35.9	-33.7	Y
-97.8	-20.6	-15.0	-14.8	-11.3	-8.6	-6.2	-97.8	-10.0	-24.7	-24.7	-47.7	-42.1	-41.9	-38.4	-35.8	-33.4	Y
-95.8	-16.7	-14.8	-13.3	-9.9	-9.6	-6.3	-95.8	-10.0	-24.7	-24.7	-43.8	-41.9	-40.4	-37.0	-36.7	-33.4	Y
-93.8	-13.9	-14.5	-12.4	-8.0	-12.3	-6.8	-93.8	-10.0	-24.7	-24.7	-41.0	-41.6	-39.5	-35.2	-39.4	-33.9	Y
-91.8	-11.6	-13.4	-11.8	-7.9	-14.6	-7.5	-91.8	-10.0	-24.7	-24.7	-38.8	-40.6	-39.0	-35.0	-41.7	-34.6	Y
-89.8	-10.5	-12.3	-11.6	-9.1	-18.1	-9.6	-89.8	-10.0	-24.7	-24.7	-37.6	-39.4	-38.7	-36.2	-45.3	-36.7	Y
-87.8	-9.0	-12.2	-12.0	-7.6	-13.2	-12.4	-87.8	-10.0	-24.7	-24.7	-36.2	-39.4	-39.1	-34.8	-40.3	-39.6	Y
-85.8	-8.1	-12.1	-13.8	-4.7	-7.1	-18.8	-85.8	-10.0	-24.7	-24.7	-35.2	-39.2	-40.9	-31.8	-34.2	-46.0	Y
-83.8	-7.6	-12.0	-15.5	-2.9	-4.5	-20.4	-83.8	-10.0	-24.7	-24.7	-34.7	-39.1	-42.6	-30.0	-31.6	-47.5	Y
-81.8	-8.6	-12.0	-17.9	-1.9	-3.3	-10.8	-81.8	-10.0	-24.7	-24.7	-35.7	-39.1	-45.0	-29.0	-30.4	-37.9	Y
-79.8	-10.7	-12.7	-20.2	-0.8	-3.6	-8.3	-79.8	-10.0	-24.7	-24.7	-37.8	-39.8	-47.4	-27.9	-30.8	-35.4	Y
-77.8	-14.2	-13.5	-20.1	0.2	-5.1	-6.2	-77.8	-10.0	-24.7	-24.7	-41.3	-40.6	-47.3	-27.0	-32.3	-33.3	Y
-75.8	-16.4	-16.3	-21.9	0.2	-7.6	-3.1	-75.8	-10.0	-24.7	-24.7	-43.6	-43.4	-49.0	-27.0	-34.8	-30.3	Y
-73.8	-13.0	-20.6	-32.1	-1.2	-7.6	-0.9	-73.8	-10.0	-24.7	-24.7	-40.1	-47.8	-59.2	-28.4	-34.7	-28.0	Y
-71.8	-9.7	-24.2	-19.2	-4.0	-4.1	0.2	-71.8	-10.0	-24.7	-24.7	-36.8	-51.3	-46.3	-31.2	-31.2	-27.0	Y
-69.8	-7.9	-25.4	-13.8	-6.5	-2.2	0.5	-69.8	-10.0	-24.7	-24.7	-35.0	-52.5	-40.9	-33.6	-29.3	-26.7	Y
-67.8	-7.7	-22.6	-11.3	-5.5	-2.1	0.0	-67.8	-10.0	-24.7	-24.7	-34.8	-49.7	-38.4	-32.6	-29.2	-27.1	Y

-65.8	-10.1	-21.5	-11.4	-3.2	-2.9	-1.6	-65.8	-10.0	-24.7	-24.7	-37.2	-48.6	-38.6	-30.3	-30.0	-28.7	Y
-63.8	-14.1	-23.0	-13.6	-1.3	-3.5	-2.3	-63.8	-10.0	-24.7	-24.7	-41.2	-50.1	-40.7	-28.4	-30.6	-29.4	Y
-61.8	-16.4	-25.8	-11.7	-0.6	-3.4	-1.5	-61.8	-10.0	-24.7	-24.7	-43.6	-53.0	-38.8	-27.7	-30.5	-28.6	Y
-59.8	-14.0	-16.6	-9.1	-2.2	-3.1	-0.4	-59.8	-10.0	-24.7	-24.7	-41.1	-43.7	-36.2	-29.3	-30.3	-27.5	Y
-57.8	-12.5	-14.8	-7.9	-3.7	-5.0	0.2	-57.8	-10.0	-24.7	-24.7	-39.7	-41.9	-35.0	-30.8	-32.1	-26.9	Y
-55.8	-10.9	-14.8	-8.3	-2.7	-9.7	1.2	-55.8	-10.0	-24.7	-24.7	-38.0	-42.0	-35.5	-29.8	-36.8	-25.9	Y
-53.8	-12.3	-24.1	-11.7	-3.0	-4.5	1.5	-53.8	-10.0	-24.7	-24.7	-39.4	-51.2	-38.9	-30.1	-31.6	-25.7	Y
-51.8	-14.0	-19.5	-19.8	-5.6	0.0	-1.1	-51.8	-10.0	-24.7	-24.7	-41.1	-46.6	-46.9	-32.7	-27.1	-28.3	Y
-49.8	-16.0	-11.6	-16.5	-9.4	1.1	-3.4	-49.8	-10.0	-24.7	-24.7	-43.1	-38.8	-43.6	-36.6	-26.0	-30.5	Y
-47.8	-18.8	-9.2	-17.6	-9.2	-1.0	-2.6	-47.8	-10.0	-24.7	-24.7	-45.9	-36.3	-44.7	-36.4	-28.2	-29.7	Y
-45.8	-19.3	-9.8	-15.0	-6.9	-2.8	-3.5	-45.8	-9.5	-24.3	-24.3	-46.5	-36.9	-42.1	-34.0	-30.0	-30.6	Y
-43.8	-26.3	-15.2	-21.9	-5.2	-3.4	-4.2	-43.8	-9.0	-23.8	-23.8	-53.4	-42.4	-49.0	-32.3	-30.5	-31.3	Y
-41.8	-22.1	-10.9	-21.6	-3.3	-3.8	-4.0	-41.8	-8.5	-23.3	-23.3	-49.2	-38.0	-48.8	-30.4	-31.0	-31.1	Y
-39.8	-22.7	-7.5	-9.7	-2.1	-5.2	-4.6	-39.8	-8.0	-22.7	-22.7	-49.9	-34.6	-36.8	-29.2	-32.3	-31.7	Y
-37.8	-16.3	-7.9	-11.9	-2.9	-7.3	-3.6	-37.8	-7.4	-22.2	-22.2	-43.4	-35.1	-39.0	-30.0	-34.4	-30.7	Y
-35.8	-13.4	-10.1	-20.6	-3.9	-4.3	-1.6	-35.8	-6.8	-21.6	-21.6	-40.6	-37.2	-47.7	-31.0	-31.4	-28.7	Y
-33.8	-9.6	-5.2	-9.3	-5.0	-2.6	-7.2	-33.8	-6.2	-21.0	-21.0	-36.7	-32.3	-36.4	-32.1	-29.7	-34.3	Y
-31.8	-10.4	-3.5	-5.3	-6.5	-2.5	-4.6	-31.8	-5.6	-20.3	-20.3	-37.5	-30.6	-32.5	-33.6	-29.6	-31.7	Y
-29.8	-9.5	-7.4	-4.9	-14.1	-4.2	-1.4	-29.8	-4.9	-19.6	-19.6	-36.6	-34.6	-32.0	-41.3	-31.3	-28.6	Y
-27.8	-9.1	-13.6	-11.6	0.0	-20.1	-3.8	-27.8	-4.1	-18.8	-18.8	-36.2	-40.7	-38.7	-27.1	-47.2	-30.9	Y
-25.8	-9.0	-12.6	-13.6	-1.9	-5.2	-0.6	-25.8	-3.3	-18.0	-18.0	-36.1	-39.7	-40.7	-29.0	-32.3	-27.7	Y
-23.8	-9.3	-15.2	-16.2	-11.4	-3.5	0.9	-23.8	-2.4	-17.2	-17.2	-36.4	-42.4	-43.3	-38.5	-30.6	-26.3	Y
-21.8	-15.2	-12.7	-13.9	-12.7	-27.9	-0.8	-21.8	-1.5	-16.2	-16.2	-42.4	-39.8	-41.0	-39.8	-55.0	-28.0	Y
-19.8	-6.7	-7.7	-17.5	-2.9	-13.2	-1.4	-19.8	-0.4	-15.2	-15.2	-33.8	-34.8	-44.6	-30.0	-40.3	-28.5	Y
-17.8	-3.7	-11.1	-4.2	0.9	-7.0	-14.8	-17.8	0.7	-14.0	-14.0	-30.9	-38.2	-31.3	-26.2	-34.1	-41.9	Y
-15.8	-5.2	-9.7	-0.4	-6.0	-7.3	1.2	-15.8	2.0	-12.7	-12.7	-32.3	-36.8	-27.5	-33.1	-34.4	-26.0	Y
-13.8	-7.8	-12.9	0.0	4.9	-10.2	0.7	-13.8	3.5	-11.2	-11.2	-35.0	-40.0	-27.1	-22.3	-37.4	-26.4	Y
-11.8	-4.5	-1.4	-5.5	1.0	-6.4	6.7	-11.8	5.2	-9.5	-9.5	-31.6	-28.5	-32.6	-26.1	-33.5	-20.5	Y
-10.0	-9.1	-1.1	-3.1	3.8	4.5	-6.0	-10.0	7.0	-7.7	-7.7	-36.2	-28.2	-30.2	-23.3	-22.6	-33.1	Y
-9.9	-9.6	0.0	-2.3	4.1	4.7	-7.5	-9.9	7.1	-7.6	-7.6	-36.7	-27.1	-29.5	-23.0	-22.4	-34.6	Y
-9.8	-9.6	0.9	-1.8	4.4	4.8	-7.8	-9.8	7.3	-7.5	-7.5	-36.8	-26.2	-28.9	-22.7	-22.4	-34.9	Y
-9.7	-9.7	1.7	-1.2	4.7	4.8	-6.6	-9.7	7.4	-7.4	-7.4	-36.8	-25.4	-28.3	-22.5	-22.3	-33.8	Y

-9.6	-9.4	2.4	-0.7	4.9	4.8	-4.6	-9.6	7.5	-7.3	-7.3	-36.5	-24.7	-27.8	-22.2	-22.4	-31.7	Y
-9.5	-9.3	3.0	-0.2	5.1	4.7	-2.4	-9.5	7.6	-7.1	-7.1	-36.4	-24.1	-27.4	-22.0	-22.4	-29.6	Y
-9.4	-9.0	3.5	0.2	5.3	4.5	-0.6	-9.4	7.7	-7.0	-7.0	-36.1	-23.6	-26.9	-21.8	-22.6	-27.7	Y
-9.3	-8.4	4.0	0.5	5.6	4.4	1.1	-9.3	7.8	-6.9	-6.9	-35.5	-23.1	-26.6	-21.5	-22.8	-26.0	Y
-9.2	-8.1	4.4	0.9	5.8	4.1	2.6	-9.2	8.0	-6.7	-6.8	-35.2	-22.7	-26.3	-21.3	-23.0	-24.5	Y
-9.1	-7.8	4.8	1.1	6.1	3.9	3.8	-9.1	8.0	-6.7	-6.7	-34.9	-22.4	-26.0	-21.0	-23.2	-23.3	Y
-9.0	-7.5	5.0	1.3	6.4	3.7	4.9	-9.0	8.0	-6.7	-6.6	-34.6	-22.1	-25.8	-20.7	-23.4	-22.2	Y
-8.9	-7.4	5.3	1.5	6.8	3.5	5.9	-8.9	8.0	-6.7	-6.4	-34.5	-21.9	-25.6	-20.4	-23.6	-21.2	Y
-8.8	-7.3	5.4	1.7	7.2	3.4	6.8	-8.8	8.0	-6.7	-6.3	-34.4	-21.7	-25.5	-19.9	-23.7	-20.3	Y
-8.7	-7.3	5.5	1.8	7.7	3.4	7.6	-8.7	8.0	-6.7	-6.2	-34.4	-21.6	-25.4	-19.5	-23.8	-19.5	Y
-8.6	-7.3	5.5	1.8	8.2	3.5	8.4	-8.6	8.0	-6.7	-6.1	-34.4	-21.6	-25.3	-18.9	-23.7	-18.7	Y
-8.5	-7.3	5.5	1.8	8.7	3.7	9.1	-8.5	8.0	-6.7	-5.9	-34.4	-21.6	-25.4	-18.4	-23.4	-18.0	Y
-8.4	-6.8	5.4	1.7	9.3	4.0	9.7	-8.4	8.0	-6.7	-5.8	-33.9	-21.7	-25.5	-17.8	-23.1	-17.4	Y
-8.3	-5.9	5.2	1.5	9.9	4.5	10.4	-8.3	8.0	-6.7	-5.7	-33.0	-21.9	-25.6	-17.2	-22.6	-16.8	Y
-8.2	-4.6	4.9	1.3	10.5	5.0	10.9	-8.2	8.0	-6.7	-5.5	-31.7	-22.3	-25.8	-16.6	-22.1	-16.2	Y
-8.1	-3.1	4.4	1.0	11.1	5.6	11.5	-8.1	8.0	-6.7	-5.4	-30.3	-22.7	-26.2	-16.0	-21.5	-15.6	Y
-8.0	-1.5	3.8	0.5	11.7	6.2	12.0	-8.0	8.0	-6.7	-5.3	-28.6	-23.3	-26.6	-15.4	-20.9	-15.1	Y
-7.9	0.2	3.1	0.0	12.3	6.8	12.6	-7.9	8.0	-6.7	-5.1	-26.9	-24.1	-27.1	-14.9	-20.3	-14.6	Y
-7.8	1.7	2.1	-0.7	12.9	7.5	13.1	-7.8	8.0	-6.7	-5.0	-25.5	-25.0	-27.8	-14.2	-19.7	-14.1	Y
-7.7	3.1	0.9	-1.5	13.5	8.1	13.6	-7.7	8.0	-6.7	-4.9	-24.0	-26.3	-28.6	-13.6	-19.0	-13.5	Y
-7.6	4.5	-0.7	-2.5	14.1	8.6	14.1	-7.6	8.0	-6.7	-4.7	-22.7	-27.8	-29.6	-13.0	-18.5	-13.1	Y
-7.5	5.7	-2.5	-3.4	14.7	9.2	14.5	-7.5	8.0	-6.7	-4.6	-21.4	-29.6	-30.5	-12.5	-17.9	-12.6	Y
-7.4	6.8	-3.7	-4.2	15.2	9.8	15.0	-7.4	8.0	-6.7	-4.4	-20.3	-30.8	-31.3	-11.9	-17.4	-12.1	Y
-7.3	7.9	-3.1	-4.2	15.7	10.3	15.5	-7.3	8.0	-6.7	-4.3	-19.2	-30.2	-31.3	-11.4	-16.8	-11.6	Y
-7.2	8.9	-0.9	-3.2	16.3	10.8	15.9	-7.2	8.0	-6.7	-4.1	-18.2	-28.0	-30.3	-10.9	-16.3	-11.2	Y
-7.1	9.8	1.7	-1.5	16.8	11.3	16.4	-7.1	8.0	-6.7	-4.0	-17.3	-25.4	-28.6	-10.4	-15.8	-10.8	Y
-7.0	10.6	4.1	0.5	17.2	11.8	16.8	-7.0	7.9	-6.8	-3.8	-16.5	-23.0	-26.6	-9.9	-15.3	-10.3	Y
-6.9	11.4	6.2	2.5	17.7	12.3	17.2	-6.9	8.1	-6.7	-3.7	-15.7	-20.9	-24.6	-9.4	-14.8	-9.9	Y
-6.8	12.1	8.0	4.2	18.2	12.8	17.7	-6.8	8.2	-6.5	-3.5	-15.0	-19.1	-22.9	-9.0	-14.3	-9.5	Y
-6.7	12.8	9.6	5.9	18.6	13.4	18.1	-6.7	8.4	-6.3	-3.3	-14.4	-17.6	-21.3	-8.6	-13.8	-9.0	Y
-6.6	13.4	11.0	7.4	19.0	13.9	18.5	-6.6	8.6	-6.2	-3.2	-13.7	-16.1	-19.7	-8.1	-13.3	-8.6	Y
-6.5	14.0	12.2	8.7	19.4	14.4	18.9	-6.5	8.7	-6.0	-3.0	-13.2	-14.9	-18.4	-7.8	-12.7	-8.3	Y

-6.4	14.5	13.3	9.9	19.7	14.9	19.2	-6.4	8.9	-5.8	-2.8	-12.7	-13.8	-17.2	-7.4	-12.2	-7.9	Y
-6.3	14.9	14.4	11.1	20.0	15.5	19.6	-6.3	9.1	-5.7	-2.7	-12.2	-12.7	-16.0	-7.1	-11.7	-7.5	Y
-6.2	15.4	15.4	12.2	20.3	16.0	19.9	-6.2	9.2	-5.5	-2.5	-11.7	-11.7	-14.9	-6.8	-11.2	-7.2	Y
-6.1	15.8	16.2	13.1	20.6	16.5	20.3	-6.1	9.4	-5.3	-2.3	-11.3	-10.9	-14.0	-6.5	-10.6	-6.9	Y
-6.0	16.2	17.0	13.9	20.8	17.0	20.6	-6.0	9.6	-5.1	-2.1	-11.0	-10.2	-13.2	-6.3	-10.1	-6.5	Y
-5.9	16.5	17.7	14.7	21.0	17.5	20.9	-5.9	9.8	-5.0	-2.0	-10.6	-9.5	-12.4	-6.1	-9.7	-6.2	Y
-5.8	16.8	18.3	15.4	21.2	17.9	21.2	-5.8	10.0	-4.8	-1.8	-10.4	-8.8	-11.7	-5.9	-9.2	-6.0	Y
-5.7	17.0	18.9	16.1	21.4	18.4	21.4	-5.7	10.2	-4.6	-1.6	-10.1	-8.3	-11.1	-5.7	-8.7	-5.7	Y
-5.6	17.2	19.4	16.7	21.5	18.8	21.7	-5.6	10.4	-4.4	-1.4	-9.9	-7.7	-10.5	-5.6	-8.3	-5.5	Y
-5.5	17.4	19.8	17.1	21.6	19.2	21.9	-5.5	10.6	-4.2	-1.2	-9.8	-7.3	-10.0	-5.5	-7.9	-5.2	Y
-5.4	17.5	20.2	17.6	21.6	19.5	22.1	-5.4	10.8	-4.0	-1.0	-9.7	-6.9	-9.5	-5.5	-7.6	-5.1	Y
-5.3	17.5	20.5	18.0	21.7	19.8	22.2	-5.3	11.0	-3.8	-0.8	-9.6	-6.6	-9.2	-5.5	-7.3	-4.9	Y
-5.2	17.5	20.8	18.3	21.7	20.0	22.4	-5.2	11.2	-3.6	-0.6	-9.6	-6.3	-8.8	-5.5	-7.1	-4.8	Y
-5.1	17.4	21.0	18.5	21.6	20.2	22.5	-5.1	11.4	-3.4	-0.4	-9.7	-6.1	-8.6	-5.5	-6.9	-4.6	Y
-5.0	17.3	21.2	18.8	21.5	20.4	22.6	-5.0	11.6	-3.2	-0.2	-9.8	-5.9	-8.4	-5.6	-6.7	-4.6	Y
-4.9	17.1	21.3	18.9	21.4	20.5	22.6	-4.9	11.8	-2.9	0.1	-10.0	-5.8	-8.2	-5.8	-6.7	-4.5	Y
-4.8	16.8	21.3	19.0	21.2	20.5	22.6	-4.8	12.0	-2.7	0.3	-10.3	-5.8	-8.1	-6.0	-6.6	-4.5	Y
-4.7	16.4	21.3	19.0	20.9	20.5	22.6	-4.7	12.3	-2.5	0.5	-10.7	-5.9	-8.1	-6.2	-6.7	-4.5	Y
-4.6	15.9	21.1	19.0	20.6	20.4	22.6	-4.6	12.5	-2.2	0.8	-11.2	-6.0	-8.1	-6.5	-6.8	-4.5	Y
-4.5	15.3	21.0	18.9	20.2	20.2	22.5	-4.5	12.7	-2.0	1.0	-11.8	-6.2	-8.2	-6.9	-7.0	-4.6	Y
-4.4	14.5	20.7	18.7	19.7	19.9	22.3	-4.4	13.0	-1.8	1.2	-12.6	-6.4	-8.4	-7.4	-7.2	-4.8	Y
-4.3	13.5	20.3	18.5	19.2	19.5	22.1	-4.3	13.2	-1.5	1.5	-13.7	-6.8	-8.6	-7.9	-7.6	-5.0	Y
-4.2	12.2	19.9	18.2	18.5	19.0	21.9	-4.2	13.5	-1.2	1.8	-14.9	-7.3	-9.0	-8.6	-8.1	-5.2	Y
-4.1	10.6	19.3	17.8	17.7	18.4	21.5	-4.1	13.8	-1.0	2.0	-16.5	-7.8	-9.3	-9.5	-8.7	-5.6	Y
-4.0	8.7	18.6	17.3	16.6	17.7	21.2	-4.0	14.0	-0.7	2.3	-18.4	-8.6	-9.8	-10.5	-9.4	-6.0	Y
-3.9	6.6	17.7	16.7	15.4	16.7	20.7	-3.9	14.3	-0.4	2.6	-20.5	-9.5	-10.4	-11.7	-10.4	-6.5	Y
-3.8	5.4	16.6	16.1	13.9	15.5	20.0	-3.8	14.6	-0.1	2.9	-21.7	-10.5	-11.0	-13.3	-11.6	-7.1	Y
-3.7	6.7	15.3	15.4	12.0	13.8	19.2	-3.7	14.9	0.1	3.1	-20.4	-11.8	-11.7	-15.1	-13.3	-7.9	Y
-3.6	9.4	13.8	14.8	10.0	11.7	18.3	-3.6	15.2	0.4	3.4	-17.7	-13.4	-12.3	-17.2	-15.4	-8.8	Y
-3.5	12.0	12.0	14.5	8.2	8.6	17.2	-3.5	15.5	0.8	3.8	-15.1	-15.1	-12.7	-18.9	-18.5	-10.0	Y
-3.4	14.3	10.6	14.5	8.3	4.7	15.8	-3.4	15.8	1.1	4.1	-12.8	-16.5	-12.6	-18.8	-22.4	-11.3	Y
-3.3	16.3	10.4	15.0	10.4	3.3	14.1	-3.3	16.1	1.4	4.4	-10.9	-16.7	-12.1	-16.7	-23.8	-13.0	Y

-3.2	18.1	11.8	16.0	13.1	7.7	12.3	-3.2	16.5	1.7	4.7	-9.0	-15.3	-11.1	-14.0	-19.4	-14.8	Y
-3.1	19.5	14.0	17.3	15.4	11.9	11.1	-3.1	16.8	2.1	5.1	-7.6	-13.2	-9.8	-11.7	-15.2	-16.0	Y
-3.0	20.8	16.1	18.6	17.4	14.9	11.5	-3.0	17.2	2.4		-6.3	-11.0	-8.5	-9.7	-12.2	-15.6	Y
-2.9	22.0	18.1	20.0	19.1	17.3	13.4	-2.9	17.6	2.8		-5.2	-9.1	-7.1	-8.0	-9.8	-13.7	Y
-2.8	23.0	19.7	21.3	20.5	19.3	15.7	-2.8	17.9	3.2		-4.1	-7.4	-5.8	-6.6	-7.8	-11.4	Y
-2.7	24.0	21.3	22.6	21.9	21.0	17.9	-2.7	18.3	3.6		-3.2	-5.8	-4.6	-5.2	-6.2	-9.2	Y
-2.6	24.9	22.6	23.6	23.1	22.4	19.8	-2.6	18.8	4.0		-2.2	-4.5	-3.5	-4.1	-4.8	-7.3	Y
-2.5	25.7	23.8	24.7	24.0	23.6	21.4	-2.5	19.2	4.4		-1.4	-3.3	-2.5	-3.1	-3.5	-5.7	Y
-2.4	26.4	24.9	25.6	25.0	24.7	22.8	-2.4	19.6	4.9		-0.7	-2.2	-1.5	-2.1	-2.4	-4.3	Y
-2.3	27.1	25.9	26.6	25.8	25.7	24.1	-2.3	20.1	5.4		0.0	-1.2	-0.6	-1.3	-1.4	-3.0	Y
-2.2	27.8	26.8	27.4	26.6	26.6	25.3	-2.2	20.6	5.8		0.6	-0.3	0.2	-0.5	-0.5	-1.9	Y
-2.1	28.3	27.6	28.1	27.3	27.5	26.3	-2.1	21.1	6.4		1.2	0.5	1.0	0.2	0.4	-0.8	Y
-2.0	28.9	28.4	28.8	28.0	28.2	27.2	-2.0	21.6	6.9		1.8	1.2	1.7	0.9	1.1	0.1	Y
-1.9	29.4	29.1	29.5	28.6	28.9	28.0	-1.9	22.2	7.5		2.3	1.9	2.3	1.5	1.8	0.9	Y
-1.8	29.9	29.7	30.1	29.1	29.6	28.8	-1.8	22.8	8.1		2.8	2.6	2.9	2.0	2.4	1.7	Y
-1.7	30.3	30.3	30.6	29.6	30.1	29.5	-1.7	23.4	8.7		3.2	3.2	3.5	2.5	3.0	2.4	Y
-1.6	30.7	30.8	31.1	30.1	30.7	30.1	-1.6	24.1	9.4		3.6	3.7	4.0	3.0	3.6	3.0	Y
-1.5	31.1	31.3	31.6	30.5	31.2	30.7	-1.5	24.6	9.9		4.0	4.2	4.4	3.4	4.1	3.6	Y
-1.4	31.4	31.8	32.0	30.9	31.6	31.2	-1.4				4.3	4.7	4.9	3.8	4.5	4.1	Y
-1.3	31.8	32.2	32.4	31.2	32.0	31.7	-1.3				4.6	5.1	5.3	4.1	4.9	4.6	Y
-1.2	32.1	32.6	32.8	31.6	32.4	32.1	-1.2				4.9	5.5	5.6	4.5	5.3	5.0	Y
-1.1	32.3	33.0	33.1	31.9	32.8	32.6	-1.1				5.2	5.9	6.0	4.7	5.7	5.4	Y
-1.0	32.5	33.3	33.4	32.1	33.1	32.9	-1.0				5.4	6.2	6.3	5.0	6.0	5.8	Y
-0.9	32.7	33.6	33.7	32.3	33.4	33.2	-0.9				5.6	6.5	6.5	5.2	6.3	6.1	Y
-0.8	32.9	33.8	33.9	32.6	33.6	33.5	-0.8				5.8	6.7	6.8	5.4	6.5	6.4	Y
-0.7	33.1	34.0	34.1	32.7	33.9	33.8	-0.7				6.0	6.9	7.0	5.6	6.8	6.6	Y
-0.6	33.2	34.2	34.3	32.9	34.1	34.0	-0.6				6.1	7.1	7.2	5.7	6.9	6.9	Y
-0.5	33.3	34.4	34.4	33.0	34.2	34.1	-0.5				6.2	7.3	7.3	5.9	7.1	7.0	Y
-0.4	33.4	34.5	34.6	33.1	34.4	34.3	-0.4				6.3	7.4	7.4	6.0	7.2	7.2	Y
-0.3	33.5	34.6	34.7	33.2	34.5	34.4	-0.3				6.4	7.5	7.6	6.1	7.3	7.3	Y
-0.2	33.5	34.7	34.7	33.2	34.6	34.5	-0.2				6.4	7.5	7.6	6.1	7.4	7.4	Y
-0.1	33.6	34.7	34.8	33.2	34.6	34.5	-0.1				6.5	7.6	7.7	6.1	7.5	7.4	Y

0.0	33.6	34.7	34.8	33.2	34.6	34.6	0.0				6.5	7.6	7.7	6.1	7.5	7.4	Y
0.1	33.6	34.7	34.8	33.2	34.6	34.6	0.1				6.5	7.6	7.7	6.1	7.5	7.4	Y
0.2	33.5	34.6	34.7	33.2	34.6	34.5	0.2				6.4	7.5	7.6	6.0	7.5	7.4	Y
0.3	33.5	34.6	34.7	33.1	34.5	34.5	0.3				6.4	7.4	7.5	6.0	7.4	7.3	Y
0.4	33.4	34.5	34.6	33.0	34.5	34.4	0.4				6.3	7.3	7.4	5.9	7.3	7.3	Y
0.5	33.3	34.3	34.4	32.9	34.4	34.3	0.5				6.2	7.2	7.3	5.8	7.2	7.2	Y
0.6	33.2	34.2	34.3	32.7	34.2	34.1	0.6				6.0	7.1	7.1	5.6	7.1	7.0	Y
0.7	33.0	34.0	34.1	32.6	34.1	34.0	0.7				5.9	6.9	6.9	5.5	6.9	6.8	Y
0.8	32.8	33.8	33.8	32.4	33.8	33.8	0.8				5.7	6.7	6.7	5.3	6.7	6.6	Y
0.9	32.6	33.5	33.6	32.1	33.6	33.5	0.9				5.5	6.4	6.5	5.0	6.5	6.4	Y
1.0	32.4	33.3	33.3	31.9	33.3	33.3	1.0				5.3	6.1	6.2	4.8	6.2	6.1	Y
1.1	32.2	33.0	33.0	31.6	33.0	32.9	1.1				5.1	5.8	5.9	4.5	5.9	5.8	Y
1.2	31.9	32.6	32.6	31.3	32.7	32.6	1.2				4.8	5.5	5.5	4.2	5.6	5.5	Y
1.3	31.6	32.3	32.3	31.0	32.3	32.2	1.3				4.5	5.2	5.2	3.8	5.2	5.1	Y
1.4	31.3	31.9	31.9	30.6	31.9	31.8	1.4				4.2	4.8	4.7	3.4	4.8	4.7	Y
1.5	31.0	31.5	31.4	30.1	31.5	31.4	1.5	24.6	9.9		3.8	4.3	4.3	3.0	4.3	4.2	Y
1.6	30.6	31.0	30.9	29.7	31.0	30.9	1.6	23.7	9.0		3.5	3.9	3.8	2.5	3.8	3.8	Y
1.7	30.2	30.5	30.4	29.2	30.4	30.3	1.7	23.0	8.3		3.1	3.4	3.3	2.1	3.3	3.2	Y
1.8	29.7	29.9	29.8	28.6	29.9	29.8	1.8	22.4	7.7		2.6	2.8	2.7	1.5	2.7	2.6	Y
1.9	29.3	29.3	29.2	28.1	29.2	29.1	1.9	21.9	7.1		2.2	2.2	2.1	0.9	2.1	2.0	Y
2.0	28.7	28.7	28.5	27.4	28.6	28.4	2.0	21.3	6.6		1.6	1.6	1.4	0.3	1.5	1.3	Y
2.1	28.2	28.0	27.8	26.7	27.8	27.6	2.1	20.8	6.0		1.1	0.8	0.7	-0.4	0.7	0.5	Y
2.2	27.6	27.2	27.0	26.0	27.0	26.8	2.2	20.3	5.6		0.5	0.1	-0.1	-1.1	-0.1	-0.4	Y
2.3	26.9	26.3	26.2	25.1	26.1	25.8	2.3	19.8	5.1		-0.2	-0.8	-0.9	-2.0	-1.0	-1.3	Y
2.4	26.3	25.4	25.3	24.2	25.1	24.7	2.4	19.4	4.6		-0.9	-1.7	-1.9	-2.9	-2.0	-2.4	Y
2.5	25.5	24.4	24.3	23.3	24.0	23.6	2.5	18.9	4.2		-1.6	-2.8	-2.8	-3.9	-3.1	-3.6	Y
2.6	24.7	23.3	23.3	22.1	22.8	22.2	2.6	18.5	3.8		-2.4	-3.9	-3.8	-5.0	-4.3	-4.9	Y
2.7	23.8	22.0	22.1	20.9	21.5	20.7	2.7	18.1	3.4		-3.3	-5.1	-5.0	-6.2	-5.6	-6.4	Y
2.8	22.7	20.5	20.9	19.6	19.9	19.0	2.8	17.7	3.0		-4.4	-6.6	-6.2	-7.6	-7.2	-8.1	Y
2.9	21.7	19.0	19.6	18.1	18.0	16.9	2.9	17.3	2.6		-5.4	-8.2	-7.5	-9.0	-9.1	-10.2	Y
3.0	20.6	17.2	18.3	16.3	15.9	14.7	3.0	17.0	2.2	5.2	-6.6	-9.9	-8.8	-10.8	-11.2	-12.4	Y
3.1	19.3	15.3	17.0	14.4	13.1	12.1	3.1	16.6	1.9	4.9	-7.9	-11.9	-10.1	-12.7	-14.0	-15.1	Y

3.2	17.8	13.6	16.0	12.1	9.4	10.1	3.2	16.3	1.5	4.5	-9.4	-13.6	-11.2	-15.0	-17.8	-17.0	Y
3.3	16.3	12.4	15.2	10.0	4.0	10.1	3.3	15.9	1.2	4.2	-10.8	-14.7	-11.9	-17.1	-23.1	-17.0	Y
3.4	14.6	12.4	14.8	8.8	1.8	11.8	3.4	15.6	0.9	3.9	-12.5	-14.7	-12.3	-18.3	-25.4	-15.4	Y
3.5	12.8	13.4	14.9	9.2	6.7	13.8	3.5	15.3	0.6	3.6	-14.3	-13.7	-12.2	-17.9	-20.4	-13.3	Y
3.6	11.1	14.7	15.2	10.8	10.3	15.5	3.6	15.0	0.3	3.3	-16.0	-12.4	-11.9	-16.3	-16.8	-11.6	Y
3.7	10.0	15.9	15.8	12.5	12.9	17.0	3.7	14.7	0.0	3.0	-17.2	-11.2	-11.3	-14.6	-14.2	-10.2	Y
3.8	9.7	17.2	16.4	14.1	14.7	18.1	3.8	14.4	-0.3	2.7	-17.4	-10.0	-10.7	-13.0	-12.4	-9.0	Y
3.9	10.4	18.0	16.9	15.5	16.1	19.1	3.9	14.1	-0.6	2.4	-16.7	-9.1	-10.2	-11.7	-11.0	-8.1	Y
4.0	11.5	18.8	17.4	16.5	17.2	19.8	4.0	13.9	-0.9	2.1	-15.6	-8.3	-9.7	-10.6	-9.9	-7.3	Y
4.1	12.6	19.5	17.8	17.5	18.1	20.5	4.1	13.6	-1.1	1.9	-14.5	-7.7	-9.3	-9.7	-9.1	-6.7	Y
4.2	13.6	20.0	18.1	18.2	18.7	20.9	4.2	13.3	-1.4	1.6	-13.5	-7.1	-9.0	-8.9	-8.4	-6.2	Y
4.3	14.5	20.4	18.4	18.8	19.2	21.4	4.3	13.1	-1.7	1.3	-12.6	-6.8	-8.7	-8.3	-7.9	-5.8	Y
4.4	15.3	20.7	18.6	19.4	19.6	21.7	4.4	12.8	-1.9	1.1	-11.8	-6.4	-8.5	-7.8	-7.5	-5.4	Y
4.5	15.9	20.9	18.7	19.8	19.9	21.9	4.5	12.6	-2.1	0.9	-11.2	-6.2	-8.4	-7.3	-7.2	-5.2	Y
4.6	16.4	21.0	18.7	20.1	20.2	22.1	4.6	12.4	-2.4	0.6	-10.7	-6.1	-8.4	-7.0	-7.0	-5.0	Y
4.7	16.8	21.1	18.7	20.4	20.3	22.3	4.7	12.1	-2.6	0.4	-10.3	-6.0	-8.4	-6.7	-6.8	-4.9	Y
4.8	17.1	21.1	18.7	20.7	20.4	22.3	4.8	11.9	-2.8	0.2	-10.0	-6.0	-8.5	-6.5	-6.8	-4.8	Y
4.9	17.4	21.0	18.6	20.8	20.4	22.4	4.9	11.7	-3.1	-0.1	-9.8	-6.1	-8.6	-6.3	-6.7	-4.8	Y
5.0	17.5	20.9	18.4	21.0	20.3	22.3	5.0	11.5	-3.3	-0.3	-9.6	-6.2	-8.7	-6.2	-6.8	-4.8	Y
5.1	17.6	20.7	18.2	21.0	20.2	22.3	5.1	11.2	-3.5	-0.5	-9.5	-6.4	-8.9	-6.1	-6.9	-4.8	Y
5.2	17.7	20.5	17.9	21.1	20.1	22.2	5.2	11.0	-3.7	-0.7	-9.5	-6.6	-9.2	-6.0	-7.0	-4.9	Y
5.3	17.6	20.2	17.6	21.1	19.9	22.1	5.3	10.8	-3.9	-0.9	-9.5	-6.9	-9.6	-6.1	-7.2	-5.1	Y
5.4	17.6	19.9	17.2	21.0	19.7	21.9	5.4	10.6	-4.1	-1.1	-9.5	-7.3	-10.0	-6.1	-7.4	-5.2	Y
5.5	17.5	19.5	16.8	20.9	19.5	21.7	5.5	10.4	-4.3	-1.3	-9.6	-7.6	-10.4	-6.2	-7.7	-5.4	Y
5.6	17.3	19.1	16.3	20.8	19.2	21.5	5.6	10.2	-4.5	-1.5	-9.8	-8.1	-10.8	-6.3	-8.0	-5.7	Y
5.7	17.1	18.6	15.8	20.7	18.8	21.2	5.7	10.0	-4.7	-1.7	-10.0	-8.6	-11.4	-6.4	-8.3	-5.9	Y
5.8	16.9	18.0	15.2	20.5	18.5	20.9	5.8	9.9	-4.9	-1.9	-10.2	-9.1	-12.0	-6.6	-8.6	-6.2	Y
5.9	16.6	17.4	14.5	20.4	18.1	20.6	5.9	9.7	-5.1	-2.1	-10.5	-9.7	-12.6	-6.8	-9.0	-6.5	Y
6.0	16.2	16.7	13.8	20.2	17.7	20.3	6.0	9.5	-5.2	-2.2	-10.9	-10.4	-13.3	-7.0	-9.4	-6.9	Y
6.1	15.9	15.9	13.0	19.9	17.3	19.9	6.1	9.3	-5.4	-2.4	-11.2	-11.2	-14.1	-7.2	-9.8	-7.2	Y
6.2	15.5	15.1	12.2	19.7	16.9	19.5	6.2	9.1	-5.6	-2.6	-11.7	-12.0	-14.9	-7.4	-10.2	-7.6	Y
6.3	15.1	14.2	11.4	19.4	16.4	19.1	6.3	9.0	-5.8	-2.8	-12.1	-12.9	-15.8	-7.7	-10.7	-8.0	Y

6.4	14.6	13.2	10.4	19.2	15.9	18.7	6.4	8.8	-5.9	-2.9	-12.5	-13.9	-16.7	-8.0	-11.2	-8.4	Y
6.5	14.0	12.0	9.4	18.9	15.4	18.3	6.5	8.6	-6.1	-3.1	-13.1	-15.1	-17.7	-8.3	-11.7	-8.8	Y
6.6	13.5	10.7	8.5	18.6	15.0	17.9	6.6	8.5	-6.3	-3.3	-13.7	-16.4	-18.7	-8.6	-12.2	-9.3	Y
6.7	12.9	9.2	7.4	18.2	14.4	17.4	6.7	8.3	-6.4	-3.4	-14.2	-17.9	-19.7	-8.9	-12.7	-9.7	Y
6.8	12.2	7.5	6.5	17.9	13.9	17.0	6.8	8.1	-6.6	-3.6	-14.9	-19.6	-20.7	-9.2	-13.3	-10.2	Y
6.9	11.6	5.5	5.6	17.5	13.3	16.5	6.9	8.0	-6.8	-3.8	-15.6	-21.6	-21.5	-9.6	-13.8	-10.6	Y
7.0	10.8	3.1	4.9	17.1	12.8	16.1	7.0	8.0	-6.7	-3.9	-16.3	-24.0	-22.2	-10.0	-14.4	-11.0	Y
7.1	10.0	0.1	4.4	16.7	12.2	15.6	7.1	8.0	-6.7	-4.1	-17.1	-27.0	-22.7	-10.4	-15.0	-11.5	Y
7.2	9.2	-3.5	4.2	16.3	11.5	15.2	7.2	8.0	-6.7	-4.2	-17.9	-30.6	-22.9	-10.8	-15.6	-11.9	Y
7.3	8.4	-6.2	4.2	15.8	10.9	14.7	7.3	8.0	-6.7	-4.4	-18.7	-33.3	-22.9	-11.3	-16.3	-12.4	Y
7.4	7.5	-5.3	4.3	15.3	10.2	14.3	7.4	8.0	-6.7	-4.5	-19.6	-32.4	-22.8	-11.8	-16.9	-12.9	Y
7.5	6.6	-2.6	4.5	14.8	9.4	13.8	7.5	8.0	-6.7	-4.7	-20.5	-29.7	-22.6	-12.3	-17.7	-13.3	Y
7.6	5.5	-0.1	4.8	14.3	8.7	13.4	7.6	8.0	-6.7	-4.8	-21.6	-27.3	-22.4	-12.8	-18.4	-13.8	Y
7.7	4.6	1.7	5.0	13.7	7.9	12.9	7.7	8.0	-6.7	-4.9	-22.6	-25.4	-22.2	-13.4	-19.2	-14.2	Y
7.8	3.5	3.0	5.2	13.1	7.1	12.5	7.8	8.0	-6.7	-5.1	-23.6	-24.1	-22.0	-14.0	-20.0	-14.6	Y
7.9	2.4	4.1	5.3	12.5	6.2	12.0	7.9	8.0	-6.7	-5.2	-24.7	-23.0	-21.8	-14.7	-20.9	-15.1	Y
8.0	1.3	4.9	5.4	11.8	5.3	11.6	8.0	8.0	-6.7	-5.4	-25.9	-22.2	-21.7	-15.3	-21.8	-15.6	Y
8.1	0.0	5.6	5.4	11.1	4.4	11.1	8.1	8.0	-6.7	-5.5	-27.1	-21.6	-21.7	-16.0	-22.8	-16.1	Y
8.2	-1.1	6.1	5.4	10.4	3.5	10.6	8.2	8.0	-6.7	-5.6	-28.2	-21.0	-21.7	-16.7	-23.6	-16.5	Y
8.3	-2.2	6.5	5.3	9.7	2.6	10.0	8.3	8.0	-6.7	-5.8	-29.3	-20.7	-21.8	-17.5	-24.5	-17.1	Y
8.4	-3.3	6.8	5.2	9.0	1.9	9.5	8.4	8.0	-6.7	-5.9	-30.4	-20.4	-21.9	-18.2	-25.2	-17.7	Y
8.5	-4.3	7.0	5.0	8.2	1.4	8.9	8.5	8.0	-6.7	-6.0	-31.4	-20.1	-22.1	-18.9	-25.7	-18.3	Y
8.6	-4.9	7.1	4.8	7.6	1.1	8.2	8.6	8.0	-6.7	-6.1	-32.1	-20.0	-22.3	-19.6	-26.0	-18.9	Y
8.7	-5.6	7.2	4.6	6.9	1.1	7.4	8.7	8.0	-6.7	-6.3	-32.7	-19.9	-22.6	-20.2	-26.0	-19.7	Y
8.8	-5.8	7.3	4.3	6.3	1.3	6.6	8.8	8.0	-6.7	-6.4	-33.0	-19.8	-22.9	-20.8	-25.8	-20.5	Y
8.9	-6.2	7.3	3.9	5.8	1.6	5.7	8.9	8.0	-6.7	-6.5	-33.4	-19.8	-23.2	-21.4	-25.5	-21.4	Y
9.0	-6.4	7.3	3.6	5.3	2.1	4.7	9.0	8.0	-6.7	-6.6	-33.5	-19.9	-23.6	-21.8	-25.1	-22.5	Y
9.1	-6.6	7.2	3.1	4.9	2.5	3.5	9.1	8.0	-6.7	-6.8	-33.7	-20.0	-24.0	-22.2	-24.6	-23.6	Y
9.2	-6.8	7.0	2.7	4.6	2.8	2.2	9.2	7.9	-6.9	-6.9	-33.9	-20.1	-24.4	-22.5	-24.3	-24.9	Y
9.3	-7.0	6.8	2.2	4.3	3.2	0.5	9.3	7.8	-7.0	-7.0	-34.1	-20.3	-24.9	-22.8	-23.9	-26.6	Y
9.4	-6.9	6.6	1.7	4.1	3.5	-1.2	9.4	7.6	-7.1	-7.1	-34.0	-20.5	-25.4	-23.1	-23.6	-28.4	Y
9.5	-7.4	6.3	1.1	3.8	3.7	-3.7	9.5	7.5	-7.2	-7.2	-34.5	-20.8	-26.0	-23.3	-23.5	-30.9	Y

9.6	-7.7	6.0	0.5	3.5	3.9	-6.8	9.6	7.4	-7.3	-7.3	-34.8	-21.2	-26.6	-23.6	-23.3	-33.9	Y
9.7	-8.1	5.6	-0.1	3.3	3.9	-10.6	9.7	7.3	-7.4	-7.4	-35.2	-21.6	-27.2	-23.8	-23.2	-37.7	Y
9.8	-8.3	5.1	-0.8	2.9	3.9	-13.5	9.8	7.2	-7.6	-7.6	-35.4	-22.1	-27.9	-24.2	-23.2	-40.6	Y
9.9	-8.7	4.7	-1.3	2.5	3.9	-11.0	9.9	7.1	-7.7	-7.7	-35.8	-22.5	-28.4	-24.6	-23.3	-38.2	Y
10.0	-9.1	4.1	-1.9	1.9	3.7	-7.6	10.0	7.0	-7.8	-7.8	-36.2	-23.0	-29.1	-25.2	-23.4	-34.7	Y
10.2	-10.3	4.0	-0.7	1.6	4.0	-12.2	10.2	6.8	-8.0	-8.0	-37.4	-23.2	-27.8	-25.5	-23.1	-39.3	Y
12.2	-18.9	-3.2	-6.7	4.1	-6.1	6.9	12.2	4.8	-9.9	-9.9	-46.1	-30.3	-33.8	-23.0	-33.2	-20.2	Y
14.2	-15.7	-5.2	-3.6	5.8	-5.8	0.2	14.2	3.2	-11.5	-11.5	-42.9	-32.4	-30.7	-21.3	-33.0	-26.9	Y
16.2	-8.9	-5.8	-3.0	-3.8	-5.0	2.5	16.2	1.8	-13.0	-13.0	-36.0	-32.9	-30.2	-30.9	-32.2	-24.6	Y
18.2	-4.9	-9.6	-4.7	1.2	-12.5	-7.1	18.2	0.5	-14.2	-14.2	-32.1	-36.8	-31.9	-25.9	-39.6	-34.2	Y
20.2	-5.7	-13.7	-24.8	-4.8	-11.0	-2.7	20.2	-0.6	-15.4	-15.4	-32.8	-40.8	-51.9	-32.0	-38.1	-29.8	Y
22.2	-13.5	-16.8	-16.4	-7.3	-13.1	-3.8	22.2	-1.7	-16.4	-16.4	-40.6	-43.9	-43.5	-34.5	-40.2	-30.9	Y
24.2	-9.9	-8.2	-14.7	-10.8	-3.8	-0.6	24.2	-2.6	-17.3	-17.3	-37.0	-35.3	-41.8	-38.0	-30.9	-27.7	Y
26.2	-8.6	-6.9	-13.0	0.0	-2.4	0.1	26.2	-3.5	-18.2	-18.2	-35.7	-34.0	-40.1	-27.1	-29.5	-27.0	Y
28.2	-7.6	-9.2	-10.0	1.9	-13.0	-4.1	28.2	-4.3	-19.0	-19.0	-34.8	-36.3	-37.1	-25.2	-40.1	-31.2	Y
30.2	-6.5	-8.1	-4.5	-8.1	-7.5	-2.5	30.2	-5.0	-19.7	-19.7	-33.6	-35.3	-31.6	-35.2	-34.7	-29.6	Y
32.2	-7.4	-3.0	-4.3	-9.7	-3.2	-4.1	32.2	-5.7	-20.4	-20.4	-34.5	-30.1	-31.4	-36.8	-30.3	-31.2	Y
34.2	-7.9	-3.0	-6.7	-8.1	-4.2	-6.4	34.2	-6.4	-21.1	-21.1	-35.0	-30.2	-33.9	-35.2	-31.4	-33.5	Y
36.2	-14.6	-6.3	-6.3	-6.6	-6.9	-2.3	36.2	-7.0	-21.7	-21.7	-41.7	-33.5	-33.4	-33.7	-34.0	-29.4	Y
38.2	-23.5	-9.3	-5.9	-4.0	-4.3	-1.6	38.2	-7.6	-22.3	-22.3	-50.6	-36.4	-33.1	-31.1	-31.4	-28.7	Y
40.2	-15.2	-9.7	-6.2	-1.1	-1.4	-5.9	40.2	-8.1	-22.8	-22.8	-42.4	-36.8	-33.3	-28.2	-28.5	-33.0	Y
42.2	-13.9	-10.9	-13.4	-1.9	-2.2	-7.3	42.2	-8.6	-23.4	-23.4	-41.0	-38.0	-40.5	-29.0	-29.3	-34.4	Y
44.2	-17.4	-8.8	-17.6	-4.8	-4.4	-6.6	44.2	-9.1	-23.9	-23.9	-44.5	-36.0	-44.8	-31.9	-31.5	-33.7	Y
46.2	-15.9	-6.5	-15.1	-6.1	-3.1	-4.9	46.2	-9.6	-24.4	-24.4	-43.1	-33.6	-42.2	-33.3	-30.2	-32.0	Y
48.2	-11.8	-6.4	-18.7	-7.3	-0.5	-2.2	48.2	-10.0	-24.7	-24.7	-39.0	-33.5	-45.8	-34.4	-27.6	-29.3	Y
50.2	-10.3	-7.7	-20.0	-9.8	1.5	-3.7	50.2	-10.0	-24.7	-24.7	-37.4	-34.9	-47.1	-36.9	-25.6	-30.8	Y
52.2	-12.2	-10.9	-18.4	-7.6	0.3	-2.1	52.2	-10.0	-24.7	-24.7	-39.3	-38.0	-45.5	-34.7	-26.9	-29.3	Y
54.2	-15.0	-14.5	-14.2	-4.2	-4.1	1.3	54.2	-10.0	-24.7	-24.7	-42.1	-41.7	-41.3	-31.3	-31.2	-25.8	Y
56.2	-19.4	-13.2	-9.4	-2.3	-9.0	2.0	56.2	-10.0	-24.7	-24.7	-46.5	-40.3	-36.5	-29.4	-36.1	-25.1	Y
58.2	-21.2	-14.0	-8.4	-1.9	-6.0	1.3	58.2	-10.0	-24.7	-24.7	-48.3	-41.1	-35.5	-29.1	-33.2	-25.8	Y
60.2	-21.1	-15.1	-9.9	-1.4	-3.9	0.4	60.2	-10.0	-24.7	-24.7	-48.2	-42.2	-37.0	-28.5	-31.1	-26.7	Y
62.2	-15.7	-16.5	-16.0	-0.5	-3.8	-1.0	62.2	-10.0	-24.7	-24.7	-42.8	-43.7	-43.1	-27.7	-30.9	-28.1	Y

64.2	-10.9	-17.0	-18.8	-1.4	-3.7	-1.9	64.2	-10.0	-24.7	-24.7	-38.0	-44.1	-45.9	-28.5	-30.8	-29.0	Y
66.2	-7.7	-18.7	-13.8	-3.9	-2.8	-1.7	66.2	-10.0	-24.7	-24.7	-34.9	-45.8	-40.9	-31.1	-29.9	-28.8	Y
68.2	-6.1	-23.4	-13.2	-7.5	-2.0	-0.3	68.2	-10.0	-24.7	-24.7	-33.2	-50.6	-40.3	-34.6	-29.1	-27.5	Y
70.2	-6.4	-25.2	-15.6	-7.7	-2.4	0.6	70.2	-10.0	-24.7	-24.7	-33.5	-52.3	-42.7	-34.8	-29.5	-26.5	Y
72.2	-7.7	-26.4	-19.8	-4.3	-3.9	0.4	72.2	-10.0	-24.7	-24.7	-34.8	-53.5	-46.9	-31.4	-31.0	-26.7	Y
74.2	-11.0	-26.2	-21.0	-1.5	-7.8	-0.1	74.2	-10.0	-24.7	-24.7	-38.1	-53.3	-48.1	-28.6	-35.0	-27.2	Y
76.2	-16.5	-20.7	-17.6	-0.3	-11.1	-2.0	76.2	-10.0	-24.7	-24.7	-43.6	-47.8	-44.7	-27.4	-38.2	-29.1	Y
78.2	-18.7	-17.7	-20.0	-0.2	-6.7	-4.3	78.2	-10.0	-24.7	-24.7	-45.9	-44.9	-47.1	-27.3	-33.8	-31.4	Y
80.2	-13.0	-15.4	-21.5	-1.2	-3.8	-7.1	80.2	-10.0	-24.7	-24.7	-40.1	-42.5	-48.7	-28.3	-31.0	-34.2	Y
82.2	-9.6	-15.0	-18.1	-2.6	-3.3	-10.3	82.2	-10.0	-24.7	-24.7	-36.7	-42.1	-45.2	-29.7	-30.4	-37.5	Y
84.2	-9.1	-14.7	-14.9	-4.2	-4.6	-17.4	84.2	-10.0	-24.7	-24.7	-36.2	-41.8	-42.1	-31.3	-31.7	-44.5	Y
86.2	-9.4	-13.9	-12.7	-6.0	-6.5	-22.9	86.2	-10.0	-24.7	-24.7	-36.5	-41.0	-39.8	-33.2	-33.6	-50.0	Y
88.2	-10.1	-15.0	-11.5	-7.8	-10.1	-12.7	88.2	-10.0	-24.7	-24.7	-37.2	-42.1	-38.6	-34.9	-37.2	-39.8	Y
90.2	-10.9	-15.5	-10.2	-7.1	-15.6	-9.6	90.2	-10.0	-24.7	-24.7	-38.0	-42.7	-37.3	-34.3	-42.7	-36.7	Y
92.2	-12.5	-14.6	-11.0	-6.6	-15.2	-8.3	92.2	-10.0	-24.7	-24.7	-39.6	-41.7	-38.1	-33.7	-42.3	-35.4	Y
94.2	-13.5	-15.4	-12.4	-7.0	-10.8	-7.2	94.2	-10.0	-24.7	-24.7	-40.6	-42.5	-39.5	-34.1	-37.9	-34.3	Y
96.2	-15.9	-15.6	-12.5	-7.9	-9.2	-6.2	96.2	-10.0	-24.7	-24.7	-43.0	-42.7	-39.7	-35.0	-36.3	-33.3	Y
98.2	-19.8	-15.7	-13.9	-9.6	-8.7	-6.3	98.2	-10.0	-24.7	-24.7	-47.0	-42.8	-41.0	-36.8	-35.8	-33.4	Y
100.2	-22.7	-15.7	-15.5	-9.8	-8.6	-7.2	100.2	-10.0	-24.7	-24.7	-49.8	-42.8	-42.6	-36.9	-35.7	-34.3	Y
102.2	-22.7	-17.7	-16.5	-9.4	-9.3	-8.0	102.2	-10.0	-24.7	-24.7	-49.9	-44.9	-43.7	-36.5	-36.4	-35.1	Y
104.2	-23.1	-18.9	-18.3	-11.6	-8.9	-8.8	104.2	-10.0	-24.7	-24.7	-50.3	-46.0	-45.5	-38.7	-36.1	-35.9	Y
106.2	-25.3	-18.4	-19.2	-14.0	-8.9	-9.8	106.2	-10.0	-24.7	-24.7	-52.4	-45.5	-46.3	-41.2	-36.0	-36.9	Y
108.2	-25.3	-19.0	-21.4	-14.7	-10.7	-10.5	108.2	-10.0	-24.7	-24.7	-52.4	-46.2	-48.6	-41.9	-37.8	-37.7	Y
110.2	-23.5	-19.9	-20.5	-14.9	-11.7	-11.7	110.2	-10.0	-24.7	-24.7	-50.6	-47.1	-47.7	-42.0	-38.8	-38.8	Y
112.2	-25.3	-21.0	-21.3	-15.8	-12.0	-13.7	112.2	-10.0	-24.7	-24.7	-52.4	-48.1	-48.4	-42.9	-39.1	-40.8	Y
114.2	-30.8	-20.1	-24.2	-17.7	-12.2	-13.3	114.2	-10.0	-24.7	-24.7	-57.9	-47.2	-51.3	-44.8	-39.3	-40.5	Y
116.2	-28.5	-22.9	-23.3	-18.2	-13.3	-14.6	116.2	-10.0	-24.7	-24.7	-55.6	-50.0	-50.5	-45.3	-40.4	-41.7	Y
118.2	-26.1	-23.5	-27.4	-20.4	-13.6	-15.1	118.2	-10.0	-24.7	-24.7	-53.3	-50.6	-54.5	-47.6	-40.7	-42.2	Y
120.2	-26.8	-22.9	-24.9	-19.6	-14.4	-15.3	120.2	-10.0	-24.7	-24.7	-53.9	-50.0	-52.0	-46.7	-41.5	-42.5	Y
122.2	-27.8	-24.0	-24.8	-19.5	-16.5	-16.7	122.2	-10.0	-24.7	-24.7	-54.9	-51.1	-52.0	-46.6	-43.6	-43.8	Y
124.2	-38.5	-25.3	-30.7	-20.2	-15.9	-17.3	124.2	-10.0	-24.7	-24.7	-65.6	-52.4	-57.8	-47.4	-43.1	-44.4	Y
126.2	-26.3	-25.6	-30.3	-24.1	-15.6	-18.1	126.2	-10.0	-24.7	-24.7	-53.4	-52.7	-57.4	-51.2	-42.7	-45.3	Y

128.2	-29.7	-30.3	-26.3	-21.7	-17.1	-18.0	128.2	-10.0	-24.7	-24.7	-56.8	-57.5	-53.4	-48.9	-44.2	-45.1	Y
130.2	-49.4	-26.3	-29.8	-24.7	-17.6	-18.7	130.2	-10.0	-24.7	-24.7	-76.5	-53.5	-57.0	-51.8	-44.7	-45.8	Y
132.2	-29.1	-29.4	-25.6	-25.2	-17.6	-19.9	132.2	-10.0	-24.7	-24.7	-56.3	-56.5	-52.7	-52.4	-44.7	-47.1	Y
134.2	-30.7	-28.5	-24.8	-21.4	-18.9	-19.0	134.2	-10.0	-24.7	-24.7	-57.9	-55.6	-51.9	-48.6	-46.0	-46.1	Y
136.2	-35.7	-28.1	-37.5	-22.1	-18.2	-20.7	136.2	-10.0	-24.7	-24.7	-62.8	-55.2	-64.6	-49.3	-45.3	-47.8	Y
138.2	-28.2	-29.3	-27.9	-28.4	-17.2	-19.7	138.2	-10.0	-24.7	-24.7	-55.3	-56.5	-55.0	-55.5	-44.3	-46.8	Y
140.2	-36.7	-27.4	-29.3	-27.1	-22.8	-20.2	140.2	-10.0	-24.7	-24.7	-63.9	-54.5	-56.4	-54.2	-50.0	-47.3	Y
142.2	-29.8	-33.7	-35.5	-26.9	-17.8	-25.3	142.2	-10.0	-24.7	-24.7	-56.9	-60.8	-62.6	-54.1	-44.9	-52.4	Y
144.2	-35.3	-31.2	-34.9	-23.1	-21.9	-19.1	144.2	-10.0	-24.7	-24.7	-62.4	-58.3	-62.0	-50.2	-49.1	-46.2	Y
146.2	-30.6	-31.6	-26.7	-23.1	-19.9	-20.2	146.2	-10.0	-24.7	-24.7	-57.7	-58.7	-53.9	-50.2	-47.1	-47.4	Y
148.2	-26.9	-39.3	-32.7	-31.3	-17.7	-21.5	148.2	-10.0	-24.7	-24.7	-54.0	-66.4	-59.8	-58.4	-44.9	-48.6	Y
150.2	-34.9	-27.2	-30.5	-23.8	-19.9	-19.3	150.2	-10.0	-24.7	-24.7	-62.0	-54.3	-57.6	-51.0	-47.0	-46.4	Y
152.2	-33.5	-33.7	-33.5	-25.0	-19.3	-20.8	152.2	-10.0	-24.7	-24.7	-60.7	-60.8	-60.6	-52.2	-46.4	-48.0	Y
154.2	-29.8	-30.0	-24.1	-26.1	-22.8	-20.7	154.2	-10.0	-24.7	-24.7	-56.9	-57.1	-51.2	-53.2	-50.0	-47.8	Y
156.2	-51.8	-40.4	-55.5	-21.8	-20.2	-22.9	156.2	-10.0	-24.7	-24.7	-78.9	-67.5	-82.6	-48.9	-47.3	-50.0	Y
158.2	-29.0	-31.3	-30.1	-24.6	-19.0	-22.9	158.2	-10.0	-24.7	-24.7	-56.2	-58.4	-57.2	-51.8	-46.2	-50.0	Y
160.2	-30.3	-27.3	-26.9	-23.2	-18.0	-23.5	160.2	-10.0	-24.7	-24.7	-57.4	-54.5	-54.0	-50.3	-45.1	-50.6	Y
162.2	-30.6	-32.6	-37.5	-23.6	-19.2	-15.5	162.2	-10.0	-24.7	-24.7	-57.7	-59.7	-64.7	-50.7	-46.3	-42.6	Y
164.2	-25.5	-27.7	-39.2	-49.5	-19.6	-20.0	164.2	-10.0	-24.7	-24.7	-52.6	-54.8	-66.4	-76.6	-46.7	-47.1	Y
166.2	-37.0	-35.8	-32.6	-21.7	-20.3	-30.6	166.2	-10.0	-24.7	-24.7	-64.2	-62.9	-59.7	-48.8	-47.4	-57.7	Y
168.2	-31.4	-21.2	-22.0	-23.5	-32.7	-20.4	168.2	-10.0	-24.7	-24.7	-58.5	-48.3	-49.1	-50.7	-59.8	-47.5	Y
170.2	-36.4	-29.5	-36.1	-25.4	-23.4	-16.1	170.2	-10.0	-24.7	-24.7	-63.5	-56.6	-63.3	-52.5	-50.5	-43.2	Y
172.2	-36.1	-29.4	-26.2	-19.7	-15.0	-14.5	172.2	-10.0	-24.7	-24.7	-63.2	-56.5	-53.3	-46.9	-42.1	-41.6	Y
174.2	-29.4	-22.7	-32.0	-19.4	-15.4	-22.7	174.2	-10.0	-24.7	-24.7	-56.5	-49.8	-59.1	-46.5	-42.5	-49.8	Y
176.2	-30.3	-35.4	-29.9	-22.6	-21.7	-23.9	176.2	-10.0	-24.7	-24.7	-57.5	-62.6	-57.0	-49.7	-48.8	-51.0	Y
178.2	-19.2	-18.5	-17.9	-28.0	-17.0	-14.9	178.2	-10.0	-24.7	-24.7	-46.3	-45.6	-45.1	-55.2	-44.2	-42.0	Y
180.0	-14.8	-11.1	-11.7	-14.8	-10.3	-10.5	180.0	-10.0	-24.7	-24.7	-41.9	-38.2	-38.9	-41.9	-37.4	-37.7	Y

Table 9 36 MHZ	X-pol Antenna Gain (dBi)						Off Axis Angle (degree)	FCC 25.209	FCC §25.221 EIRP X-Pol Mask, N = 16	X-Pol ESV EIRP (dBW/4 kHz)						Meets Mask
	5.85 H plane	6.138 H Plane	6.425 H Plane	5.85 E plane	6.138 E Plane	6.425 E plane				5.85 H plane	6.138 H Plane	6.425 H Plane	5.85 E plane	6.138 E Plane	6.425 E plane	
-9.2	-12.8	-5.3	-17.6	-10.0	-18.0	-15.2	-9.2	-2.0	-16.7	-36.9	-29.4	-41.7	-34.1	-42.1	-39.3	Y
-9.1	-12.8	-5.3	-17.3	-9.6	-18.5	-14.4	-9.1	-2.0	-16.7	-36.9	-29.4	-41.4	-33.7	-42.7	-38.5	Y
-9.0	-12.8	-5.3	-16.9	-9.4	-19.2	-13.7	-9.0	-2.0	-16.7	-36.9	-29.4	-41.1	-33.5	-43.3	-37.8	Y
-8.9	-13.0	-5.3	-17.0	-9.4	-20.3	-12.9	-8.9	-2.0	-16.7	-37.1	-29.4	-41.1	-33.5	-44.4	-37.1	Y
-8.8	-13.0	-5.2	-16.5	-9.2	-21.4	-12.4	-8.8	-2.0	-16.7	-37.1	-29.4	-40.6	-33.3	-45.5	-36.5	Y
-8.7	-13.7	-5.4	-16.2	-9.2	-23.5	-11.9	-8.7	-2.0	-16.7	-37.8	-29.6	-40.3	-33.3	-47.6	-36.0	Y
-8.6	-14.0	-5.6	-15.8	-9.2	-26.5	-11.4	-8.6	-2.0	-16.7	-38.1	-29.7	-39.9	-33.3	-50.6	-35.5	Y
-8.5	-14.7	-5.8	-15.4	-9.3	-32.0	-10.7	-8.5	-2.0	-16.7	-38.8	-29.9	-39.5	-33.4	-56.1	-34.8	Y
-8.4	-15.5	-6.0	-15.0	-9.5	-39.0	-10.2	-8.4	-2.0	-16.7	-39.6	-30.1	-39.2	-33.7	-63.1	-34.3	Y
-8.3	-16.4	-6.2	-15.0	-9.6	-31.9	-9.7	-8.3	-2.0	-16.7	-40.5	-30.3	-39.1	-33.7	-56.0	-33.8	Y
-8.2	-17.6	-6.5	-14.4	-10.1	-25.3	-9.2	-8.2	-2.0	-16.7	-41.7	-30.6	-38.6	-34.2	-49.4	-33.3	Y
-8.1	-18.9	-6.6	-14.2	-10.4	-21.7	-8.6	-8.1	-2.0	-16.7	-43.0	-30.7	-38.3	-34.5	-45.8	-32.8	Y
-8.0	-20.0	-6.8	-14.1	-10.7	-18.8	-8.2	-8.0	-2.0	-16.7	-44.1	-30.9	-38.2	-34.8	-42.9	-32.3	Y
-7.9	-20.4	-7.0	-13.8	-10.9	-16.4	-7.6	-7.9	-2.0	-16.7	-44.5	-31.1	-37.9	-35.1	-40.5	-31.7	Y
-7.8	-19.5	-7.0	-13.7	-11.5	-14.3	-7.2	-7.8	-2.0	-16.7	-43.7	-31.1	-37.8	-35.6	-38.5	-31.3	Y
-7.7	-17.7	-7.0	-13.7	-11.6	-12.4	-6.7	-7.7	-2.0	-16.7	-41.8	-31.1	-37.8	-35.7	-36.5	-30.8	Y
-7.6	-15.7	-6.7	-13.8	-11.7	-11.0	-6.3	-7.6	-2.0	-16.7	-39.8	-30.8	-37.9	-35.8	-35.1	-30.4	Y
-7.5	-13.7	-6.2	-13.9	-11.4	-9.5	-5.8	-7.5	-2.0	-16.7	-37.8	-30.3	-38.0	-35.5	-33.6	-29.9	Y
-7.4	-11.9	-5.7	-14.4	-10.9	-8.1	-5.3	-7.4	-2.0	-16.7	-36.1	-29.8	-38.5	-35.0	-32.2	-29.5	Y
-7.3	-10.3	-5.0	-14.9	-10.2	-6.9	-4.9	-7.3	-2.0	-16.7	-34.4	-29.1	-39.0	-34.3	-31.0	-29.1	Y
-7.2	-8.9	-4.4	-15.6	-9.2	-5.6	-4.5	-7.2	-2.0	-16.7	-33.0	-28.5	-39.7	-33.3	-29.8	-28.6	Y
-7.1	-7.7	-3.8	-16.6	-8.3	-4.7	-4.1	-7.1	-2.0	-16.7	-31.9	-27.9	-40.7	-32.4	-28.8	-28.3	Y
-7.0	-6.6	-3.0	-17.7	-7.3	-3.7	-3.7	-7.0	-2.0	-16.7	-30.7	-27.1	-41.8	-31.4	-27.8	-27.8	Y
-6.9	-5.7	-2.3	-20.0	-6.4	-2.8	-3.4	-6.9	-2.0	-16.8	-29.8	-26.4	-44.1	-30.5	-26.9	-27.5	Y
-6.8	-4.8	-1.6	-21.8	-5.6	-1.9	-3.0	-6.8	-1.9	-16.6	-28.9	-25.7	-45.9	-29.7	-26.1	-27.1	Y
-6.7	-4.0	-0.9	-22.0	-4.7	-1.2	-2.7	-6.7	-1.7	-16.4	-28.1	-25.0	-46.1	-28.9	-25.3	-26.8	Y

-6.6	-3.3	-0.3	-20.4	-4.0	-0.5	-2.3	-6.6	-1.5	-16.3	-27.4	-24.5	-44.5	-28.1	-24.6	-26.4	Y
-6.5	-2.7	0.2	-17.7	-3.4	0.2	-1.9	-6.5	-1.4	-16.1	-26.8	-23.9	-41.8	-27.5	-23.9	-26.0	Y
-6.4	-2.1	0.8	-15.0	-2.9	0.7	-1.6	-6.4	-1.2	-15.9	-26.2	-23.3	-39.1	-27.0	-23.4	-25.7	Y
-6.3	-1.7	1.3	-12.7	-2.5	1.2	-1.2	-6.3	-1.0	-15.8	-25.8	-22.8	-36.9	-26.6	-22.9	-25.3	Y
-6.2	-1.2	1.8	-10.8	-2.1	1.6	-0.8	-6.2	-0.9	-15.6	-25.4	-22.3	-34.9	-26.2	-22.5	-25.0	Y
-6.1	-0.9	2.2	-9.1	-1.9	1.9	-0.5	-6.1	-0.7	-15.4	-25.0	-21.9	-33.2	-26.0	-22.2	-24.6	Y
-6.0	-0.6	2.6	-7.6	-1.6	2.2	-0.2	-6.0	-0.5	-15.2	-24.7	-21.5	-31.8	-25.7	-21.9	-24.3	Y
-5.9	-0.3	3.0	-6.5	-1.5	2.4	0.2	-5.9	-0.3	-15.1	-24.4	-21.1	-30.6	-25.6	-21.8	-23.9	Y
-5.8	0.0	3.3	-5.4	-1.3	2.4	0.6	-5.8	-0.1	-14.9	-24.1	-20.8	-29.5	-25.5	-21.7	-23.5	Y
-5.7	0.1	3.7	-4.5	-1.3	2.5	0.9	-5.7	0.0	-14.7	-24.0	-20.4	-28.6	-25.4	-21.7	-23.2	Y
-5.6	0.3	4.0	-3.7	-1.3	2.4	1.2	-5.6	0.2	-14.5	-23.8	-20.2	-27.8	-25.4	-21.7	-22.9	Y
-5.5	0.5	4.2	-3.1	-1.2	2.3	1.6	-5.5	0.4	-14.3	-23.6	-19.9	-27.3	-25.3	-21.9	-22.5	Y
-5.4	0.6	4.4	-2.5	-1.2	2.0	1.9	-5.4	0.6	-14.1	-23.5	-19.7	-26.7	-25.3	-22.1	-22.2	Y
-5.3	0.7	4.6	-2.1	-1.0	1.7	2.2	-5.3	0.8	-13.9	-23.5	-19.5	-26.2	-25.1	-22.4	-21.9	Y
-5.2	0.7	4.8	-1.9	-0.8	1.4	2.5	-5.2	1.0	-13.7	-23.4	-19.3	-26.0	-25.0	-22.7	-21.6	Y
-5.1	0.8	4.9	-1.7	-0.6	1.0	2.8	-5.1	1.2	-13.5	-23.3	-19.2	-25.8	-24.7	-23.1	-21.4	Y
-5.0	0.8	5.0	-1.6	-0.2	0.5	3.0	-5.0	1.5	-13.3	-23.3	-19.1	-25.7	-24.3	-23.6	-21.1	Y
-4.9	0.8	5.1	-1.6	0.3	0.1	3.2	-4.9	1.7	-13.1	-23.3	-19.0	-25.7	-23.8	-24.0	-20.9	Y
-4.8	0.8	5.1	-1.7	0.9	-0.2	3.4	-4.8	1.9	-12.8	-23.3	-19.0	-25.8	-23.2	-24.3	-20.7	Y
-4.7	0.8	5.2	-1.9	1.5	-0.5	3.6	-4.7	2.1	-12.6	-23.3	-18.9	-26.0	-22.7	-24.6	-20.5	Y
-4.6	0.8	5.1	-2.2	2.1	-0.6	3.8	-4.6	2.4	-12.4	-23.4	-19.0	-26.3	-22.0	-24.7	-20.3	Y
-4.5	0.7	5.0	-2.6	2.7	-0.6	3.9	-4.5	2.6	-12.1	-23.4	-19.1	-26.7	-21.4	-24.7	-20.2	Y
-4.4	0.6	4.9	-3.1	3.2	-0.5	4.0	-4.4	2.8	-11.9	-23.5	-19.2	-27.2	-20.9	-24.6	-20.1	Y
-4.3	0.5	4.8	-3.6	3.8	-0.3	4.1	-4.3	3.1	-11.7	-23.6	-19.4	-27.7	-20.4	-24.4	-20.0	Y
-4.2	0.4	4.5	-4.2	4.2	0.0	4.1	-4.2	3.3	-11.4	-23.7	-19.6	-28.3	-19.9	-24.1	-20.0	Y
-4.1	0.4	4.2	-4.7	4.6	0.3	4.1	-4.1	3.6	-11.1	-23.7	-19.9	-28.8	-19.5	-23.8	-20.0	Y
-4.0	0.5	3.9	-5.1	5.0	0.7	4.1	-4.0	3.9	-10.8	-23.6	-20.2	-29.2	-19.1	-23.4	-20.0	Y
-3.9	0.7	3.5	-5.3	5.3	1.0	4.0	-3.9	4.1	-10.6	-23.4	-20.6	-29.4	-18.8	-23.1	-20.1	Y
-3.8	0.9	3.1	-5.2	5.5	1.4	3.8	-3.8	4.4	-10.3	-23.2	-21.1	-29.3	-18.6	-22.7	-20.3	Y
-3.7	1.3	2.5	-4.7	5.6	1.8	3.6	-3.7	4.7	-10.0	-22.8	-21.6	-28.8	-18.5	-22.4	-20.5	Y
-3.6	1.9	2.0	-4.0	5.7	2.2	3.4	-3.6	5.0	-9.7	-22.2	-22.1	-28.1	-18.4	-21.9	-20.7	Y
-3.5	2.5	1.4	-3.1	5.7	2.8	3.0	-3.5	5.3	-9.4	-21.6	-22.7	-27.2	-18.4	-21.4	-21.1	Y

-3.4	3.2	0.8	-2.1	5.7	3.3	2.6	-3.4	5.6	-9.1	-20.9	-23.3	-26.2	-18.4	-20.8	-21.5	Y
-3.3	4.0	0.4	-1.0	5.6	4.0	2.1	-3.3	5.9	-8.8	-20.1	-23.7	-25.1	-18.5	-20.1	-22.1	Y
-3.2	4.7	0.2	0.0	5.4	4.7	1.5	-3.2	6.3	-8.5	-19.4	-23.9	-24.1	-18.7	-19.4	-22.6	Y
-3.1	5.5	0.4	1.0	5.2	5.4	0.7	-3.1	6.6	-8.1	-18.6	-23.7	-23.2	-18.9	-18.7	-23.4	Y
-3.0	6.2	0.9	1.9	5.0	6.1	-0.2	-3.0	7.0	-7.8	-17.9	-23.2	-22.2	-19.1	-18.0	-24.3	Y
-2.9	7.0	1.8	2.7	4.9	6.8	-1.3	-2.9	7.3	-7.4	-17.2	-22.3	-21.4	-19.3	-17.3	-25.4	Y
-2.8	7.6	2.8	3.5	4.7	7.6	-2.5	-2.8	7.7	-7.0	-16.5	-21.3	-20.6	-19.4	-16.6	-26.7	Y
-2.7	8.3	3.9	4.2	4.6	8.2	-4.0	-2.7	8.1	-6.6	-15.8	-20.2	-19.9	-19.5	-15.9	-28.1	Y
-2.6	8.9	5.1	4.9	4.5	8.9	-5.2	-2.6	8.5	-6.2	-15.2	-19.0	-19.2	-19.6	-15.3	-29.3	Y
-2.5	9.5	6.1	5.5	4.6	9.5	-5.9	-2.5	8.9	-5.8	-14.6	-18.0	-18.6	-19.5	-14.7	-30.0	Y
-2.4	10.0	7.2	6.1	4.7	10.0	-5.4	-2.4	9.4	-5.4	-14.1	-16.9	-18.0	-19.4	-14.1	-29.5	Y
-2.3	10.5	8.2	6.6	4.9	10.5	-3.9	-2.3	9.8	-4.9	-13.6	-16.0	-17.5	-19.2	-13.6	-28.0	Y
-2.2	11.0	9.0	7.1	5.2	10.9	-2.1	-2.2	10.3	-4.4	-13.1	-15.1	-17.0	-18.9	-13.2	-26.2	Y
-2.1	11.5	9.8	7.6	5.5	11.3	-0.3	-2.1	10.8	-4.0	-12.7	-14.3	-16.5	-18.6	-12.8	-24.4	Y
-2.0	11.9	10.6	8.0	5.9	11.7	1.4	-2.0	11.3	-3.4	-12.2	-13.5	-16.1	-18.2	-12.4	-22.7	Y
-1.9	12.2	11.3	8.4	6.2	12.0	2.9	-1.9	11.9	-2.9	-11.9	-12.8	-15.7	-17.9	-12.1	-21.2	Y
-1.8	12.6	11.9	8.8	6.6	12.3	4.3	-1.8	12.6	-2.1	-11.5	-12.2	-15.3	-17.5	-11.8	-19.9	Y
-1.7	12.9	12.5	9.1	7.0	12.5	5.5	-1.7			-11.2	-11.6	-15.0	-17.1	-11.6	-18.7	Y
-1.6	13.2	13.0	9.4	7.4	12.7	6.5	-1.6			-10.9	-11.1	-14.7	-16.7	-11.4	-17.6	Y
-1.5	13.5	13.5	9.7	7.8	12.8	7.5	-1.5			-10.6	-10.6	-14.4	-16.3	-11.3	-16.6	Y
-1.4	13.8	14.0	10.0	8.1	13.0	8.3	-1.4			-10.3	-10.1	-14.2	-16.0	-11.1	-15.9	Y
-1.3	14.0	14.3	10.2	8.5	13.1	9.0	-1.3			-10.1	-9.8	-13.9	-15.7	-11.0	-15.1	Y
-1.2	14.2	14.7	10.4	8.8	13.2	9.7	-1.2			-9.9	-9.4	-13.7	-15.3	-10.9	-14.4	Y
-1.1	14.4	15.1	10.7	9.1	13.2	10.3	-1.1			-9.7	-9.0	-13.4	-15.0	-10.9	-13.8	Y
-1.0	14.6	15.4	10.9	9.4	13.3	10.8	-1.0			-9.5	-8.7	-13.2	-14.7	-10.8	-13.3	Y
-0.9	14.8	15.6	11.1	9.7	13.3	11.3	-0.9			-9.4	-8.5	-13.0	-14.4	-10.8	-12.8	Y
-0.8	14.9	15.9	11.3	9.9	13.4	11.7	-0.8			-9.2	-8.2	-12.8	-14.2	-10.7	-12.4	Y
-0.7	15.0	16.1	11.5	10.2	13.4	12.0	-0.7			-9.1	-8.0	-12.6	-13.9	-10.7	-12.1	Y
-0.6	15.1	16.2	11.6	10.5	13.4	12.3	-0.6			-9.0	-7.9	-12.5	-13.7	-10.7	-11.8	Y
-0.5	15.2	16.4	11.8	10.7	13.5	12.5	-0.5			-8.9	-7.7	-12.3	-13.4	-10.6	-11.6	Y
-0.4	15.2	16.5	12.0	10.9	13.5	12.7	-0.4			-8.9	-7.6	-12.1	-13.2	-10.6	-11.4	Y
-0.3	15.2	16.6	12.1	11.2	13.5	12.8	-0.3			-8.9	-7.5	-12.0	-12.9	-10.6	-11.3	Y

-0.2	15.2	16.6	12.2	11.4	13.6	12.9	-0.2			-8.9	-7.5	-11.9	-12.7	-10.5	-11.2	Y
-0.1	15.2	16.7	12.4	11.6	13.6	13.0	-0.1			-8.9	-7.4	-11.8	-12.5	-10.5	-11.1	Y
0.0	15.2	16.7	12.5	11.9	13.6	13.0	0.0			-8.9	-7.4	-11.6	-12.3	-10.5	-11.1	Y
0.1	15.2	16.7	12.6	12.1	13.6	12.9	0.1			-8.9	-7.4	-11.5	-12.0	-10.5	-11.2	Y
0.2	15.1	16.7	12.6	12.3	13.6	12.8	0.2			-9.0	-7.4	-11.5	-11.8	-10.5	-11.3	Y
0.3	15.0	16.6	12.6	12.5	13.6	12.7	0.3			-9.1	-7.5	-11.5	-11.6	-10.5	-11.4	Y
0.4	14.9	16.6	12.6	12.6	13.5	12.6	0.4			-9.2	-7.5	-11.5	-11.5	-10.6	-11.6	Y
0.5	14.8	16.5	12.6	12.8	13.4	12.4	0.5			-9.3	-7.6	-11.5	-11.3	-10.7	-11.7	Y
0.6	14.7	16.4	12.6	12.9	13.2	12.2	0.6			-9.4	-7.7	-11.5	-11.2	-10.9	-11.9	Y
0.7	14.5	16.3	12.5	13.0	13.1	11.9	0.7			-9.6	-7.8	-11.6	-11.1	-11.0	-12.2	Y
0.8	14.4	16.2	12.4	13.1	12.8	11.7	0.8			-9.7	-7.9	-11.7	-11.0	-11.3	-12.4	Y
0.9	14.2	16.1	12.3	13.1	12.6	11.5	0.9			-9.9	-8.0	-11.9	-11.0	-11.5	-12.6	Y
1.0	14.0	15.9	12.1	13.1	12.3	11.2	1.0			-10.1	-8.2	-12.0	-11.0	-11.8	-12.9	Y
1.1	13.8	15.7	11.9	13.1	11.9	11.0	1.1			-10.3	-8.4	-12.2	-11.0	-12.2	-13.1	Y
1.2	13.6	15.6	11.6	13.1	11.5	10.7	1.2			-10.5	-8.5	-12.5	-11.0	-12.6	-13.4	Y
1.3	13.3	15.3	11.4	13.0	11.0	10.4	1.3			-10.8	-8.8	-12.8	-11.1	-13.2	-13.7	Y
1.4	13.1	15.1	11.0	12.8	10.4	10.1	1.4			-11.1	-9.0	-13.1	-11.3	-13.7	-14.0	Y
1.5	12.8	14.9	10.8	12.7	9.7	9.8	1.5			-11.3	-9.2	-13.4	-11.4	-14.4	-14.3	Y
1.6	12.5	14.6	10.4	12.5	9.1	9.5	1.6			-11.6	-9.5	-13.7	-11.6	-15.0	-14.6	Y
1.7	12.2	14.4	10.0	12.3	8.3	9.2	1.7			-11.9	-9.7	-14.1	-11.8	-15.8	-14.9	Y
1.8	11.8	14.1	9.6	12.0	7.4	8.8	1.8	12.6	-2.1	-12.3	-10.0	-14.5	-12.1	-16.7	-15.3	Y
1.9	11.5	13.7	9.2	11.7	6.5	8.4	1.9	12.2	-2.5	-12.6	-10.4	-15.0	-12.4	-17.6	-15.8	Y
2.0	11.1	13.3	8.7	11.4	5.4	7.9	2.0	11.6	-3.1	-13.0	-10.8	-15.4	-12.8	-18.7	-16.2	Y
2.1	10.7	12.9	8.2	11.0	4.2	7.4	2.1	11.1	-3.6	-13.4	-11.2	-15.9	-13.1	-19.9	-16.7	Y
2.2	10.3	12.5	7.7	10.6	3.0	6.8	2.2	10.6	-4.2	-13.8	-11.6	-16.4	-13.6	-21.2	-17.3	Y
2.3	9.8	12.0	7.2	10.1	1.5	6.2	2.3	10.1	-4.6	-14.3	-12.1	-16.9	-14.0	-22.6	-17.9	Y
2.4	9.4	11.5	6.7	9.6	-0.1	5.5	2.4	9.6	-5.1	-14.8	-12.6	-17.4	-14.5	-24.2	-18.7	Y
2.5	8.9	10.9	6.2	9.0	-2.0	4.7	2.5	9.2	-5.6	-15.3	-13.2	-17.9	-15.1	-26.1	-19.4	Y
2.6	8.3	10.3	5.6	8.5	-4.0	3.9	2.6	8.8	-6.0	-15.8	-13.8	-18.5	-15.7	-28.1	-20.2	Y
2.7	7.7	9.6	5.0	7.8	-6.3	3.0	2.7	8.3	-6.4	-16.4	-14.5	-19.1	-16.3	-30.4	-21.1	Y
2.8	7.1	8.9	4.3	7.2	-9.0	2.1	2.8	7.9	-6.8	-17.0	-15.3	-19.8	-17.0	-33.1	-22.0	Y
2.9	6.5	8.1	3.7	6.4	-11.7	1.3	2.9	7.6	-7.2	-17.6	-16.0	-20.5	-17.7	-35.8	-22.8	Y

3.0	5.8	7.3	2.8	5.6	-13.9	0.6	3.0	7.2	-7.6	-18.3	-16.8	-21.3	-18.5	-38.0	-23.5	Y
3.1	5.1	6.5	2.0	4.7	-13.8	0.0	3.1	6.8	-7.9	-19.0	-17.6	-22.1	-19.4	-37.9	-24.1	Y
3.2	4.2	5.7	1.1	3.7	-12.2	-0.3	3.2	6.5	-8.3	-19.9	-18.4	-23.1	-20.4	-36.3	-24.4	Y
3.3	3.4	5.0	0.0	2.7	-10.4	-0.3	3.3	6.1	-8.6	-20.7	-19.1	-24.1	-21.4	-34.5	-24.4	Y
3.4	2.5	4.3	-1.1	1.5	-9.0	0.0	3.4	5.8	-8.9	-21.6	-19.8	-25.2	-22.7	-33.1	-24.1	Y
3.5	1.5	3.9	-2.3	0.0	-7.8	0.4	3.5	5.5	-9.2	-22.6	-20.2	-26.4	-24.1	-31.9	-23.7	Y
3.6	0.4	3.6	-3.7	-1.6	-6.9	0.9	3.6	5.2	-9.6	-23.7	-20.5	-27.8	-25.7	-31.0	-23.3	Y
3.7	-0.7	3.6	-4.9	-3.6	-6.1	1.5	3.7	4.9	-9.9	-24.8	-20.6	-29.0	-27.7	-30.3	-22.6	Y
3.8	-2.0	3.6	-5.9	-6.2	-5.5	2.1	3.8	4.6	-10.1	-26.1	-20.5	-30.1	-30.3	-29.6	-22.0	Y
3.9	-3.3	3.8	-6.5	-9.4	-5.0	2.6	3.9	4.3	-10.4	-27.4	-20.3	-30.6	-33.5	-29.2	-21.5	Y
4.0	-4.8	4.1	-6.5	-13.4	-4.6	3.1	4.0	4.0	-10.7	-28.9	-20.0	-30.7	-37.5	-28.7	-21.0	Y
4.1	-6.4	4.3	-6.0	-14.6	-4.3	3.6	4.1	3.8	-11.0	-30.5	-19.8	-30.1	-38.7	-28.4	-20.5	Y
4.2	-8.1	4.5	-5.2	-11.1	-4.2	4.0	4.2	3.5	-11.2	-32.2	-19.6	-29.3	-35.2	-28.3	-20.1	Y
4.3	-9.9	4.7	-4.3	-7.6	-4.0	4.3	4.3	3.2	-11.5	-34.0	-19.4	-28.4	-31.7	-28.1	-19.8	Y
4.4	-11.6	4.8	-3.5	-5.1	-4.0	4.6	4.4	3.0	-11.8	-35.7	-19.3	-27.7	-29.2	-28.1	-19.5	Y
4.5	-13.0	4.9	-2.9	-3.1	-4.0	4.8	4.5	2.7	-12.0	-37.1	-19.2	-27.0	-27.2	-28.1	-19.4	Y
4.6	-13.7	4.9	-2.3	-1.6	-4.1	4.9	4.6	2.5	-12.2	-37.8	-19.2	-26.4	-25.8	-28.2	-19.2	Y
4.7	-13.9	4.9	-1.9	-0.4	-4.2	5.0	4.7	2.3	-12.5	-38.0	-19.3	-26.0	-24.5	-28.3	-19.1	Y
4.8	-13.5	4.8	-1.5	0.6	-4.5	5.0	4.8	2.0	-12.7	-37.6	-19.4	-25.6	-23.5	-28.6	-19.1	Y
4.9	-12.8	4.6	-1.3	1.4	-4.8	4.9	4.9	1.8	-12.9	-36.9	-19.5	-25.4	-22.7	-28.9	-19.2	Y
5.0	-12.0	4.4	-1.2	2.0	-5.1	4.8	5.0	1.6	-13.2	-36.2	-19.7	-25.3	-22.1	-29.2	-19.3	Y
5.1	-11.5	4.2	-1.1	2.6	-5.5	4.7	5.1	1.4	-13.4	-35.6	-19.9	-25.3	-21.5	-29.6	-19.5	Y
5.2	-10.9	3.9	-1.3	3.0	-5.9	4.4	5.2	1.2	-13.6	-35.0	-20.2	-25.4	-21.1	-30.0	-19.7	Y
5.3	-10.6	3.6	-1.5	3.3	-6.3	4.1	5.3	1.0	-13.8	-34.7	-20.6	-25.6	-20.8	-30.4	-20.0	Y
5.4	-10.3	3.2	-1.7	3.5	-6.8	3.7	5.4	0.8	-14.0	-34.4	-20.9	-25.8	-20.6	-30.9	-20.4	Y
5.5	-10.1	2.8	-2.2	3.6	-7.3	3.4	5.5	0.6	-14.2	-34.2	-21.3	-26.3	-20.5	-31.4	-20.7	Y
5.6	-10.0	2.3	-2.7	3.7	-7.8	3.0	5.6	0.4	-14.4	-34.1	-21.8	-26.8	-20.4	-32.0	-21.2	Y
5.7	-10.1	1.9	-3.3	3.7	-8.2	2.5	5.7	0.2	-14.6	-34.2	-22.2	-27.4	-20.4	-32.3	-21.6	Y
5.8	-10.2	1.4	-4.0	3.6	-8.8	2.0	5.8	0.0	-14.8	-34.3	-22.7	-28.1	-20.5	-32.9	-22.1	Y
5.9	-10.2	0.8	-4.8	3.5	-9.0	1.5	5.9	-0.2	-15.0	-34.3	-23.3	-28.9	-20.6	-33.1	-22.6	Y
6.0	-10.4	0.2	-5.7	3.3	-9.7	1.0	6.0	-0.4	-15.1	-34.5	-23.9	-29.8	-20.8	-33.8	-23.1	Y
6.1	-10.6	-0.4	-6.6	3.1	-10.1	0.5	6.1	-0.6	-15.3	-34.7	-24.5	-30.7	-21.0	-34.2	-23.6	Y

6.2	-10.9	-1.1	-7.6	2.8	-10.5	0.0	6.2	-0.8	-15.5	-35.0	-25.2	-31.7	-21.3	-34.6	-24.1	Y
6.3	-11.2	-1.9	-8.7	2.5	-10.9	-0.5	6.3	-0.9	-15.7	-35.3	-26.0	-32.8	-21.6	-35.0	-24.6	Y
6.4	-11.5	-2.7	-9.8	2.2	-11.2	-0.9	6.4	-1.1	-15.8	-35.6	-26.8	-33.9	-22.0	-35.3	-25.1	Y
6.5	-11.7	-3.5	-10.8	1.8	-11.5	-1.4	6.5	-1.3	-16.0	-35.9	-27.7	-34.9	-22.3	-35.6	-25.5	Y
6.6	-12.1	-4.5	-11.7	1.4	-11.9	-1.7	6.6	-1.4	-16.2	-36.2	-28.6	-35.9	-22.7	-36.0	-25.9	Y
6.7	-12.5	-5.6	-12.5	1.0	-12.2	-2.1	6.7	-1.6	-16.3	-36.6	-29.7	-36.6	-23.1	-36.3	-26.2	Y
6.8	-12.7	-6.7	-13.3	0.6	-12.6	-2.4	6.8	-1.8	-16.5	-36.8	-30.9	-37.4	-23.5	-36.7	-26.6	Y
6.9	-13.1	-8.0	-13.9	0.2	-13.0	-2.8	6.9	-1.9	-16.7	-37.2	-32.1	-38.0	-23.9	-37.1	-26.9	Y
7.0	-13.3	-9.4	-14.6	-0.2	-13.4	-3.1	7.0	-2.1	-16.8	-37.4	-33.5	-38.7	-24.3	-37.5	-27.2	Y
7.1	-13.6	-10.9	-15.3	-0.6	-13.9	-3.4	7.1	-2.0	-16.7	-37.7	-35.1	-39.4	-24.7	-38.0	-27.5	Y
7.2	-13.8	-12.7	-16.0	-1.0	-14.4	-3.8	7.2	-2.0	-16.7	-37.9	-36.8	-40.1	-25.1	-38.6	-27.9	Y
7.3	-14.0	-14.6	-17.0	-1.3	-15.0	-4.2	7.3	-2.0	-16.7	-38.1	-38.7	-41.1	-25.5	-39.1	-28.3	Y
7.4	-14.2	-17.0	-18.0	-1.7	-16.0	-4.6	7.4	-2.0	-16.7	-38.3	-41.1	-42.1	-25.8	-40.1	-28.7	Y
7.5	-14.2	-19.1	-19.0	-2.0	-17.1	-5.0	7.5	-2.0	-16.7	-38.3	-43.2	-43.1	-26.1	-41.2	-29.1	Y
7.6	-14.4	-20.6	-20.0	-2.3	-18.3	-5.6	7.6	-2.0	-16.7	-38.5	-44.7	-44.1	-26.4	-42.4	-29.7	Y
7.7	-14.7	-20.8	-20.7	-2.6	-19.8	-6.1	7.7	-2.0	-16.7	-38.8	-44.9	-44.8	-26.7	-44.0	-30.2	Y
7.8	-14.8	-19.7	-20.6	-2.9	-21.9	-6.7	7.8	-2.0	-16.7	-38.9	-43.9	-44.7	-27.0	-46.0	-30.8	Y
7.9	-15.1	-18.3	-20.3	-3.2	-24.2	-7.3	7.9	-2.0	-16.7	-39.2	-42.4	-44.4	-27.3	-48.3	-31.4	Y
8.0	-15.3	-16.9	-19.4	-3.4	-26.8	-7.8	8.0	-2.0	-16.7	-39.4	-41.0	-43.5	-27.6	-51.0	-31.9	Y
8.1	-15.5	-15.9	-18.5	-3.7	-27.0	-8.3	8.1	-2.0	-16.7	-39.6	-40.0	-42.6	-27.8	-51.1	-32.4	Y
8.2	-15.7	-15.1	-17.7	-4.0	-24.9	-8.7	8.2	-2.0	-16.7	-39.9	-39.2	-41.8	-28.1	-49.0	-32.8	Y
8.3	-16.0	-14.3	-16.6	-4.2	-22.5	-8.9	8.3	-2.0	-16.7	-40.1	-38.4	-40.7	-28.4	-46.6	-33.1	Y
8.4	-16.3	-13.6	-15.8	-4.5	-20.2	-9.2	8.4	-2.0	-16.7	-40.4	-37.7	-39.9	-28.6	-44.3	-33.3	Y
8.5	-16.6	-13.2	-15.3	-4.7	-18.5	-9.2	8.5	-2.0	-16.7	-40.7	-37.3	-39.4	-28.8	-42.6	-33.3	Y
8.6	-17.2	-12.9	-14.7	-4.9	-17.0	-9.1	8.6	-2.0	-16.7	-41.3	-37.0	-38.8	-29.1	-41.1	-33.2	Y
8.7	-17.6	-12.7	-14.3	-5.1	-16.0	-9.0	8.7	-2.0	-16.7	-41.7	-36.8	-38.4	-29.2	-40.1	-33.2	Y
8.8	-18.5	-12.4	-13.9	-5.4	-15.2	-8.9	8.8	-2.0	-16.7	-42.7	-36.6	-38.0	-29.5	-39.3	-33.0	Y
8.9	-19.2	-12.4	-13.5	-5.5	-14.8	-8.8	8.9	-2.0	-16.7	-43.3	-36.5	-37.6	-29.6	-38.9	-32.9	Y
9.0	-20.3	-12.3	-13.0	-5.7	-14.0	-8.7	9.0	-2.0	-16.7	-44.4	-36.4	-37.1	-29.8	-38.1	-32.8	Y
9.1	-21.5	-12.3	-12.5	-5.8	-13.7	-8.6	9.1	-2.0	-16.7	-45.6	-36.4	-36.6	-29.9	-37.9	-32.7	Y
9.2	-22.9	-12.4	-12.1	-5.9	-13.6	-8.5	9.2	-2.0	-16.7	-47.1	-36.5	-36.2	-30.0	-37.7	-32.7	Y

4. Pointing Accuracy

The V11 terminal will utilize a motion stabilized tracking antenna and a direct sequence spread spectrum (DSSS) burst modem manufactured by ViaSat to access the satellite. This approach is well-proven and used by other ESV terminals manufactured by KVH and licensed by the Commission for commercial operation, including the V3 and V7 Ku-band terminals.

The ESV terminal uses a common spreading code and a random access method called code reuse multiple access (“CRMA”) to access the satellite. CRMA is closely analogous to the more generally understood code division multiple access (CDMA) multiple access method, but differs in that all terminals use a common spreading code rather than a number of individual codes for each transmitter. Individual bursts are distinguished by time difference of arrival. The use of this spreading technique allows the RF spectral density for each ESV to be significantly lower than typical TDMA systems operating at C-band.

The antenna system utilizes a conical scanning function and rate gyros to stabilize the antenna and keep it pointed properly at the desired satellite. The conscan is currently set to worst case 0.38° from boresight. The dynamic pointing error expected during operation is expected to be less than 0.2° one sigma. Thus, the total expected mean pointing error for each vessel while under way, including both conscan and dynamic error, is 0.58° .

During the small percentage of time when conditions cause the antenna pointing error to exceed the specified maximum pointing error limit of $.58^\circ$, the antenna system will send a message to the modem, and the modem will inhibit transmission until the aggregate conscan plus dynamic pointing error value is back to within 0.38° . The time lag from detection of exceedance of mispointing to time when transmit is inhibited will be less than 100 ms. This error limit of $.58^\circ$ is the declared maximum antenna pointing error as described in Section 25.221(b)(1)(iv)(A).

As described above, the C-band ESV terminals use a spread spectrum multiple access technique whereby the individual off-axis EIRP density of each ESV terminal is well below the maximum aggregate network limit. Thus, each antenna individually will not generate harmful levels of interference. Figure 9 below shows the ESV off-axis EIRP considering a full 1 degree pointing error (which could not happen in reality because the V11 automatically mutes transmission at $.58$ degrees). As can be seen even in this extreme example, the V11’s off-axis EIRP density complies with the Section 25.221 mask for an individual ESV terminal.

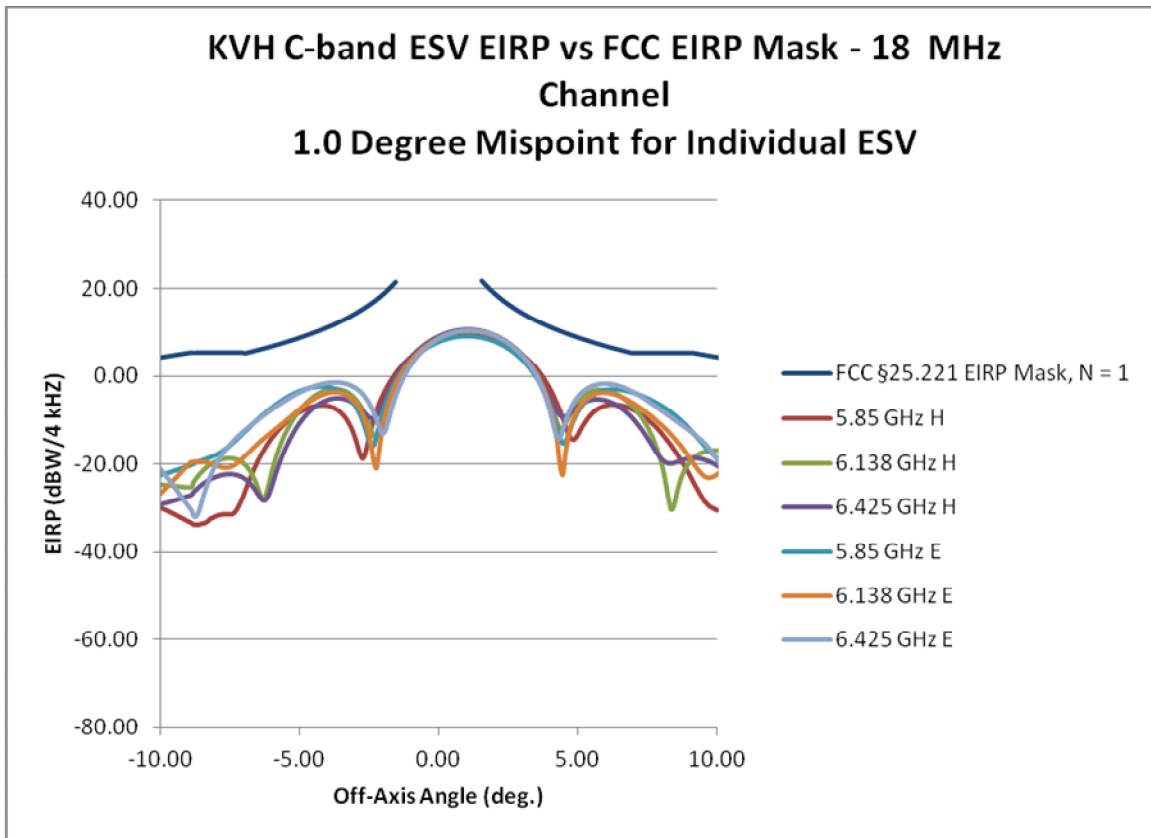


Figure 9 – C-Band ESV Antenna Off-axis EIRP with 1.0 degree pointing error vs 25.221 limit

Protection of Fixed-Satellite Service

As discussed above, KVH’s terminals will operate in such a manner that the off-axis EIRP levels are no greater than the levels established for C-band ESV operations, which are consistent with the Commission’s two-degree spacing policies. To the extent that any adjacent satellite operator experiences unacceptable interference from KVH’s operations, KVH will cease terminal transmissions immediately.

6. FCC §25.221 Compliance Matrix for the V11 Terminal

	FCC Part 25 Earth Station on Vessels (ESV) Rules for C-Band	Complies	Comments
§ 25.221	§ 25.221 Blanket Licensing provisions for Earth Stations on Vessels (ESVs) receiving in the 3700-4200 MHz (space-to-Earth) frequency band and transmitting in the 5925-6425 MHz (Earth-to-space) frequency band, operating with Geostationary Satellite Orbit (GSO) Satellites in the Fixed-Satellite Service.		
§ 25.221(a)	(a) The following ongoing requirements govern all ESV licensees and operations in the 3700-4200 MHz (space-to-Earth) and 5925-6425 MHz (Earth-to-space) bands transmitting to GSO satellites in the fixed-satellite service. ESV licensees must comply with the requirements in either paragraph (a)(1) or (a)(2) of this section and all of the requirements set forth in paragraphs (a)(3) through (a)(12) of this section. Paragraph (b) of this section identifies items that must be included in the application for ESV operations to demonstrate that these ongoing requirements will be met.	Complies	Complies with (a)(1) and remaining provisions
§ 25.221(a)(1)	(1) The following requirements shall apply to an ESV that uses transmitters with off-axis effective isotropically radiated power (EIRP) spectral-densities lower than or equal to the levels in paragraph (a)(1)(i) of this section. An ESV, or ESV system, operating under this section shall provide a detailed demonstration as described in paragraph (b)(1) of this section. The ESV transmitter must also comply with the antenna pointing and cessation of emission requirements in paragraphs (a)(1)(ii) and (a)(1)(iii) of this section.		
§ 25.221(a)(1)(i)	(i) 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.		

§ 25.221(a)(1)(i)(A)	(A) The off-axis EIRP spectral-density emitted from the ESV, in the plane of the GSO as it appears at the particular earth station location, shall not exceed the following values:	Complies	Narrative, Section I.C.1; Exhibit 1, Section 3
	26.3 - 10log(N) - 25logTH dBW/4 kHz for 1.5DEG <= TH <= 7DEG		
	5.3 -10log(N) dBW/4 kHz for 7DEG < TH <= 9.2DEG		
	29.3 -10log(N) - 25logTH dBW/4 kHz for 9.2DEG < TH <= 48DEG		
	-12.7 -10log(N) dBW/4 kHz for 48DEG < TH <= 180DEG		
	Where theta (TH) is the angle in degrees from the line connecting the focal point of the antenna to the orbital location of the target satellite, the plane of the GSO is determined by the focal point of the antenna and the line tangent to the arc of the GSO at the orbital location of the target satellite. For an ESV network using frequency division multiple access (FDMA) or time division multiple access (TDMA) techniques, N is equal to one. For ESV networks using multiple co-frequency transmitters that have the same EIRP, N is the maximum expected number of co-frequency simultaneously transmitting ESV earth stations in the same satellite receiving beam. For the purpose of this section, the peak EIRP of an individual sidelobe may not exceed the envelope defined above for TH between 1.5DEG and 7.0DEG. For TH greater than 7.0DEG, the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the envelope given above by more than 3 dB.		
§ 25.221(a)(1)(i)(B)	(B) In all directions other than along the GSO, the off-axis EIRP spectral-density for co-polarized signals emitted from the ESV shall not exceed the following values:	Complies	Narrative, Section I.C.1; Exhibit 1, Section 3
	29.3 - 10log(N) - 25logTH dBW/4 kHz for 3.0DEG <= TH <= 48DEG		
	-12.7 - 10log(N) dBW/4 kHz for 48DEG < TH <= 180DEG		
	Where TH and N are defined in paragraph (a)(1)(i)(A) of this section. This off-axis EIRP spectral-density applies in any plane that includes the line connecting the focal point of the antenna to the orbital location of the target satellite with the exception of the plane of the GSO as defined in paragraph (a)(1)(i)(A) of this section. For the purpose of this section, 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 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.	Complies	Narrative, Section I.C.1; Exhibit 1, Section 3

§ 25.221(a)(1)(i)(C)	In all directions, the off-axis EIRP spectral-density for cross-polarized signals emitted from the ESV shall not exceed the following values:	Complies	
	16.3 - 10log(N) - 25logTH dBW/4 kHz for 1.8DEG <= TH <= 7.0DEG		
	-4.7 - 10log(N) dBW/4 kHz for 7.0DEG < TH <= 9.2DEG		
	Where TH and N are defined as set forth in paragraph (a)(1)(i)(A) of this section. This EIRP spectral-density applies in any plane that includes the line connecting the focal point of the antenna to the orbital location of the target satellite.		
§ 25.221(a)(1)(i)(D)	(D) For non-circular ESV antennas, the major axis of the antenna will be aligned with the tangent to the arc of the GSO at the orbital location of the target satellite, to the extent required to meet the specified off-axis EIRP spectral-density criteria.	N/A	
§ 25.221(a)(1)(ii)	(ii) Each ESV transmitter must meet one of the following antenna pointing requirements:		
§ 25.221(a)(1)(ii)(A)	(A) Each ESV transmitter shall maintain a pointing error of less than or equal to 0.2DEG between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna, or		
§ 25.221(a)(1)(ii)(B)	(B) Each ESV transmitter shall maintain the declared maximum antenna pointing error that may be greater than 0.2DEG provided that the ESV does not exceed the off-axis EIRP spectral-density limits in paragraph (a)(1)(i) of this section, taking into account the antenna pointing error.	Complies	Narrative, Section I.C.2; Exhibit 1, Section 4
§ 25.221(a)(1)(iii)	Each ESV transmitter must meet one of the following cessation of emission requirements:		
§ 25.221(a)(1)(iii)(A)	(A) For ESVs operating under paragraph (a)(1)(ii)(A) of this section, all emissions from the ESV shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna exceeds 0.5DEG, and transmission will not resume until such angle is less than or equal to 0.2DEG, or		
§ 25.221(a)(1)(iii)(B)	(B) For ESV transmitters operating under paragraph (a)(1)(ii)(B) of this section, all emissions from the ESV shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna exceeds the declared maximum antenna pointing error and shall not resume transmissions until such angle is less than or equal to the declared maximum antenna pointing error.	Complies	Narrative, Section I.C.2; Exhibit 1, Section 4; ceases transmissions at .58 deg offset; resumes at .38 deg pointing error
§ 25.221(a)(2)	(2) The following requirements shall apply to an ESV that uses off-axis EIRP spectral-densities in excess of the levels in paragraph (a)(1)(i) of this section. An ESV, or ESV system, operating under this section shall file certifications and provide a detailed demonstration as described in paragraph (b)(2) of this section.	N/A	

§ 25.221(a)(2)(i)	(i) The ESV shall transmit only to the target satellite system(s) referred to in the certifications required by paragraph (b)(2) of this section.		
§ 25.221(a)(2)(ii)	(ii) If a good faith agreement cannot be reached between the target satellite operator and the operator of a future satellite that is located within 6 degrees longitude of the target satellite, the ESV operator shall accept the power-density levels that would accommodate that adjacent satellite.		
§ 25.221(a)(2)(iii)	(iii) The ESV shall operate in accordance with the off-axis EIRP spectral-densities that the ESV supplied to the target satellite operator in order to obtain the certifications listed in paragraph (b)(2) of this section. The ESV shall automatically cease emissions within 100 milliseconds if the ESV transmitter exceeds the off-axis EIRP spectral-densities supplied to the target satellite operator.		
§ 25.221(a)(3)	(3) There shall be a point of contact in the United States, with phone number and address, available 24 hours a day, seven days a 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 United States has a bilateral agreement that enables such cessation of emissions.	Complies	Narrative, Section I.C.3
§ 25.221(a)(4)	(4) 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 n 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, or the Commission within 24 hours of the request.	Complies	Narrative, Section I.C.3; Exhibit 1, Section 3
§ 25.221(a)(5)	(5) 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.	Complies	Narrative, Section I.C.3
§ 25.221(a)(6)	(6) 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.	Complies	Narrative, Section I.C.3

§ 25.221(a)(7)	(7) ESV operators transmitting in the 5925-6425 MHz (Earth-to-space) frequency bands to GSO satellites in the fixed-satellite service (FSS) shall not seek to coordinate, in any geographic location, more than 36 megahertz of uplink bandwidth on each of no more than two GSO FSS satellites.	Complies	Narrative, Section I.C.3
§ 25.221(a)(8)	(8) ESVs shall not operate in the 5925-6425 MHz (Earth-to-space) and 3700-4200 MHz (space-to-Earth) frequency bands on vessels smaller than 300 gross tons.		
§ 25.221(a)(9)	(9) ESVs, operating while docked, that complete coordination with terrestrial stations in the 3700-4200 MHz band in accordance with § 25.251, shall receive protection from such terrestrial stations in accordance with the coordination agreements, for 180 days, renewable for 180 days.		
§ 25.221(a)(10)	(10) ESVs in motion shall not claim protection from harmful interference from any authorized terrestrial stations or lawfully operating satellites to which frequencies are either already assigned, or may be assigned in the future in the 3700-4200 MHz (space-to-Earth) frequency band.		
§ 25.221(a)(11)	(11) ESVs operating within 200 km from the baseline of the United States, or within 200 km from a U.S.-licensed fixed service offshore installation, shall complete coordination with potentially affected U.S.-licensed fixed service operators prior to operation. The coordination method and the interference criteria objective shall be determined by the frequency coordinator. The details of the coordination shall be maintained and available at the frequency coordinator, and shall be filed with the Commission to be placed on public notice. Operation of each individual ESV may commence immediately after the public notice is released that identifies the notification sent to the Commission. Continuance of operation of that ESV for the duration of the coordination term shall be dependent upon successful completion of the normal public notice process. If, prior to the end of the 30-day comment period of the public notice, any objections are received from U.S.-licensed fixed service operators that have been excluded from coordination, the ESV licensee shall immediately cease operation of that particular station on frequencies used by the affected U.S.-licensed fixed service station until the coordination dispute is resolved and the ESV licensee informs the Commission of the resolution.		

§ 25.221(a)(12)	(12) ESV operators must automatically cease transmission if the ESV operates in violation of the terms of its coordination agreement, including, but not limited to, conditions related to speed of the vessel or if the ESV travels outside the coordinated area, if within 200 km from the baseline of the United States, or within 200 km from a U.S.-licensed fixed service offshore installation. Transmissions may be controlled by the ESV network. The frequency coordinator may decide whether ESV operators should automatically cease transmissions if the vessel falls below a prescribed speed within a prescribed geographic area.		
§ 25.221(b)	(b) Applications for ESV operation in the 5925-6425 MHz (Earth-to-space) band to GSO satellites in the fixed-satellite service must include, in addition to the particulars of operation identified on Form 312, and associated Schedule B, the applicable technical demonstrations in paragraphs (b)(1) or (b)(2) of this section and the documentation identified in paragraphs (b)(3) through (b)(5) of this section.		
§ 25.221(b)(1)	(1) An ESV applicant proposing to implement a transmitter under paragraph (a)(1) of this section must demonstrate that the transmitter meets the off-axis EIRP spectral-density limits contained in paragraph (a)(1)(i) of this section. To provide this demonstration, the application shall include the tables described in paragraph (b)(1)(i) of this section or the certification described in paragraph (b)(1)(ii) of this section. The ESV applicant also must provide the value N described in paragraph (a)(1)(i)(A) of this section. An ESV applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(A) of this section must provide the certifications identified in paragraph (b)(1)(iii) of this section. An ESV applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(B) of this section must provide the demonstrations identified in paragraph (b)(1)(iv) of this section.	Complies	Narrative, Section I.C.1: Exhibit 1, Section 3
§ 25.221(b)(1)(i)	(i) Any ESV applicant filing 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, 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 0.1DEG for angles between 0DEG and 10DEG off-axis, and at increments of 5DEG for angles between 10DEG and 180DEG off-axis.	Complies	Exhibit 1, Section 3
§ 25.221(b)(1)(i)(B)	(B) For purposes of the off-axis co-polarized EIRP table in the elevation plane, the off-axis angle is the angle in degrees from the line connecting the focal point of the antenna to the orbital position of the target satellite, and the elevation plane is defined as the plane perpendicular to the plane of the GSO defined in paragraph (b)(1)(i)(A) of this section.		


§ 25.221(b)(1)(i)(C)	(C) For purposes of the cross-polarized EIRP table, the off-axis angle is the angle in degrees from the line connecting the focal point of the antenna to the orbital position of the target satellite and the plane of the GSO as defined in paragraph (b)(1)(i)(A) of this section will be used.		
§ 25.221(b)(1)(ii)	(ii) 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 spectral 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 at the target satellite.	N/A	Demonstration provided under § 25.221(b)(1)(i)
§ 25.221(b)(1)(iii)	(iii) 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 0.2DEG between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna and that the antenna tracking system is capable of ceasing emissions within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna exceeds 0.5DEG.		
§ 25.221(b)(1)(iv)	(iv) An ESV applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(B) of this section must:		
§ 25.221(b)(1)(iv)(A)	(A) Declare, in its application, a maximum antenna pointing error and demonstrate that the maximum antenna pointing error can be achieved without exceeding the off-axis EIRP spectral-density limits in paragraph (a)(1)(i) of this section; and	Complies	Narrative Section I.B.2; Exhibit 1, Section 4
§ 25.221(b)(1)(iv)(B)	(B) Demonstrate that the ESV transmitter can detect if the transmitter exceeds the declared maximum antenna pointing error and can cease transmission within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna exceeds the declared maximum antenna pointing error, and will not resume transmissions until the angle between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna is less than or equal to the declared maximum antenna pointing error.	Complies	Narrative Section I.B.2; Exhibit 1, Section 4

§ 25.221(b)(2)	(2) An ESV applicant proposing to implement a transmitter under paragraph (a)(2) of this section and using off-axis EIRP spectral-densities in excess of the levels in paragraph (a)(1)(i) of this section shall provide the following certifications and demonstration as exhibits to its earth station application:	N/A	
§ 25.221(b)(2)(i)	(i) A statement from the target satellite operator certifying that the proposed operation of the ESV has the potential to create harmful interference to satellite networks adjacent to the target satellite(s) that may be unacceptable.		
§ 25.221(b)(2)(ii)	(ii) A statement from the target satellite operator certifying that the power-density levels that the ESV applicant provided to the target satellite operator are consistent with the existing coordination agreements between its satellite(s) and the adjacent satellite systems within 6DEG of orbital separation from its satellite(s).		
§ 25.221(b)(2)(iii)	(iii) A statement from the target satellite operator certifying that it will include the power-density levels of the ESV applicant in all future coordination agreements.		
§ 25.221(b)(2)(iv)	(iv) A demonstration from the ESV operator that the ESV system is capable of detecting and automatically ceasing emissions within 100 milliseconds when the transmitter exceeds the off-axis EIRP spectral-densities supplied to the target satellite operator.		
§ 25.221(b)(2)(v)	(v) A certification from the ESV operator that the ESV system complies with the power limits in § 25.204(h).		
§ 25.221(b)(3)	(3) There shall be an exhibit included with the application describing the geographic area(s) in which the ESVs will operate.	Complies	Exhibit 1, Section I.A
§ 25.221(b)(4)	(4) The point of contact information referred to in paragraph (a)(3) of this section and, if applicable, paragraph (a)(6) of this section, must be included in the application.	Complies	Narrative, Section I.C.3
§ 25.221(b)(5)	(5) 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.	Complies	Exhibit 2, Radiation Hazard Study

Engineering Certificate

**CERTIFICATION OF PERSON RESPONSIBLE
FOR PREPARING ENGINEERING INFORMATION
SUBMITTED IN THIS APPLICATION FOR
EXPERIMENTAL AUTHORIZATION**

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this Experimental Authorization request. I am familiar with Parts 2, 5, 25, 76, 78, and 101 of the Commission's Rules (47 CFR), that I have either prepared or reviewed the engineering information submitted in this application, and that it is complete and accurate to the best of my knowledge.

By: 
Kenneth G. Ryan, P.E.
Vice President
Skjei Telecom, Inc.

Date: 03/28/2012

