

Exhibit A2 – Concept of Operation

KVH On-Site C-band ESV Testing – Additional site in Carlsbad, CA Modification of STA License Call Sign WF9XGC File Number 0662-EX-ST-2011

Introduction

KVH would like to modify their existing Special Temporary Authority to test their newly designed C-band earth station onboard vessel (ESV) satellite terminal. The modification consists of

1. Adding an additional test site, KVH's modem manufacturer's facility, ViaSat, Inc., in Carlsbad, CA. The testing would be performed under controlled circumstances at the ViaSat Carlsbad facility with visibility to the GSO satellite arc. The testing would allow KVH to validate that the prototype performance matches theoretical. The testing will also validate the manufacturing procedures, which includes over-the-air testing before product ship. A maximum of three (3) terminals would be tested.
2. Adding a GSO satellite as an additional point of communication - Intelsat IS18 at 180 East Longitude. Specific frequencies of operation are 6262-6276 MHz. An interference analysis and frequency coordination to clear this satellite and spectrum have been completed, and are attached as Exhibits B2 (Transponder Analysis) and C2 (Frequency Coordination).
3. Additionally, KVH would like to extend the STA's period of testing by three months from June 1, 2012 to September 1, 2012.

Description of ESV Terminal

The terminal to be tested is identical to the terminals licensed for Middletown, RI under the above call sign.

The C-band ESV terminal is a highly efficient and affordable terminal for use with KVH's global ESV network. The 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 256 kbits/s. The ESVs will transmit using CRMA spreading¹ over a 10 MHz channel bandwidth.

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

Up to three terminals will be tested at the Carlsbad, CA site. KVH has secured satellite transponder bandwidth on Intelsat IS 18 at 180 E.L. between 6262-6276 MHz on global beam transponder G18C.

Details of operating parameters for this test program are shown in Table 1 below:

Technical Operating Parameters

The operational parameters of the C-band ESV are shown in the table below:

Company	KVH	
Site Name, State	Carlsbad, CA	
Latitude (NAD83)	33.126389	N
Longitude (NAD83)	117.2688611	W
Elevation AMSL (ft/m)	287	87.48
Antenna Parameters		
Antenna Diameter (m)		1
Antenna Centerline (ft/m)	8.0	2.44
Range of Satellite Orbital Long. (deg W)	180	180
Antenna Elevation Angles (deg)	14.1	14.1
Range of Azimuths from North (deg)	254.3	254.3
Parameters at Center Freq (GHz)	3.95 (RX)	6.18 (TX)
Antenna Gain, Main Beam (dBi)	31.3	34.5
15 DB Half Beamwidth (deg)	4.00	2.95
3 DB Half Beamwidth (deg)	2.20	1.50
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 500	to 256
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)		47.0
Modulation / Emission Designator (Rx/Tx)	4M50G7D	9M98G7D
Frequency Range (MHz)	Receive	Transmit
	3700	5925
	4200	6425
HPA Size (W)		22
Output Circuit Losses, including radome loss (dB)		1
Receive G/T (dB/K)	9.7	

Table 1 – C-Band ESV Carlsbad, CA Operating Parameters

6 GHz Terrestrial Microwave Interference Analysis and Frequency Coordination

The operational parameters of the C-band ESV terminal are shown in Table 1 above. An interference analysis, using the Comsearch database, to determine the impact of these tests on the surrounding 6 GHz microwave service was performed on February 15, 2012. The 6 GHz transmission use the CRMA spread spectrum technique developed by ViaSat resulting in a very low transmitted RF power density of -21.5 dBW/4 kHz.

The low RF power density resulted in no potential interference cases. Exhibit B2 of this STA modification request contains the Comsearch transponder analysis clearing the specific frequencies of operation. Additionally, Comsearch performed a temporary frequency coordination for a period March 1, 2012 to September 1, 2012. The Prior Coordination Notice is attached as Exhibit C2 to this request.

This means that there is no potential for interference into any surrounding terrestrial systems.

24/7 Point of Contact

The 24/7 point of contact to cease operation if interference occurs from this KVH testing is:

Name: Marc Edwards,
Cellular telephone number: 401 835-8488,
Email: medwards@kvh.com

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

The data rates transmitted from the terminal will vary from 32 kbits/s to 256 kbits/s. Additionally, the ESVs will transmit using CRMA spreading over a 10 MHz channel bandwidth. The small diameter C-band ESV antenna does not meet the FCC 25.209 antenna pattern, see antenna gain patterns in Figures 3 and 4, 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 are shown in Figures 5 and 6 below. Note that a calculated worst case aggregate EIRP would occur when N=5 users for a 10 MHz channel. KVH does not intend to use more than three (3) terminals simultaneously during these tests. Table 3 below summarizes the channel power and off-axis EIRP calculations.

10 MHz Channel Calculations		
Power a feed Flange	17.46	W
Power a feed Flange	12.42	dBW
Channel Bandwidth	9.98E+00	MHz

RF Power Density at Flange	-21.6	dBW/4 kHz
RF Power Density at Flange	2.4	dBW/ MHz
Maximum Horizon EIRP Density (@10.8° Elevation Angle)	11.50	dBW/MHz*
Maximum Horizon EIRP	20.80	dBW*
At Angle	10.80	deg
Maximum Number Simultaneous Users N	5	
Worst Case Antenna Gain Exceedance	-11.09	dB
At Angle	-5.88	deg.
For Antenna Pattern	5.85 GHz E	
EIRP Exceedance Limited by Pattern	5.85 GHz E	
At Angle	-5.87500	deg

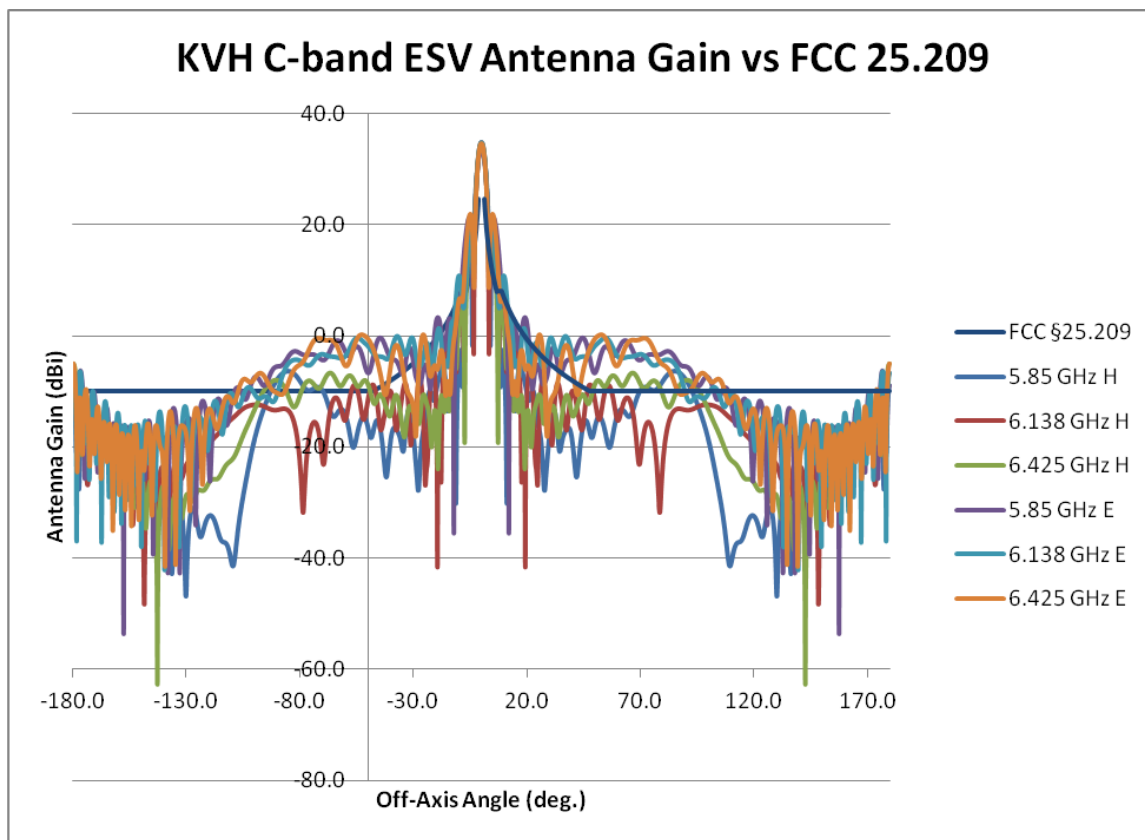


Figure 3 – C-Band ESV Antenna Pattern vs 25.209 mask, +/- 180 degrees

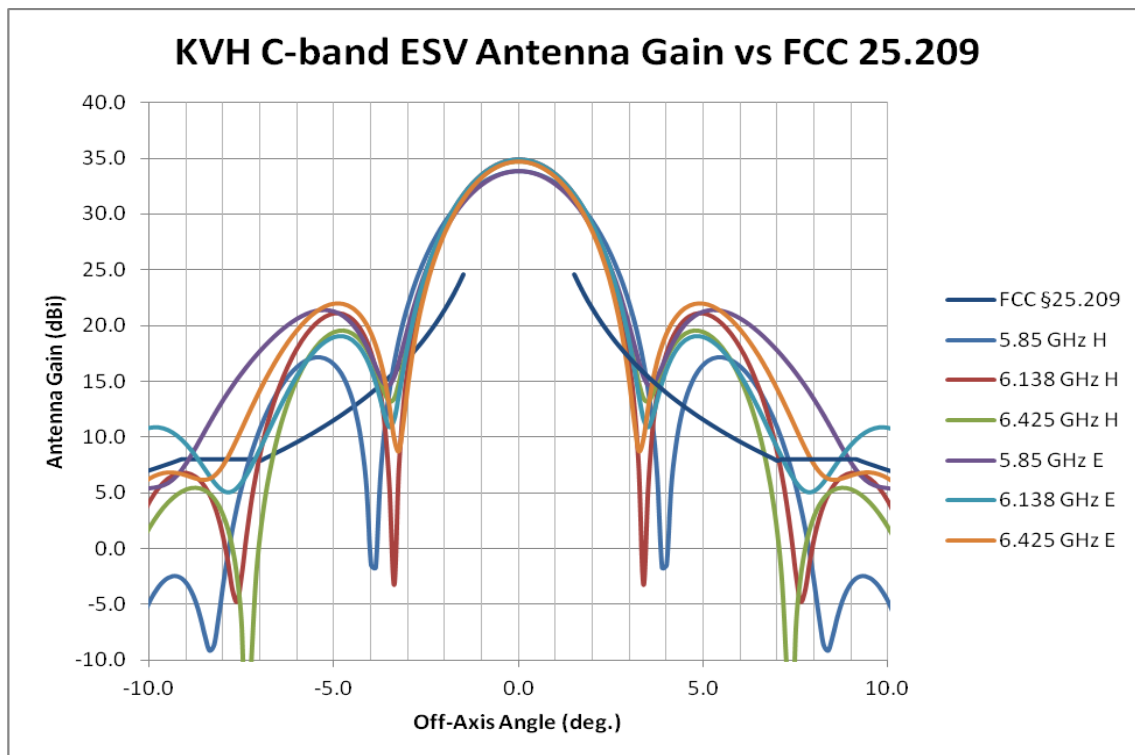


Figure 4– C-band ESV Antenna Pattern vs 25.209 mask , +/- 10 degrees

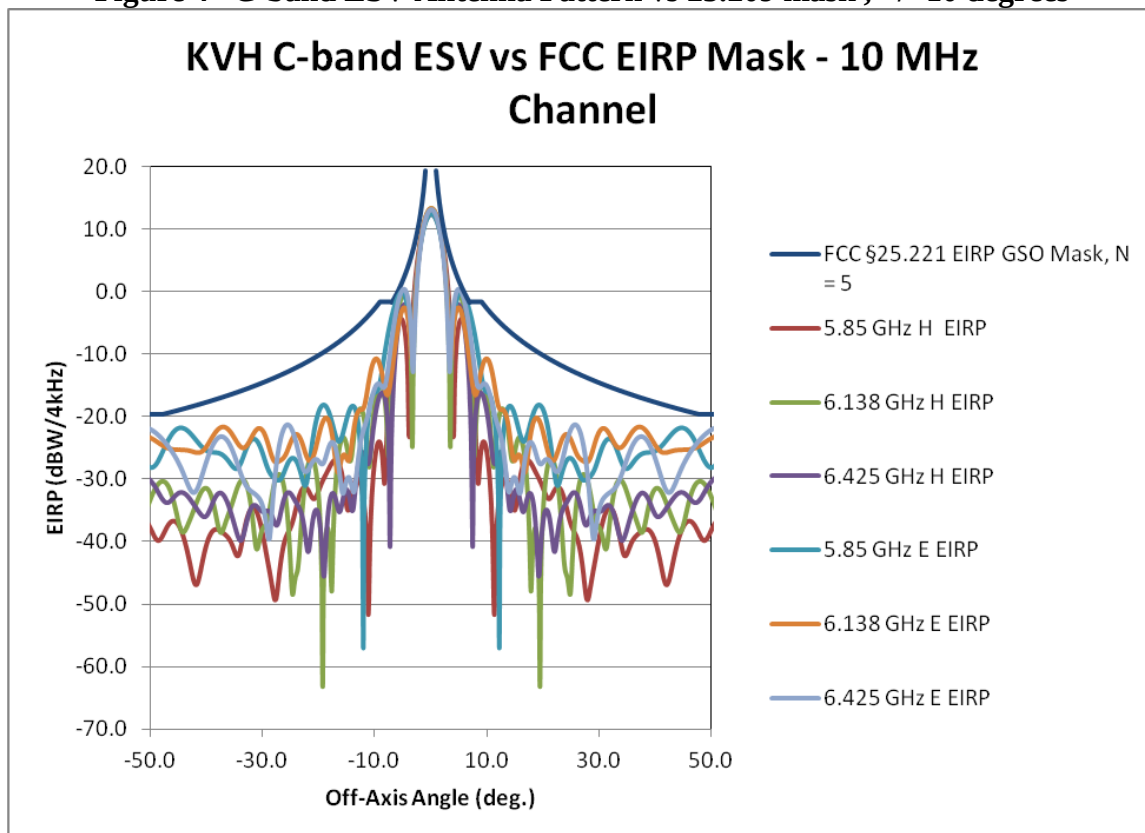


Figure 5 – C-band ESV Antenna EIRP vs 25.221 mask , +/- 180 degrees

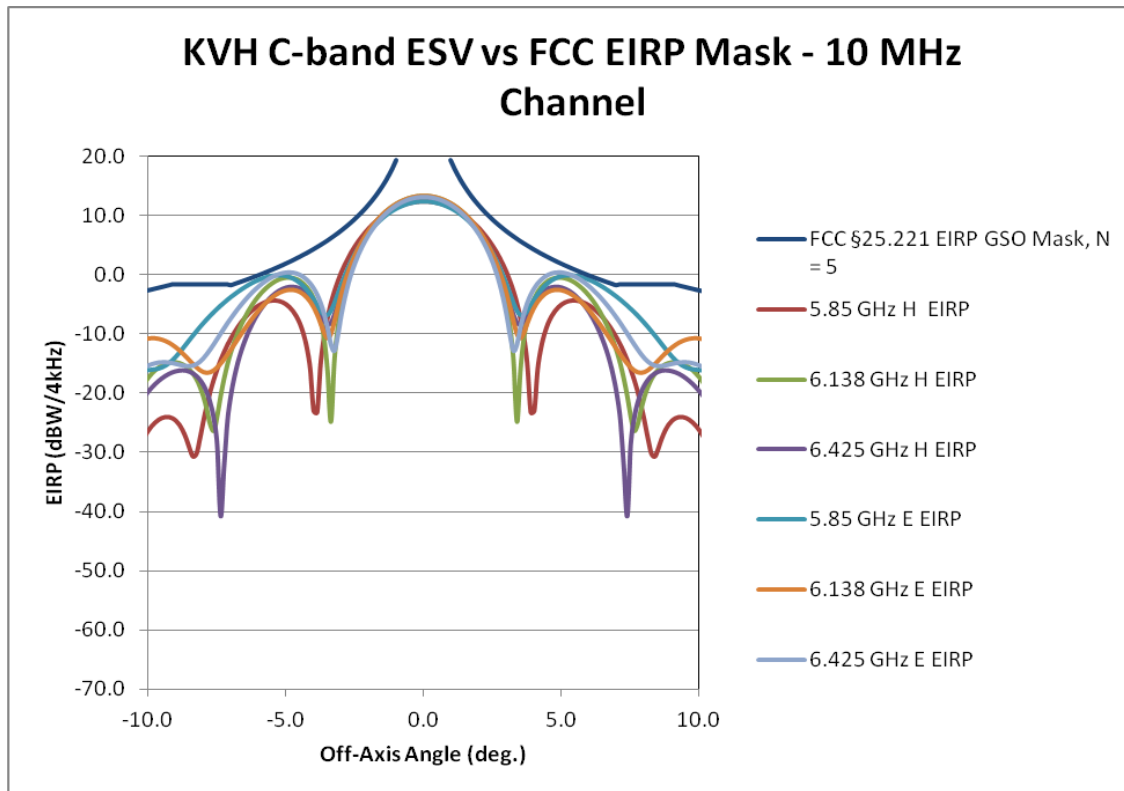


Figure 6 – C-band ESV Antenna EIRP vs 25.221 mask , +/- 10 degrees

Pointing Accuracy

The C-band 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.

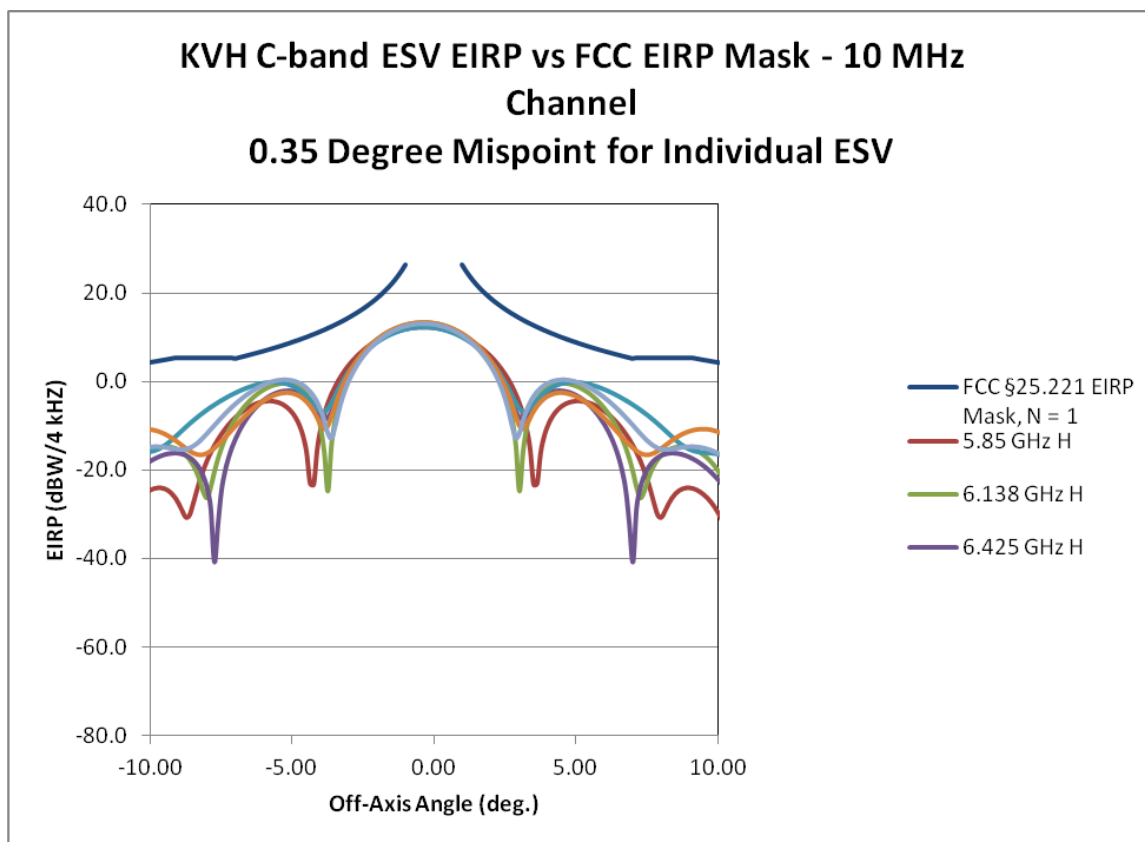
The ESV terminal uses a common spreading code and a random access method called code reuse multiple access (“CRMA”) to access the satellite. CRMA is closely analogous to the more generally understood code division multiple access (CDMA) multiple access method, but differs in that all terminals use a 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 0.15° from boresight. The dynamic pointing error expected during testing operation is expected to be less than 0.2°s one sigma. Thus the total expected mean pointing error for each vessel while under way, including both conscan and dynamic

error, is 0.35° - but the proposed tests are stationary only, so 0.15° 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 $.35^\circ$, 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 0.15° . 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 $.35^\circ$ is the declared maximum antenna pointing error as described in §25.222(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 7 below shows the ESV off-axis EIRP considering a $.35^\circ$ degree pointing error. As can be seen the EIRP density complies with the Section 25.221 mask for an individual ESV terminal.



**Figure 7 – C-Band 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 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 experimental operations, KVH will cease terminal transmissions immediately.

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:  Date: 2/17/2012
Kenneth G. Ryan, P.E.
Vice President
Skjei Telecom, Inc.

