



TESTING
CERT #803.01, 803.02, 803.05, 803.06

**VEGA HELMET
ADDENDUM TEST REPORT TO FC09-088**

**FOR THE
BLUETOOTH HEADSET, V-TUNE HELMET
FCC PART 15 SUBPART C SECTIONS 15.207, 15.209 & 15.247
TESTING**

DATE OF ISSUE: JUNE 19, 2009

PREPARED FOR:

Vega Helmet
18235 Olympic Ave S
Tukwila, WA 98188

PREPARED BY:

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CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

W.O. No.:89573

Date of test: May 15-30, 2009

Report No.: FC09-088A

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ADMINISTRATIVE INFORMATION

DATE OF TEST: May 15-30, 2009

DATE OF RECEIPT: May 15, 2009

REPRESENTATIVE: Jeanne DeMund

MANUFACTURER:

Vega Helmet
18235 Olympic Ave S
Tukwila, WA 98188

TEST LOCATION:

CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

TEST METHOD: ANSI C63.4 (2003)

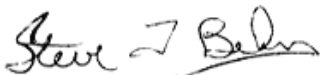
PURPOSE OF TEST:

Original: To perform the testing of the Bluetooth Headset, V-Tune Helmet with the requirements for FCC Part 15 Subpart C Sections 15.207, 15.209 and 15.247 devices.

Addendum A: The RF Power Output section was replaced with new data that represents an antenna gain of 2. No new testing was performed.

APPROVALS

QUALITY ASSURANCE:

A handwritten signature in black ink that reads "Steve Behm".

Steve Behm, Director of Engineering Services

TEST PERSONNEL:

A handwritten signature in black ink that appears to read "Eddie Wong".

Eddie Wong, Senior EMC Engineer

SUMMARY OF RESULTS

Test	Specification/Method	Results
Voltage Variation on Power	FCC 15.31(e)	Pass
AC Conducted Emissions	FCC 15.207	Pass
Radiated Emissions	FCC 15.209	Pass
Frequency Separation	FCC 15.247(a)(1)	Pass
Number of Hopping Channels	FCC 15.247(a)(1)	Pass
-20 dB Bandwidth	FCC 15.247(a)(1)	Pass
Average Time of Occupancy	FCC 15.247(a)(1)	Pass
RF Power Output	FCC 15.247(b)(2)	Pass
Spurious Emissions	FCC 15.247 (d)	Pass
Bandedge Compliance	ITU-R 55/1	Pass

SITE FILE REGISTRATION NUMBERS

Location	Japan	Canada	FCC
Brea A	R-301, C-314 & T-266	3082D-1	90473

CONDITIONS DURING TESTING

No modifications to the EUT were necessary during testing.

FCC 15.31(e) Voltage Variations

15.31(e) Supply voltage varied between 85% and 115% of the nominal rated supply.
No change in power level was observed.

FCC 15.31(m) Number Of Channels

This device operates on three channels.

FCC 15.33(a) Frequency Ranges Tested

15.207 Conducted Emissions: 150 kHz – 30 MHz

15.209 Radiated Emissions: 9 kHz – 25 GHz

15.247 Radiated Emissions: 9 kHz – 25 GHz

EUT Operating Frequency

The EUT was operating at 2402-2480 MHz within the operating range of 2400-2483.5 MHz for frequency hopping devices.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The customer declares the EUT tested by CKC Laboratories was representative of a production unit.

EQUIPMENT UNDER TEST

Bluetooth Headset

Manuf: Vega Helmet
Model: V-Tune Helmet
Serial: NA

Battery Charger

Manuf: Shenzhen Haiwei-Tek Electronic Company
Model: DL-UCHG03
Serial: NA

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Cellular Phone

Manuf: Nokia
Model: N-95 8GB
Serial: NA
FCC ID: PDNRM-320

MEASUREMENT UNCERTAINTIES

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.

REPORT OF EMISSIONS MEASUREMENTS

TESTING PARAMETERS

TEMPERATURE AND HUMIDITY DURING TESTING

The temperature during testing was within $+15^{\circ}\text{C}$ and $+35^{\circ}\text{C}$.
The relative humidity was between 20% and 75%.

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 $\text{dB}\mu\text{V/m}$, 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.

SAMPLE CALCULATIONS		
	Meter reading	(dBμV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBμV/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. 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. When conducted emissions testing was performed, a 10 dB external attenuator was used with internal offset correction in the analyzer.

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 "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "QP" or an "Ave" on the appropriate rows of the data sheets. 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/receiver readings recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the measuring device called "peak hold," the measuring device had the ability to measure transients 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

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the quasi-peak detector.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer/receiver. 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.

FCC 15.207 – AC CONDUCTED EMISSIONS

Test Setup Photos



Test Data Sheets

Test Location: CKC Laboratories, Inc. • 110. N. Olinda Place. • Brea, CA 92821 • (714) 993-6112

Customer: **Vega Helmet**
 Specification: **FCC 15.207 COND [AVE]**
 Work Order #: **89573**
 Test Type: **Conducted Emissions**
 Equipment: **Bluetooth Headset**
 Manufacturer: Vega Helmet
 Model: V-Tune Helmet
 S/N: NA

Date: 5/27/2009
 Time: 10:15:58
 Sequence#: 6
 Tested By: E. Wong
 110V 60Hz

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer	US44300438	07/23/2008	07/23/2010	02672
LISN	1104	12/09/2008	12/09/2010	00847
6dB Attenuator	None	10/14/2008	10/14/2010	P05886
150kHz HPF	G7755	01/09/2008	01/09/2010	02610
Conducted Emission Cable	Cable #21	05/12/2008	05/12/2010	P04358

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Bluetooth Headset*	Vega Helmet	V-Tune Helmet	NA
Battery Charger	Shenzhen Haiwei-Tek Electronic company	DL-UCHG03	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Cellular Phone	Nokia	N-95 8GB	NA

Test Conditions / Notes:

The rechargeable battery powered EUT is placed on a wooden table.

The EUT is set in charging mode for the evaluation of charging circuit. The battery charger is connected to the EUT, the Bluetooth transceiver is in communication with the support Bluetooth device during charge cycle, and transmit and receive data packets are playing music.

23°C and 54% relative humidity

Transducer Legend:

T1=150kHz HPF AN02610_010910	T2=6dB atten-P05886-101410.TRN
T3=Cable #21 -P04358- Site A 05/12/10	T4=L1 Insertion Loss AN00847_120910

Measurement Data:

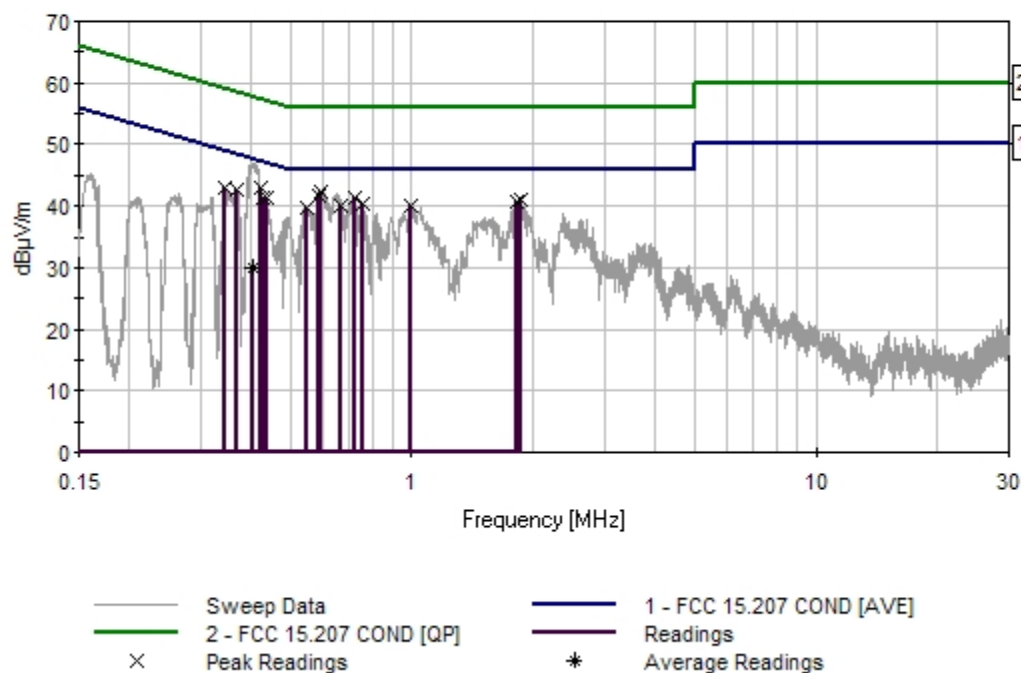
Reading listed by margin.

Test Lead: Black

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	598.686k	36.0	+0.2	+6.1	+0.0	+0.0	+0.0	42.3	46.0	-3.7	Black
2	424.157k	36.8	+0.2	+6.1	+0.0	+0.0	+0.0	43.1	47.4	-4.3	Black
3	587.051k	35.3	+0.2	+6.1	+0.0	+0.0	+0.0	41.6	46.0	-4.4	Black
4	720.130k	34.8	+0.3	+6.1	+0.0	+0.0	+0.0	41.2	46.0	-4.8	Black

5	1.851M	34.5	+0.2	+6.1	+0.1	+0.0	+0.0	40.9	46.0	-5.1	Black
6	1.826M	34.3	+0.2	+6.1	+0.1	+0.0	+0.0	40.7	46.0	-5.3	Black
7	436.519k	35.2	+0.2	+6.1	+0.0	+0.0	+0.0	41.5	47.1	-5.6	Black
8	755.763k	34.0	+0.3	+6.1	+0.0	+0.0	+0.0	40.4	46.0	-5.6	Black
9	370.343k	36.3	+0.2	+6.1	+0.0	+0.0	+0.0	42.6	48.5	-5.9	Black
10	428.520k	35.0	+0.2	+6.1	+0.0	+0.0	+0.0	41.3	47.3	-6.0	Black
11	996.281k	33.4	+0.3	+6.1	+0.1	+0.0	+0.0	39.9	46.0	-6.1	Black
12	346.346k	36.6	+0.2	+6.1	+0.0	+0.0	+0.0	42.9	49.0	-6.1	Black
13	669.952k	33.6	+0.2	+6.1	+0.0	+0.0	+0.0	39.9	46.0	-6.1	Black
14	549.236k	33.5	+0.2	+6.1	+0.0	+0.0	+0.0	39.8	46.0	-6.2	Black
15	402.055k	23.8	+0.2	+6.1	+0.0	+0.0	+0.0	30.1	47.8	-17.7	Black
Ave											
^	403.068k	40.7	+0.2	+6.1	+0.0	+0.0	+0.0	47.0	47.8	-0.8	Black

CKC Laboratories, Inc. Date: 5/27/2009 Time: 10:15:58 Vega Helmet WO#: 89573
FCC 15.207 COND [AVE] Test Lead: Black 110V 60Hz Sequence#: 6
V-Tune Helmet



Test Location: CKC Laboratories, Inc. • 110. N. Olinda Place. • Brea, CA 92821 • (714) 993-6112

Customer: **Vega Helmet**
 Specification: **FCC 15.207 COND [AVE]**
 Work Order #: **89573**
 Test Type: **Conducted Emissions**
 Equipment: **Bluetooth Headset**
 Manufacturer: Vega Helmet
 Model: V-Tune Helmet
 S/N: NA

Date: 5/27/2009
 Time: 10:16:59 AM
 Sequence#: 7
 Tested By: E. Wong
 110V 60Hz

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer	US44300438	07/23/2008	07/23/2010	02672
LISN	1104	12/09/2008	12/09/2010	00847
6dB Attenuator	None	10/14/2008	10/14/2010	P05886
150kHz HPF	G7755	01/09/2008	01/09/2010	02610
Conducted Emission Cable	Cable #21	05/12/2008	05/12/2010	P04358

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Bluetooth Headset*	Vega Helmet	V-Tune Helmet	NA
Battery Charger	Shenzhen Haiwei-Tek Electronic company	DL-UCHG03	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Cellular Phone	Nokia	N-95 8GB	NA

Test Conditions / Notes:

The rechargeable battery powered EUT is placed on a wooden table.

The EUT is set in charging mode for the evaluation of charging circuit. The battery charger is connected to the EUT, the Bluetooth transceiver is in communication with the support Bluetooth device during charge cycle, and transmit and receive data packets are playing music.

23°C and 54% relative humidity

Transducer Legend:

T1=150kHz HPF AN02610_010910	T2=6dB atten-P05886-101410.TRN
T3=Cable #21 -P04358- Site A 05/12/10	T4=L2 Insertion Loss AN00847_120910

Measurement Data:

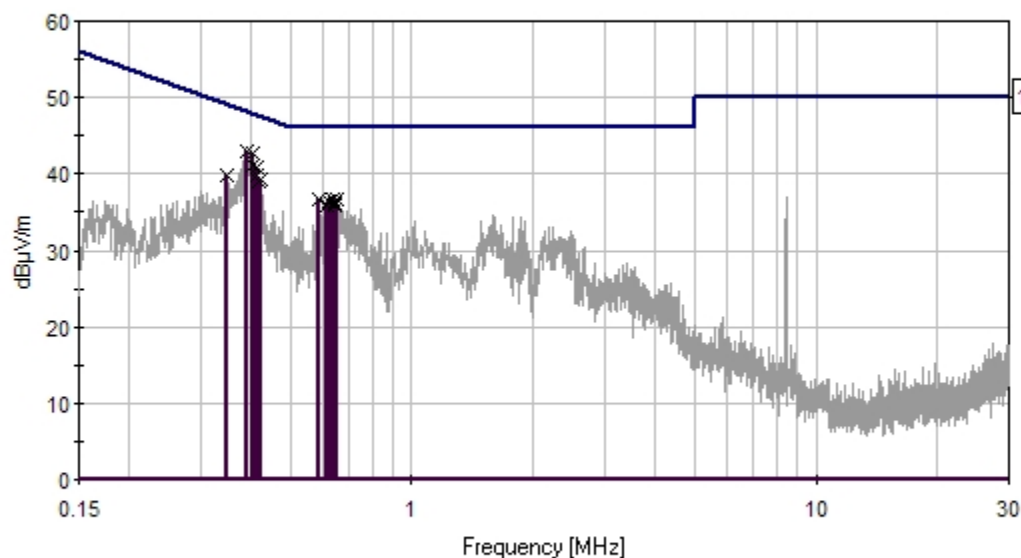
Reading listed by margin.

Test Lead: White

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	391.431k	36.8	+0.2	+6.1	+0.0	+0.0	+0.0	43.1	48.0	-4.9	White
2	403.067k	36.4	+0.2	+6.1	+0.0	+0.0	+0.0	42.7	47.8	-5.1	White
3	405.248k	34.9	+0.2	+6.1	+0.0	+0.0	+0.0	41.2	47.7	-6.5	White
4	414.702k	34.5	+0.2	+6.1	+0.0	+0.0	+0.0	40.8	47.6	-6.8	White

5	411.793k	33.6	+0.2	+6.1	+0.0	+0.0	+0.0	39.9	47.6	-7.7	White
6	423.429k	33.0	+0.2	+6.1	+0.0	+0.0	+0.0	39.3	47.4	-8.1	White
7	417.611k	32.7	+0.2	+6.1	+0.0	+0.0	+0.0	39.0	47.5	-8.5	White
8	588.504k	30.5	+0.2	+6.1	+0.0	+0.0	+0.0	36.8	46.0	-9.2	White
9	347.072k	33.4	+0.2	+6.1	+0.0	+0.0	+0.0	39.7	49.0	-9.3	White
10	635.773k	30.3	+0.2	+6.1	+0.0	+0.0	+0.0	36.6	46.0	-9.4	White
11	655.407k	30.3	+0.2	+6.1	+0.0	+0.0	+0.0	36.6	46.0	-9.4	White
12	623.410k	30.1	+0.2	+6.1	+0.0	+0.0	+0.0	36.4	46.0	-9.6	White
13	643.045k	29.9	+0.2	+6.1	+0.0	+0.0	+0.0	36.2	46.0	-9.8	White
14	645.226k	29.7	+0.2	+6.1	+0.0	+0.0	+0.0	36.0	46.0	-10.0	White
15	613.229k	29.5	+0.2	+6.1	+0.0	+0.0	+0.0	35.8	46.0	-10.2	White

CKC Laboratories, Inc. Date: 5/27/2009 Time: 10:16:59 AM Vega Helmet WO#: 89573
FCC 15.207 COND [AVE] Test Lead: White 110V 60Hz Sequence#: 7
V-Tune Helmet



— Sweep Data
— Readings

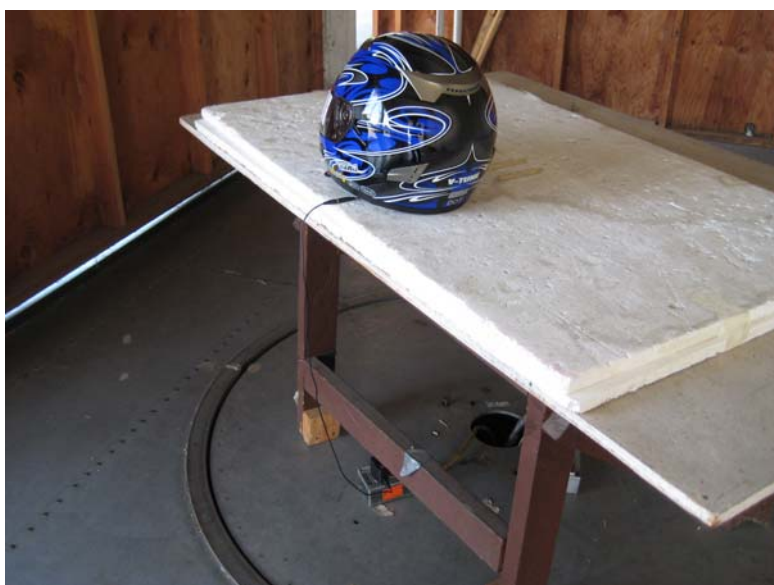
— 1 - FCC 15.207 COND [AVE]
× Peak Readings

FCC 15.209 – RADIATED EMISSIONS

Test Setup Photos



X Orientation



X Orientation



Y Orientation



Y Orientation

Test Data Sheets

Test Location: CKC Laboratories, Inc. • 110. N. Olinda Place. • Brea, CA 92821 • (714) 993-6112

Customer: **Vega Helmet**
 Specification: **FCC 15.209**
 Work Order #: **89573**
 Test Type: **Radiated Scan**
 Equipment: **Bluetooth Headset**
 Manufacturer: Vega Helmet
 Model: V-Tune Helmet
 S/N: NA

Date: 5/27/2009
 Time: 10:43:24
 Sequence#: 3
 Tested By: E. Wong

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer	US44300438	07/23/2008	07/23/2010	02672
Bilog Antenna	2451	01/21/2008	01/21/2010	01995
Pre amp to SA Cable	Cable #10	04/16/2009	04/16/2011	P05050
Cable	Cable15	01/05/2009	01/05/2011	P05198
Pre Amp	1937A02548	05/02/2008	05/02/2010	00309
Horn Antenna	6246	06/06/2008	06/06/2010	00849
Microwave Pre-amp	3123A00281	07/28/2008	07/28/2010	00786
2'-40GHz cable	NA	09/18/2007	09/18/2009	P2948
Helix Antenna Cable	P5565	09/04/2008	09/04/2010	P05565
18-26GHz Horn	942126-003	11/12/2008	11/12/2010	01413
3.0 GHz HPF	1	03/25/2008	03/25/2010	02744
2.0 GHz LPF	6	01/11/2008	01/11/2010	02746

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Bluetooth Headset*	Vega Helmet	V-Tune Helmet	NA
Battery Charger	Shenzhen Haiwei-Tek Electronic company	DL-UCHG03	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Cellular Phone	Nokia	N-95 8GB	NA

Test Conditions / Notes:

The rechargeable battery powered EUT is placed on a wooden table lined with 5 cm thickness of Styrofoam material.

The EUT is set in FHSS, transmit and receive mode with default power level setting. The EUT is in communication with a remote device via Bluetooth protocol and plays the received audio file.

Freq range: 2400-2483.5 MHz

Tx Freq = Hopping

The emission profile of all three orthogonal orientations was evaluated; presented data is the worst case scenario.

The battery is fully charged and the battery power level is maintained by the battery charger.

Frequency range of measurement = 9kHz- 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.

Transducer Legend:

T1=Bilog-AN01995 BILOG_012110	T2=Cable #10 ANP05050 041611
T3=Cable #15_05198_ Site A, 010511	T4=Pre_amp_HP8447D-AN00309-050210
T5=Heliac Cable 54' ANP05565 090410	T6=HF_pre AMP-1-26GHz_AN00786-072810.TRN
T7=Hi Freq_40GHz_2ft-ANP02948-091809	T8=Horn Ant AN00849 060610
T9=K&L 2GHz LPF_AN02746_011110	

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	375.024M	44.2	+15.4 +0.0 +0.0	+0.4 +0.0	+3.5 +0.0	-27.8 +0.0	+0.0	35.7	46.0	-10.3	Vert
2	61.580M	49.0	+6.1 +0.0 +0.0	+0.1 +0.0	+1.2 +0.0	-28.0 +0.0	+0.0	28.4	40.0	-11.6	Vert
3	63.170M	49.0	+6.1 +0.0 +0.0	+0.1 +0.0	+1.2 +0.0	-28.0 +0.0	+0.0	28.4	40.0	-11.6	Vert
4	499.983M	36.9	+18.2 +0.0 +0.0	+0.4 +0.0	+4.1 +0.0	-27.8 +0.0	+0.0	31.8	46.0	-14.2	Horiz
5	447.983M	38.0	+17.1 +0.0 +0.0	+0.3 +0.0	+3.8 +0.0	-27.8 +0.0	+0.0	31.4	46.0	-14.6	Horiz
6	217.633M	44.5	+10.4 +0.0 +0.0	+0.3 +0.0	+2.5 +0.0	-27.9 +0.0	+0.0	29.8	46.0	-16.2	Horiz
7	192.050M	42.2	+9.1 +0.0 +0.0	+0.3 +0.0	+2.3 +0.0	-28.0 +0.0	+0.0	25.9	43.5	-17.6	Horiz
8	539.483M	29.5	+18.9 +0.0 +0.0	+0.4 +0.0	+4.3 +0.0	-27.6 +0.0	+0.0	25.5	46.0	-20.5	Horiz
9	404.017M	32.9	+16.1 +0.0 +0.0	+0.4 +0.0	+3.6 +0.0	-27.8 +0.0	+0.0	25.2	46.0	-20.8	Horiz
10	425.050M	31.0	+16.6 +0.0 +0.0	+0.3 +0.0	+3.7 +0.0	-27.8 +0.0	+0.0	23.8	46.0	-22.2	Vert
11	426.717M	30.7	+16.6 +0.0 +0.0	+0.3 +0.0	+3.7 +0.0	-27.8 +0.0	+0.0	23.5	46.0	-22.5	Vert
12	166.150M	35.5	+10.1 +0.0 +0.0	+0.3 +0.0	+2.1 +0.0	-27.9 +0.0	+0.0	20.1	43.5	-23.4	Horiz
13	376.017M	30.9	+15.4 +0.0 +0.0	+0.4 +0.0	+3.5 +0.0	-27.8 +0.0	+0.0	22.4	46.0	-23.6	Vert

14	1645.600M Ave	35.1	+0.0 +3.0 +0.4	+0.0 -38.2 +0.3	+0.0 +0.3 +25.8	+0.0	26.4	54.0	-27.6	Horiz
^	1645.600M	54.8	+0.0 +3.0 +0.4	+0.0 -38.2 +0.3	+0.0 +0.3 +25.8	+0.0	46.1	54.0	-7.9	Horiz
16	1648.900M Ave	34.8	+0.0 +3.0 +0.4	+0.0 -38.2 +0.3	+0.0 +0.3 +25.8	+0.0	26.1	54.0	-27.9	Horiz
^	1648.900M	56.6	+0.0 +3.0 +0.4	+0.0 -38.2 +0.3	+0.0 +0.3 +25.8	+0.0	47.9	54.0	-6.1	Horiz
18	1626.500M Ave	34.3	+0.0 +3.0 +0.4	+0.0 -38.2 +0.3	+0.0 +0.3 +25.7	+0.0	25.5	54.0	-28.5	Horiz
^	1626.500M	60.9	+0.0 +3.0 +0.4	+0.0 -38.2 +0.3	+0.0 +0.3 +25.7	+0.0	52.1	54.0	-1.9	Horiz

FCC 15.247(a)(1) – FREQUENCY SEPARATION, NUMBER OF HOPPING CHANNELS, - 20DB BANDWIDTH AND AVERAGE TIME OF OCCUPANCY

Test Equipment

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	02672	Agilent	E4446A	US44300438	072308	072310

Test Setup Photos

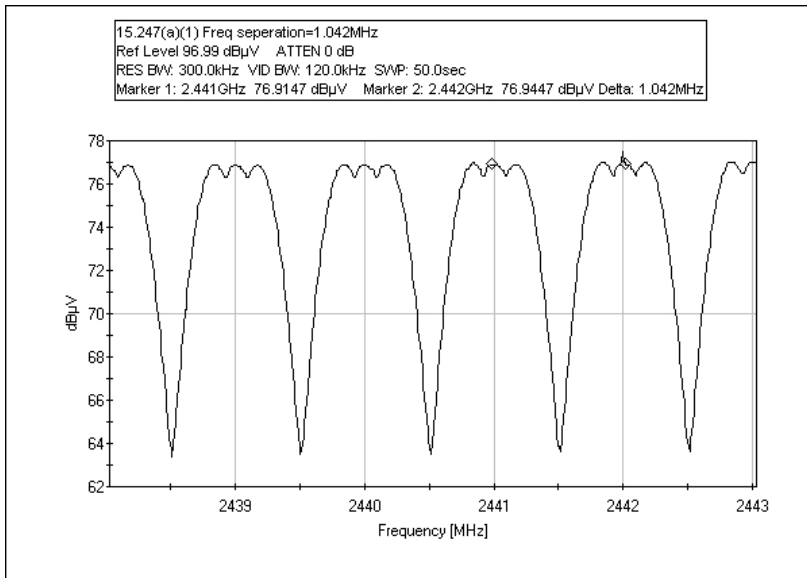




Setup: The EUT is placed on the test bench, a spectrum analyzer and a field probe were used for the analysis.

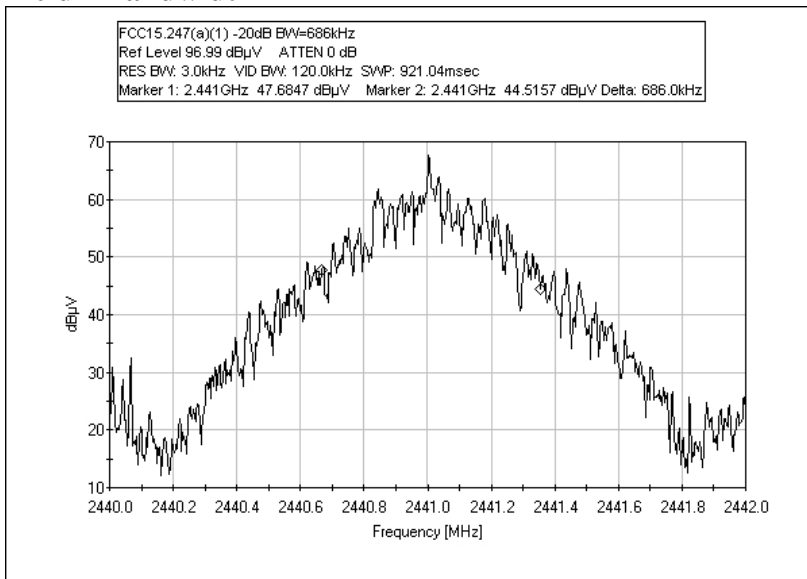
15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Frequency Separation



Channel separation = 1.04MHz

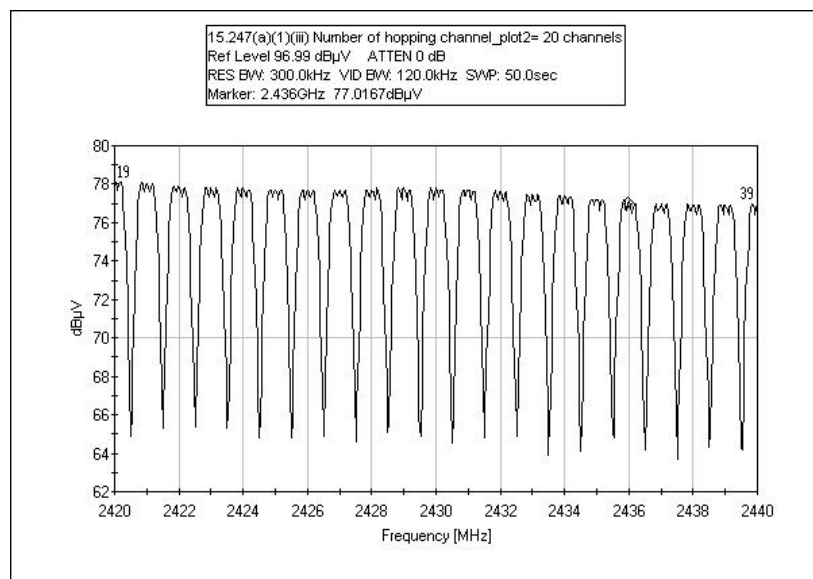
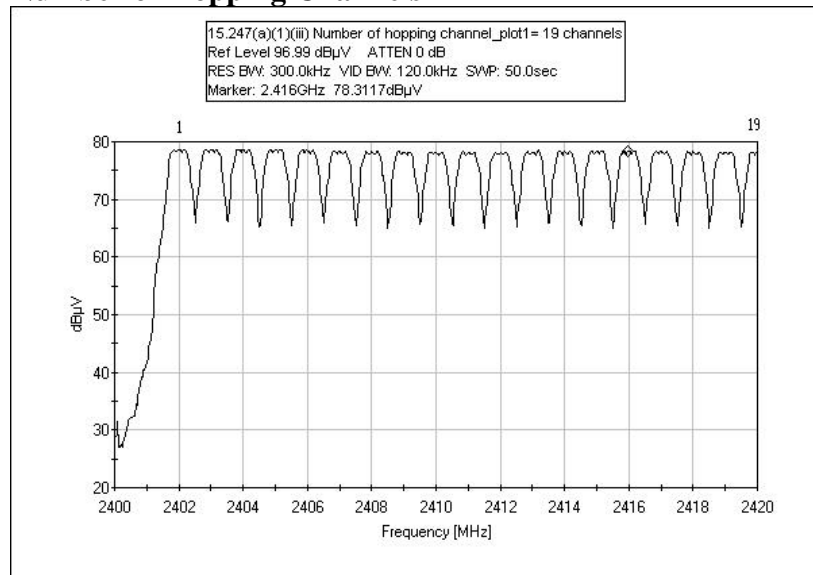
-20 dB Bandwidth



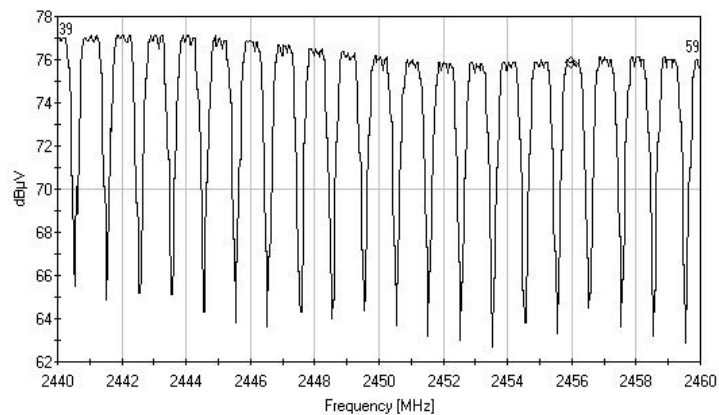
-20dB BW= 0.686MHz

15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

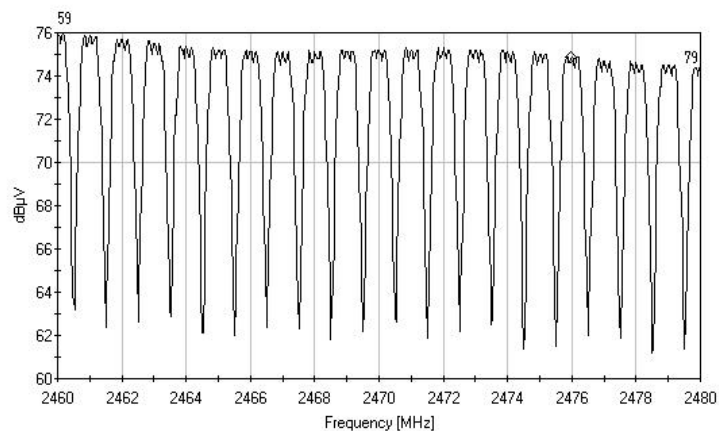
Number of Hopping Channels

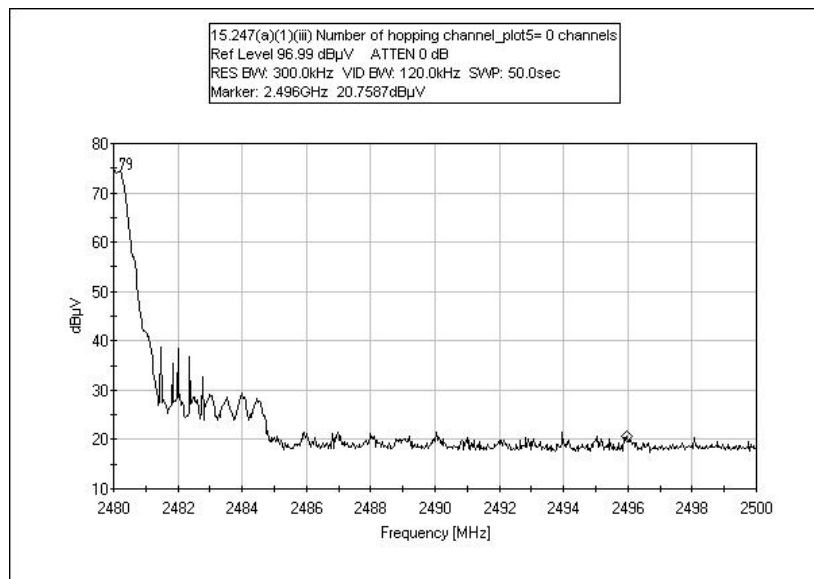


15.247(a)(1)(iii) Number of hopping channel_plot3= 20 channels
Ref Level 96.99 dBuV ATTEN 0 dB
RES BW: 300.0kHz VID BW: 120.0kHz SWP: 50.0sec
Marker: 2.456GHz 75.8697dBuV



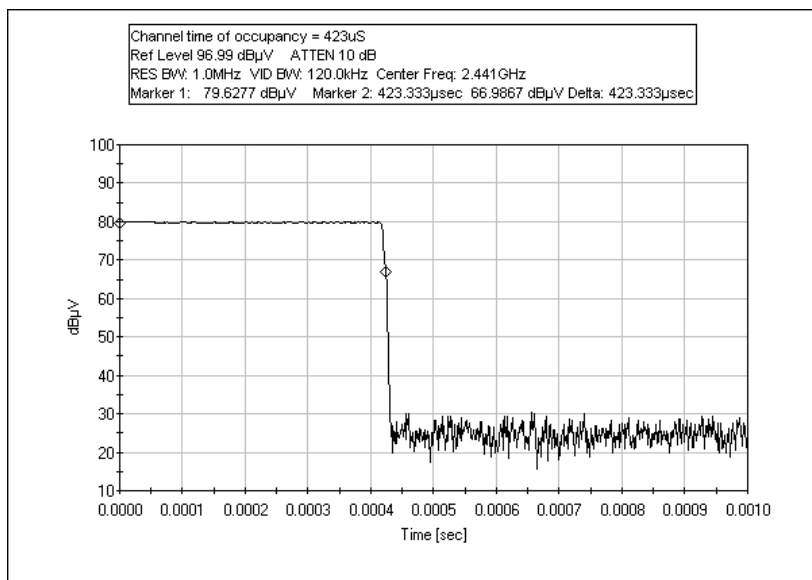
15.247(a)(1)(iii) Number of hopping channel_plot4= 20 channels
Ref Level 96.99 dBuV ATTEN 0 dB
RES BW: 300.0kHz VID BW: 120.0kHz SWP: 50.0sec
Marker: 2.476GHz 74.8477dBuV





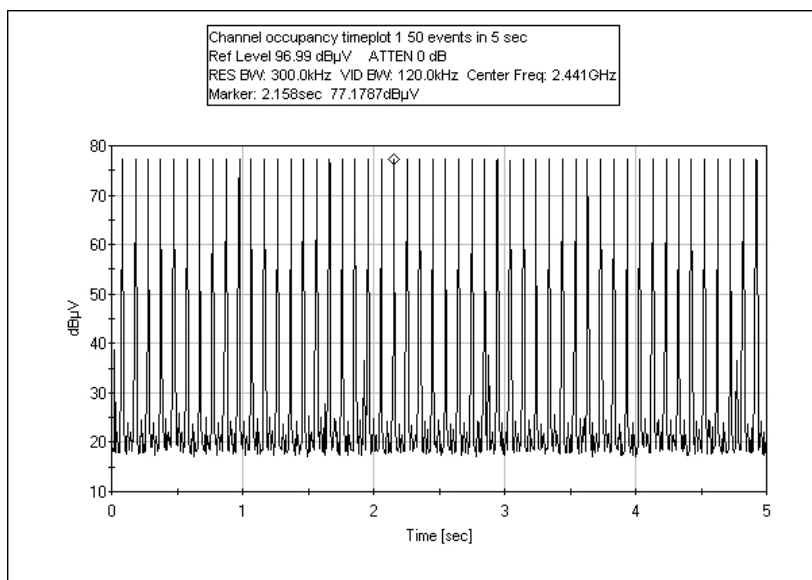
Total number of hopping channel = 79.

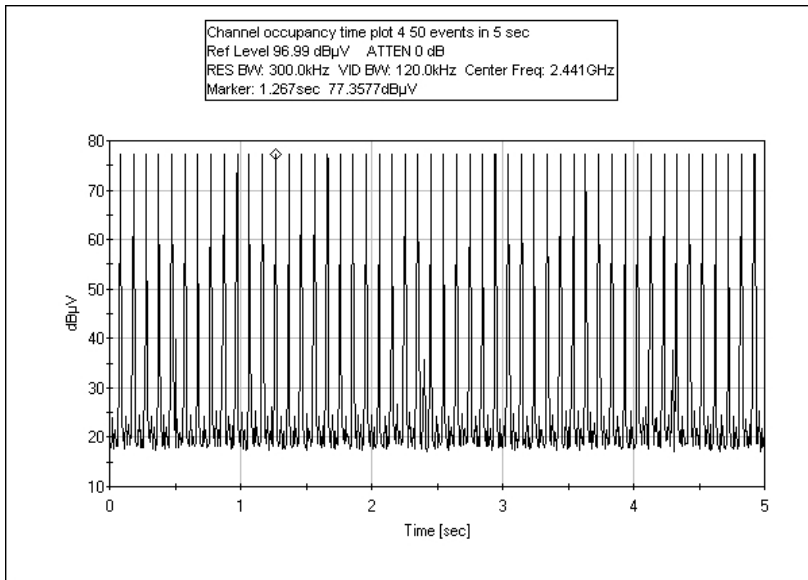
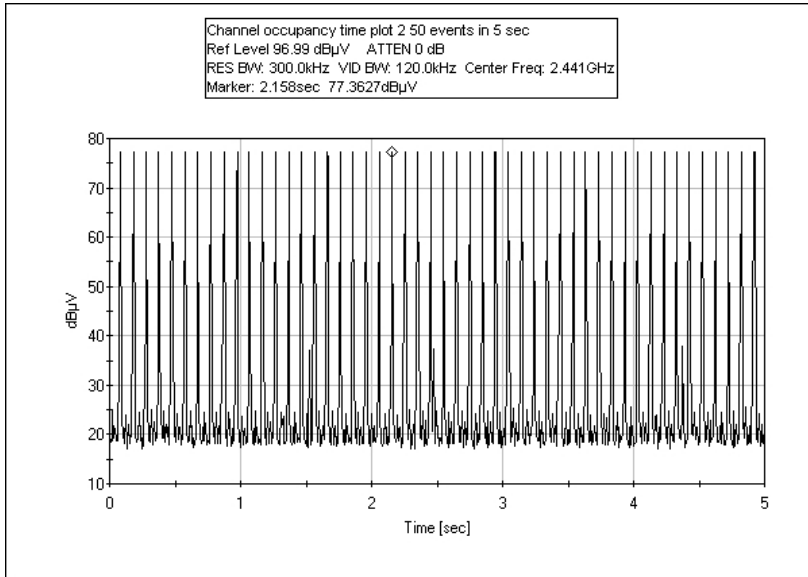
Average time of occupancy



Centered in one hopping channel, the event on time was measured.

Event on time = 423uS.





Three separate sweeps at 5 second were acquired, average 50 events per 5 second sweep. 50 events/ 5 second, 10 events per second. Limit: On time shall not exceed 0.4 second, in 0.4 sec x 79 channels (31.6 Sec). Each events on time = 423 uS. Therefore, in 31.6 second, total on time = 31.6 sec x 10 events /sec x 423uS/event = 0.13 sec.

FCC 15.247(b)(2) – RF Power Output

Test Setup Photos





Antenna Substitution

Test Equipment

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer	US44300438	07/23/2008	07/23/2010	02672
Horn Antenna	6246	06/06/2008	06/06/2010	00849
Microwave Pre-amp	3123A00281	07/28/2008	07/28/2010	00786
2'-40GHz cable	NA	09/18/2007	09/18/2009	P2948
Helix Antenna Cable	P5565	09/04/2008	09/04/2010	P05565
Horn Antenna	4683	06/06/2008	06/06/2010	01646

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Bluetooth Headset*	Vega Helmet	V-Tune Helmet	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Battery Charger	Shenzhen Haiwei-Tek Electronic company	DL-UCHG03	NA
Mouse	Dell	M UK-Dell	NA
Keyboard	Gateway	G9900	C789397
Monitor	MPC	TFT1780PS	40G190-767-8A
Computer	Lenovo	9637-23U	LKHMR65

RF Output power: Test Conditions / Notes:

The rechargeable battery powered EUT is placed on a wooden table lined with 5 cm thickness of Styrofoam material. To set the EUT in Test mode, a section of I/O cable is connected to the circuit board and a support interface board which is connected to a remote support computer. Bluetooth test software is employed to set the EUT in constant transmit mode with modulation and the ability to change channel. A battery charger is connected to the EUT and the input voltage level is maintained at fully charge DC level. The EUT is set in test mode. Freq range: 2400-2483.5 MHz. Tx Freq = 2402, 2441, 2480MHz Power setting (Ext, Int): 255, 50. The emission profile of all three orthogonal orientations was evaluated; presented data is the worst case scenario.

Test method in accordance with DA 00-705

$$P = \frac{(Exd)^2}{30 \times G}$$

Gain of the Transmit antenna=3.1 dBi= 2 (linear gain)

Worse case orientation: Upright.

Freq	Reading @3 m (dBuV/m)	Power (W)
2402 V	90.9	0.000185
2441 V	87.8	0.000090
2480 V	84.2	0.000039
2402 H	94.5	0.000423
2441 H	90.7	0.000176
2480 H	87.6	0.000086

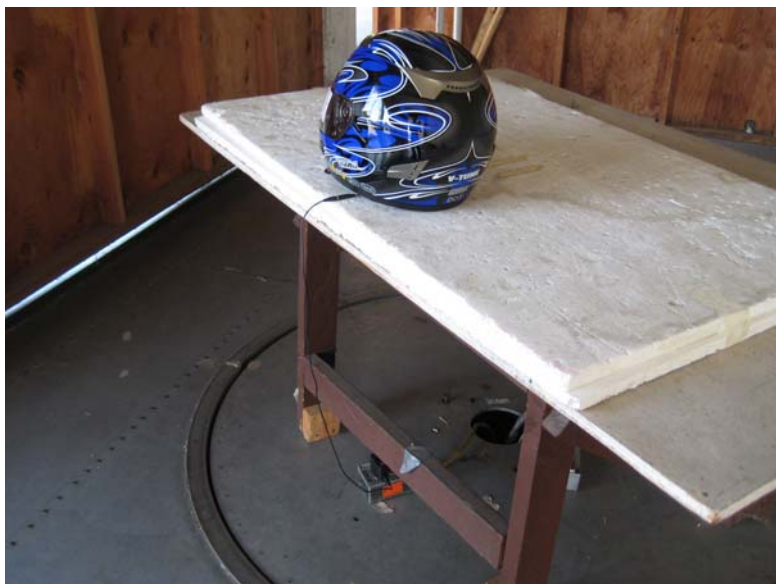
Supply voltage varied between 85% and 115% of the nominal rated supply Voltage, no changed in power level was observed.

FCC 15.247(d) – OATS RADIATED SPURIOUS EMISSIONS

Test Setup Photos



X Orientation



X Orientation



Y Orientation



Y Orientation

Test Data Sheets

Test Location: CKC Laboratories, Inc. • 110. N. Olinda Place. • Brea, CA 92821 • (714) 993-6112
 Customer: **Vega Helmet**
 Specification: **FCC 15.247 (d) (FCC 15.205 restricted band)**
 Work Order #: **89573** Date: 5/30/2009
 Test Type: **Radiated Scan** Time: 12:43:41
 Equipment: **Bluetooth Headset** Sequence#: 5
 Manufacturer: Vega Helmet Tested By: E. Wong
 Model: V-Tune Helmet S/N: NA

Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer	US44300438	07/23/2008	07/23/2010	02672
Bilog Antenna	2451	01/21/2008	01/21/2010	01995
Pre amp to SA Cable	Cable #10	04/16/2009	04/16/2011	P05050
Cable	Cable15	01/05/2009	01/05/2011	P05198
Pre Amp	1937A02548	05/02/2008	05/02/2010	00309
Horn Antenna	6246	06/06/2008	06/06/2010	00849
Microwave Pre-amp	3123A00281	07/28/2008	07/28/2010	00786
2'-40GHz cable	NA	09/18/2007	09/18/2009	P2948
Helix Antenna Cable	P5565	09/04/2008	09/04/2010	P05565
18-26GHz Horn	942126-003	11/12/2008	11/12/2010	01413
3.0 GHz HPF	1	03/25/2008	03/25/2010	02744
2.0 GHz LPF	6	01/11/2008	01/11/2010	02746
Loop Antenna	2014	06/16/2008	06/16/2010	00314

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Bluetooth Headset*	Vega Helmet	V-Tune Helmet	NA

Support Devices:

Function	Manufacturer	Model #	S/N
Battery Charger	Shenzhen Haiwei-Tek Electronic company	DL-UCHG03	NA
Mouse	Dell	M UK-Dell	NA
Keyboard	Gateway	G9900	C789397
Monitor	MPC	TFT1780PS	40G190-767-8A
Computer	Lenovo	9637-23U	LKHMR65

Test Conditions / Notes:

The rechargeable battery powered EUT is placed on a wooden table lined with 5 cm thickness of Styrofoam material. To set the EUT in Test mode, a section of I/O cable is connected to the circuit board and a support interface board which is connected to a remote support computer. Bluetooth test software is employed to set the EUT in constant transmit mode with modulation and the ability to change channel. A battery charger is connected to the EUT and the input voltage level is maintained at fully charged DC level.

The EUT is set in test mode. Freq range: 2400-2483.5 MHz. Operating freq range = 2402 -2480MHz. Tx Freq = 2402, 2441, 2480MHz. Power setting (Ext, Int): 255, 50. The emission profile of all three orthogonal orientations was evaluated; presented data is the worst case scenario. Dwell time correction factor add to Averaged spurious emission. Dwell time correction = 20 Log (423 e-6 / 100e-3) = -47.5dB

Frequency range of measurement = 9kHz- 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-25000 MHz RBW=1 MHz, VBW=1 MHz.

Transducer Legend:

T1=Bilog-AN01995 BILOG_012110	T2=Cable #10 ANP05050 041611
T3=Cable #15_05198_ Site A, 010511	T4=Pre_amp_HP8447D-AN00309-050210
T5=Heliac Cable 54' ANP05565 090410	T6=HF_pre AMP-1-26GHz_AN00786-072810.TRN
T7=Hi Freq_40GHz_2ft-ANP02948-091809	T8=Horn Ant AN00849 060610
T9=K&L 2GHz LPF_AN02746_011110	T10=HPF_3GHz-AN02744-032510
T11=Time of Occupancy Corr -47.5dB	

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7 T11	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	1602.000M	58.4	+0.0 +3.0 +0.3	+0.0 -38.3 +0.0	+0.0 +0.3	+0.0 +25.5	+0.0	49.2	54.0 side way	-4.8	Vert
2	1602.000M	57.6	+0.0 +3.0 +0.3	+0.0 -38.3 +0.0	+0.0 +0.3	+0.0 +25.5	+0.0	48.4	54.0 up right	-5.6	Vert
3	1601.833M Ave	53.6	+0.0 +3.0 +0.3	+0.0 -38.3 +0.0	+0.0 +0.3	+0.0 +25.5	+0.0	44.4	54.0 up right	-9.6	Vert
4	1602.000M Ave	52.8	+0.0 +3.0 +0.3	+0.0 -38.3 +0.0	+0.0 +0.3	+0.0 +25.5	+0.0	43.6	54.0 up right	-10.4	Horiz
^	1602.000M	56.7	+0.0 +3.0 +0.3	+0.0 -38.3 +0.0	+0.0 +0.3	+0.0 +25.5	+0.0	47.5	54.0 side way	-6.5	Horiz
^	1602.000M	55.8	+0.0 +3.0 +0.3	+0.0 -38.3 +0.0	+0.0 +0.3	+0.0 +25.5	+0.0	46.6	54.0 up right	-7.4	Horiz
7	171.550M	40.5	+9.6 +0.0 +0.0	+0.3 +0.0 +0.0	+2.2 +0.0 +0.0	-27.9 +0.0 +0.0	+0.0	24.7	43.5	-18.8	Vert
8	1653.983M Ave	60.7	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3	+0.0 +25.8	+0.0	52.0	74.0 up right	-22.0	Horiz
^	1653.983M	62.6	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3	+0.0 +25.8	+0.0	53.9	74.0 up right	-20.1	Horiz
10	328.020M	33.0	+14.1 +0.0 +0.0	+0.3 +0.0 +0.0	+3.2 +0.0 +0.0	-27.8 +0.0 +0.0	+0.0	22.8	46.0	-23.2	Vert
11	1653.983M Ave	59.2	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3	+0.0 +25.8	+0.0	50.5	74.0 up right	-23.5	Vert
12	1628.000M Ave	59.0	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3	+0.0 +25.7	+0.0	50.2	74.0 up right	-23.8	Vert
13	1628.033M Ave	58.8	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3	+0.0 +25.7	+0.0	50.0	74.0 up right	-24.0	Horiz

14	1628.042M Ave	58.6	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3 +25.7	+0.0	49.8	74.0 side way	-24.2	Horiz
^	1628.042M	60.6	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3 +25.7	+0.0	51.8	74.0 side way	-22.2	Horiz
^	1628.033M	60.3	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3 +25.7	+0.0	51.5	74.0 up right	-22.5	Horiz
17	1653.998M Ave	58.0	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3 +25.8	+0.0	49.3	74.0 side way	-24.7	Vert
^	1653.983M	61.1	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3 +25.8	+0.0	52.4	74.0 up right	-21.6	Vert
^	1653.998M	60.7	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3 +25.8	+0.0	52.0	74.0 side way	-22.0	Vert
20	1628.042M Ave	57.8	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3 +25.7	+0.0	49.0	74.0 side way	-25.0	Vert
^	1628.000M	60.3	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3 +25.7	+0.0	51.5	74.0 up right	-22.5	Vert
^	1628.042M	59.3	+0.0 +3.0 +0.4	+0.0 -38.2 +0.0	+0.0 +0.3 +25.7	+0.0	50.5	74.0 side way	-23.5	Vert
23	4960.017M Ave	55.5	+0.0 +6.0 +0.0	+0.0 -36.7 +0.5	+0.0 +0.5 -47.5	+0.0	11.8	54.0 side way	-42.2	Horiz
^	4960.017M	66.7	+0.0 +6.0 +0.0	+0.0 -36.7 +0.5	+0.0 +0.5 +33.5	+0.0	70.5	54.0 side way	+16.5	Horiz
^	4960.000M	64.8	+0.0 +6.0 +0.0	+0.0 -36.7 +0.5	+0.0 +0.5 +33.5	+0.0	68.6	54.0 up right	+14.6	Horiz
26	4882.000M Ave	55.5	+0.0 +5.9 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 -47.5	+0.0	11.6	54.0 side way	-42.4	Horiz
^	4882.000M	67.0	+0.0 +5.9 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 +33.4	+0.0	70.6	54.0 side way	+16.6	Horiz
^	4882.000M	63.3	+0.0 +5.9 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 +33.4	+0.0	66.9	54.0 up right	+12.9	Horiz
29	4960.000M Ave	53.5	+0.0 +6.0 +0.0	+0.0 -36.7 +0.5	+0.0 +0.5 -47.5	+0.0	9.8	54.0 up right	-44.2	Horiz
30	4804.000M Ave	54.0	+0.0 +5.8 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 -47.5	+0.0	9.8	54.0 side way	-44.2	Horiz
^	4804.000M	65.4	+0.0 +5.8 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 +33.2	+0.0	68.7	54.0 side way	+14.7	Horiz

^ 4804.083M	64.0	+0.0 +5.8 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 +33.2	+0.0 +0.0 +0.0	67.3	54.0 up right	+13.3	Horiz
33 4882.017M Ave	52.2	+0.0 +5.9 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 -47.5	+0.0 +33.4	8.3	54.0 up right	-45.7	Vert
34 4804.083M Ave	52.4	+0.0 +5.8 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 -47.5	+0.0 +33.2	8.2	54.0 up right	-45.8	Horiz
35 4882.000M Ave	51.9	+0.0 +5.9 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 -47.5	+0.0 +33.4	8.0	54.0 up right	-46.0	Horiz
36 4960.000M Ave	50.4	+0.0 +6.0 +0.0	+0.0 -36.7 +0.5	+0.0 +0.5 -47.5	+0.0 +33.5	6.7	54.0 up right	-47.3	Vert
^ 4960.000M	61.5	+0.0 +6.0 +0.0	+0.0 -36.7 +0.5	+0.0 +0.5 +33.5	+0.0	65.3	54.0 up right	+11.3	Vert
38 4804.250M Ave	50.3	+0.0 +5.8 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 -47.5	+0.0 +33.2	6.1	54.0 up right	-47.9	Vert
^ 4804.250M	62.9	+0.0 +5.8 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 +33.2	+0.0	66.2	54.0 up right	+12.2	Vert
40 4959.650M Ave	45.9	+0.0 +6.0 +0.0	+0.0 -36.7 +0.5	+0.0 +0.5 -47.5	+0.0 +33.5	2.2	54.0 side way	-51.8	Vert
^ 4959.650M	59.2	+0.0 +6.0 +0.0	+0.0 -36.7 +0.5	+0.0 +0.5 +33.5	+0.0	63.0	54.0 side way	+9.0	Vert
42 4804.000M Ave	45.5	+0.0 +5.8 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 -47.5	+0.0 +33.2	1.3	54.0 side way	-52.7	Vert
^ 4804.000M	56.9	+0.0 +5.8 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 +33.2	+0.0	60.2	54.0 side way	+6.2	Vert
44 4882.100M Ave	44.4	+0.0 +5.9 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 -47.5	+0.0 +33.4	0.5	54.0 side way	-53.5	Vert
^ 4882.017M	63.6	+0.0 +5.9 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 +33.4	+0.0	67.2	54.0 up right	+13.2	Vert
^ 4882.100M	56.2	+0.0 +5.9 +0.0	+0.0 -36.8 +0.6	+0.0 +0.5 +33.4	+0.0	59.8	54.0 side way	+5.8	Vert