

# FREQUENCY COORDINATION AND INTERFERENCE ANALYSIS REPORT

Prepared for

**KVH Industries, Inc.  
Carlsbad, California**

**Satellite Earth Station**

Prepared By:

COMSEARCH

19700 Janelia Farm Boulevard

Ashburn, Virginia 20147

December 20, 2013

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# 1. CONCLUSIONS

An interference study considering all existing, proposed and prior coordinated microwave facilities within the coordination contours of the proposed earth station demonstrates that this site will operate satisfactorily with the common carrier microwave environment, based upon the restrictions noted in the Summary of Results (Section 2).

## 2. SUMMARY OF RESULTS

A number of great circle interference cases were identified during the interference study of the proposed earth station. Each of the cases, which exceeded the interference objective on a line-of-sight basis, was profiled and the propagation losses estimated using NBS TN101 (Revised) techniques. The losses were found to be sufficient to reduce the signal levels to acceptable magnitudes in most cases.

The following companies reported potential great circle interference conflicts that did not meet the objectives on a line-of-sight basis. When frequency separation and over-the-horizon losses are considered on the interfering paths, sufficient losses exist to negate harmful interference from occurring with the proposed transmit-receive earth station. Further, the transmit spectrum will be limited to frequencies 5925.0 to 6048.7 MHz, 6109.0 to 6182.0 MHz, 6212.5 to 6330.0 MHz, 6361.0 to 6389.5 MHz, and 6420.0 to 6425.0 MHz.

### Company

New Cingular Wireless PCS LLC – San Diego  
Verizon Wireless (VAW) LLC CA

No other carriers reported potential interference cases.

### 3. SUPPLEMENTAL SHOWING

Pursuant to Part 25.203(c) of the FCC Rules and Regulations, the satellite earth station proposed in this application was coordinated by Comsearch using computer techniques and in accordance with Part 25 of the FCC Rules and Regulations.

Expedited coordination data for this earth station was emailed and sent to the below listed carriers with a letter dated November 22, 2013.

#### Company

ABC Holding Company Inc.  
ANAHEIM CITY, COMMUNICATIONS DIVISION  
AT&T California  
AirSites2000, LLC  
COAST COMMUNITY COLLEGE DISTRICT  
California, State of  
Calvary Chapel of Costa Mesa  
Cellco Partnership - California  
DRS Technical Services  
Entravision Holdings, LLC  
KTLA, LLC  
Los Angeles County FCC Licensing Section  
Los Angeles SMSA Ltd. Partnership  
MHO Networks  
MOBILE RELAY ASSOCIATES INC  
Metropolitan Water Dist of So California  
New Cingular Wireless PCS - Los Angeles  
New Cingular Wireless PCS LLC -San Diego  
ORANGE, COUNTY OF, CA  
QUALCOMM INC.  
Regional 3Cs  
Riverside, County of  
SAN DIEGO, CITY OF  
San Bernardino County of California  
San Diego County  
San Diego County Water Authority  
San Diego Gas & Electric Company  
Skyriver Communications  
Southern California Edison Company  
Southern California Gas Company  
Southern California Regional Rail Auth.  
TV MICROWAVES CO  
Turn Wireless, LLC  
University of California,HPWREN  
Verizon California Inc.  
Verizon Wireless (VAW) LLC (CA)

## **4. EARTH STATION COORDINATION DATA**

This section presents the data pertinent to frequency coordination of the proposed earth station that was circulated to all carriers within its coordination contours.

# COMSEARCH

## Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147  
(703)726-5500 <http://www.comsearch.com>

Date: 12/20/2013  
Job Number: 131122COMSJC04

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### Administrative Information

Status ENGINEER PROPOSAL  
Call Sign  
Licensee Code KVHIND  
Licensee Name KVH Industries, Inc.

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### Site Information CARLSBAD, CALIFORNIA

Venue Name  
Latitude (NAD 83) 33° 7' 30.7" N  
Longitude (NAD 83) 117° 16' 2.7" W  
Climate Zone A  
Rain Zone 4  
Ground Elevation (AMSL) 87.48 m / 287.0 ft

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### Link Information

Satellite Type Geostationary  
Mode TR - Transmit-Receive  
Modulation Digital  
Satellite Arc 180° W to 180° West Longitude  
Azimuth Range 254.3° to 254.3°  
Corresponding Elevation Angles 14.1° / 14.1°  
Antenna Centerline (AGL) 10.36 m / 34.0 ft

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### Antenna Information

Manufacturer KVH Industries, Inc.  
Model 1.0 Meter  
Gain / Diameter 31.2 dBi / 1.0 m  
3-dB / 15-dB Beamwidth 2.20° / 4.00°

### Receive

### Transmit

KVH Industries, Inc.  
1.0 Meter  
34.5 dBi / 1.0 m  
1.50° / 2.95°

Max Available RF Power (dBW/4 kHz) -21.5  
(dBW/MHz) 2.5

Maximum EIRP (dBW/4 kHz) 13.0  
(dBW/MHz) 37.0

Interference Objectives: Long Term -156.0 dBW/MHz 20% -154.0 dBW/4 kHz 20%  
Short Term -146.0 dBW/MHz 0.01% -131.0 dBW/4 kHz 0.0025%

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### Frequency Information

Emission / Frequency Range (MHz) 1M00G7D - 36M0G7D / 3700.0 - 4200.0

### Receive 4.0 GHz

### Transmit 6.1 GHz

1M00G7D - 36M0G7D / 5925.0 - 6048.7  
1M00G7D - 36M0G7D / 6109.0 - 6182.0  
1M00G7D - 36M0G7D / 6212.5 - 6330.0  
1M00G7D - 28M0G7D / 6361.0 - 6389.5  
1M00G7D - 4M50G7D / 6420.0 - 6425.0

Max Great Circle Coordination Distance 381.9 km / 237.3 mi  
Precipitation Scatter Contour Radius 378.9 km / 235.4 mi

148.7 km / 92.4 mi  
100.0 km / 62.1 mi

# COMSEARCH

## Earth Station Data Sheet

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### Coordination Values

### CARLSBAD, CA

Licensee Name KVH Industries, Inc.  
Latitude (NAD 83) 33° 7' 30.7" N  
Longitude (NAD 83) 117° 16' 2.7" W  
Ground Elevation (AMSL) 87.48 m / 287.0 ft  
Antenna Centerline (AGL) 10.36 m / 34.0 ft  
Antenna Model KVH Industries, Inc. 1.0 Meter  
Antenna Mode Receive 4.0 GHz Transmit 6.1 GHz  
Interference Objectives: Long Term -156.0 dBW/MHz 20% -154.0 dBW/4 kHz 20%  
Short Term -146.0 dBW/MHz 0.01% -131.0 dBW/4 kHz 0.0025%  
Max Available RF Power -21.5 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Receive 4.0 GHz		Transmit 6.1 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
0	0.75	105.30	-10.00	234.09	-10.00	100.00
5	0.86	110.15	-10.00	227.82	-10.00	100.00
10	0.91	115.00	-10.00	225.13	-10.00	100.00
15	1.11	119.86	-10.00	216.78	-10.00	100.00
20	1.52	124.75	-10.00	204.95	-10.00	100.00
25	1.08	129.47	-10.00	217.83	-10.00	100.00
30	1.25	134.27	-10.00	212.66	-10.00	100.00
35	1.29	139.01	-10.00	211.54	-10.00	100.00
40	1.30	143.69	-10.00	211.34	-10.00	100.00
45	1.51	148.35	-10.00	205.37	-10.00	100.00
50	1.68	152.90	-10.00	203.05	-10.00	100.00
55	1.67	157.18	-10.00	203.52	-10.00	100.00
60	1.68	161.15	-10.00	203.23	-10.00	100.00
65	1.69	164.53	-10.00	202.97	-10.00	100.00
70	1.61	166.79	-10.00	205.01	-10.00	100.00
75	1.60	167.45	-10.00	205.42	-10.00	100.00
80	1.78	166.40	-10.00	200.46	-10.00	100.00
85	1.74	163.66	-10.00	201.65	-10.00	100.00
90	1.56	159.96	-10.00	206.49	-10.00	100.00
95	1.69	155.97	-10.00	202.81	-10.00	100.00
100	2.25	151.83	-10.00	188.80	-10.00	100.00
105	2.47	147.33	-10.00	183.80	-10.00	100.00
110	1.55	142.40	-10.00	206.72	-10.00	100.00
115	1.29	137.63	-10.00	211.52	-10.00	100.00
120	1.36	132.90	-10.00	209.42	-10.00	100.00
125	1.82	128.20	-10.00	199.52	-10.00	100.00
130	1.95	123.39	-10.00	195.95	-10.00	100.00
135	1.25	118.46	-10.00	212.61	-10.00	100.00
140	1.08	113.60	-10.00	217.79	-10.00	100.00
145	1.07	108.75	-10.00	218.12	-10.00	100.00
150	0.35	103.85	-10.00	266.32	-10.00	100.99
155	0.00	98.98	-10.00	285.28	-10.00	113.23
160	0.00	94.14	-10.00	285.28	-10.00	113.23
165	0.00	89.29	-10.00	285.28	-10.00	113.23
170	0.00	84.44	-10.00	285.28	-10.00	113.23
175	0.00	79.60	-10.00	285.28	-10.00	113.23
180	0.00	74.76	-10.00	285.28	-10.00	113.23
185	0.22	69.90	-10.00	282.97	-10.00	111.77



# COMSEARCH

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### Coordination Values

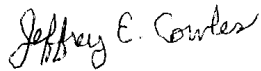
### CARLSBAD, CA

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Ground Elevation (AMSL)	87.48 m / 287.0 ft		
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Antenna Model	KVH Industries, Inc. 1.0 Meter		
Antenna Mode	Receive 4.0 GHz		Transmit 6.1 GHz
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	-154.0 dBW/4 kHz 20%
Short Term	-146.0 dBW/MHz	0.01%	-131.0 dBW/4 kHz 0.0025%
Max Available RF Power			-21.5 (dBW/4 kHz)

Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Receive 4.0 GHz		Transmit 6.1 GHz	
			Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
190	0.20	65.08	-10.00	285.04	-10.00	113.08
195	0.00	60.29	-10.00	285.28	-10.00	113.23
200	0.24	55.46	-10.00	280.29	-10.00	110.06
205	0.00	50.74	-10.00	285.28	-10.00	113.23
210	0.00	46.02	-9.57	288.01	-9.57	114.32
215	0.00	41.34	-8.41	295.60	-8.41	117.30
220	0.21	36.66	-7.11	302.69	-7.11	119.63
225	0.35	32.09	-5.66	294.37	-5.66	111.92
230	0.39	27.68	-4.05	301.60	-4.05	113.61
235	0.23	23.60	-2.32	335.33	-2.32	130.98
240	0.21	19.83	-0.43	352.25	-0.43	136.64
245	0.00	16.85	1.34	366.95	1.34	142.61
250	0.00	14.75	2.78	378.35	2.78	147.21
255	0.00	14.15	3.23	381.95	3.23	148.70
260	0.00	15.23	2.44	375.59	2.44	146.09
265	0.00	17.68	0.81	362.88	0.81	141.01
270	0.00	21.03	-1.07	348.48	-1.07	135.51
275	0.00	24.91	-2.91	334.78	-2.91	131.74
280	0.00	29.12	-4.61	322.49	-4.61	127.22
285	0.00	33.53	-6.14	311.04	-6.14	123.19
290	0.00	38.08	-7.52	301.57	-7.52	119.60
295	0.00	42.71	-8.76	293.27	-8.76	116.39
300	0.00	47.40	-9.89	285.95	-9.89	113.50
305	0.00	52.14	-10.00	285.28	-10.00	113.23
310	0.00	56.91	-10.00	285.28	-10.00	113.23
315	0.00	61.70	-10.00	285.28	-10.00	113.23
320	0.00	66.51	-10.00	285.28	-10.00	113.23
325	0.00	71.34	-10.00	285.28	-10.00	113.23
330	0.26	76.16	-10.00	278.26	-10.00	108.76
335	0.20	81.01	-10.00	284.67	-10.00	112.85
340	0.00	85.86	-10.00	285.28	-10.00	113.23
345	0.45	90.71	-10.00	255.66	-10.00	100.00
350	0.28	95.57	-10.00	274.85	-10.00	106.56
355	0.47	100.43	-10.00	253.31	-10.00	100.00

## 5. CERTIFICATION

I HEREBY CERTIFY THAT I AM THE TECHNICALLY QUALIFIED PERSON RESPONSIBLE FOR THE PREPARATION OF THE FREQUENCY COORDINATION DATA CONTAINED IN THIS APPLICATION, THAT I AM FAMILIAR WITH PARTS 101 AND 25 OF THE FCC RULES AND REGULATIONS, THAT I HAVE EITHER PREPARED OR REVIEWED THE FREQUENCY COORDINATION DATA SUBMITTED WITH THIS APPLICATION, AND THAT IT IS COMPLETE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.



Jeffrey E. Cowles  
Engineer III, Telecommunications  
COMSEARCH  
19700 Janelia Farm Boulevard  
Ashburn, Va. 20147

DATED: December 20, 2013