

# Heads Up Systems

TEST REPORT FOR

**Visual Indicator, EGAS Sign**

Tested To The Following Standards:

**FCC Part 15 Subpart C Sections 15.207, 15.249  
and  
RSS 210 Issue 8**

**Report No.: 91979-10**

Date of issue: December 20, 2011



This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

## TABLE OF CONTENTS

Administrative Information .....	3
Test Report Information .....	3
Report Authorization .....	3
Test Facility Information .....	4
Site Registration & Accreditation Information .....	4
Summary of Results .....	5
Conditions During Testing .....	5
Equipment Under Test .....	6
Peripheral Devices .....	6
FCC Part 15 Subpart C .....	7
15.207 AC Conducted Emissions .....	7
15.249 RF Power Output / Spurious Emissions .....	14
-20dBc Occupied Bandwidth .....	20
Bandedge .....	22
RSS-210 .....	25
99 % Bandwidth .....	25
Supplemental Information .....	27
Measurement Uncertainty .....	27
Emissions Test Details .....	27

## ADMINISTRATIVE INFORMATION

### Test Report Information

**REPORT PREPARED FOR:**

Heads Up Systems  
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**REPORT PREPARED BY:**

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Project Number: 91979

**DATE OF EQUIPMENT RECEIPT:**

November 7, 2011

**DATE(S) OF TESTING:**

November 7- December 6, 2011

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



*Steve Behm*  
Director of Quality Assurance & Engineering Services  
CKC Laboratories, Inc.

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

**TEST LOCATION(S):**  
CKC Laboratories, Inc.  
110 Olinda Place  
Brea, CA 92823

## Site Registration & Accreditation Information

Location	CB #	Japan	Canada	FCC
Brea A	US0060	R-2945, C-3248 & T-1572	3082D-1	90473

## SUMMARY OF RESULTS

### Standard / Specification: FCC Part 15 Subpart C and RSS 210 Issue 8

Description	Test Procedure/Method	Results
Conducted Emissions	FCC Part 15 Subpart C Section 15.207 / ANSI C63.4 (2003)	Pass
RF Power Output / Spurious Emissions	FCC Part 15 Subpart C Section 15.249	Pass
-20dBc Occupied Bandwidth	FCC Part 15 Subpart C Section 15.249	Pass
Bandedge	FCC Part 15 Subpart C	Pass
99% Bandwidth	RSS 210 Issue 8	Pass

### Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
Modification during 15.249 RF Power Output: Firmware power set at -12dBm

## EQUIPMENT UNDER TEST (EUT)

### EQUIPMENT UNDER TEST

#### Visual Indicator

Manuf: Heads Up Systems  
Model: EGAS Sign  
Serial: NA

#### Power Supply

Manuf: V-Infinity  
Model: EPSA120100U  
Serial: NA

### PERIPHERAL DEVICES

The EUT was not tested with peripheral devices.

## FCC PART 15 SUBPART C

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) 47 CFR 15C requirements for Unlicensed Radio Frequency Devices, Subpart C - Intentional Radiators.

### 15.207 AC Conducted Emissions

#### Test Data Sheets

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Heads Up Systems**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **91979** Date: 11/14/2011  
 Test Type: **Conducted Emissions** Time: 10:01:16  
 Equipment: **Visual indicator** Sequence#: 8  
 Manufacturer: Heads Up Systems Tested By: E. Wong  
 Model: EGAS Sign 110V 60Hz  
 S/N: NA

#### *Test Equipment:*

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
T1	ANP06084	Attenuator	SA18N10W-06	12/8/2010	12/8/2012
T2	AN02610	High Pass Filter	HE9615-150K-50-720B	11/16/2009	11/16/2011
T3	ANP04358	Cable	RG142	5/7/2010	5/7/2012
T4	AN00847.1	50uH LISN-Line 1 (dB)	3816/2NM	12/21/2010	12/21/2012
	AN00847.1	50uH LISN-Line 2 (dB)	3816/2NM	12/21/2010	12/21/2012

#### *Equipment Under Test (\* = EUT):*

Function	Manufacturer	Model #	S/N
Visual indicator*	Heads Up Systems	EGAS Sign	NA
Power Supply	V-Infinity	EPSA120100U	NA

#### *Support Devices:*

Function	Manufacturer	Model #	S/N

**Test Conditions / Notes:**

The EUT is placed on the wooden table, set in constant transmit mode.

Freq: 2424 MHz

EGAS Sign is orientated in normal position as intended during the test.

Frequency range of measurement = 150kHz- 30MHz.

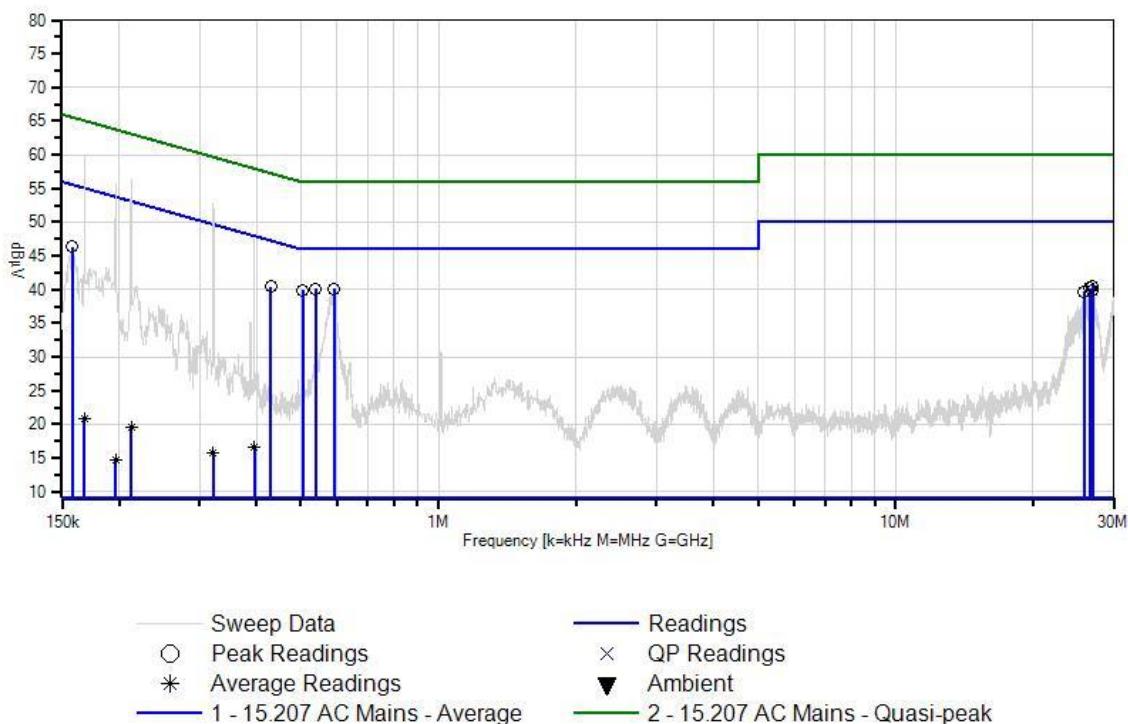
150 kHz-30 MHz; RBW=9 kHz, VBW=9kHz

17°C, 37% Relative Humidity

Ext Attn: 0 dB

#	Freq MHz	Reading listed by margin.				Dist Table	Corr dB $\mu$ V	Spec dB $\mu$ V	Margin dB	Polar Ant	Test Lead: L1
		Rdng dB $\mu$ V	T1 dB	T2 dB	T3 dB						
1	539.055k	33.9	+5.8	+0.3	+0.1	+0.0	+0.0	40.1	46.0	-5.9	L1
2	590.687k	33.9	+5.8	+0.3	+0.1	+0.0	+0.0	40.1	46.0	-5.9	L1
3	504.149k	33.8	+5.7	+0.3	+0.1	+0.0	+0.0	39.9	46.0	-6.1	L1
4	429.974k	34.3	+5.7	+0.3	+0.1	+0.0	+0.0	40.4	47.3	-6.9	L1
5	157.999k	39.7	+5.8	+0.7	+0.1	+0.0	+0.0	46.3	55.6	-9.3	L1
6	26.958M	32.3	+5.8	+0.2	+0.4	+1.8	+0.0	40.5	50.0	-9.5	L1
7	26.567M	32.0	+5.8	+0.2	+0.4	+1.8	+0.0	40.2	50.0	-9.8	L1
8	26.978M	31.7	+5.8	+0.2	+0.4	+1.8	+0.0	39.9	50.0	-10.1	L1
9	25.848M	31.6	+5.8	+0.2	+0.4	+1.7	+0.0	39.7	50.0	-10.3	L1
10	395.068k Ave	10.6	+5.7	+0.3	+0.1	+0.0	+0.0	16.7	48.0	-31.3	L1
^	395.068k	41.3	+5.7	+0.3	+0.1	+0.0	+0.0	47.4	48.0	-0.6	L1
12	212.540k Ave	13.3	+5.8	+0.3	+0.1	+0.0	+0.0	19.5	53.1	-33.6	L1
^	212.540k	50.3	+5.8	+0.3	+0.1	+0.0	+0.0	56.5	53.1	+3.4	L1
14	320.893k Ave	9.6	+5.7	+0.3	+0.1	+0.0	+0.0	15.7	49.7	-34.0	L1
^	320.893k	46.7	+5.7	+0.3	+0.1	+0.0	+0.0	52.8	49.7	+3.1	L1
^	322.348k	45.8	+5.7	+0.3	+0.1	+0.0	+0.0	51.9	49.6	+2.3	L1

17	168.180k	14.6	+5.8	+0.4	+0.1	+0.0	+0.0	20.9	55.0	-34.1	L1
Ave											
19	196.541k	8.5	+5.8	+0.3	+0.1	+0.0	+0.0	14.7	53.8	-39.1	L1
Ave											
15.207 AC Mains - Average											
1 - 15.207 AC Mains - Average											
2 - 15.207 AC Mains - Quasi-peak											

CKC Laboratories, Inc. Date: 11/14/2011 Time: 10:01:16 Heads Up Systems WO#: 91979  
15.207 AC Mains - Average Test Lead: L1 110V 60Hz Sequence#: 8 Ext ATTN: 0 dB


Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Heads Up Systems**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **91979** Date: 11/14/2011  
 Test Type: **Conducted Emissions** Time: 10:13:19  
 Equipment: **Visual indicator** Sequence#: 9  
 Manufacturer: Heads Up Systems Tested By: E. Wong  
 Model: EGAS Sign 110V 60Hz  
 S/N: NA

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
T1	ANP06084	Attenuator	SA18N10W-06	12/8/2010	12/8/2012
T2	AN02610	High Pass Filter	HE9615-150K-50-720B	11/16/2009	11/16/2011
T3	ANP04358	Cable	RG142	5/7/2010	5/7/2012
	AN00847.1	50uH LISN-Line 1 (dB)	3816/2NM	12/21/2010	12/21/2012
T4	AN00847.1	50uH LISN-Line 2 (dB)	3816/2NM	12/21/2010	12/21/2012

**Equipment Under Test (\* = EUT):**

Function	Manufacturer	Model #	S/N
Visual indicator*	Heads Up Systems	EGAS Sign	NA
Power Supply	V-Infinity	EPSA120100U	NA

**Support Devices:**

Function	Manufacturer	Model #	S/N

**Test Conditions / Notes:**

The EUT is placed on the wooden table, set in constant transmit mode.

Freq: 2424 MHz

EGAS Sign is orientated in normal position as intended during the test.

Frequency range of measurement = 150kHz- 30MHz.

150 kHz-30 MHz; RBW=9 kHz, VBW=9kHz

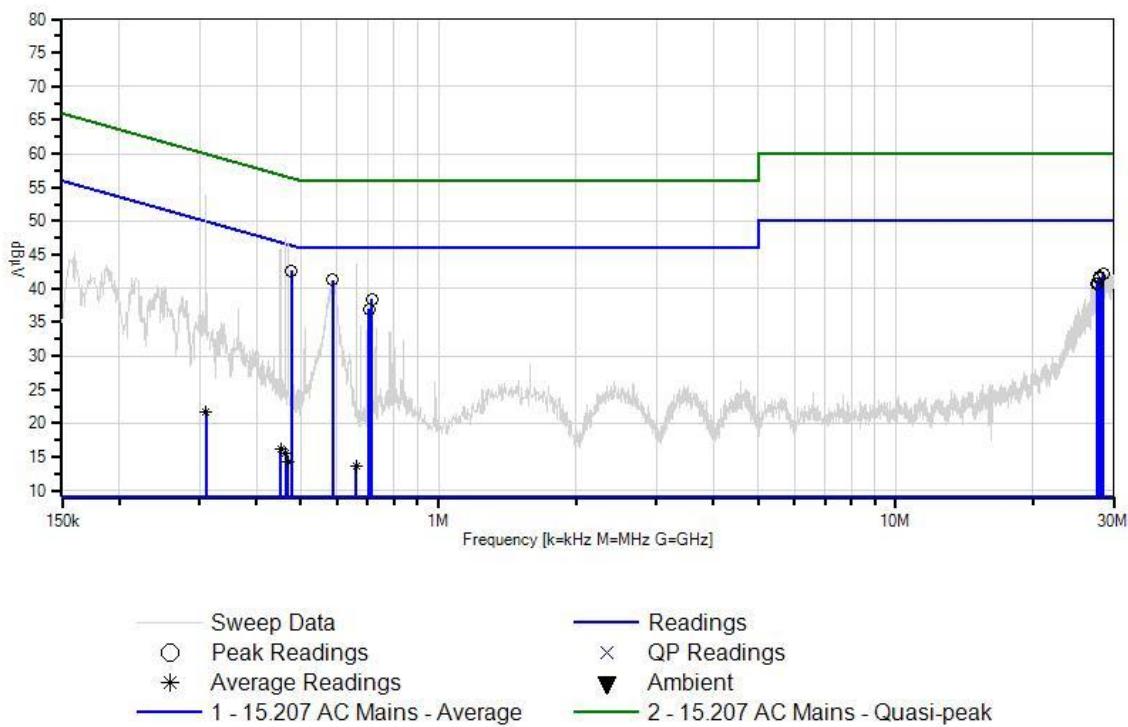
17°C, 37% Relative Humidity

Ext Attn: 0 dB

<b>Measurement Data:</b>		Reading listed by margin.					Test Lead: L2						
		#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			MHz	dB $\mu$ V	dB	dB	dB	dB	Table	dB $\mu$ V	dB $\mu$ V	dB	Ant
1	475.788k		36.5	+5.7	+0.3	+0.1	+0.0	+0.0	42.6	46.4	-3.8	L2	
2	587.051k		35.1	+5.8	+0.3	+0.1	+0.0	+0.0	41.3	46.0	-4.7	L2	
3	713.585k		32.3	+5.8	+0.2	+0.1	+0.0	+0.0	38.4	46.0	-7.6	L2	
4	28.499M		33.8	+5.8	+0.2	+0.4	+2.0	+0.0	42.2	50.0	-7.8	L2	

5	27.890M	33.4	+5.8	+0.2	+0.4	+1.9	+0.0	41.7	50.0	-8.3	L2
6	27.992M	33.2	+5.8	+0.2	+0.4	+2.0	+0.0	41.6	50.0	-8.4	L2
7	704.858k	30.7	+5.8	+0.3	+0.1	+0.0	+0.0	36.9	46.0	-9.1	L2
8	27.677M	32.4	+5.8	+0.2	+0.4	+1.9	+0.0	40.7	50.0	-9.3	L2
9	27.807M	32.4	+5.8	+0.2	+0.4	+1.9	+0.0	40.7	50.0	-9.3	L2
10	27.554M	32.3	+5.8	+0.2	+0.4	+1.9	+0.0	40.6	50.0	-9.4	L2
11	309.985k	15.6	+5.7	+0.3	+0.1	+0.0	+0.0	21.7	50.0	-28.3	L2
	Ave										
^	309.985k	47.8	+5.7	+0.3	+0.1	+0.0	+0.0	53.9	50.0	+3.9	L2
13	451.063k	10.0	+5.7	+0.3	+0.1	+0.0	+0.0	16.1	46.9	-30.8	L2
	Ave										
^	451.063k	39.8	+5.7	+0.3	+0.1	+0.0	+0.0	45.9	46.9	-1.0	L2
15	462.699k	9.5	+5.7	+0.3	+0.1	+0.0	+0.0	15.6	46.6	-31.0	L2
	Ave										
^	462.699k	41.5	+5.7	+0.3	+0.1	+0.0	+0.0	47.6	46.6	+1.0	L2
^	462.600k	9.4	+5.7	+0.3	+0.1	+0.0	+0.0	15.5	46.6	-31.1	L2
18	660.499k	7.5	+5.8	+0.3	+0.1	+0.0	+0.0	13.7	46.0	-32.3	L2
	Ave										
^	660.499k	37.5	+5.8	+0.3	+0.1	+0.0	+0.0	43.7	46.0	-2.3	L2
20	468.516k	8.1	+5.7	+0.3	+0.1	+0.0	+0.0	14.2	46.5	-32.3	L2
	Ave										
^	468.516k	40.7	+5.7	+0.3	+0.1	+0.0	+0.0	46.8	46.5	+0.3	L2

CKC Laboratories, Inc. Date: 11/14/2011 Time: 10:13:19 Heads Up Systems WO#: 91979  
 15.207 AC Mains - Average Test Lead: L2 110V 60Hz Sequence#: 9 Ext ATTN: 0 dB



**Test Setup Photos**



## 15.249 RF Power Output / Spurious Emissions

### Test Data

Test Location: CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Heads Up Systems**  
 Specification: **15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter)**  
 Work Order #: **91979** Date: 11/14/2011  
 Test Type: **Radiated Scan** Time: 09:07:26  
 Equipment: **Visual indicator** Sequence#: 1  
 Manufacturer: Heads Up Systems Tested By: E. Wong  
 Model: EGAS Sign  
 S/N: NA

***Test Equipment:***

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02672	Spectrum Analyzer	E4446A	8/9/2010	8/9/2012
T2	AN00309	Preamp	8447D	5/7/2010	5/7/2012
T3	AN01995	Biconilog Antenna	CBL6111C	3/8/2010	3/8/2012
T4	ANP05050	Cable	RG223/U	3/21/2011	3/21/2013
T5	ANP05198	Cable	8268	12/21/2010	12/21/2012
T6	AN00786	Preamp	83017A	8/5/2010	8/5/2012
T7	AN00849	Horn Antenna	3115	4/23/2010	4/23/2012
T8	ANP05565	Cable	ANDL-1-PNMN-54	9/3/2010	9/3/2012
T9	ANP05421	Cable	Sucoflex 104A	2/12/2010	2/12/2012
T10	ANP05563	Cable	ANDL-1-PNMN-48	9/3/2010	9/3/2012
	AN00314	Loop Antenna	6502	6/30/2010	6/30/2012
	AN01413	Horn Antenna-ANSI C63.5 Antenna Factors (dB)	84125-80008	12/2/2010	12/2/2012
T11	AN02744	High Pass Filter	11SH10-3000/T10000-O/O	3/5/2010	3/5/2012
T12	AN01239	Dipole Antenna	CKC	11/28/2011	11/28/2013

***Equipment Under Test (\* = EUT):***

Function	Manufacturer	Model #	S/N
Visual indicator*	Heads Up Systems	EGAS Sign	NA
PowerSupply	V-Infinity	EPSA120100U	NA

***Support Devices:***

Function	Manufacturer	Model #	S/N

**Test Conditions / Notes:**

The EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. The EUT is set in constant transmit mode.

Freq: 2424 MHz

EGAS Sign is set in normal orientation as intended during the test.

15.31(e) compliance: the supply voltage was varied between 85% and 115% of the nominal rated supply voltage, no change in the Fundamental signal level was observed.

Frequency range of measurement = 9 kHz- 25 GHz.

Frequency 9 kHz - 150 kHz RBW=200 Hz, VBW=200 Hz; 150 kHz- 30 MHz RBW=9 kHz, VBW=9 kHz; 30 MHz- 1000 MHz RBW=120 kHz, VBW=120 kHz; 1000 MHz-25,000 MHz RBW=1 MHz, VBW=1 MHz.

17°C, 37% Relative Humidity

Modification: Firmware power set at -12dBm

Worse case Fundamental: 83.6 dB<sub>u</sub>V/m @ 3m

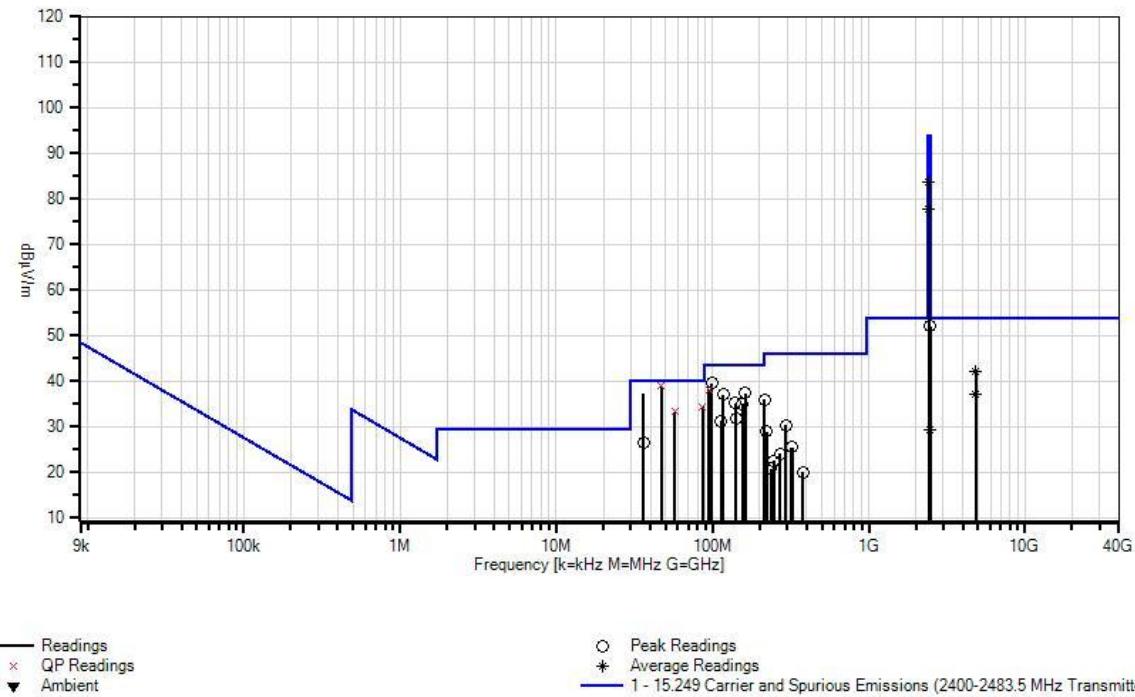
Worse case Spur: 42.2 dB<sub>u</sub>V/m @ 3m

Measurement Data:			Reading listed by margin.				Test Distance: 3 Meters				
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
	MHz	dB <sub>u</sub> V	dB	dB	dB	dB	Table	dB <sub>u</sub> V/m	dB <sub>u</sub> V/m	dB	Ant
1	47.160M	56.3	+0.0	-27.9	+9.3	+0.1	+0.0	38.9	40.0	-1.1	Vert
	QP		+1.1	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	47.160M	58.7	+0.0	-27.9	+9.3	+0.1	+0.0	41.3	40.0	+1.3	Vert
			+1.1	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
3	35.960M	63.6	+0.0	-27.8	+0.0	+0.1	+0.0	37.2	40.0	-2.8	Vert
	Dipole		+1.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.3					
4	99.309M	55.5	+0.0	-27.8	+10.0	+0.1	+0.0	39.5	43.5	-4.0	Vert
			+1.7	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
5	95.253M	54.6	+0.0	-27.8	+9.6	+0.1	+0.0	38.2	43.5	-5.3	Vert
	QP		+1.7	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	95.253M	57.5	+0.0	-27.8	+9.6	+0.1	+0.0	41.1	43.5	-2.4	Vert
			+1.7	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
7	86.418M	51.9	+0.0	-27.8	+8.6	+0.1	+0.0	34.4	40.0	-5.6	Vert
	QP		+1.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	86.418M	55.5	+0.0	-27.8	+8.6	+0.1	+0.0	38.0	40.0	-2.0	Vert
			+1.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					

9	162.308M	52.2	+0.0	-27.8	+10.5	+0.2	+0.0	37.3	43.5	-6.2	Horiz
			+2.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
10	117.090M	51.3	+0.0	-27.8	+11.6	+0.2	+0.0	37.1	43.5	-6.4	Vert
			+1.8	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
11	57.410M	53.7	+0.0	-27.9	+6.2	+0.1	+0.0	33.4	40.0	-6.6	Vert
	QP		+1.3	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
^	57.410M	57.5	+0.0	-27.9	+6.2	+0.1	+0.0	37.2	40.0	-2.8	Vert
			+1.3	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
13	214.159M	50.7	+0.0	-27.8	+10.2	+0.2	+0.0	35.9	43.5	-7.6	Vert
			+2.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
14	140.280M	49.2	+0.0	-27.7	+11.6	+0.1	+0.0	35.2	43.5	-8.3	Horiz
			+2.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
15	155.909M	49.5	+0.0	-27.7	+10.9	+0.1	+0.0	35.0	43.5	-8.5	Vert
			+2.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
16	2423.730M	86.2	+0.0	+0.0	+0.0	+0.0	+0.0	83.6	94.0	-10.4	Vert
	Ave		+0.0	-38.0	+28.4	+2.7					
			+1.2	+3.1	+0.0	+0.0					
^	2423.730M	108.5	+0.0	+0.0	+0.0	+0.0	+0.0	105.9	94.0	+11.9	Vert
			+0.0	-38.0	+28.4	+2.7					
			+1.2	+3.1	+0.0	+0.0					
18	4848.060M	35.4	+0.0	+0.0	+0.0	+0.0	+0.0	42.2	54.0	-11.8	Vert
	Ave		+0.0	-37.1	+33.0	+4.2					
			+1.9	+4.4	+0.4	+0.0					
^	4848.060M	55.1	+0.0	+0.0	+0.0	+0.0	+0.0	61.9	54.0	+7.9	Vert
			+0.0	-37.1	+33.0	+4.2					
			+1.9	+4.4	+0.4	+0.0					
20	141.375M	45.7	+0.0	-27.7	+11.6	+0.1	+0.0	31.7	43.5	-11.8	Vert
			+2.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
21	113.700M	45.8	+0.0	-27.8	+11.3	+0.2	+0.0	31.3	43.5	-12.2	Horiz
			+1.8	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
22	36.300M	37.6	+0.0	-27.8	+15.5	+0.1	+0.0	26.4	40.0	-13.6	Horiz
			+1.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
23	292.810M	41.7	+0.0	-27.8	+13.2	+0.2	+0.0	30.3	46.0	-15.7	Vert
			+3.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
24	2423.730M	80.4	+0.0	+0.0	+0.0	+0.0	+0.0	77.8	94.0	-16.2	Horiz
	Ave		+0.0	-38.0	+28.4	+2.7					
			+1.2	+3.1	+0.0	+0.0					
^	2423.730M	101.9	+0.0	+0.0	+0.0	+0.0	+0.0	99.3	94.0	+5.3	Horiz
			+0.0	-38.0	+28.4	+2.7					
			+1.2	+3.1	+0.0	+0.0					

26	4847.987M	30.8	+0.0	+0.0	+0.0	+0.0	+0.0	37.2	54.0	-16.8	Horiz
	Ave		+0.0	-37.1	+33.0	+4.2					
			+1.9	+4.4	+0.0	+0.0					
^	4847.987M	48.1	+0.0	+0.0	+0.0	+0.0	+0.0	54.5	54.0	+0.5	Horiz
			+0.0	-37.1	+33.0	+4.2					
			+1.9	+4.4	+0.0	+0.0					
28	220.642M	43.3	+0.0	-27.8	+10.6	+0.2	+0.0	28.9	46.0	-17.1	Vert
			+2.6	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
29	318.730M	36.0	+0.0	-27.8	+13.9	+0.2	+0.0	25.5	46.0	-20.5	Horiz
			+3.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
30	322.680M	35.9	+0.0	-27.8	+14.0	+0.2	+0.0	25.5	46.0	-20.5	Vert
			+3.2	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
31	270.810M	35.6	+0.0	-27.7	+13.0	+0.3	+0.0	24.1	46.0	-21.9	Vert
			+2.9	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
32	245.080M	35.1	+0.0	-27.8	+12.3	+0.2	+0.0	22.6	46.0	-23.4	Vert
			+2.8	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
33	2483.500M	31.4	+0.0	+0.0	+0.0	+0.0	+0.0	29.3	54.0	-24.7	Vert
	Ave		+0.0	-37.9	+28.5	+2.8					
			+1.3	+3.2	+0.0	+0.0					
^	2483.500M	53.0	+0.0	+0.0	+0.0	+0.0	+0.0	50.9	54.0	-3.1	Vert
			+0.0	-37.9	+28.5	+2.8					
			+1.3	+3.2	+0.0	+0.0					
35	235.225M	34.0	+0.0	-27.8	+11.7	+0.2	+0.0	20.8	46.0	-25.2	Vert
			+2.7	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
36	378.980M	28.5	+0.0	-27.9	+15.6	+0.3	+0.0	20.0	46.0	-26.0	Vert
			+3.5	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					
37	2473.500M	54.2	+0.0	+0.0	+0.0	+0.0	+0.0	52.1	94.0	-41.9	Vert
			+0.0	-37.9	+28.5	+2.8					
			+1.3	+3.2	+0.0	+0.0					

CKC Laboratories, Inc. Date: 11/14/2011 Time: 09:07:26 Heads Up Systems WO#: 91979  
 15.249 Carrier and Spurious Emissions (2400-2483.5 MHz Transmitter) Test Distance: 3 Meters Sequence#: 1 Ext  
 ATTN: 0 dB



**Test Setup Photos**



## -20dBc Occupied Bandwidth

### Test Conditions / Setup

The EUT is set in constant transmit mode and placed next to a spectrum analyzer with a un-calibrated field probe attached., the BW measurement is relative to the peak of the detected amplitude as detected with the field probe.

Freq: 2424 MHz

Temperature: 17°C

Relative Humidity: 37%

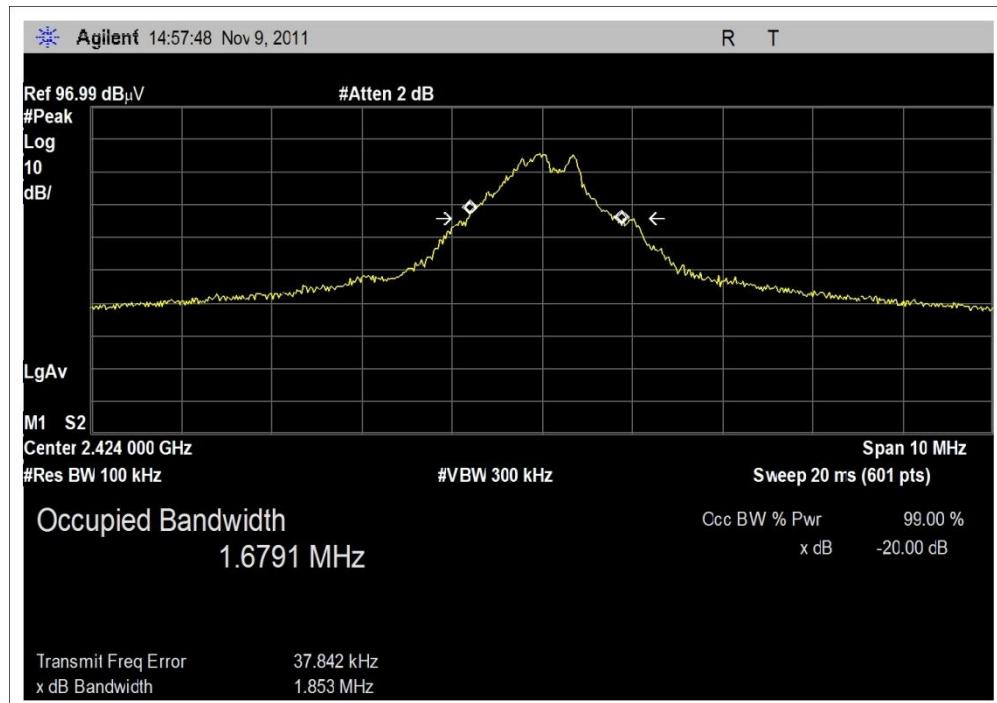
Modification: Firmware power set at -12dBm

Engineer Name: E. Wong

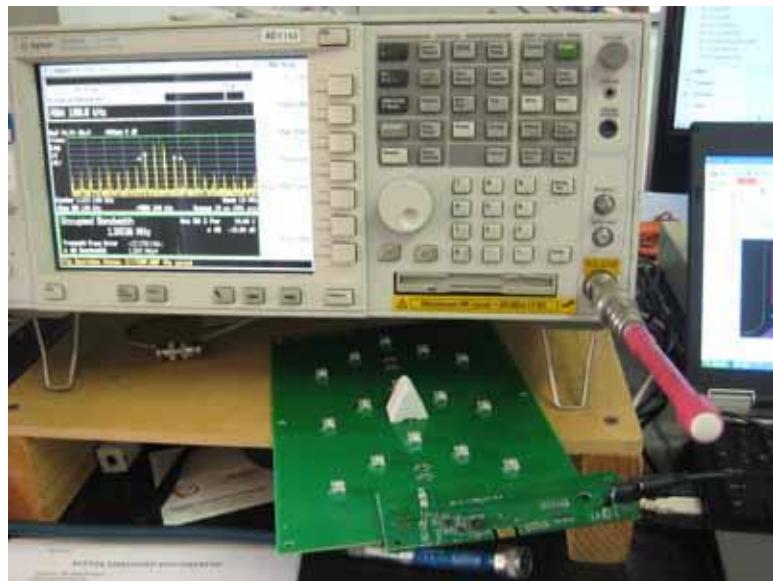
### **Test Equipment**

Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
AN02672	Spectrum Analyzer	E4446A	Agilent	8/9/2010	8/9/2012

### Test Plots



**Test Setup Photos**



## Bandedge

### Test Conditions / Setup

The EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. The EUT is set in constant transmit mode.

Freq: 2424 MHz

EGAS Sign is set in normal orientation as intended during the test.

Peak and video averaged bandedge plot were presented.

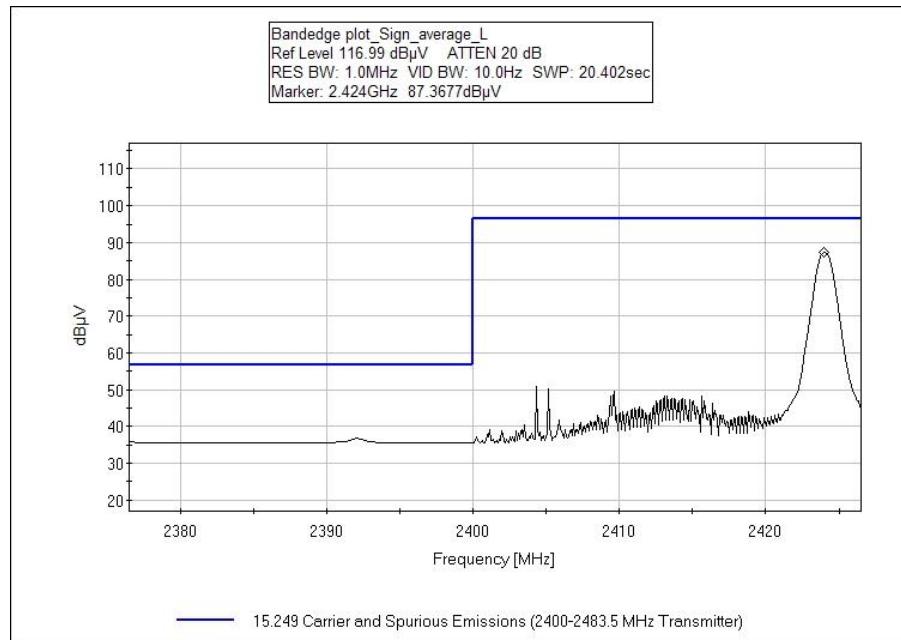
Temperature: 17°C, 37% Relative Humidity

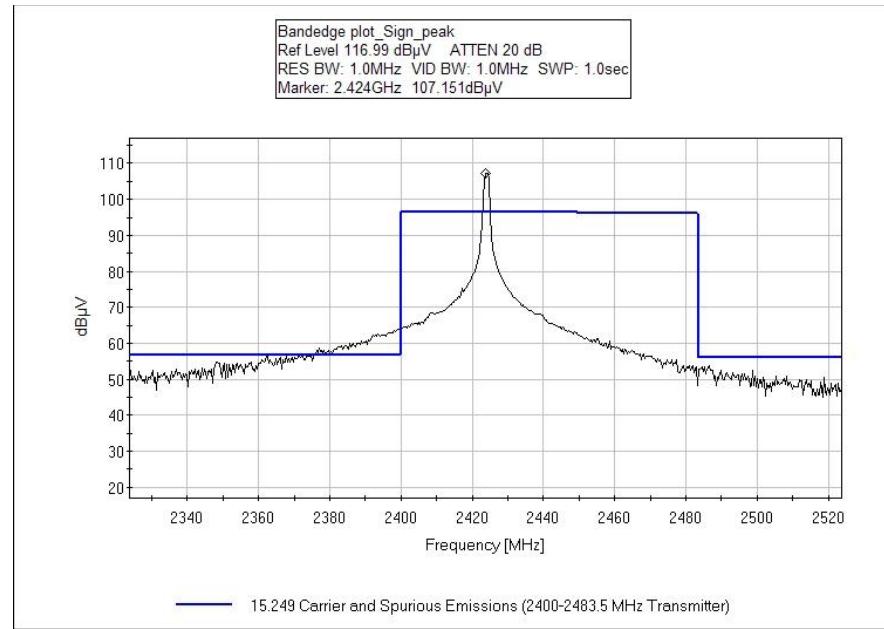
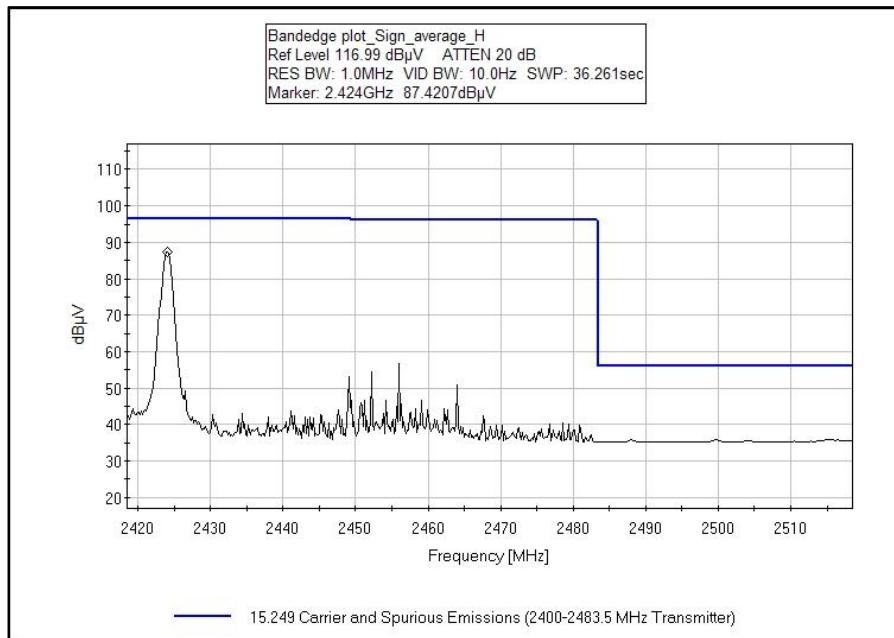
Engineer Name: E. Wong

### Test Equipment

Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
AN02672	Spectrum Analyzer	E4446A	Agilent	8/9/2010	8/9/2012
AN00786	Preamp	83017A	HP	8/5/2010	8/5/2012
AN00849	Horn Antenna	3115	ETS	4/23/2010	4/23/2012
ANP05565	Cable	ANDL-1-PNMN-54	Andrews	9/3/2010	9/3/2012
ANP05421	Cable	Sucoflex 104A	Huber & Suhner	2/12/2010	2/12/2012
ANP05563	Cable	ANDL-1-PNMN-48	Andrews	9/3/2010	9/3/2012

### Test Data





**Test Setup Photos**



## RSS-210

### 99 % Bandwidth

#### Test Conditions / Setup

The EUT is set in constant transmit mode and placed next to a spectrum analyzer with a un-calibrated field probe attached., the BW measurement is relative to the peak of the detected amplitude as detected with the field probe.

Freq: 2424 MHz

Temperature: 17°C, 37% Relative Humidity

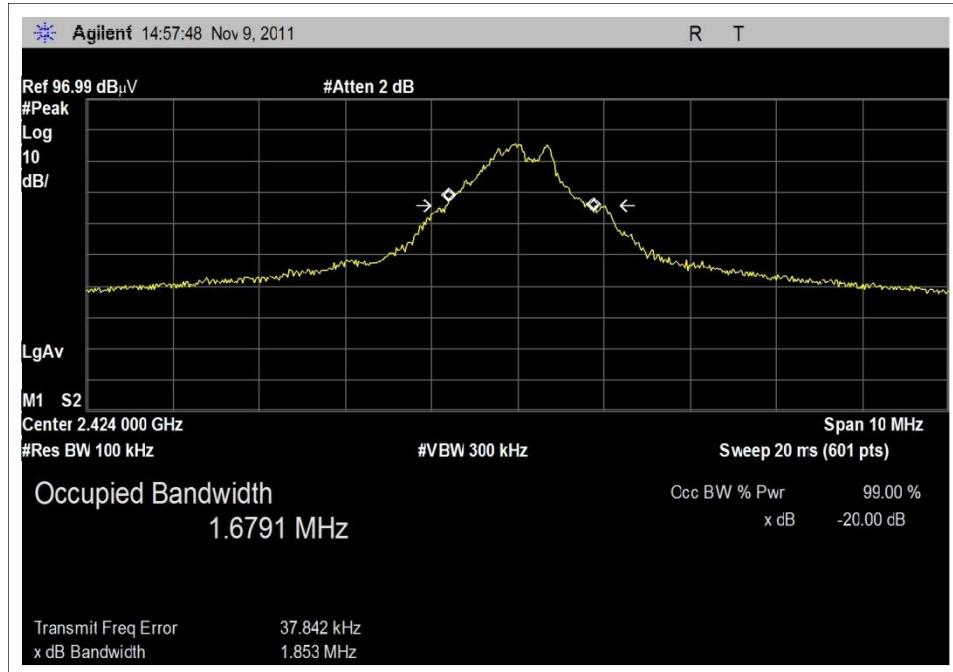
Modification: Firmware power set at -12dBm

Engineer Name: E. Wong

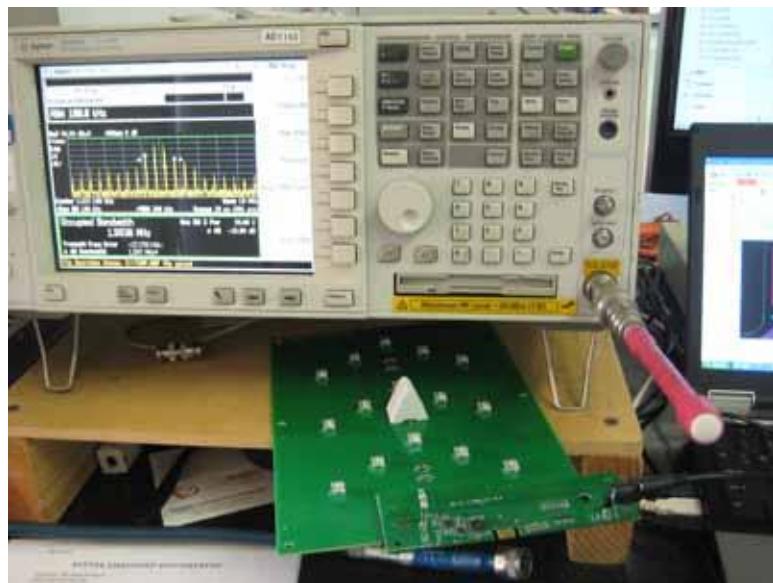
#### Test Equipment

Asset/Serial #	Description	Model	Manufacturer	Cal Date	Cal Due
AN02672	Spectrum Analyzer	E4446A	Agilent	8/9/2010	8/9/2012

#### Test Data



**Test Setup Photos**



## SUPPLEMENTAL INFORMATION

### Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ . Compliance is deemed to occur provided measurements are below the specified limits.

### Emissions Test Details

#### TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

#### CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in  $\text{dB}\mu\text{V}/\text{m}$ , the spectrum analyzer reading in  $\text{dB}\mu\text{V}$  was corrected by using the following formula. This reading was then compared to the applicable specification limit.

<b>SAMPLE CALCULATIONS</b>	
Meter reading	(dB $\mu$ V)
+ Antenna Factor	(dB)
+ Cable Loss	(dB)
- Distance Correction	(dB)
- Preamplifier Gain	(dB)
= Corrected Reading	(dB $\mu$ V/m)

#### TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

<b>MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE</b>			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

#### SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

##### Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

##### Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

##### Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.