Exhibit 1 – Antenna Patterns, EIRP Compliance and Concept of Operation
12/31/2013

Carlsbad, CA C-band V11 Terminal Operation

1. Introduction

KVH would like to operate their C-band V11 earth station satellite terminal at their main vendor facility in Carlsbad, CA. The operation would be performed under controlled circumstances on the roof of the ViaSat operations facility, with visibility to the GSO satellite arc. The operation would allow KVH to test and validate enhancements to the product. The operation will also validate manufacturing procedures, which includes over-the-air testing before product ship.

The 24x7 Point of Contact for the KVH testing is Marc Edwards, KVH Program Manager, cell telephone number: 401-835-8488.

2. Description of V11 ESV Terminal

The C-band V11 ESV terminal is a highly efficient and affordable terminal for use with KVH's global ESV network. The V11 ESV terminal operates in C-band fixed-satellite service (FSS) frequencies, 5.925-6.425 GHz for transmit and 3.7-4.2 GHz for receive. The antenna is a 1 meter 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 RF equipment is integrated into the base of the terminal and includes a 22 watt SSPA. The data rates transmitted from the terminal will vary from 32 kbits/s to 512 kbits/s. The V11 ESV will transmit using CRMA spreading[1] over, at least, a 10 MHz channel bandwidth.

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

3.   Technical Operating Parameters

The operational parameters of the C-band V11 are shown in Table 1 below:

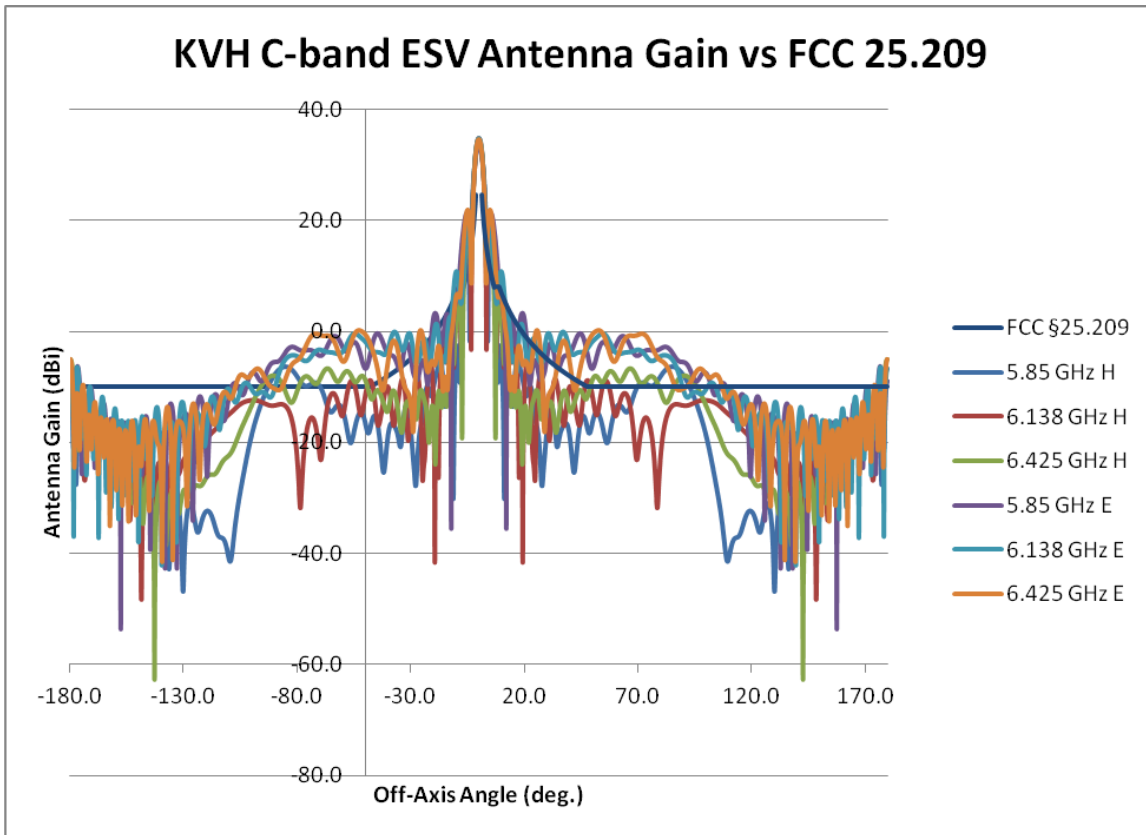| **TABLE 1** - Company	KVH	
Site Name, State	Carlsbad, CA	0
Latitude (NAD83) Main Port	33.12519444	N
Longitude (NAD83) Main Port	117.2674167	W
Elevation AMSL (ft/m)	287.0	87.5
Antenna Centerline (ft/m)	34.0	10.4
Antenna Parameters	V11	
Antenna Diameter (m)		1
Antenna Centerline (ft/m)	34	10.36
Antenna Elevation Angles (deg)	14.1	14.1
Range of Satellite Orbital Long. (deg W)	180	180
Range of Azimuths from North (deg)	254.3	254.3
Parameters at Center Freq (GHz)	**3.95 (RX)**	**6.138 (TX)**
Antenna Gain, Main Beam (dBi)	31.3	34.5
15 DB Half Beamwidth (deg) / 3 DB Half Beamwidth (deg)	4/2.2	2.95/1.5
Interference Analysis Parameters		
4 GHz Max Interference Power Long Term (dBW/MHz) (20%)	-156	
4 GHz Max Interference Power Short Term (dBW/MHz) (.01%)	-146	
6 GHz Max Interference Power Long Term (dBW/4kHz) (20%)		-154
6 GHz Max Interference Power Short Term (dBW/4kHz) (.0025%)		-131
Transmission Parameters		
Information Rate (kbits/s)	to 512	to 512
FEC Rate	1/3	1/3
Modulation	DSSS OQPSK	DSSS GMSK
Spreading Factor	3	26
Noise bandwidth (MHz)	4.5	9.98
Threshold Eb/No (dB)	1.7	2.2
Max Transmitter Power (dBW/4KHz)		-21.5
Max EIRP Main Beam (dBW/4KHz)		46.9
Modulation / Emission Designator (Rx/Tx)	4M50G7D	9M98G7D
Frequency Range* (MHz)	Receive	Transmit
* based upon frequency coordination results, see Exhibit 2	3700 - 4200	5925 - 6425
HPA Size (W)		22
Output Circuit Losses, including radome loss (dB)		1
Receive G/T (dB/K)	9.7	

4.   C-band Frequency Coordination

The C-band Frequency Coordination Final report is included as Exhibit 2 to this application.

5.   C-band V11 ESV Antenna Pattern and Off-Axis EIRP Analysis
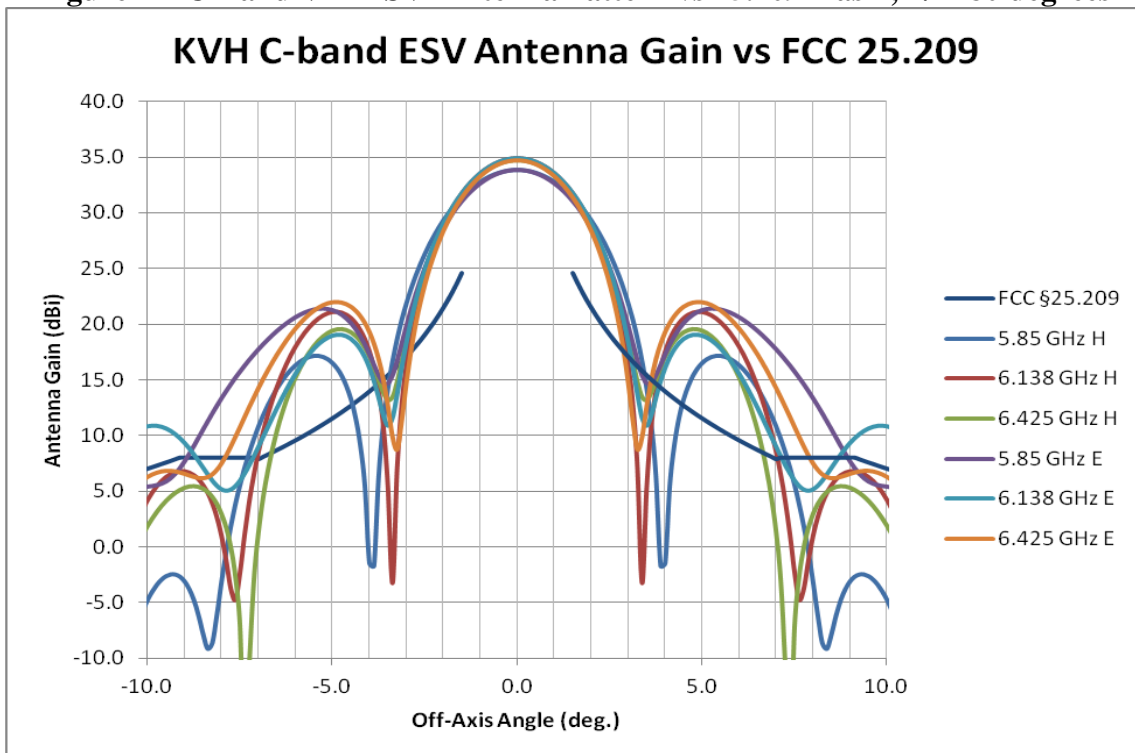
The data rates transmitted from the terminal will vary from 32 kbits/s to 512 kbits/s. Additionally, the V11 ESV will transmit using CRMA spreading over at least a 10 MHz channel bandwidth.   The small diameter C-band V11 antenna does not meet the FCC 25.209 antenna pattern, see antenna gain patterns in Figures 1 and 2. The worst case exceedance is 11.3 dB at 5.6 degrees (as well as 11.7dB at 56 degree). KVH will compensate for this exceedance by operating at a very lower RF power density. The worst case RF power density is -21.5 dBW/4kHz. This is 18.8 dB below FCC RF level specified in FCC Rule §25.212. KVH certifies that the off-axis EIRP levels will not exceed the limits specified in FCC Rules Section §25.218, as well as levels set 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 V11 ESV terminal are shown in Figures 3 and 4 below. Note that a calculated worst case aggregate EIRP would occur when N=5 users for a 10 MHz channel. Table 3 below summarizes the channel power and off-axis EIRP calculations.

Table 2 - Worst Case Power Density 9.98 MHz Channel Calculations		
Power a feed Flange	17.475	W
Power a feed Flange	12.42	dBW
Channel; Bandwidth	9.98E+00	MHz
RF Power Density at Flange	-21.5	dBW/4 kHz
RF Power Density at Flange	2.48	dBW/ MHz
Maximum Horizon EIRP Density (14.1° Elevation Angle)	5.71	dBW/MHz*
Maximum Horizon EIRP	15.65	dBW*
At Angle	14.1	deg
Maximum Number Simultaneous Users N	5	
Worst Case Antenna Gain Exceedance	-11.70	dB
At Angle	56.19	deg.
For Antenna Pattern	6.425 GHz E	
EIRP Exceedance Limited by Pattern	6.425 GHz E	
At Angle	56.19	
Worst Case Gain Exceedance between -7 and +7 degrees	-11.33	dB
at angle	-5.47	degree

* Resolution 902 sets C-band Limits at 20.8 dBW maximum horizon EIRP and 17 dBW/MHz maximum EIRP density

Figure 1 – C-Band V11 ESV Antenna Pattern vs 25.209 mask , +/- 180 degrees

Figure 2– C-band V11 ESV Antenna Pattern vs 25.209 mask , +/- 10 degrees

KVH C-band ESV vs FCC EIRP Mask - 10 MHz Channel

Figure 3 – C-band V11 ESV Antenna EIRP vs 25.221 mask , +/- 180 degrees

KVH C-band ESV vs FCC EIRP Mask - 10 MHz Channel

Figure 4 – C-band V11 ESV Antenna EIRP vs 25.221 mask , +/- 10 degrees

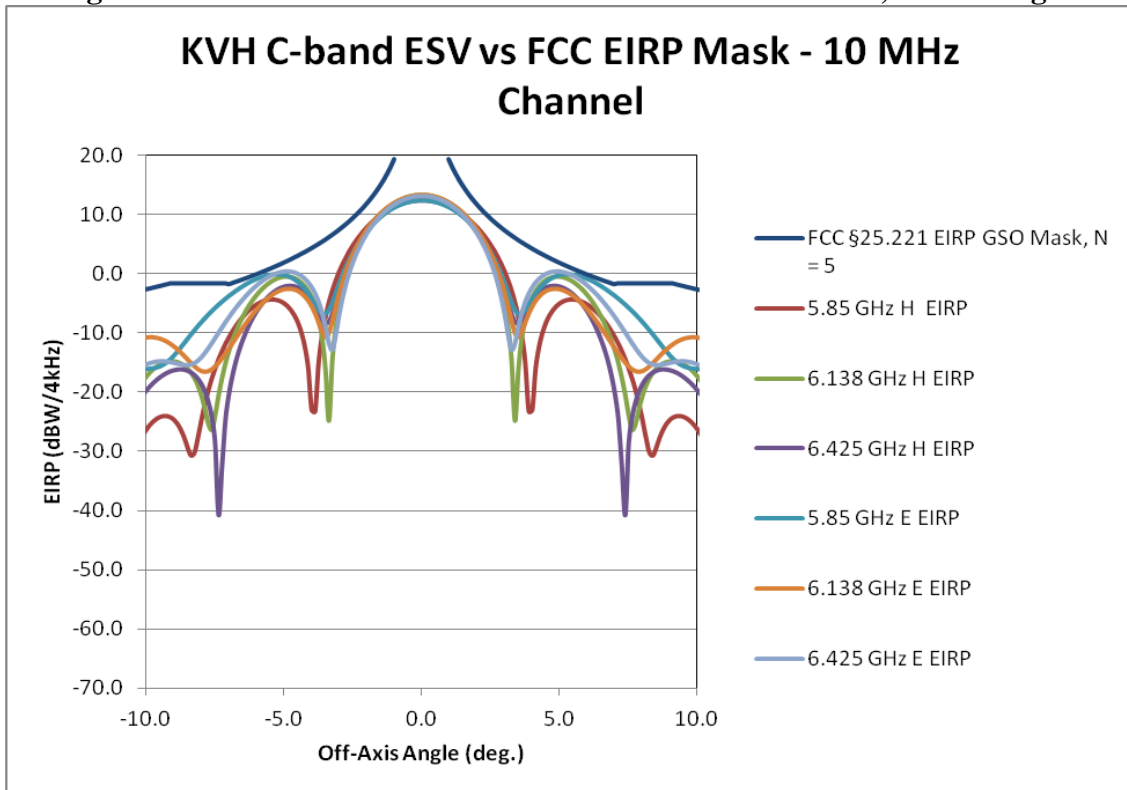| Table 3 – Off Axis Angle (deg)	5.85 GHz H	6.138 GHz H	6.425 GHz H	5.85 GHz E	6.138 GHz E	6.425 GHz E	Off Axis Angle (degree)	FCC §25.209	FCC §25.221 EIRP GSO Mask, N = 5	FCC §25.221 EIRP Elevation Mask, N = 5	5.85 GHz H EIRP	6.138 GHz H EIRP	6.425 GHz H EIRP	5.85 GHz E EIRP	6.138 GHz E EIRP	6.425 GHz E EIRP	Meets Mask
-175.8	-27.1	-26.3	-32.8	-27.0	-22.1	-24.7	-175.8	-10.0	-19.7	-19.7	-48.7	-47.9	-54.3	-48.6	-43.7	-46.2	Y
-169.8	-29.5	-26.5	-27.0	-27.5	-23.7	-18.8	-169.8	-10.0	-19.7	-19.7	-51.1	-48.1	-48.5	-49.1	-45.3	-40.4	Y
-163.8	-30.0	-28.6	-36.9	-46.8	-18.0	-16.9	-163.8	-10.0	-19.7	-19.7	-51.6	-50.2	-58.4	-68.4	-39.5	-38.5	Y
-157.8	-31.5	-54.1	-31.0	-22.4	-17.9	-21.3	-157.8	-10.0	-19.7	-19.7	-53.0	-75.7	-52.6	-44.0	-39.5	-42.8	Y
-151.8	-35.6	-38.8	-31.2	-27.6	-24.1	-22.8	-151.8	-10.0	-19.7	-19.7	-57.2	-60.3	-52.8	-49.2	-45.6	-44.4	Y
-145.8	-40.5	-28.7	-37.6	-26.7	-22.0	-19.5	-145.8	-10.0	-19.7	-19.7	-62.0	-50.2	-59.2	-48.3	-43.6	-41.0	Y
-139.8	-33.6	-28.0	-28.3	-32.2	-18.3	-19.7	-139.8	-10.0	-19.7	-19.7	-55.1	-49.5	-49.9	-53.7	-39.9	-41.2	Y
-133.8	-36.4	-33.4	-30.5	-21.5	-18.6	-18.8	-133.8	-10.0	-19.7	-19.7	-57.9	-55.0	-52.1	-43.0	-40.1	-40.4	Y
-127.8	-29.9	-31.7	-33.3	-22.6	-17.5	-18.3	-127.8	-10.0	-19.7	-19.7	-51.4	-53.2	-54.9	-44.1	-39.0	-39.8	Y
-121.8	-29.9	-23.8	-26.0	-18.3	-19.2	-18.7	-121.8	-10.0	-19.7	-19.7	-51.5	-45.4	-47.6	-39.8	-40.7	-40.2	Y
-115.8	-32.6	-23.6	-24.1	-17.5	-14.5	-14.2	-115.8	-10.0	-19.7	-19.7	-54.2	-45.1	-45.7	-39.1	-36.0	-35.8	Y
-109.8	-28.8	-22.9	-21.8	-14.4	-11.3	-11.9	-109.8	-10.0	-19.7	-19.7	-50.4	-44.5	-43.3	-36.0	-32.9	-33.5	Y
-103.8	-26.5	-16.7	-18.1	-10.7	-8.4	-8.6	-103.8	-10.0	-19.7	-19.7	-48.0	-38.3	-39.6	-32.3	-30.0	-30.2	Y
-97.8	-20.6	-15.0	-14.8	-11.3	-8.6	-6.2	-97.8	-10.0	-19.7	-19.7	-42.1	-36.6	-36.4	-32.8	-30.2	-27.8	Y
-91.8	-11.6	-13.4	-11.8	-7.9	-14.6	-7.5	-91.8	-10.0	-19.7	-19.7	-33.2	-35.0	-33.4	-29.5	-36.2	-29.0	Y
-85.8	-8.1	-12.1	-13.8	-4.7	-7.1	-18.8	-85.8	-10.0	-19.7	-19.7	-29.7	-33.6	-35.4	-26.2	-28.6	-40.4	Y
-79.8	-10.7	-12.7	-20.2	-0.8	-3.6	-8.3	-79.8	-10.0	-19.7	-19.7	-32.3	-34.3	-41.8	-22.3	-25.2	-29.8	Y
-73.8	-13.0	-20.6	-32.1	-1.2	-7.6	-0.9	-73.8	-10.0	-19.7	-19.7	-34.5	-42.2	-53.6	-22.8	-29.2	-22.4	Y

-67.8	-7.7	-22.6	-11.3	-5.5	-2.1	0.0	-67.8	-10.0	-19.7	-19.7	-29.2	-44.1	-32.8	-27.0	-23.6	-21.6	Y
-61.8	-16.4	-25.8	-11.7	-0.6	-3.4	-1.5	-61.8	-10.0	-19.7	-19.7	-38.0	-47.4	-33.2	-22.1	-24.9	-23.1	Y
-55.8	-10.9	-14.8	-8.3	-2.7	-9.7	1.2	-55.8	-10.0	-19.7	-19.7	-32.4	-36.4	-29.9	-24.2	-31.3	-20.3	Y
-49.8	-16.0	-11.6	-16.5	-9.4	1.1	-3.4	-49.8	-10.0	-19.7	-19.7	-37.6	-33.2	-38.0	-31.0	-20.4	-24.9	Y
-43.8	-26.3	-15.2	-21.9	-5.2	-3.4	-4.2	-43.8	-9.0	-18.7	-18.7	-47.8	-36.8	-43.4	-26.7	-24.9	-25.7	Y
-37.8	-16.3	-7.9	-11.9	-2.9	-7.3	-3.6	-37.8	-7.4	-17.1	-17.1	-37.8	-29.5	-33.4	-24.4	-28.9	-25.2	Y
-31.8	-10.4	-3.5	-5.3	-6.5	-2.5	-4.6	-31.8	-5.6	-15.3	-15.3	-32.0	-25.1	-26.9	-28.0	-24.1	-26.2	Y
-25.8	-9.0	-12.6	-13.6	-1.9	-5.2	-0.6	-25.8	-3.3	-13.0	-13.0	-30.6	-34.2	-35.1	-23.5	-26.7	-22.2	Y
-19.8	-6.7	-7.7	-17.5	-2.9	-13.2	-1.4	-19.8	-0.4	-10.1	-10.1	-28.3	-29.3	-39.1	-24.5	-34.8	-23.0	Y
-13.8	-7.8	-12.9	0.0	4.9	-10.2	0.7	-13.8	3.5	-6.2	-6.2	-29.4	-34.4	-21.5	-16.7	-31.8	-20.8	Y
-9.9	-9.6	0.0	-2.3	4.1	4.7	-7.5	-9.9	7.1	-2.5	-2.5	-31.1	-21.6	-23.9	-17.4	-16.9	-29.1	Y
-10.0	-9.1	-1.1	-3.1	3.8	4.5	-6.0	-10.0	7.0	-2.7	-2.7	-30.7	-22.6	-24.6	-17.8	-17.0	-27.6	Y
-9.9	-9.6	0.0	-2.3	4.1	4.7	-7.5	-9.9	7.1	-2.5	-2.5	-31.1	-21.6	-23.9	-17.4	-16.9	-29.1	Y
-9.8	-9.6	0.9	-1.8	4.4	4.8	-7.8	-9.8	7.3	-2.4	-2.4	-31.2	-20.7	-23.3	-17.1	-16.8	-29.3	Y
-9.7	-9.7	1.7	-1.2	4.7	4.8	-6.6	-9.7	7.4	-2.3	-2.3	-31.2	-19.9	-22.8	-16.9	-16.8	-28.2	Y
-9.6	-9.4	2.4	-0.7	4.9	4.8	-4.6	-9.6	7.5	-2.2	-2.2	-31.0	-19.2	-22.2	-16.7	-16.8	-26.2	Y
-9.5	-9.3	3.0	-0.2	5.1	4.7	-2.4	-9.5	7.6	-2.1	-2.1	-30.8	-18.5	-21.8	-16.5	-16.8	-24.0	Y
-9.4	-9.0	3.5	0.2	5.3	4.5	-0.6	-9.4	7.7	-2.0	-2.0	-30.6	-18.0	-21.4	-16.2	-17.0	-22.1	Y
-9.3	-8.4	4.0	0.5	5.6	4.4	1.1	-9.3	7.8	-1.9	-1.9	-29.9	-17.5	-21.0	-16.0	-17.2	-20.4	Y
-9.2	-8.1	4.4	0.9	5.8	4.1	2.6	-9.2	8.0	-1.7	-1.7	-29.6	-17.1	-20.7	-15.7	-17.4	-18.9	Y
-9.1	-7.8	4.8	1.1	6.1	3.9	3.8	-9.1	8.0	-1.7	-1.6	-29.3	-16.8	-20.4	-15.5	-17.6	-17.7	Y
-9.0	-7.5	5.0	1.3	6.4	3.7	4.9	-9.0	8.0	-1.7	-1.5	-29.1	-16.5	-20.2	-15.1	-17.9	-16.6	Y
-8.9	-7.4	5.3	1.5	6.8	3.5	5.9	-8.9	8.0	-1.7	-1.4	-28.9	-16.3	-20.0	-14.8	-18.0	-15.6	Y
-8.8	-7.3	5.4	1.7	7.2	3.4	6.8	-8.8	8.0	-1.7	-1.3	-28.8	-16.1	-19.9	-14.3	-18.1	-14.7	Y
-8.7	-7.3	5.5	1.8	7.7	3.4	7.6	-8.7	8.0	-1.7	-1.1	-28.8	-16.0	-19.8	-13.9	-18.2	-13.9	Y
-8.6	-7.3	5.5	1.8	8.2	3.5	8.4	-8.6	8.0	-1.7	-1.0	-28.9	-16.0	-19.8	-13.4	-18.1	-13.2	Y
-8.5	-7.3	5.5	1.8	8.7	3.7	9.1	-8.5	8.0	-1.7	-0.9	-28.8	-16.1	-19.8	-12.8	-17.8	-12.5	Y
-8.4	-6.8	5.4	1.7	9.3	4.0	9.7	-8.4	8.0	-1.7	-0.8	-28.3	-16.2	-19.9	-12.3	-17.5	-11.8	Y
-8.3	-5.9	5.2	1.5	9.9	4.5	10.4	-8.3	8.0	-1.7	-0.6	-27.4	-16.4	-20.0	-11.7	-17.0	-11.2	Y
-8.2	-4.6	4.9	1.3	10.5	5.0	10.9	-8.2	8.0	-1.7	-0.5	-26.2	-16.7	-20.3	-11.1	-16.5	-10.6	Y
-8.1	-3.1	4.4	1.0	11.1	5.6	11.5	-8.1	8.0	-1.7	-0.4	-24.7	-17.1	-20.6	-10.4	-15.9	-10.0	Y
-8.0	-1.5	3.8	0.5	11.7	6.2	12.0	-8.0	8.0	-1.7	-0.2	-23.0	-17.7	-21.0	-9.9	-15.3	-9.5	Y

-7.9	0.2	3.1	0.0	12.3	6.8	12.6	-7.9	8.0	-1.7	-0.1	-21.4	-18.5	-21.6	-9.3	-14.7	-9.0	Y
-7.8	1.7	2.1	-0.7	12.9	7.5	13.1	-7.8	8.0	-1.7	0.0	-19.9	-19.5	-22.2	-8.6	-14.1	-8.5	Y
-7.7	3.1	0.9	-1.5	13.5	8.1	13.6	-7.7	8.0	-1.7	0.2	-18.4	-20.7	-23.0	-8.0	-13.5	-8.0	Y
-7.6	4.5	-0.7	-2.5	14.1	8.6	14.1	-7.6	8.0	-1.7	0.3	-17.1	-22.2	-24.0	-7.5	-12.9	-7.5	Y
-7.5	5.7	-2.5	-3.4	14.7	9.2	14.5	-7.5	8.0	-1.7	0.5	-15.9	-24.0	-25.0	-6.9	-12.3	-7.0	Y
-7.4	6.8	-3.7	-4.2	15.2	9.8	15.0	-7.4	8.0	-1.7	0.6	-14.7	-25.2	-25.7	-6.3	-11.8	-6.5	Y
-7.3	7.9	-3.1	-4.2	15.7	10.3	15.5	-7.3	8.0	-1.7	0.8	-13.6	-24.6	-25.7	-5.8	-11.3	-6.1	Y
-7.2	8.9	-0.9	-3.2	16.3	10.8	15.9	-7.2	8.0	-1.7	0.9	-12.7	-22.4	-24.7	-5.3	-10.8	-5.6	Y
-7.1	9.8	1.7	-1.5	16.8	11.3	16.4	-7.1	8.0	-1.7	1.1	-11.7	-19.9	-23.1	-4.8	-10.2	-5.2	Y
-7.0	10.6	4.1	0.5	17.2	11.8	16.8	-7.0	7.9	-1.8	1.2	-11.0	-17.4	-21.1	-4.3	-9.7	-4.7	Y
-6.9	11.4	6.2	2.5	17.7	12.3	17.2	-6.9	8.1	-1.6	1.4	-10.2	-15.3	-19.1	-3.8	-9.2	-4.3	Y
-6.8	12.1	8.0	4.2	18.2	12.8	17.7	-6.8	8.2	-1.5	1.5	-9.5	-13.6	-17.3	-3.4	-8.7	-3.9	Y
-6.7	12.8	9.6	5.9	18.6	13.4	18.1	-6.7	8.4	-1.3	1.7	-8.8	-12.0	-15.7	-3.0	-8.2	-3.5	Y
-6.6	13.4	11.0	7.4	19.0	13.9	18.5	-6.6	8.6	-1.1	1.9	-8.2	-10.6	-14.2	-2.6	-7.7	-3.1	Y
-6.5	14.0	12.2	8.7	19.4	14.4	18.9	-6.5	8.7	-1.0	2.0	-7.6	-9.3	-12.8	-2.2	-7.2	-2.7	Y
-6.4	14.5	13.3	9.9	19.7	14.9	19.2	-6.4	8.9	-0.8	2.2	-7.1	-8.2	-11.6	-1.8	-6.7	-2.3	Y
-6.3	14.9	14.4	11.1	20.0	15.5	19.6	-6.3	9.1	-0.6	2.4	-6.6	-7.2	-10.5	-1.5	-6.1	-1.9	Y
-6.2	15.4	15.4	12.2	20.3	16.0	19.9	-6.2	9.2	-0.4	2.6	-6.2	-6.2	-9.4	-1.2	-5.6	-1.6	Y
-6.1	15.8	16.2	13.1	20.6	16.5	20.3	-6.1	9.4	-0.3	2.7	-5.7	-5.4	-8.5	-1.0	-5.1	-1.3	Y
-6.0	16.2	17.0	13.9	20.8	17.0	20.6	-6.0	9.6	-0.1	2.9	-5.4	-4.6	-7.6	-0.7	-4.6	-1.0	Y
-5.9	16.5	17.7	14.7	21.0	17.5	20.9	-5.9	9.8	0.1	3.1	-5.1	-3.9	-6.8	-0.5	-4.1	-0.7	Y
-5.8	16.8	18.3	15.4	21.2	17.9	21.2	-5.8	10.0	0.3	3.3	-4.8	-3.2	-6.1	-0.3	-3.6	-0.4	Y
-5.7	17.0	18.9	16.1	21.4	18.4	21.4	-5.7	10.2	0.5	3.5	-4.5	-2.7	-5.5	-0.2	-3.1	-0.1	Y
-5.6	17.2	19.4	16.7	21.5	18.8	21.7	-5.6	10.4	0.7	3.7	-4.3	-2.2	-4.9	0.0	-2.7	0.1	Y
-5.5	17.4	19.8	17.1	21.6	19.2	21.9	-5.5	10.6	0.9	3.9	-4.2	-1.7	-4.4	0.0	-2.4	0.3	Y
-5.4	17.5	20.2	17.6	21.6	19.5	22.1	-5.4	10.8	1.1	4.1	-4.1	-1.3	-4.0	0.1	-2.0	0.5	Y
-5.3	17.5	20.5	18.0	21.7	19.8	22.2	-5.3	11.0	1.3	4.3	-4.0	-1.0	-3.6	0.1	-1.8	0.7	Y
-5.2	17.5	20.8	18.3	21.7	20.0	22.4	-5.2	11.2	1.5	4.5	-4.0	-0.7	-3.3	0.1	-1.5	0.8	Y
-5.1	17.4	21.0	18.5	21.6	20.2	22.5	-5.1	11.4	1.7	4.7	-4.1	-0.5	-3.0	0.1	-1.3	0.9	Y
-5.0	17.3	21.2	18.8	21.5	20.4	22.6	-5.0	11.6	1.9	4.9	-4.2	-0.4	-2.8	0.0	-1.2	1.0	Y
-4.9	17.1	21.3	18.9	21.4	20.5	22.6	-4.9	11.8	2.1	5.1	-4.5	-0.3	-2.6	-0.2	-1.1	1.1	Y
-4.8	16.8	21.3	19.0	21.2	20.5	22.6	-4.8	12.0	2.3	5.3	-4.8	-0.2	-2.6	-0.4	-1.1	1.1	Y

-4.7	16.4	21.3	19.0	20.9	20.5	22.6	-4.7	12.3	2.6	5.6	-5.1	-0.3	-2.5	-0.6	-1.1	1.1	Y
-4.6	15.9	21.1	19.0	20.6	20.4	22.6	-4.6	12.5	2.8	5.8	-5.6	-0.4	-2.6	-0.9	-1.2	1.0	Y
-4.5	15.3	21.0	18.9	20.2	20.2	22.5	-4.5	12.7	3.1	6.1	-6.3	-0.6	-2.7	-1.3	-1.4	0.9	Y
-4.4	14.5	20.7	18.7	19.7	19.9	22.3	-4.4	13.0	3.3	6.3	-7.1	-0.9	-2.8	-1.8	-1.7	0.8	Y
-4.3	13.5	20.3	18.5	19.2	19.5	22.1	-4.3	13.2	3.5	6.5	-8.1	-1.2	-3.1	-2.4	-2.1	0.6	Y
-4.2	12.2	19.9	18.2	18.5	19.0	21.9	-4.2	13.5	3.8	6.8	-9.3	-1.7	-3.4	-3.1	-2.5	0.3	Y
-4.1	10.6	19.3	17.8	17.7	18.4	21.5	-4.1	13.8	4.1	7.1	-10.9	-2.3	-3.8	-3.9	-3.1	0.0	Y
-4.0	8.7	18.6	17.3	16.6	17.7	21.2	-4.0	14.0	4.3	7.3	-12.8	-3.0	-4.3	-4.9	-3.9	-0.4	Y
-3.9	6.6	17.7	16.7	15.4	16.7	20.7	-3.9	14.3	4.6	7.6	-15.0	-3.9	-4.8	-6.2	-4.8	-0.9	Y
-3.8	5.4	16.6	16.1	13.9	15.5	20.0	-3.8	14.6	4.9	7.9	-16.2	-5.0	-5.5	-7.7	-6.1	-1.5	Y
-3.7	6.7	15.3	15.4	12.0	13.8	19.2	-3.7	14.9	5.2	8.2	-14.9	-6.2	-6.1	-9.5	-7.8	-2.3	Y
-3.6	9.4	13.8	14.8	10.0	11.7	18.3	-3.6	15.2	5.5	8.5	-12.1	-7.8	-6.7	-11.6	-9.8	-3.2	Y
-3.5	12.0	12.0	14.5	8.2	8.6	17.2	-3.5	15.5	5.8	8.8	-9.6	-9.5	-7.1	-13.4	-12.9	-4.4	Y
-3.4	14.3	10.6	14.5	8.3	4.7	15.8	-3.4	15.8	6.1	9.1	-7.3	-10.9	-7.1	-13.2	-16.9	-5.7	Y
-3.3	16.3	10.4	15.0	10.4	3.3	14.1	-3.3	16.1	6.4	9.4	-5.3	-11.2	-6.5	-11.1	-18.2	-7.5	Y
-3.2	18.1	11.8	16.0	13.1	7.7	12.3	-3.2	16.5	6.8	9.8	-3.5	-9.7	-5.5	-8.5	-13.8	-9.2	Y
-3.1	19.5	14.0	17.3	15.4	11.9	11.1	-3.1	16.8	7.1	10.1	-2.1	-7.6	-4.3	-6.2	-9.6	-10.4	Y
-3.0	20.8	16.1	18.6	17.4	14.9	11.5	-3.0	17.1	7.4	10.4	-0.8	-5.4	-2.9	-4.2	-6.6	-10.0	Y
-2.9	22.0	18.1	20.0	19.1	17.3	13.4	-2.9	17.6	7.9		0.4	-3.5	-1.6	-2.5	-4.2	-8.1	Y
-2.8	23.0	19.7	21.3	20.5	19.3	15.7	-2.8	17.9	8.2		1.5	-1.8	-0.3	-1.0	-2.3	-5.8	Y
-2.7	24.0	21.3	22.6	21.9	21.0	17.9	-2.7	18.3	8.6		2.4	-0.2	1.0	0.4	-0.6	-3.6	Y
-2.6	24.9	22.6	23.6	23.1	22.4	19.8	-2.6	18.8	9.1		3.3	1.1	2.1	1.5	0.8	-1.8	Y
-2.5	25.7	23.8	24.7	24.0	23.6	21.4	-2.5	19.2	9.5		4.2	2.2	3.1	2.5	2.1	-0.1	Y
-2.4	26.4	24.9	25.6	25.0	24.7	22.8	-2.4	19.6	9.9		4.9	3.3	4.1	3.4	3.2	1.3	Y
-2.3	27.1	25.9	26.6	25.8	25.7	24.1	-2.3	20.1	10.4		5.6	4.3	5.0	4.3	4.1	2.5	Y
-2.2	27.8	26.8	27.4	26.6	26.6	25.3	-2.2	20.6	10.9		6.2	5.2	5.8	5.1	5.1	3.7	Y
-2.1	28.3	27.6	28.1	27.3	27.5	26.3	-2.1	21.1	11.4		6.8	6.1	6.6	5.8	5.9	4.8	Y
-2.0	28.9	28.4	28.8	28.0	28.2	27.2	-2.0	21.6	11.9		7.3	6.8	7.3	6.4	6.7	5.7	Y
-1.9	29.4	29.1	29.5	28.6	28.9	28.0	-1.9	22.2	12.5		7.8	7.5	7.9	7.0	7.4	6.5	Y
-1.8	29.9	29.7	30.1	29.1	29.6	28.8	-1.8	22.8	13.1		8.3	8.2	8.5	7.6	8.0	7.3	Y
-1.7	30.3	30.3	30.6	29.6	30.1	29.5	-1.7	23.4	13.7		8.8	8.7	9.0	8.1	8.6	8.0	Y
-1.6	30.7	30.8	31.1	30.1	30.7	30.1	-1.6	24.1	14.4		9.2	9.3	9.6	8.6	9.1	8.6	Y

-1.5	31.1	31.3	31.6	30.5	31.2	30.7	-1.5	24.6	14.9		9.5	9.8	10.0	9.0	9.6	9.2	Y
-1.4	31.4	31.8	32.0	30.9	31.6	31.2	-1.4				9.9	10.3	10.4	9.4	10.1	9.7	Y
-1.3	31.8	32.2	32.4	31.2	32.0	31.7	-1.3				10.2	10.7	10.8	9.7	10.5	10.2	Y
-1.2	32.1	32.6	32.8	31.6	32.4	32.1	-1.2				10.5	11.1	11.2	10.0	10.9	10.6	Y
-1.1	32.3	33.0	33.1	31.9	32.8	32.6	-1.1				10.7	11.4	11.5	10.3	11.2	11.0	Y
-1.0	32.5	33.3	33.4	32.1	33.1	32.9	-1.0				11.0	11.8	11.8	10.6	11.5	11.3	Y
-0.9	32.7	33.6	33.7	32.3	33.4	33.2	-0.9				11.2	12.0	12.1	10.8	11.8	11.7	Y
-0.8	32.9	33.8	33.9	32.6	33.6	33.5	-0.8				11.4	12.3	12.3	11.0	12.1	12.0	Y
-0.7	33.1	34.0	34.1	32.7	33.9	33.8	-0.7				11.5	12.5	12.6	11.2	12.3	12.2	Y
-0.6	33.2	34.2	34.3	32.9	34.1	34.0	-0.6				11.7	12.7	12.7	11.3	12.5	12.4	Y
-0.5	33.3	34.4	34.4	33.0	34.2	34.1	-0.5				11.8	12.8	12.9	11.5	12.7	12.6	Y
-0.4	33.4	34.5	34.6	33.1	34.4	34.3	-0.4				11.9	13.0	13.0	11.6	12.8	12.7	Y
-0.3	33.5	34.6	34.7	33.2	34.5	34.4	-0.3				12.0	13.1	13.1	11.6	12.9	12.9	Y
-0.2	33.5	34.7	34.7	33.2	34.6	34.5	-0.2				12.0	13.1	13.2	11.7	13.0	12.9	Y
-0.1	33.6	34.7	34.8	33.2	34.6	34.5	-0.1				12.0	13.2	13.2	11.7	13.1	13.0	Y
0.0	33.6	34.7	34.8	33.2	34.6	34.6	0.0				12.0	13.2	13.3	11.7	13.1	13.0	Y
0.1	33.6	34.7	34.8	33.2	34.6	34.6	0.1				12.0	13.1	13.2	11.7	13.1	13.0	Y
0.2	33.5	34.6	34.7	33.2	34.6	34.5	0.2				12.0	13.1	13.2	11.6	13.1	13.0	Y
0.3	33.5	34.6	34.7	33.1	34.5	34.5	0.3				11.9	13.0	13.1	11.6	13.0	12.9	Y
0.4	33.4	34.5	34.6	33.0	34.5	34.4	0.4				11.8	12.9	13.0	11.5	12.9	12.8	Y
0.5	33.3	34.3	34.4	32.9	34.4	34.3	0.5				11.7	12.8	12.9	11.3	12.8	12.7	Y
0.6	33.2	34.2	34.3	32.7	34.2	34.1	0.6				11.6	12.6	12.7	11.2	12.7	12.6	Y
0.7	33.0	34.0	34.1	32.6	34.1	34.0	0.7				11.5	12.4	12.5	11.0	12.5	12.4	Y
0.8	32.8	33.8	33.8	32.4	33.8	33.8	0.8				11.3	12.2	12.3	10.8	12.3	12.2	Y
0.9	32.6	33.5	33.6	32.1	33.6	33.5	0.9				11.1	12.0	12.0	10.6	12.1	12.0	Y
1.0	32.4	33.3	33.3	31.9	33.3	33.3	1.0				10.9	11.7	11.8	10.3	11.8	11.7	Y
1.1	32.2	33.0	33.0	31.6	33.0	32.9	1.1				10.6	11.4	11.4	10.1	11.5	11.4	Y
1.2	31.9	32.6	32.6	31.3	32.7	32.6	1.2				10.4	11.1	11.1	9.7	11.2	11.1	Y
1.3	31.6	32.3	32.3	31.0	32.3	32.2	1.3				10.1	10.7	10.7	9.4	10.8	10.7	Y
1.4	31.3	31.9	31.9	30.6	31.9	31.8	1.4				9.8	10.3	10.3	9.0	10.4	10.3	Y
1.5	31.0	31.5	31.4	30.1	31.5	31.4	1.5	24.6	14.9		9.4	9.9	9.8	8.6	9.9	9.8	Y
1.6	30.6	31.0	30.9	29.7	31.0	30.9	1.6	23.7	14.0		9.0	9.4	9.4	8.1	9.4	9.3	Y

1.7	30.2	30.5	30.4	29.2	30.4	30.3	1.7	23.0	13.4		8.6	8.9	8.8	7.6	8.9	8.8	Y
1.8	29.7	29.9	29.8	28.6	29.9	29.8	1.8	22.4	12.7		8.2	8.4	8.3	7.1	8.3	8.2	Y
1.9	29.3	29.3	29.2	28.1	29.2	29.1	1.9	21.9	12.2		7.7	7.8	7.7	6.5	7.7	7.5	Y
2.0	28.7	28.7	28.5	27.4	28.6	28.4	2.0	21.3	11.6		7.2	7.1	7.0	5.9	7.0	6.9	Y
2.1	28.2	28.0	27.8	26.7	27.8	27.6	2.1	20.8	11.1		6.6	6.4	6.3	5.2	6.2	6.0	Y
2.2	27.6	27.2	27.0	26.0	27.0	26.8	2.2	20.3	10.6		6.0	5.6	5.5	4.4	5.5	5.2	Y
2.3	26.9	26.3	26.2	25.1	26.1	25.8	2.3	19.8	10.1		5.4	4.8	4.7	3.6	4.5	4.2	Y
2.4	26.3	25.4	25.3	24.2	25.1	24.7	2.4	19.4	9.7		4.7	3.8	3.7	2.7	3.6	3.2	Y
2.5	25.5	24.4	24.3	23.3	24.0	23.6	2.5	18.9	9.2		3.9	2.8	2.8	1.7	2.5	2.0	Y
2.6	24.7	23.3	23.3	22.1	22.8	22.2	2.6	18.5	8.8		3.1	1.7	1.7	0.6	1.3	0.7	Y
2.7	23.8	22.0	22.1	20.9	21.5	20.7	2.7	18.1	8.4		2.2	0.4	0.6	-0.6	-0.1	-0.8	Y
2.8	22.7	20.5	20.9	19.6	19.9	19.0	2.8	17.7	8.0		1.2	-1.0	-0.6	-2.0	-1.6	-2.5	Y
2.9	21.7	19.0	19.6	18.1	18.0	16.9	2.9	17.3	7.6		0.2	-2.6	-1.9	-3.5	-3.5	-4.6	Y
3.0	20.6	17.2	18.3	16.3	15.9	14.7	3.0	17.0	7.3	10.3	-1.0	-4.4	-3.2	-5.2	-5.7	-6.9	Y
3.1	19.3	15.3	17.0	14.4	13.1	12.1	3.1	16.6	6.9	9.9	-2.3	-6.3	-4.5	-7.1	-8.5	-9.5	Y
3.2	17.8	13.6	16.0	12.1	9.4	10.1	3.2	16.3	6.6	9.6	-3.8	-8.0	-5.6	-9.4	-12.2	-11.5	Y
3.3	16.3	12.4	15.2	10.0	4.0	10.1	3.3	15.9	6.2	9.2	-5.2	-9.1	-6.4	-11.6	-17.5	-11.5	Y
3.4	14.6	12.4	14.8	8.8	1.8	11.8	3.4	15.6	5.9	8.9	-7.0	-9.1	-6.7	-12.8	-19.8	-9.8	Y
3.5	12.8	13.4	14.9	9.2	6.7	13.8	3.5	15.3	5.6	8.6	-8.8	-8.2	-6.7	-12.4	-14.9	-7.7	Y
3.6	11.1	14.7	15.2	10.8	10.3	15.5	3.6	15.0	5.3	8.3	-10.4	-6.9	-6.3	-10.7	-11.3	-6.0	Y
3.7	10.0	15.9	15.8	12.5	12.9	17.0	3.7	14.7	5.0	8.0	-11.6	-5.6	-5.8	-9.0	-8.7	-4.6	Y
3.8	9.7	17.2	16.4	14.1	14.7	18.1	3.8	14.4	4.7	7.7	-11.8	-4.4	-5.2	-7.4	-6.8	-3.4	Y
3.9	10.4	18.0	16.9	15.5	16.1	19.1	3.9	14.1	4.5	7.5	-11.2	-3.5	-4.7	-6.1	-5.4	-2.5	Y
4.0	11.5	18.8	17.4	16.5	17.2	19.8	4.0	13.9	4.2	7.2	-10.1	-2.7	-4.2	-5.0	-4.4	-1.7	Y
4.1	12.6	19.5	17.8	17.5	18.1	20.5	4.1	13.6	3.9	6.9	-8.9	-2.1	-3.8	-4.1	-3.5	-1.1	Y
4.2	13.6	20.0	18.1	18.2	18.7	20.9	4.2	13.3	3.7	6.7	-7.9	-1.6	-3.4	-3.3	-2.8	-0.6	Y
4.3	14.5	20.4	18.4	18.8	19.2	21.4	4.3	13.1	3.4	6.4	-7.0	-1.2	-3.2	-2.7	-2.3	-0.2	Y
4.4	15.3	20.7	18.6	19.4	19.6	21.7	4.4	12.8	3.2	6.2	-6.3	-0.9	-3.0	-2.2	-1.9	0.1	Y
4.5	15.9	20.9	18.7	19.8	19.9	21.9	4.5	12.6	2.9	5.9	-5.6	-0.7	-2.9	-1.7	-1.6	0.4	Y
4.6	16.4	21.0	18.7	20.1	20.2	22.1	4.6	12.4	2.7	5.7	-5.1	-0.5	-2.8	-1.4	-1.4	0.6	Y
4.7	16.8	21.1	18.7	20.4	20.3	22.3	4.7	12.1	2.4	5.4	-4.7	-0.5	-2.8	-1.1	-1.3	0.7	Y
4.8	17.1	21.1	18.7	20.7	20.4	22.3	4.8	11.9	2.2	5.2	-4.4	-0.5	-2.9	-0.9	-1.2	0.8	Y

4.9	17.4	21.0	18.6	20.8	20.4	22.4	4.9	11.7	2.0	5.0	-4.2	-0.5	-3.0	-0.7	-1.2	0.8	Y
5.0	17.5	20.9	18.4	21.0	20.3	22.3	5.0	11.5	1.8	4.8	-4.0	-0.6	-3.2	-0.6	-1.2	0.8	Y
5.1	17.6	20.7	18.2	21.0	20.2	22.3	5.1	11.2	1.6	4.6	-3.9	-0.8	-3.4	-0.5	-1.3	0.7	Y
5.2	17.7	20.5	17.9	21.1	20.1	22.2	5.2	11.0	1.3	4.3	-3.9	-1.1	-3.6	-0.5	-1.4	0.6	Y
5.3	17.6	20.2	17.6	21.1	19.9	22.1	5.3	10.8	1.1	4.1	-3.9	-1.3	-4.0	-0.5	-1.6	0.5	Y
5.4	17.6	19.9	17.2	21.0	19.7	21.9	5.4	10.6	0.9	3.9	-4.0	-1.7	-4.4	-0.5	-1.8	0.4	Y
5.5	17.5	19.5	16.8	20.9	19.5	21.7	5.5	10.4	0.7	3.7	-4.1	-2.1	-4.8	-0.6	-2.1	0.1	Y
5.6	17.3	19.1	16.3	20.8	19.2	21.5	5.6	10.2	0.5	3.5	-4.2	-2.5	-5.3	-0.7	-2.4	-0.1	Y
5.7	17.1	18.6	15.8	20.7	18.8	21.2	5.7	10.0	0.4	3.4	-4.4	-3.0	-5.8	-0.8	-2.7	-0.4	Y
5.8	16.9	18.0	15.2	20.5	18.5	20.9	5.8	9.9	0.2	3.2	-4.7	-3.5	-6.4	-1.0	-3.1	-0.6	Y
5.9	16.6	17.4	14.5	20.4	18.1	20.6	5.9	9.7	0.0	3.0	-5.0	-4.1	-7.0	-1.2	-3.4	-1.0	Y
6.0	16.2	16.7	13.8	20.2	17.7	20.3	6.0	9.5	-0.2	2.8	-5.3	-4.8	-7.7	-1.4	-3.8	-1.3	Y
6.1	15.9	15.9	13.0	19.9	17.3	19.9	6.1	9.3	-0.4	2.6	-5.7	-5.6	-8.5	-1.6	-4.3	-1.7	Y
6.2	15.5	15.1	12.2	19.7	16.9	19.5	6.2	9.1	-0.6	2.4	-6.1	-6.4	-9.3	-1.9	-4.7	-2.0	Y
6.3	15.1	14.2	11.4	19.4	16.4	19.1	6.3	9.0	-0.7	2.3	-6.5	-7.3	-10.2	-2.1	-5.1	-2.4	Y
6.4	14.6	13.2	10.4	19.2	15.9	18.7	6.4	8.8	-0.9	2.1	-7.0	-8.4	-11.1	-2.4	-5.6	-2.8	Y
6.5	14.0	12.0	9.4	18.9	15.4	18.3	6.5	8.6	-1.1	1.9	-7.5	-9.5	-12.1	-2.7	-6.1	-3.3	Y
6.6	13.5	10.7	8.5	18.6	15.0	17.9	6.6	8.5	-1.2	1.8	-8.1	-10.8	-13.1	-3.0	-6.6	-3.7	Y
6.7	12.9	9.2	7.4	18.2	14.4	17.4	6.7	8.3	-1.4	1.6	-8.7	-12.3	-14.1	-3.3	-7.1	-4.1	Y
6.8	12.2	7.5	6.5	17.9	13.9	17.0	6.8	8.1	-1.6	1.4	-9.3	-14.0	-15.1	-3.7	-7.7	-4.6	Y
6.9	11.6	5.5	5.6	17.5	13.3	16.5	6.9	8.0	-1.7	1.3	-10.0	-16.0	-15.9	-4.0	-8.3	-5.0	Y
7.0	10.8	3.1	4.9	17.1	12.8	16.1	7.0	8.0	-1.7	1.1	-10.7	-18.4	-16.6	-4.4	-8.8	-5.5	Y
7.1	10.0	0.1	4.4	16.7	12.2	15.6	7.1	8.0	-1.7	1.0	-11.5	-21.4	-17.1	-4.8	-9.4	-5.9	Y
7.2	9.2	-3.5	4.2	16.3	11.5	15.2	7.2	8.0	-1.7	0.8	-12.3	-25.0	-17.4	-5.3	-10.0	-6.4	Y
7.3	8.4	-6.2	4.2	15.8	10.9	14.7	7.3	8.0	-1.7	0.7	-13.2	-27.7	-17.4	-5.7	-10.7	-6.8	Y
7.4	7.5	-5.3	4.3	15.3	10.2	14.3	7.4	8.0	-1.7	0.5	-14.0	-26.9	-17.2	-6.2	-11.4	-7.3	Y
7.5	6.6	-2.6	4.5	14.8	9.4	13.8	7.5	8.0	-1.7	0.4	-15.0	-24.1	-17.0	-6.7	-12.1	-7.7	Y
7.6	5.5	-0.1	4.8	14.3	8.7	13.4	7.6	8.0	-1.7	0.2	-16.0	-21.7	-16.8	-7.3	-12.8	-8.2	Y
7.7	4.6	1.7	5.0	13.7	7.9	12.9	7.7	8.0	-1.7	0.1	-17.0	-19.8	-16.6	-7.9	-13.7	-8.6	Y
7.8	3.5	3.0	5.2	13.1	7.1	12.5	7.8	8.0	-1.7	0.0	-18.0	-18.5	-16.4	-8.4	-14.5	-9.1	Y
7.9	2.4	4.1	5.3	12.5	6.2	12.0	7.9	8.0	-1.7	-0.2	-19.1	-17.5	-16.2	-9.1	-15.3	-9.5	Y
8.0	1.3	4.9	5.4	11.8	5.3	11.6	8.0	8.0	-1.7	-0.3	-20.3	-16.7	-16.1	-9.8	-16.2	-10.0	Y

8.1	0.0	5.6	5.4	11.1	4.4	11.1	8.1	8.0	-1.7	-0.4	-21.5	-16.0	-16.1	-10.5	-17.2	-10.5	Y
8.2	-1.1	6.1	5.4	10.4	3.5	10.6	8.2	8.0	-1.7	-0.6	-22.6	-15.5	-16.1	-11.2	-18.1	-11.0	Y
8.3	-2.2	6.5	5.3	9.7	2.6	10.0	8.3	8.0	-1.7	-0.7	-23.8	-15.1	-16.2	-11.9	-18.9	-11.5	Y
8.4	-3.3	6.8	5.2	9.0	1.9	9.5	8.4	8.0	-1.7	-0.8	-24.9	-14.8	-16.3	-12.6	-19.6	-12.1	Y
8.5	-4.3	7.0	5.0	8.2	1.4	8.9	8.5	8.0	-1.7	-1.0	-25.9	-14.6	-16.5	-13.3	-20.1	-12.7	Y
8.6	-4.9	7.1	4.8	7.6	1.1	8.2	8.6	8.0	-1.7	-1.1	-26.5	-14.4	-16.7	-14.0	-20.4	-13.4	Y
8.7	-5.6	7.2	4.6	6.9	1.1	7.4	8.7	8.0	-1.7	-1.2	-27.1	-14.3	-17.0	-14.6	-20.5	-14.1	Y
8.8	-5.8	7.3	4.3	6.3	1.3	6.6	8.8	8.0	-1.7	-1.3	-27.4	-14.3	-17.3	-15.2	-20.3	-14.9	Y
8.9	-6.2	7.3	3.9	5.8	1.6	5.7	8.9	8.0	-1.7	-1.5	-27.8	-14.2	-17.6	-15.8	-19.9	-15.9	Y
9.0	-6.4	7.3	3.6	5.3	2.1	4.7	9.0	8.0	-1.7	-1.6	-27.9	-14.3	-18.0	-16.2	-19.5	-16.9	Y
9.1	-6.6	7.2	3.1	4.9	2.5	3.5	9.1	8.0	-1.7	-1.7	-28.1	-14.4	-18.4	-16.6	-19.1	-18.1	Y
9.2	-6.8	7.0	2.7	4.6	2.8	2.2	9.2	7.9	-1.8	-1.8	-28.4	-14.5	-18.9	-17.0	-18.7	-19.4	Y
9.3	-7.0	6.8	2.2	4.3	3.2	0.5	9.3	7.8	-1.9	-1.9	-28.6	-14.7	-19.3	-17.3	-18.4	-21.0	Y
9.4	-6.9	6.6	1.7	4.1	3.5	-1.2	9.4	7.6	-2.1	-2.1	-28.5	-15.0	-19.9	-17.5	-18.1	-22.8	Y
9.5	-7.4	6.3	1.1	3.8	3.7	-3.7	9.5	7.5	-2.2	-2.2	-29.0	-15.2	-20.4	-17.7	-17.9	-25.3	Y
9.6	-7.7	6.0	0.5	3.5	3.9	-6.8	9.6	7.4	-2.3	-2.3	-29.3	-15.6	-21.0	-18.0	-17.7	-28.4	Y
9.7	-8.1	5.6	-0.1	3.3	3.9	-10.6	9.7	7.3	-2.4	-2.4	-29.6	-16.0	-21.7	-18.3	-17.6	-32.1	Y
9.8	-8.3	5.1	-0.8	2.9	3.9	-13.5	9.8	7.2	-2.5	-2.5	-29.9	-16.5	-22.4	-18.7	-17.6	-35.1	Y
9.9	-8.7	4.7	-1.3	2.5	3.9	-11.0	9.9	7.1	-2.6	-2.6	-30.3	-16.9	-22.8	-19.1	-17.7	-32.6	Y
10.0	-9.1	4.1	-1.9	1.9	3.7	-7.6	10.0	7.0	-2.7	-2.7	-30.6	-17.5	-23.5	-19.6	-17.8	-29.1	Y
16.2	-8.9	-5.8	-3.0	-3.8	-5.0	2.5	16.2	1.8	-7.9	-7.9	-30.4	-27.3	-24.6	-25.3	-26.6	-19.1	Y
22.2	-13.5	-16.8	-16.4	-7.3	-13.1	-3.8	22.2	-1.7	-11.3	-11.3	-35.1	-38.4	-38.0	-28.9	-34.6	-25.3	Y
28.2	-7.6	-9.2	-10.0	1.9	-13.0	-4.1	28.2	-4.3	-13.9	-13.9	-29.2	-30.7	-31.6	-19.7	-34.5	-25.7	Y
34.2	-7.9	-3.0	-6.7	-8.1	-4.2	-6.4	34.2	-6.4	-16.0	-16.0	-29.5	-24.6	-28.3	-29.6	-25.8	-28.0	Y
40.2	-15.2	-9.7	-6.2	-1.1	-1.4	-5.9	40.2	-8.1	-17.8	-17.8	-36.8	-31.2	-27.7	-22.6	-23.0	-27.5	Y
46.2	-15.9	-6.5	-15.1	-6.1	-3.1	-4.9	46.2	-9.6	-19.3	-19.3	-37.5	-28.0	-36.6	-27.7	-24.7	-26.5	Y
52.2	-12.2	-10.9	-18.4	-7.6	0.3	-2.1	52.2	-10.0	-19.7	-19.7	-33.7	-32.5	-39.9	-29.2	-21.3	-23.7	Y
56.2	-19.4	-13.2	-9.4	-2.3	-9.0	1.7	56.2	-10.0	-19.7	-19.7	-40.9	-34.7	-30.9	-23.8	-30.5	-19.9	Y
62.2	-15.7	-16.5	-16.0	-0.5	-3.8	-1.0	62.2	-10.0	-19.7	-19.7	-37.3	-38.1	-37.5	-22.1	-25.3	-22.6	Y
68.2	-6.1	-23.4	-13.2	-7.5	-2.0	-0.3	68.2	-10.0	-19.7	-19.7	-27.7	-45.0	-34.7	-29.0	-23.5	-21.9	Y
74.2	-11.0	-26.2	-21.0	-1.5	-7.8	-0.1	74.2	-10.0	-19.7	-19.7	-32.6	-47.7	-42.5	-23.1	-29.4	-21.6	Y
80.2	-13.0	-15.4	-21.5	-1.2	-3.8	-7.1	80.2	-10.0	-19.7	-19.7	-34.6	-36.9	-43.1	-22.7	-25.4	-28.7	Y

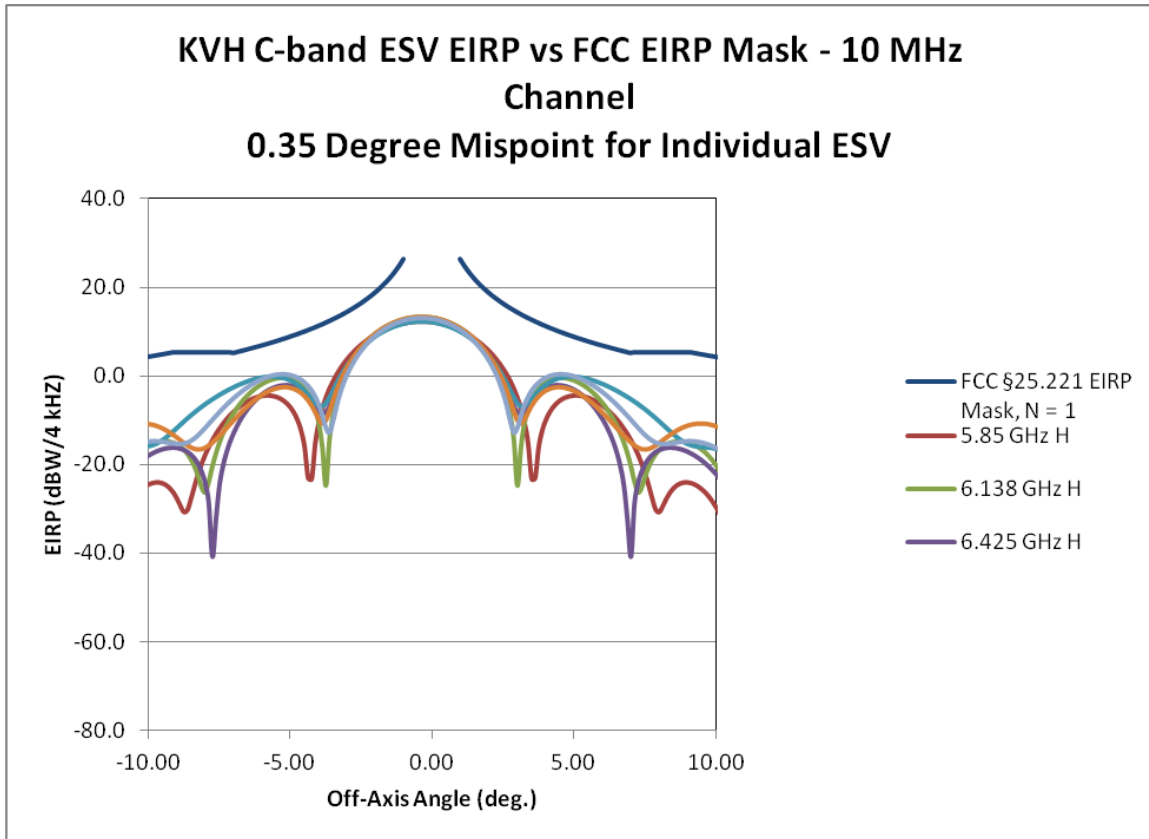|																	
86.2	-9.4	-13.9	-12.7	-6.0	-6.5	-22.9	86.2	-10.0	-19.7	-19.7	-31.0	-35.5	-34.3	-27.6	-28.0	-44.4	Y
92.2	-12.5	-14.6	-11.0	-6.6	-15.2	-8.3	92.2	-10.0	-19.7	-19.7	-34.1	-36.1	-32.6	-28.1	-36.7	-29.8	Y
98.2	-19.8	-15.7	-13.9	-9.6	-8.7	-6.3	98.2	-10.0	-19.7	-19.7	-41.4	-37.3	-35.5	-31.2	-30.3	-27.8	Y
104.2	-23.1	-18.9	-18.3	-11.6	-8.9	-8.8	104.2	-10.0	-19.7	-19.7	-44.7	-40.4	-39.9	-33.1	-30.5	-30.3	Y
110.2	-23.5	-19.9	-20.5	-14.9	-11.7	-11.7	110.2	-10.0	-19.7	-19.7	-45.0	-41.5	-42.1	-36.4	-33.3	-33.2	Y
116.2	-28.5	-22.9	-23.3	-18.2	-13.3	-14.6	116.2	-10.0	-19.7	-19.7	-50.0	-44.4	-44.9	-39.8	-34.8	-36.1	Y
122.2	-27.8	-24.0	-24.8	-19.5	-16.5	-16.7	122.2	-10.0	-19.7	-19.7	-49.3	-45.5	-46.4	-41.0	-38.1	-38.2	Y
128.2	-29.7	-30.3	-26.3	-21.7	-17.1	-18.0	128.2	-10.0	-19.7	-19.7	-51.2	-51.9	-47.8	-43.3	-38.7	-39.5	Y
134.2	-30.7	-28.5	-24.8	-21.4	-18.9	-19.0	134.2	-10.0	-19.7	-19.7	-52.3	-50.1	-46.4	-43.0	-40.4	-40.5	Y
140.2	-36.7	-27.4	-29.3	-27.1	-22.8	-20.2	140.2	-10.0	-19.7	-19.7	-58.3	-49.0	-50.8	-48.6	-44.4	-41.8	Y
146.2	-30.6	-31.6	-26.7	-23.1	-19.9	-20.2	146.2	-10.0	-19.7	-19.7	-52.1	-53.2	-48.3	-44.7	-41.5	-41.8	Y
152.2	-33.5	-33.7	-33.5	-25.0	-19.3	-20.8	152.2	-10.0	-19.7	-19.7	-55.1	-55.2	-55.0	-46.6	-40.9	-42.4	Y
158.2	-29.0	-31.3	-30.1	-24.6	-19.0	-22.9	158.2	-10.0	-19.7	-19.7	-50.6	-52.8	-51.6	-46.2	-40.6	-44.5	Y
164.2	-25.5	-27.7	-39.2	-49.5	-19.6	-20.0	164.2	-10.0	-19.7	-19.7	-47.1	-49.3	-60.8	-71.0	-41.2	-41.5	Y
170.2	-36.4	-29.5	-36.1	-25.4	-23.4	-16.1	170.2	-10.0	-19.7	-19.7	-57.9	-51.0	-57.7	-46.9	-45.0	-37.6	Y
176.2	-30.3	-35.4	-29.9	-22.6	-21.7	-23.9	176.2	-10.0	-19.7	-19.7	-51.9	-57.0	-51.4	-44.1	-43.2	-45.5	Y
180.0	-14.8	-11.1	-11.7	-14.8	-10.3	-10.5	180.0	-10.0	-19.7	-19.7	-36.3	-32.7	-33.3	-36.3	-31.8	-32.1	Y

6. Pointing Accuracy

The C-band V11 ESV 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 V11 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 V11 ESV to be significantly lower that 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 0.15º from boresight. The dynamic pointing error expected during testing operation is expected to be less than 0.2ºs one sigma. Thus the total expected mean pointing error for each vessel while under way, including both conscan and dynamic error, is 0.35º - but the proposed tests are stationary only, so 0.15º conscan should be the only pointing offset experienced.

During the small percentage of time when conditions cause the antenna pointing error to exceed the specified maximum pointing error limit of .35º, 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 0.15º. 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 .35º is the declared maximum antenna pointing error as described in §25.222(b)(1)(iv)(A).

As described above, the C-band V11 ESV terminal uses a spread spectrum multiple access technique whereby the individual off-axis EIRP density of each V11 ESV terminal is well below the maximum aggregate network limit. Thus, each antenna individually will not generate harmful levels of interference. Figure 5 below shows the V11 ESV off-axis EIRP considering a .35 degree pointing error. As can be seen the EIRP density complies with the Section 25.221 mask for an individual V11 ESV terminal.

**Figure 5 – C-Band V11 ESV Terminal Off-axis EIRP
with 1.5 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 V11 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.

7.   Engineering Certificate

<div align="center">

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

</div>

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this 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: 12/31/2013

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