



**FCC CFR47 PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 8**

**CERTIFICATION TEST REPORT**

**FOR**

**WIRELESS STEREO HEADSET**

**MODEL NUMBER: CECHYA-0086**

**FCC ID: ZL2CECHYA0086  
IC: 409P-CECHYA0086**

**REPORT NUMBER: 12U1487-1, Revision B**

**ISSUE DATE: July 31, 2012**

*Prepared for*  
**Sony Computer Entertainment America  
919 East Hillsdale Blvd.  
Foster City, CA 94404-2175**

*Prepared by*  
**UL LLC  
333 Pfingsten Rd.  
Northbrook, IL 60062  
TEL: (847) 272-8800**



NVLAP Lab code: 100414-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	07/05/12	Initial Issue	M.Ferrer
A	07/11/12	Adding serial number	M.Ferrer
B	07/31/12	Revised Antenna and Worst Case description	M.Ferrer

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Sony Computer Entertainment America  
919 East Hillsdale Blvd.  
Foster City, CA 94404-2175

**EUT DESCRIPTION:** Wireless Stereo Headset

**MODEL:** CECHYA-0086

**SERIAL NUMBER:** Conducted tests SN:181, Radiated Tests SN:PVT-000004

**DATE TESTED:** 06/26/12 – 07/03/12

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL By:



MICHAEL ANTOLA  
SENIOR PROJECT ENGINEER  
UL

Tested By:



MICHAEL FERRER  
SENIOR PROJECT ENGINEER  
UL

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, IL 60193, USA.

UL NBK is accredited by NVLAP, Laboratory Code 100414-0

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

#### Sample Calculations

Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:

Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)

Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)

Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	+/- 0.3 dB (k=2)
Radiated Disturbance, 30 to 1000 MHz	+/- 3.17 dB (k=2)

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an USB wireless adapter that operates at 2.4GHz.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2405 - 2477	DTS	2.99	1.99

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a Diversity antenna installed internally integral, Antenna 0 gain 0.5 and antenna 1 gain 0.8. The both antenna are the same, therefore the higher gain antenna was used during transmission.

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was R01.00.00.

The EUT driver used standard windows drivers.

The test utility software used during testing was VMIttest, rev. 1.1.6.38.

## **5.5. WORST-CASE CONFIGURATION AND MODE**

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the single channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X axis orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X axis orientation. EUT was set to single channel as worst case.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Sony	PCG-6H4L	3000002	DoC
AC/DC adapter	Sony	VGP-AC19V25	1480131	DoC

### I/O CABLES

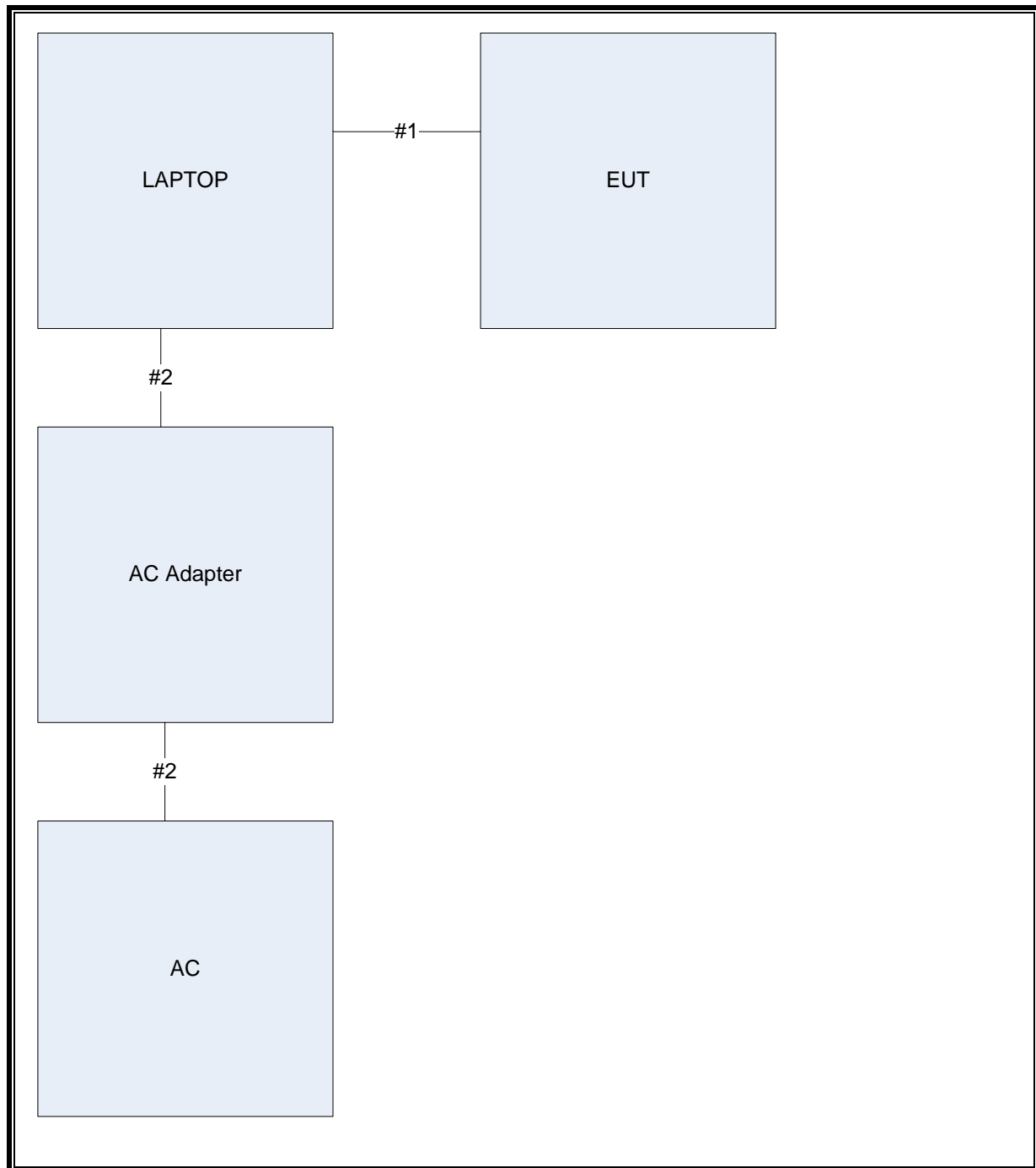
I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	2	USB	Shielded	5 ft	None
2	DC	1	DC	2 wire	8.5 ft	AC adapter

### TEST SETUP

The EUT is connected to the host laptop computer via USB during the tests. Test software exercised the radio card.



**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List						
Description	Manufacturer	Model	Asset	Cal Date	Cal Due	Test
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20111228	20121231	RE, CP
Bicon Antenna	Chase	VBA6106A	EMC4078	20120117	20130131	RE, CP
Log-P Antenna	Chase	UPA6109	EMC4258	20110927	20120928	RE
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20111227	20121231	RE
Antenna Array	UL	BOMS	EMC4276	20111227	20121231	RE
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20111228	20121231	CE
LISN	Solar	8602-50-TS-50-N	EMC4052	20120106	20130106	CE
LISN	Solar	8602-50-TS-50-N	EMC4064	20120106	20130106	CE
EMI Test Receiver	Agilent	N9030A	EMC4360	20120515	20130515	OBW, PSD
Power Meter	Rohde & Schwarz	NRVD	EMC4074	20111229	20121231	AP
Power Sensor	Rohde & Schwarz	NRV-Z555	EMC4265	20120529	20130531	AP

RE: Radiated Emissions  
CP: Conducted Antenna Peak Power, Spurious Emissions  
CE: Conducted Emissions AC Mains  
OBW: Occupied BW  
PSD: Power Spectral Density  
AP: Average Power

## 7. ANTENNA PORT TEST RESULTS

### 7.1. DTS MODE IN THE 2.4 GHz BAND

#### 7.1.1. 6 dB BANDWIDTH

##### LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

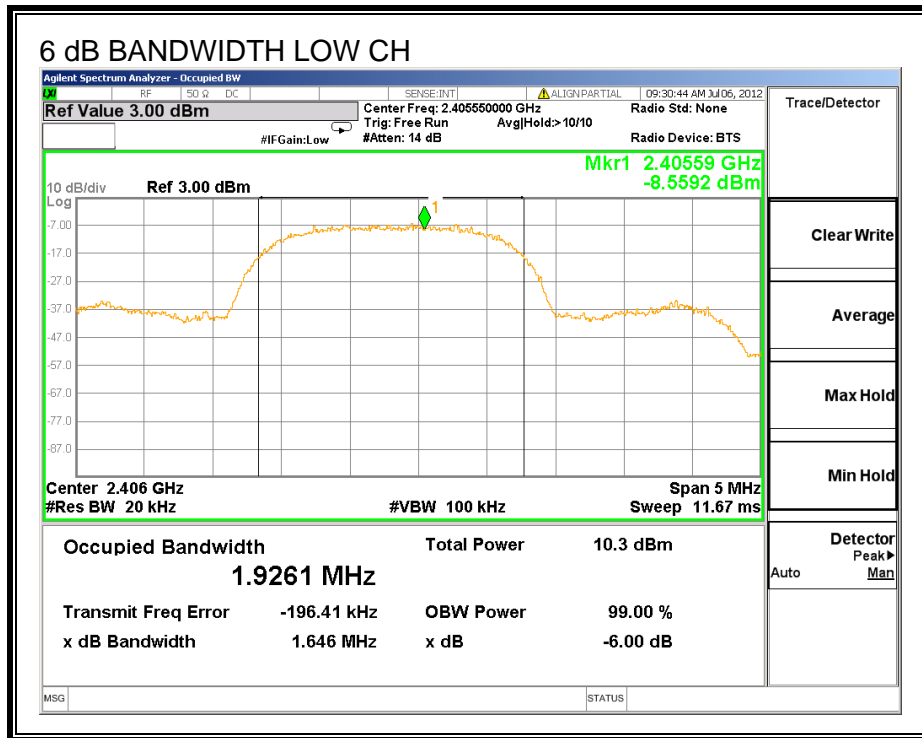
##### TEST PROCEDURE

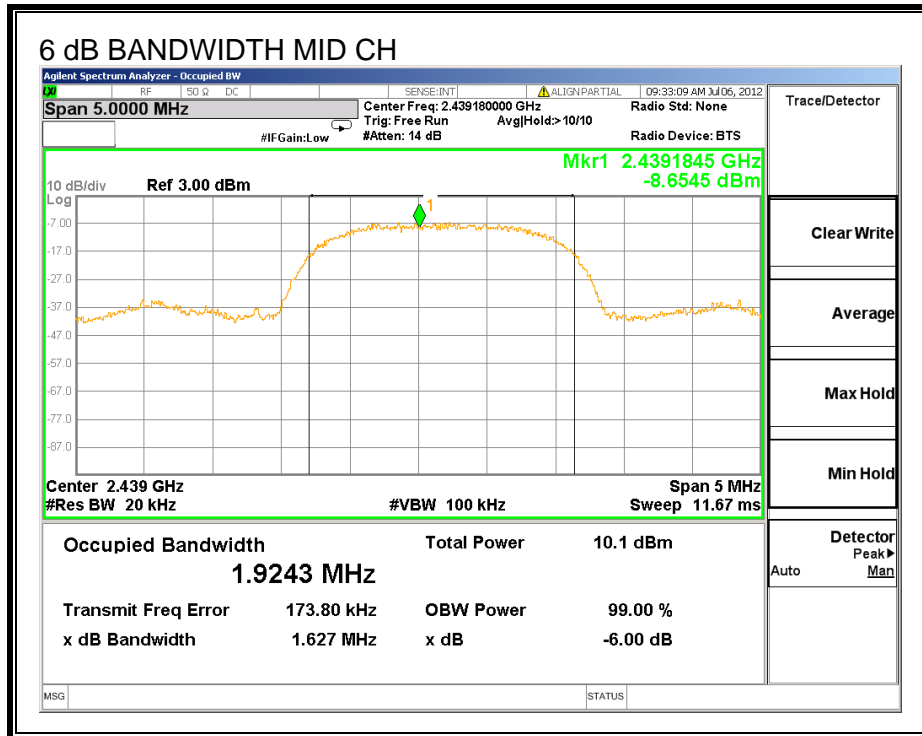
The transmitter output is connected to a spectrum analyzer. The RBW is set to 20 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

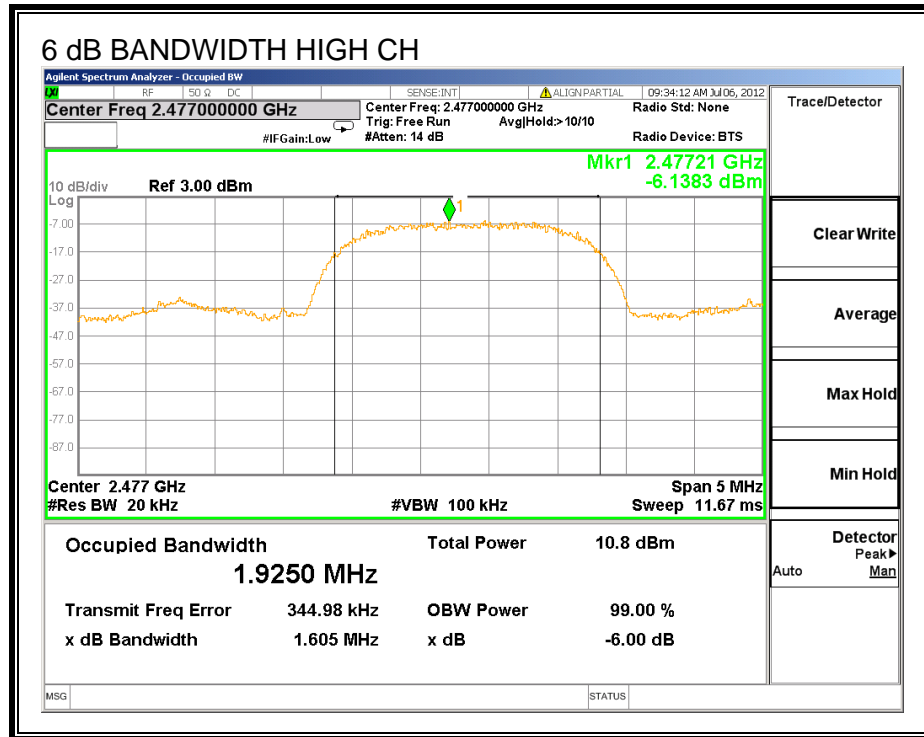
##### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2.405	1.6460	0.5
Middle	2.439	1.6270	0.5
High	2.477	1.6050	0.5

## 6 dB BANDWIDTH







### 7.1.2. 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

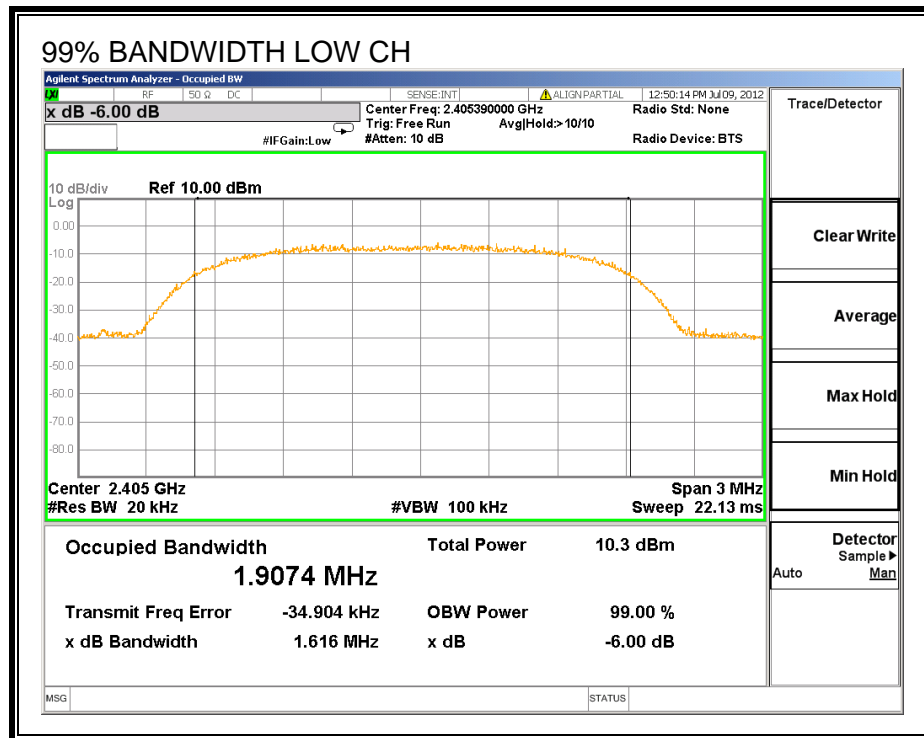
#### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

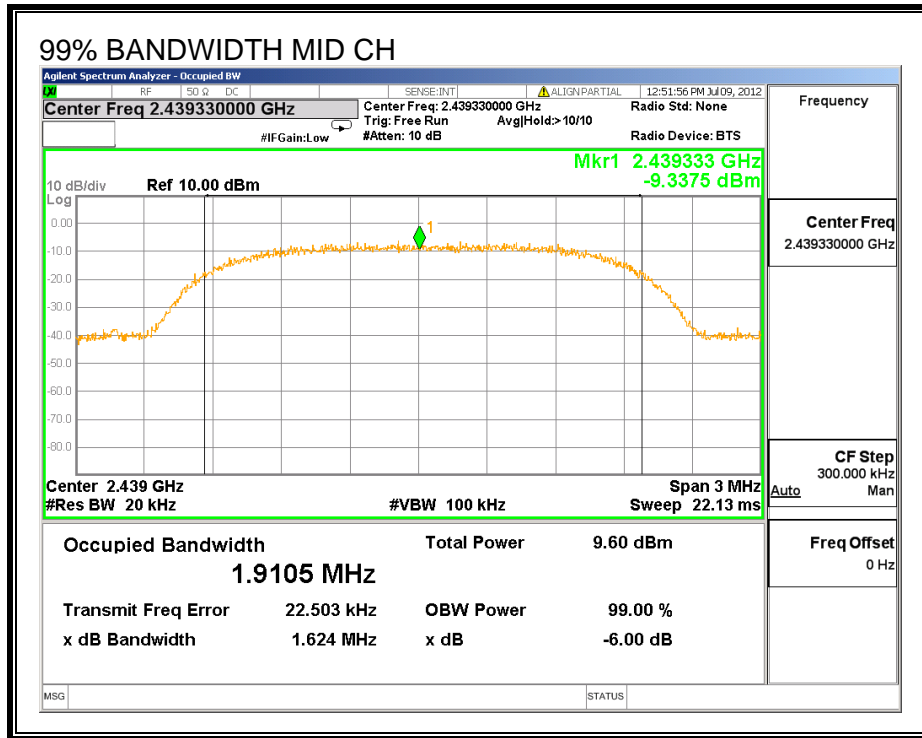
#### RESULTS

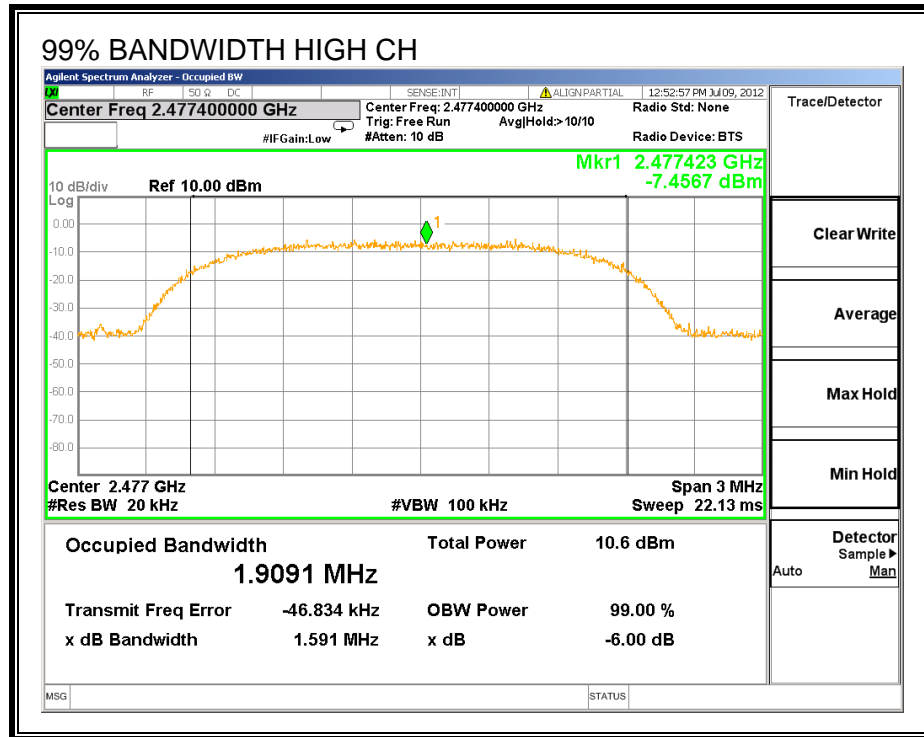
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	1.9074
Middle	2439	1.9105
High	2477	1.9091

**99% BANDWIDTH**









### 7.1.3. OUTPUT POWER

#### LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

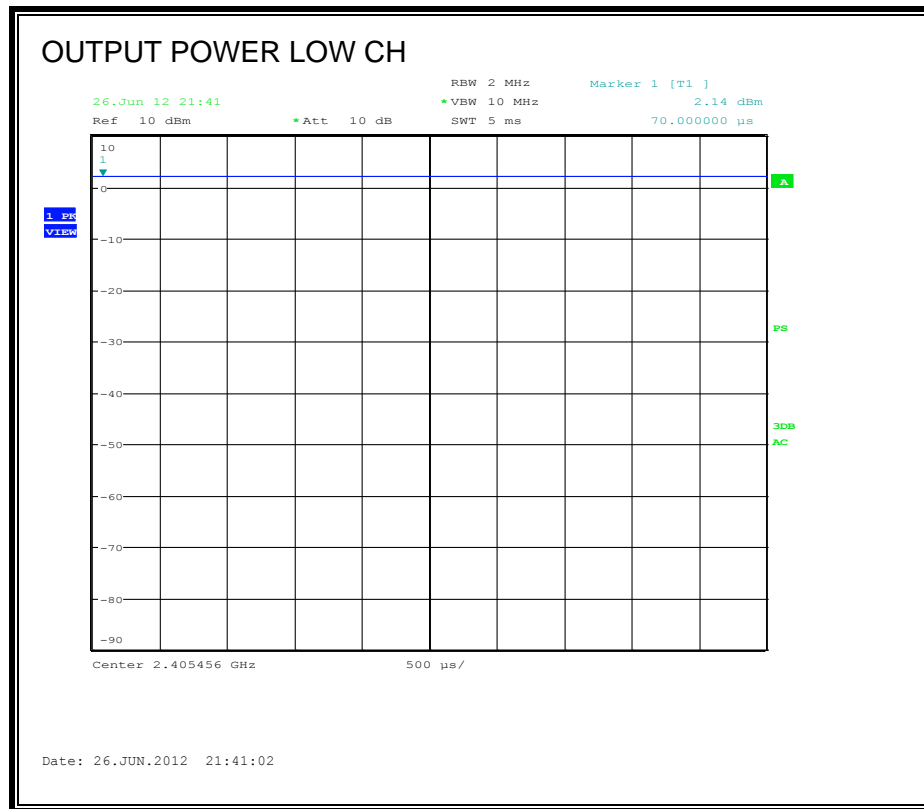
#### TEST PROCEDURE

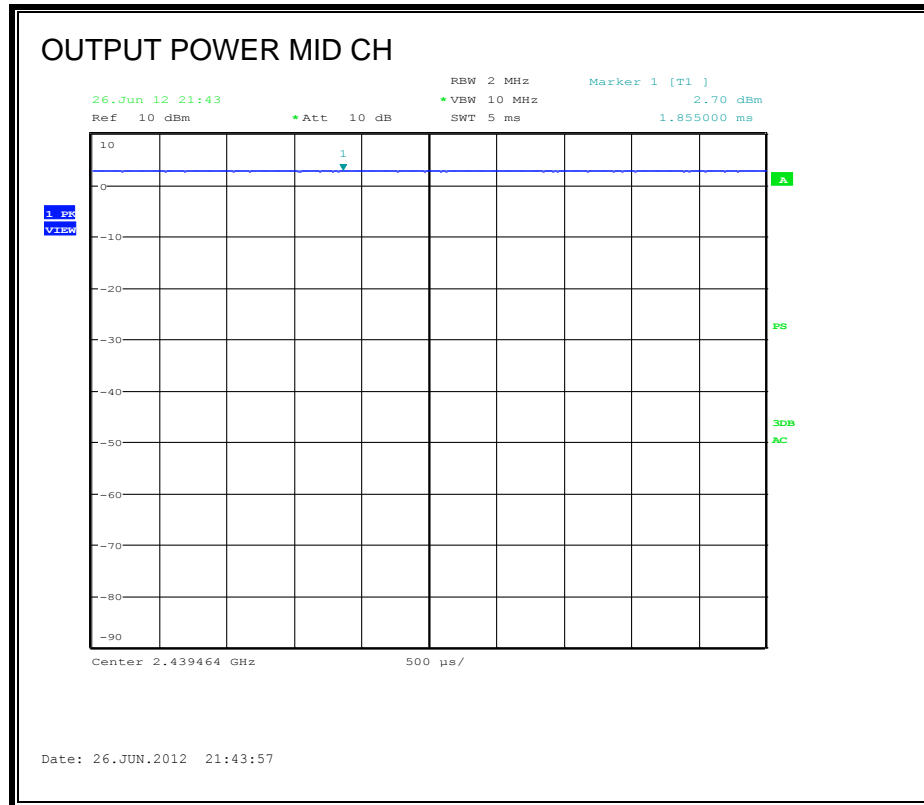
Peak Power is measured using procedure from KDB 558074 DTS Meas Guidance v02  
Section 7.2.1.1

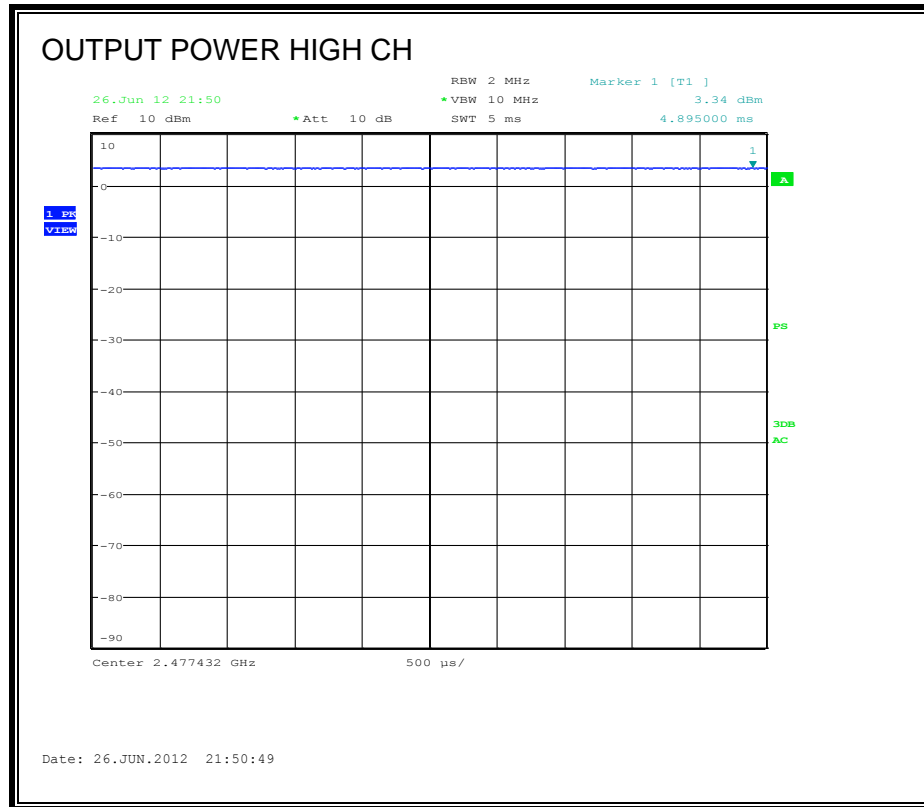
#### RESULTS

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2.405	2.140	30	-27.860
Middle	2.439	2.700	30	-27.300
High	2.477	3.340	30	-26.660

## OUTPUT POWER







#### **7.1.4. AVERAGE POWER**

##### **LIMITS**

None; for reporting purposes only.

##### **TEST PROCEDURE**

From KDB 558074 DTS Meas Guidance DR01  
Section 7.2.2.3 Option 3 was used

The transmitter output is connected to a power meter.

##### **RESULTS**

The cable assembly insertion loss of 1 dB for the cable was included in the table below.

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>AV power (dBm)</b>
Low	2.405	0.47
Middle	2.439	1.04
High	2.477	1.63

### 7.1.5. POWER SPECTRAL DENSITY

#### LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

#### TEST PROCEDURE

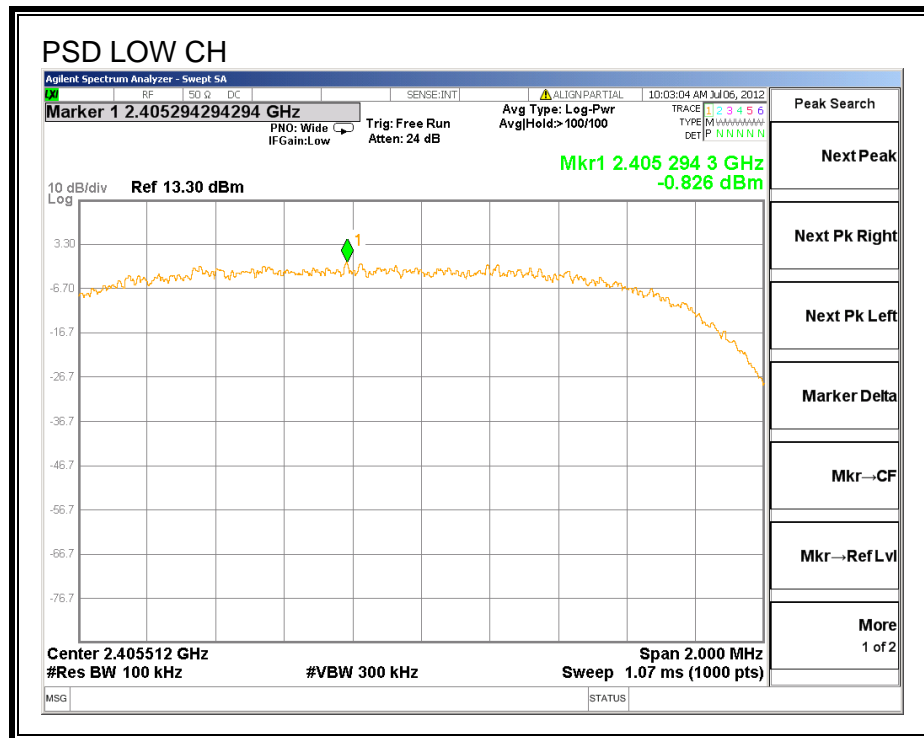
PSD Procedure used from KDB 558074 DTS Meas Guidance DR01 Section 7.3.1, note item 10 (-15.2 dB) used for scaling and included in the table below.

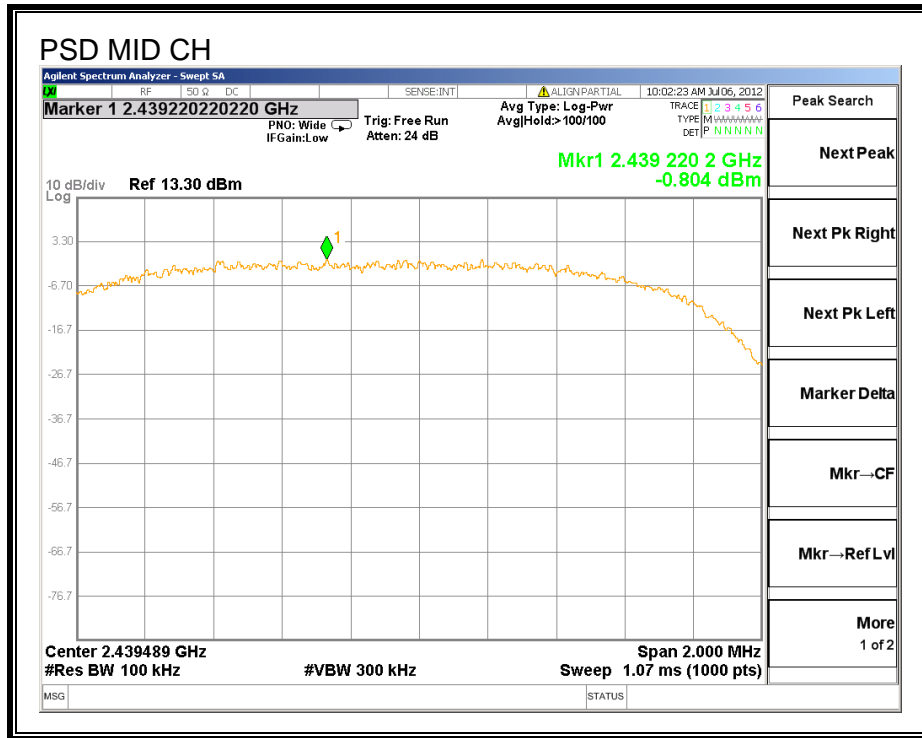
#### RESULTS

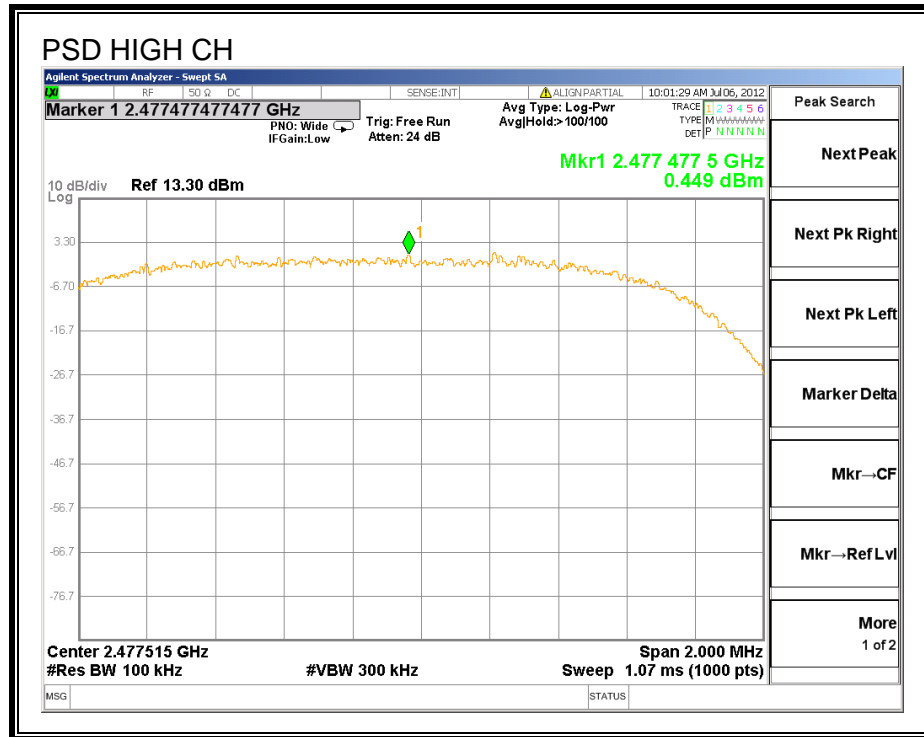
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Margin (dB)
Low	2.405	-16.03	8	-24.03
Middle	2.439	-16.00	8	-24.00
High	2.477	-14.75	8	-22.75



# **POWER SPECTRAL DENSITY**







## **7.1.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

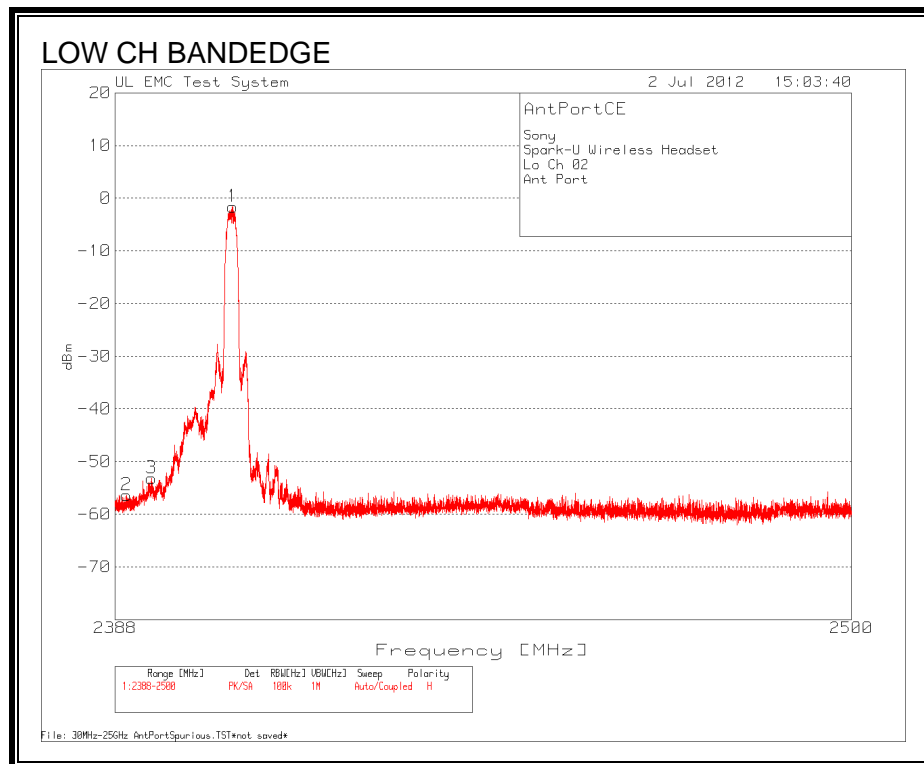
### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 1MHz. Peak Detector was used

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

## RESULTS

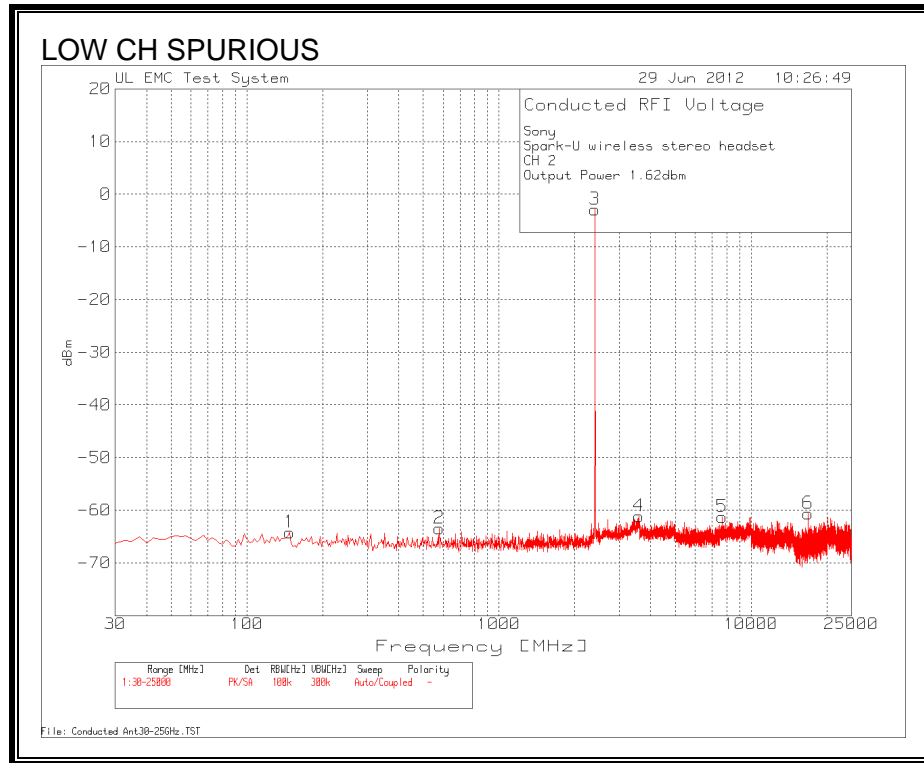
### SPURIOUS EMISSIONS, LOW CHANNEL



Sony  
Spark-U Wireless Headset  
Lo Ch 02  
Ant Port

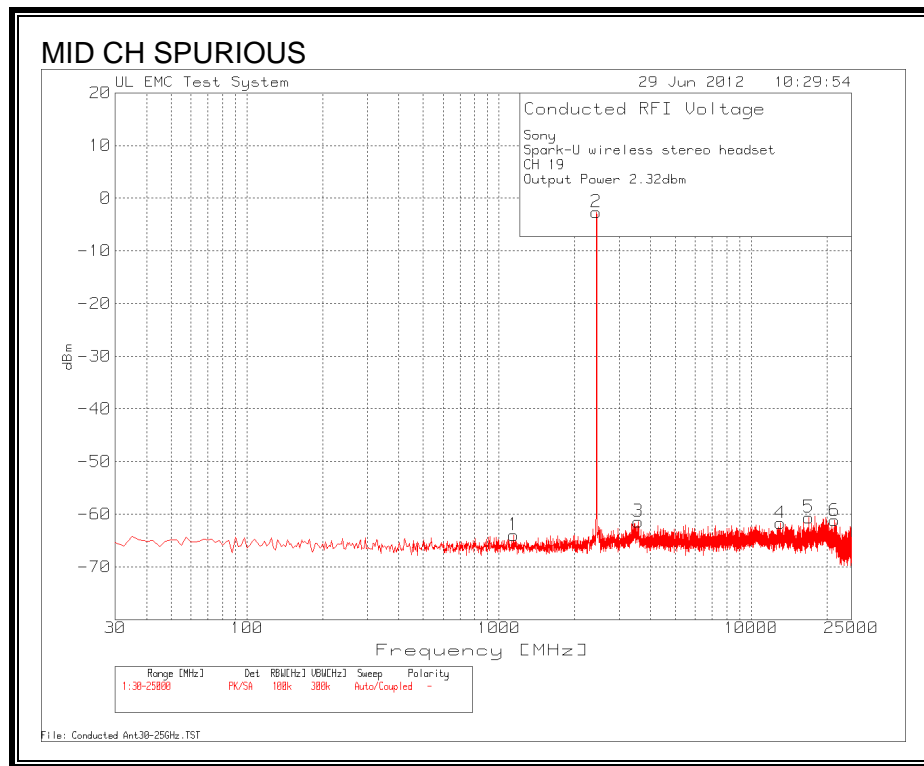
Test No.	Frequency [MHz]	Meter Reading (dBuV)	Transducer Factor [dB]	Gain/Loss Factor [dB]	Level dBm	Limit:1	2	3	4	5	6
1	2405.531	95.35 PK	-107	10	-1.65	-	-	-	-	-	-
		Height:100	Horz	Margin [dB]		-	-	-	-	-	-
2	2389.641	40.48 PK	-107	10.1	-56.42	-	-	-	-	-	-
		Height:100	Horz	Margin [dB]		-	-	-	-	-	-
3	2393.421	43.69 PK	-107	10.1	-53.21	-	-	-	-	-	-
		Height:100	Horz	Margin [dB]		-	-	-	-	-	-

PK - Peak detector



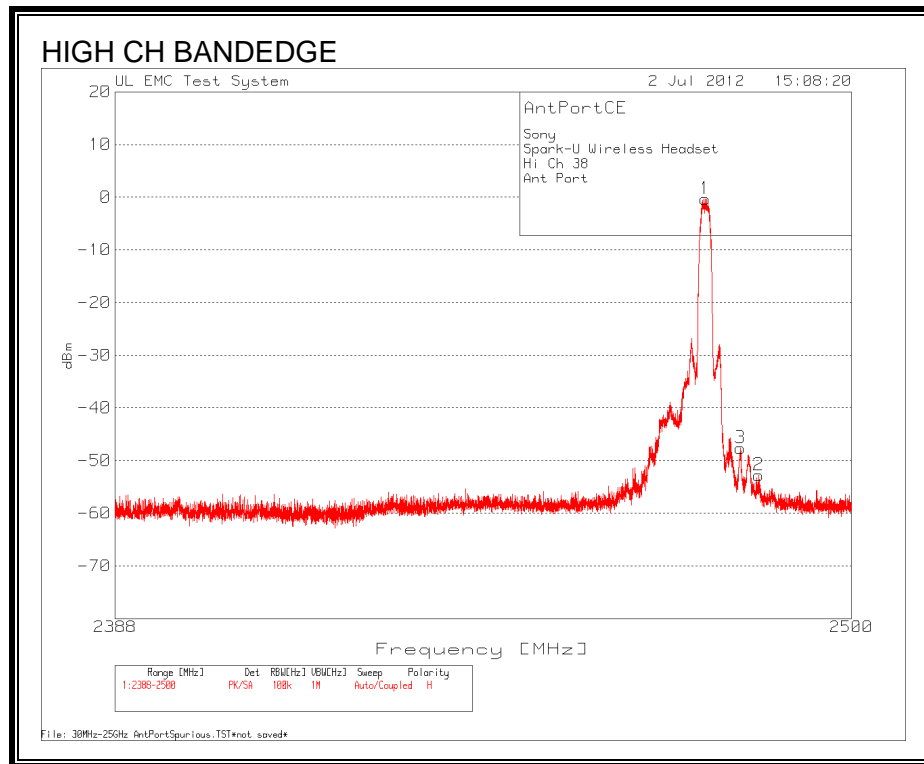
All Emissions 20dB below fundamental as seen in plot

**SPURIOUS EMISSIONS, MID CHANNEL**



All Emissions 20dB below fundamental as seen in plot

# **SPURIOUS EMISSIONS, HIGH CHANNEL**

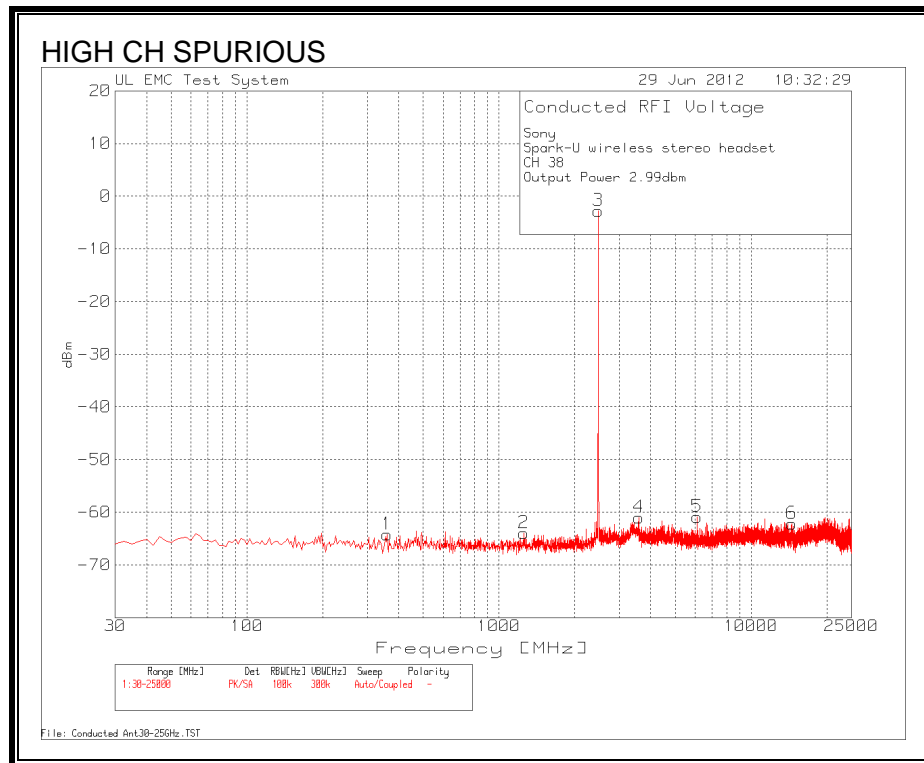


Sony  
Spark-U Wireless Headset  
Hi Ch 38  
Ant Port

Test No.	Frequency [MHz]	Meter Reading [dBuV]	Transducer Factor [dB]	Gain/Loss Factor [dB]	Level [dBm]	Limit:1	2	3	4	5	6
1	2477.321	96.61 PK	-107	10.1	-29	-	-	-	-	-	-
		Height:100	Horz	Margin [dB]	-	-	-	-	-	-	-
2	2485.615	44.24 PK	-107	10	-52.76	-	-	-	-	-	-
		Height:100	Horz	Margin [dB]	-	-	-	-	-	-	-
3	2482.842	49.35 PK	-107	10	-47.65	-	-	-	-	-	-
		Height:100	Horz	Margin [dB]	-	-	-	-	-	-	-

PK - Peak detector





All Emissions 20dB below fundamental as seen in plot

## 8. RADIATED TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 25 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## 8.2. TRANSMITTER ABOVE 1 GHz

### 8.2.1. TX ABOVE 1 GHz FOR DTS TX MODE IN THE 2.4 GHz BAND

Please note different limits shown in plots.

Red: Peak limit

Yellow: Avg Limit

Peak Scan: RBW=VBW=1MHz Shown in Red trace

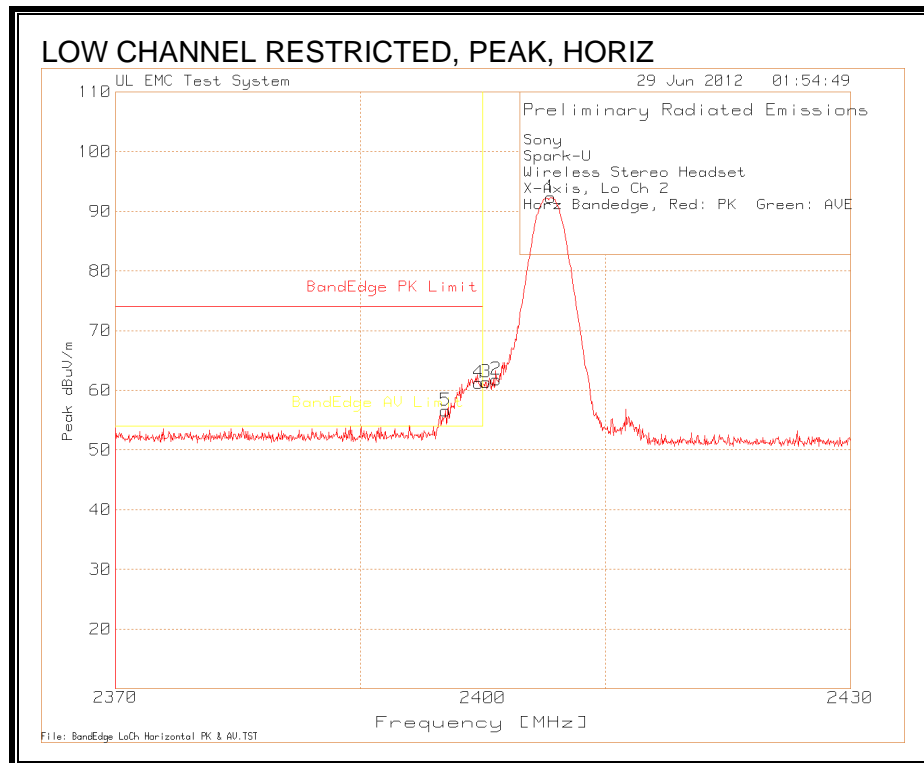
Average Scan: RBW=1MHz VBW =1Hz Shown in Green trace

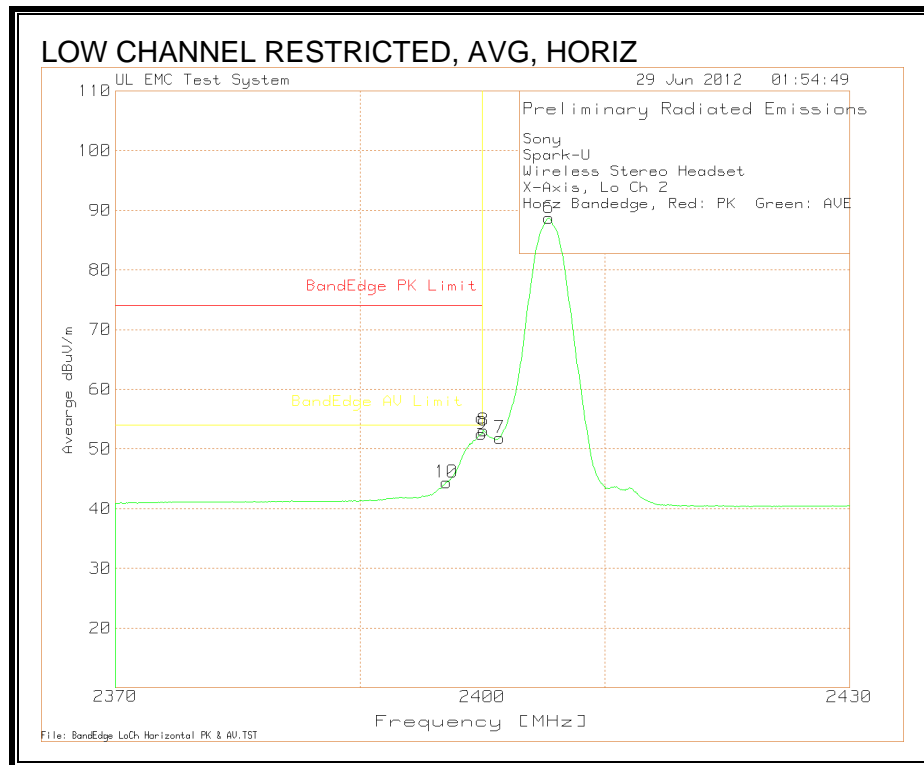
The plot is segmented into 3 sections with a dotted line separating each section vertically

The 1<sup>st</sup> dotted line is at 2390MHz which signifies the end of the restricted band.

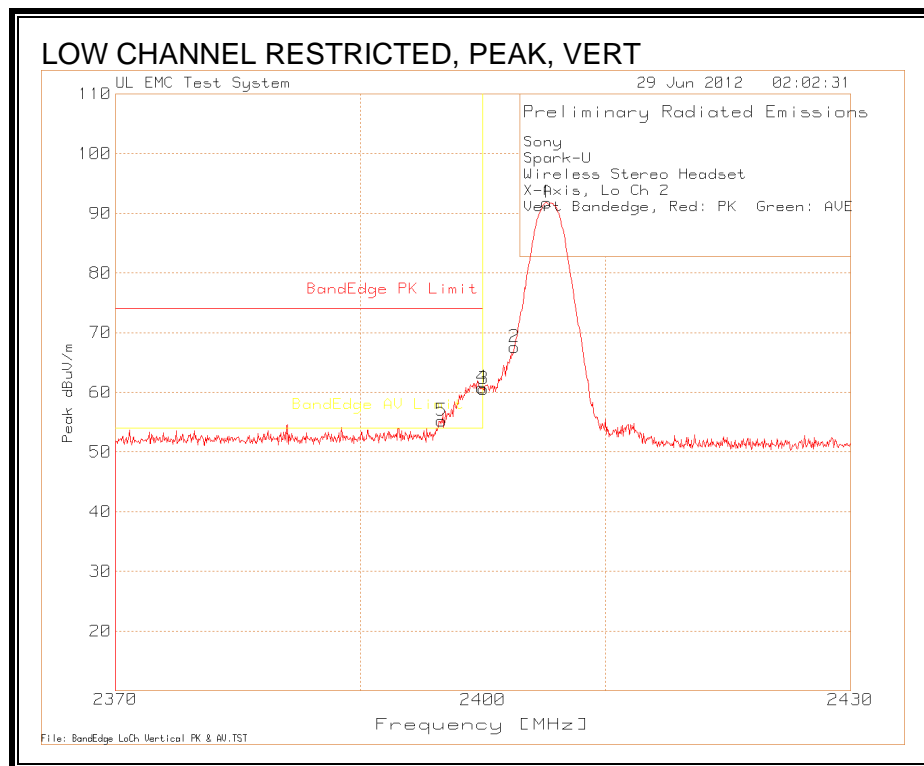
The plot for high channel shows the limit line starts at 2.4835GHz for the start of the restricted band

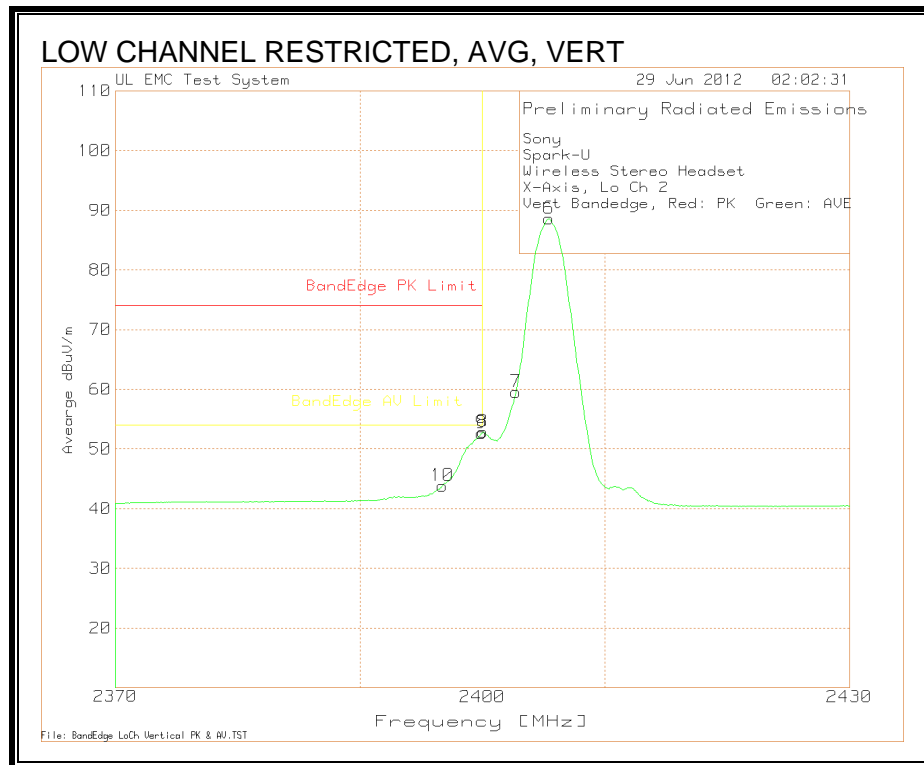
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



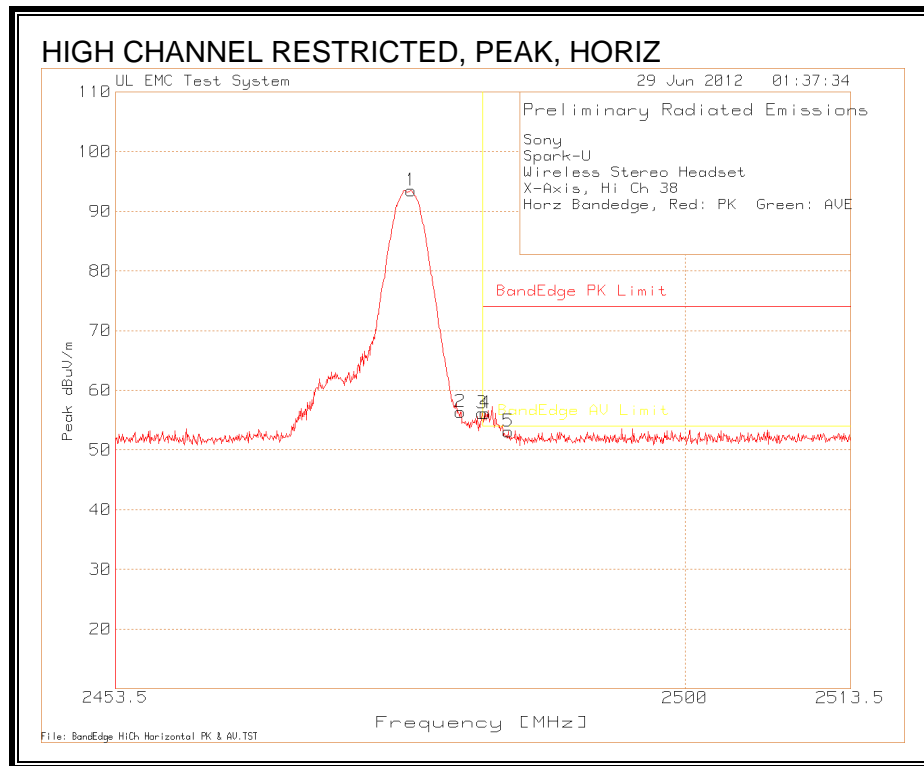


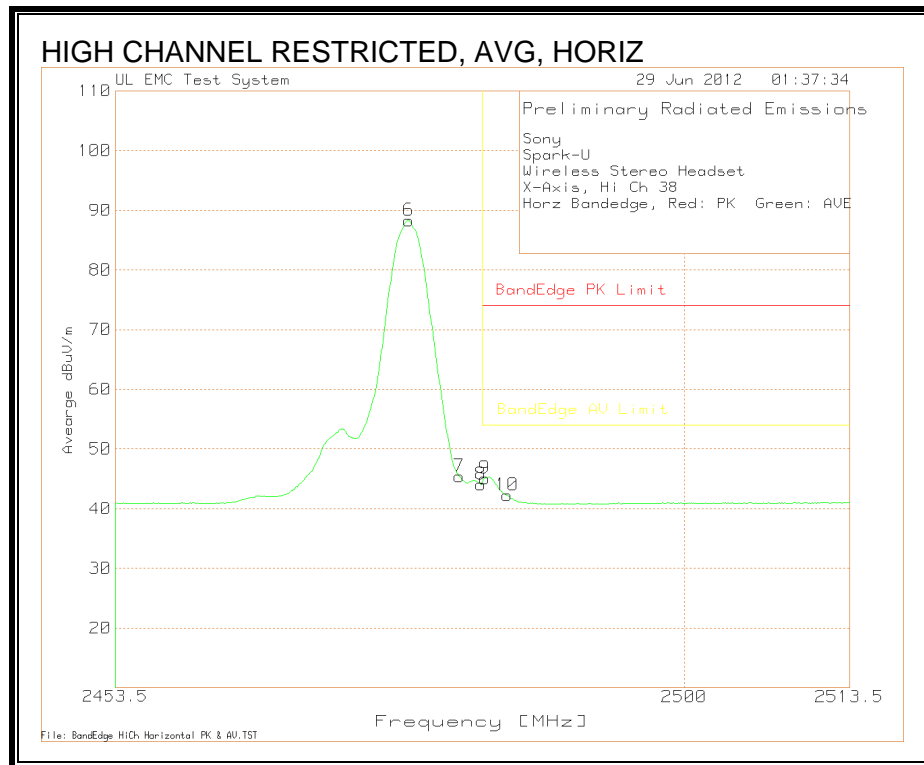
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**





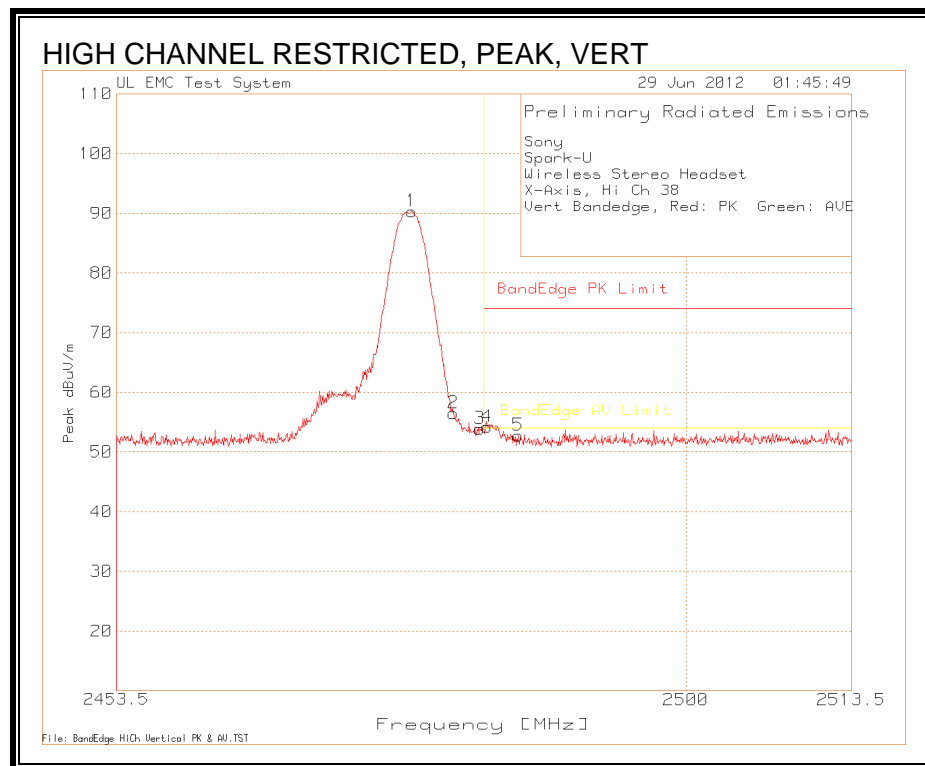
**RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)**

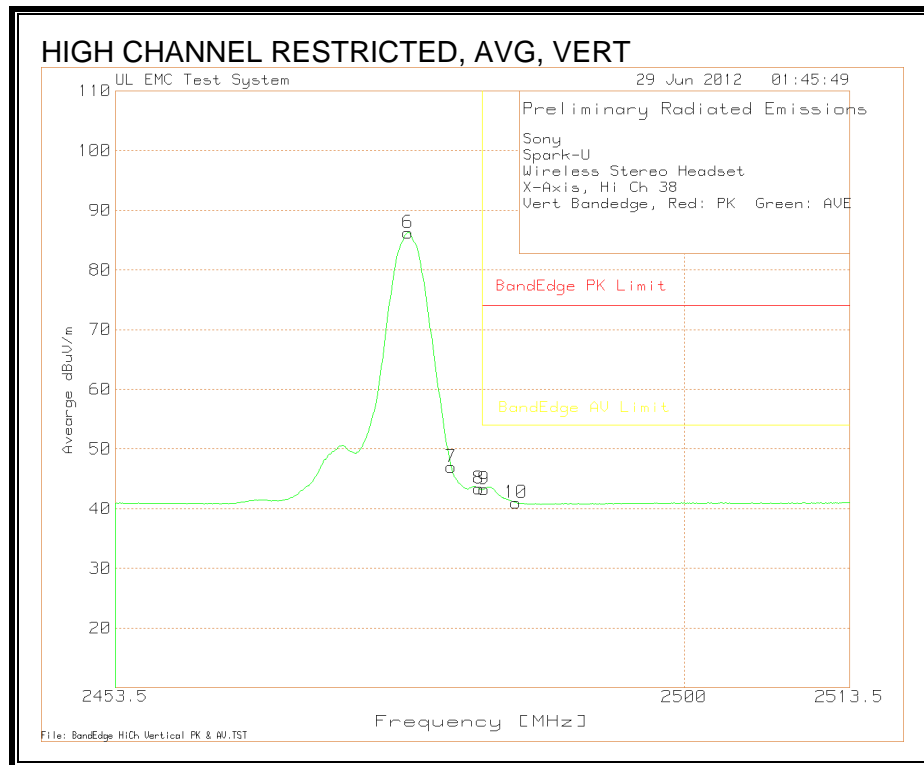






**RESTRICTED BANEDGE (HIGH CHANNEL, VERTICAL)**



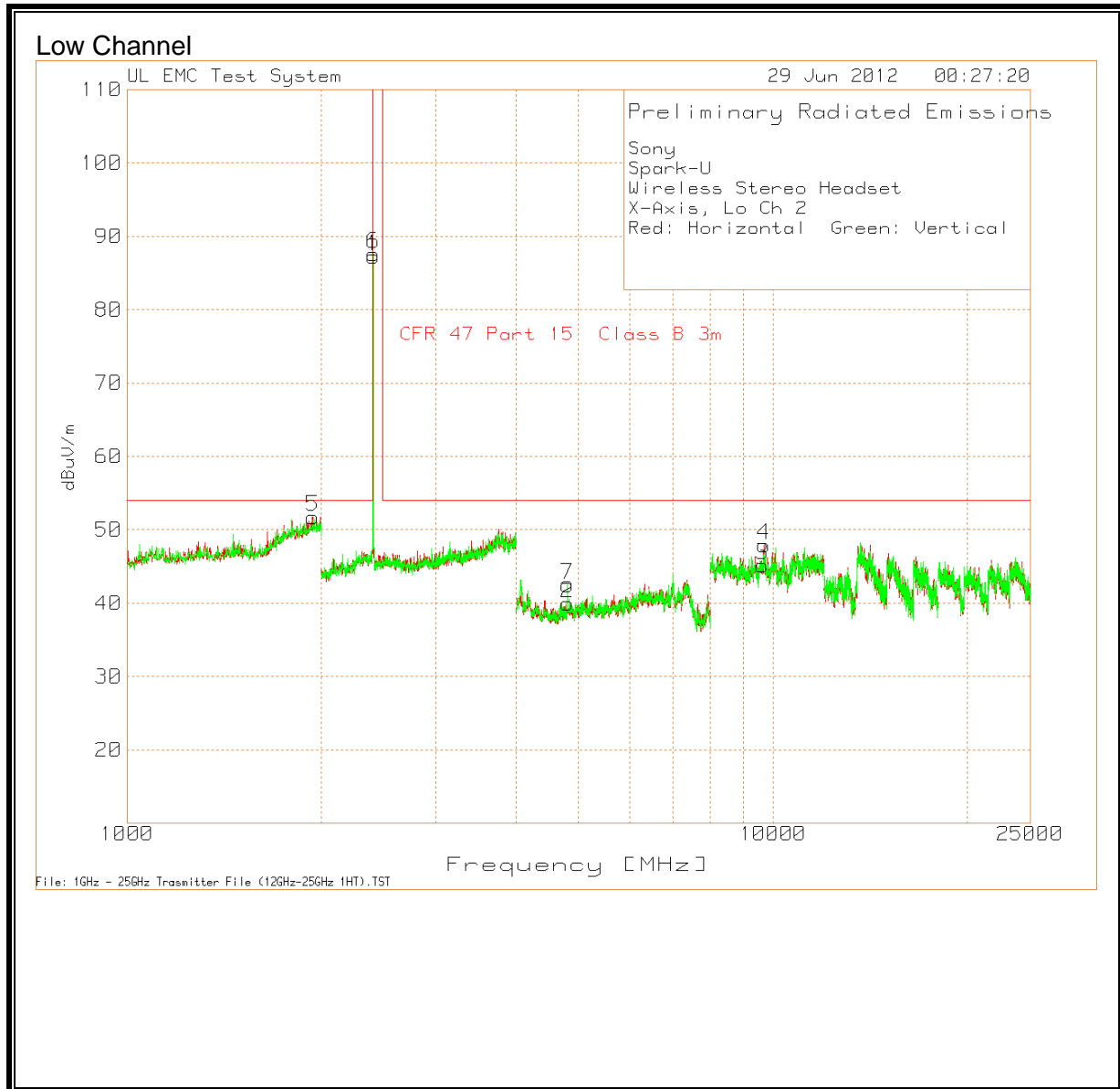


### 8.3. WORST-CASE Above 1 GHz

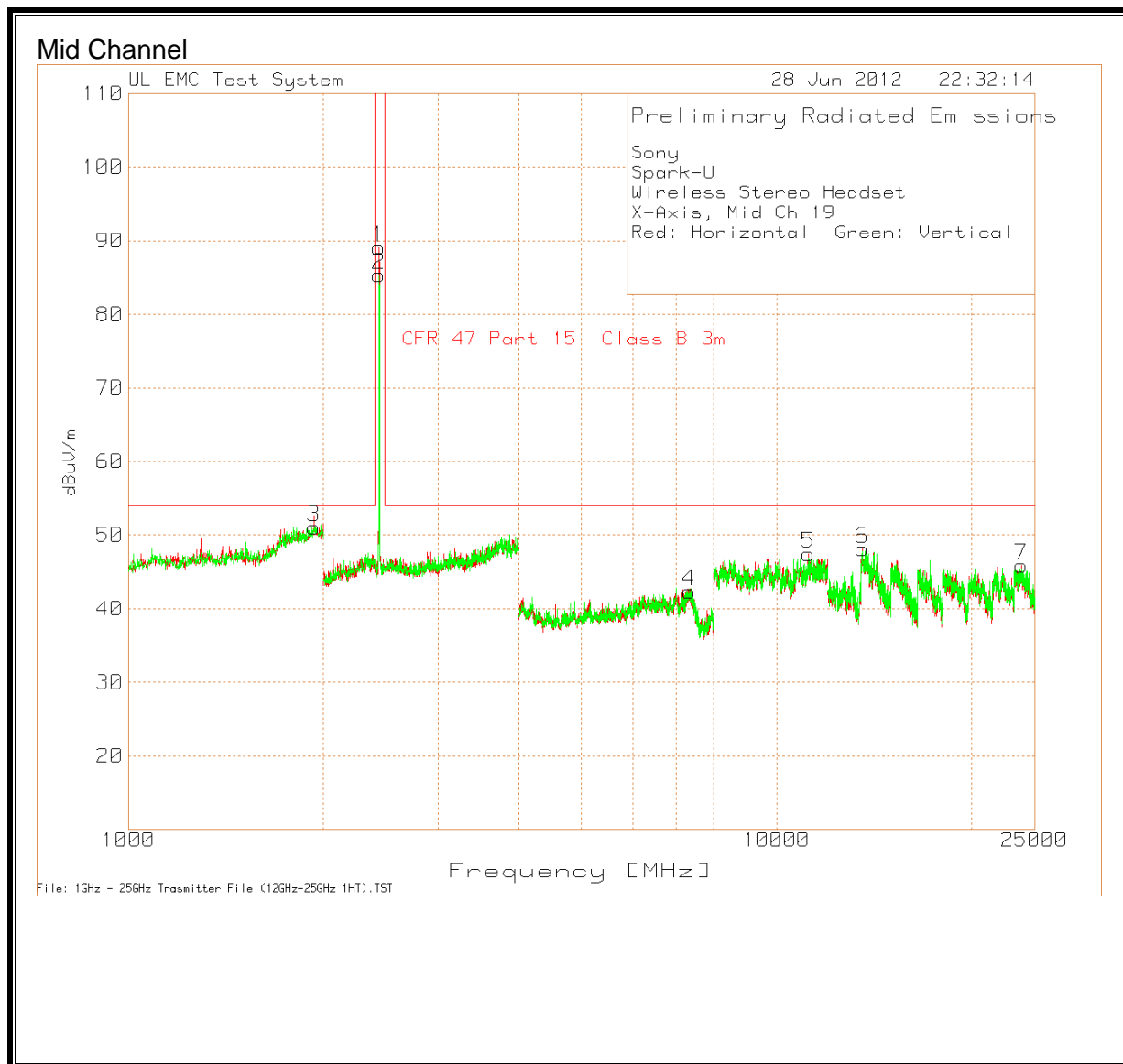
#### SPURIOUS EMISSIONS 1 TO 25 GHz (WORST-CASE CONFIGURATION, HORIZONTAL)

Other than fundamental, all emissions was considered below noise floor.

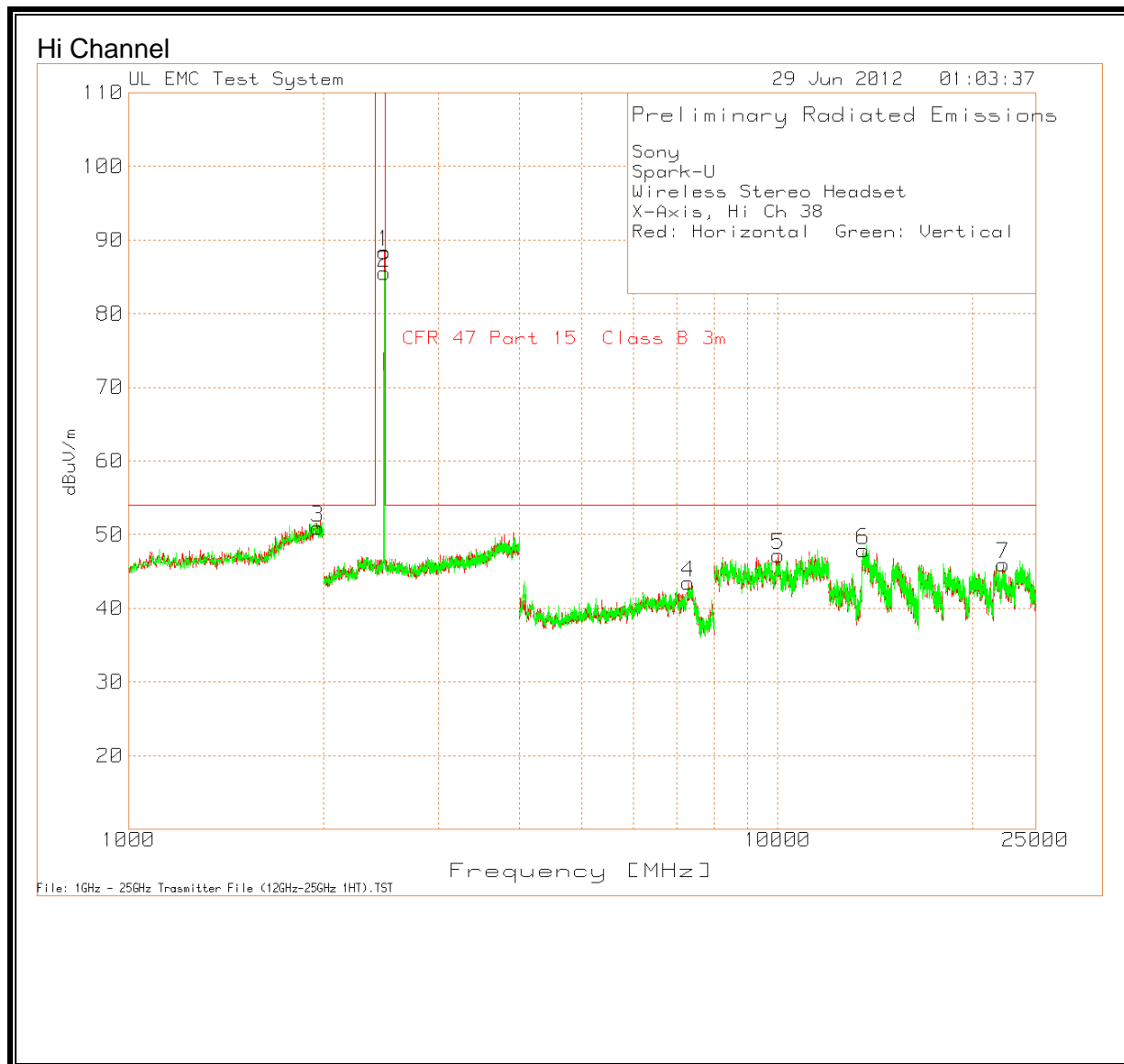
Peak detector was used.



Sony									
Spark-U									
Wireless Stereo Headset									
X-Axis, Lo Ch 2									
Red: Horizontal Green: Vertical									
Test	Meter		Antenna	BOMS		Class B		Height	
Frequency	Reading	Detector	Factor	Factor [dB]	dBuV/m	3m	Margin	[cm]	Polarity
1939.88	20.44	PK	27.4	3.94	51.78	54	-2.22	150	Horz
2404.404	61.23	PK	21.8	4.18	87.21	-	-	100	Horz
4811.207	63.63	PK	27.7	-51.35	39.98	54	-14.02	100	Horz
9622.415	58.74	PK	36.4	-49.94	45.2	54	-8.8	150	Horz
9697.131	60.44	PK	36.4	-48.89	47.95	54	-6.05	100	Horz
2404.404	61.65	PK	21.8	4.18	87.63	-	-	100	Vert
4808.539	66.11	PK	27.7	-51.36	42.45	54	-11.55	101	Vert
PK - Peak detector									



Sony									
Spark-U									
Wireless Stereo Headset									
X-Axis, Mid Ch 19									
Red: Horizontal Green: Vertical									
Test	Meter		Antenna	BOMS		Class B		Height	
Frequency	Reading	Detector	Factor	Factor	dBuV/m	3m	Margin	[cm]	Polarity
2438.438	62.95	PK	21.9	4.18	89.03	-	-	100	Horz
7338.225	58.19	PK	30.7	-46.49	42.4	54	-11.6	150	Horz
11202.135	57.42	PK	36.7	-46.66	47.46	54	-6.54	150	Horz
13587.794	49.25	PK	39.8	-40.89	48.16	54	-5.84	100	Horz
23879.44	59.87	PK	40.3	-54.28	45.89	54	-8.11	100	Horz
1935.872	19.65	PK	27.4	3.97	51.02	54	-2.98	100	Vert
2438.438	59.27	PK	21.9	4.18	85.35	-	-	100	Vert
PK - Peak detector									



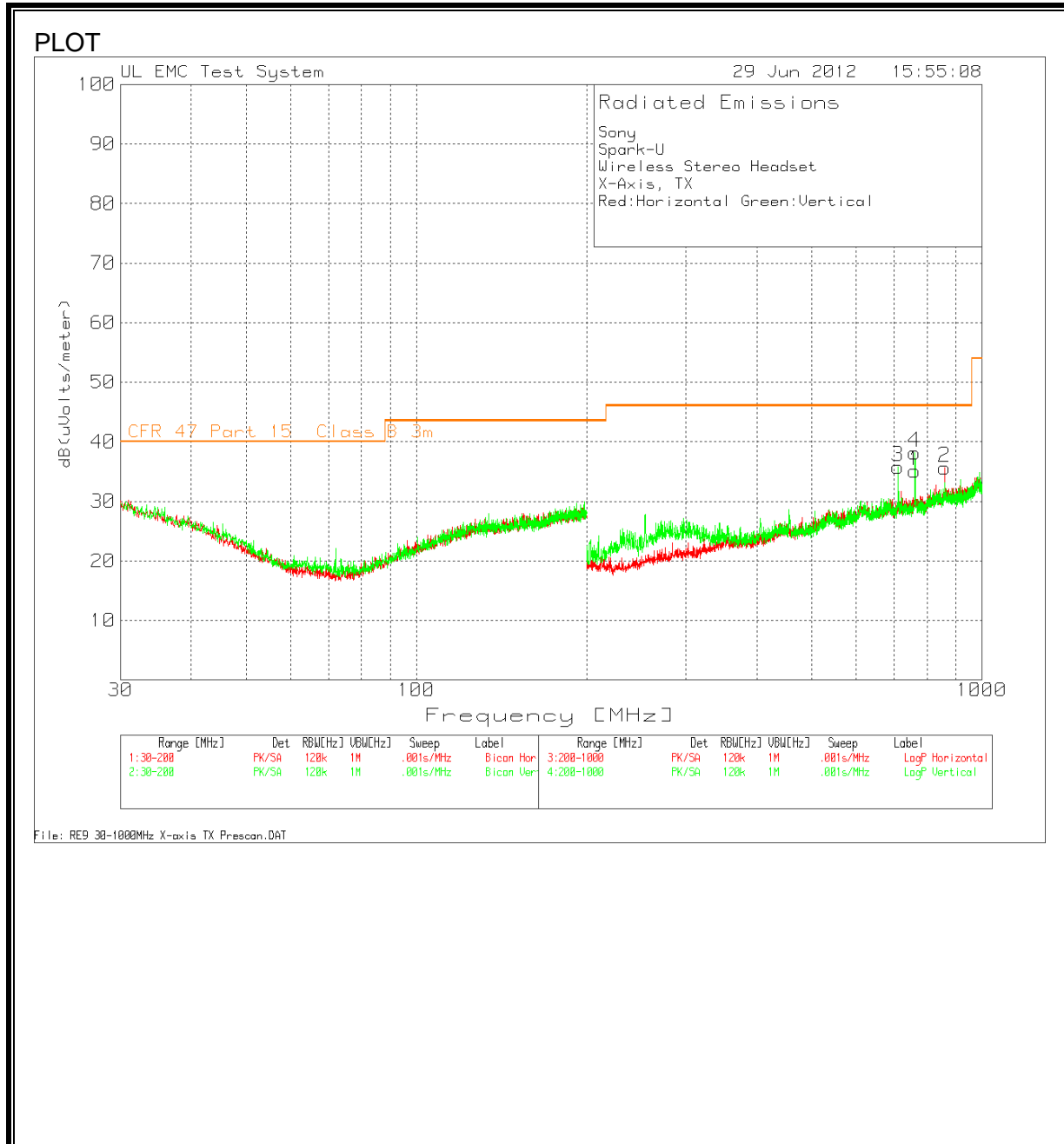
Sony									
Spark-U									
Wireless Stereo Headset									
X-Axis, Hi Ch 38									
Red: Horizontal Green: Vertical									
Test	Meter		Antenna	BOMS		Class B		Height	
Frequency	Reading	Detector	Factor	Factor [dB]	dBuV/m	3m	Margin	[cm]	Polarity
1955.912	19.82	PK	27.4	3.76	50.98	54	-3.02	100	Horz
2476.476	62.65	PK	22	3.78	88.43	-	-	100	Horz
7303.536	58.89	PK	30.5	-45.85	43.54	54	-10.46	150	Horz
10046.698	59.69	PK	36.4	-48.84	47.25	54	-6.75	100	Horz
13572.786	48.68	PK	39.8	-40.62	47.86	54	-6.14	100	Horz
22265.133	58.13	PK	40.5	-52.67	45.96	54	-8.04	100	Horz
2476.476	59.75	PK	22	3.78	85.53	-	-	101	Vert
PK - Peak detector									



## 8.4. WORST-CASE BELOW 1 GHz

### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION,

Peak Detector was used



# Data

Sony											
Spark-U											
Wireless Stereo Headset											
X-Axis, TX											
Red:Horizontal Green:Vertical											
Marker No.	Test Frequency	Meter Reading	Detector	Antenna Factor	Cable factor	10m to 3m (dB)	dB(uV s/meter)	Class B 3m	Margin	Height [cm]	Polarity
1	760.4264	34.37	PK	21.2	-31	10.5	35.07	46	-10.93	399	Horz
2	859.2938	33.94	PK	22.8	-31.6	10.5	35.64	46	-10.36	100	Horz
3	711.6589	35.63	PK	20.7	-31	10.5	35.83	46	-10.17	100	Vert
4	760.1599	37.44	PK	21.2	-31	10.5	38.14	46	-7.86	100	Vert
PK - Peak detector											

## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

### TEST PROCEDURE

ANSI C63.4

### RESULTS

In Plots

Red Limit line is QP limit

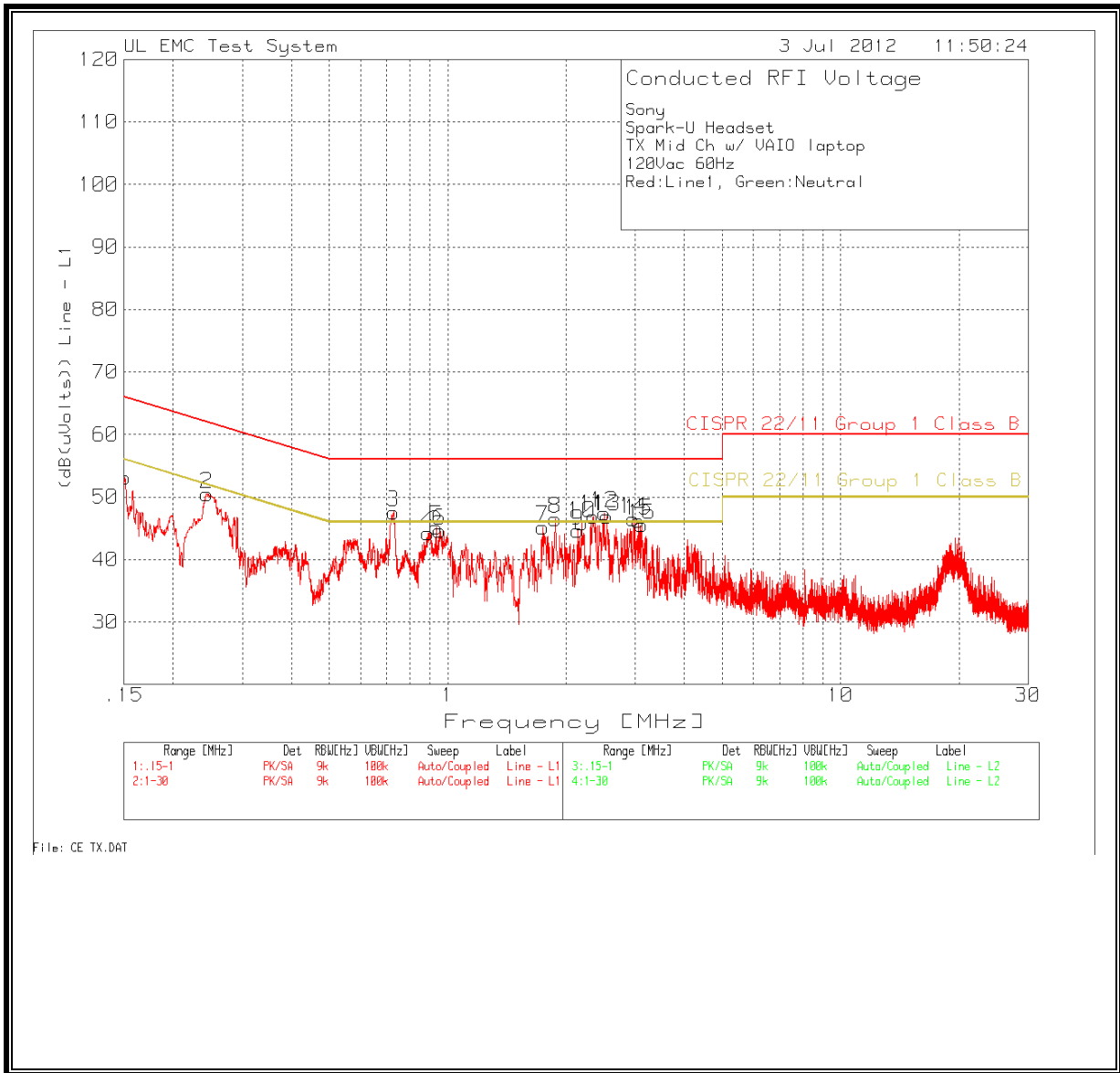
Yellow Limit Line is AV Limit

# 6 WORST EMISSIONS

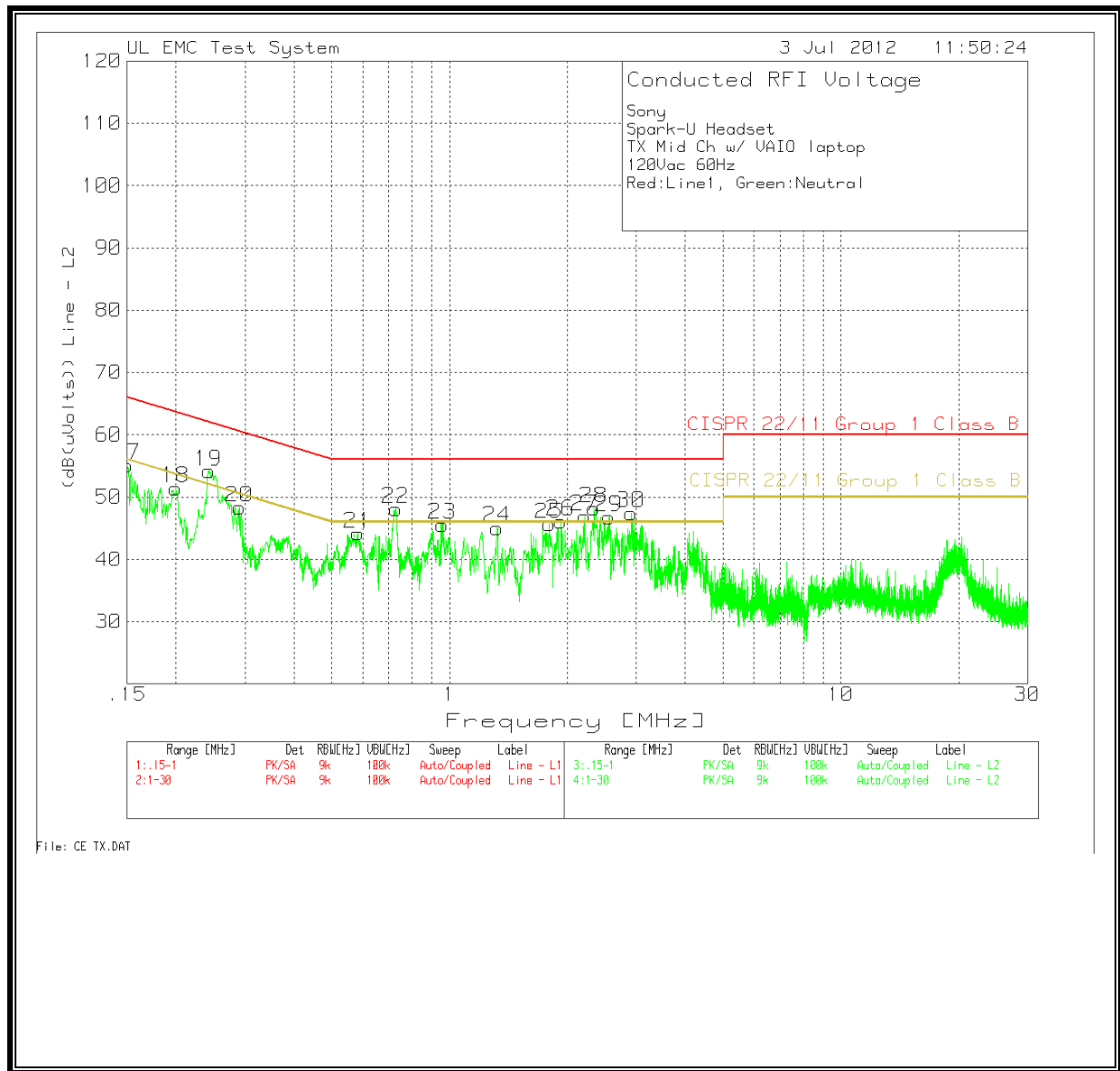
Sony									
Spark-U Headset									
TX Mid Ch w/ VAIO laptop									
120Vac 60Hz									
Red:Line1, Green:Neutral									
Line - L1									
Test Frequency	Meter Reading	Detector	LISN Factor	Cable Factor	(dB(uVolts))	Class B QP	Margin	Class B AV	Margin
0.15064	40.12	PK	0.1	12.9	53.12	66	-12.88	56	-2.88
0.24386	39.23	PK	0	11.3	50.53	62	-11.47	52	-1.47
0.72799	36.98	PK	0	10.6	47.58	56	-8.42	46	1.58
0.89128	33.66	PK	0	10.6	44.26	56	-11.74	46	-1.74
0.93396	34.54	PK	0	10.6	45.14	56	-10.86	46	-0.86
0.95286	34.04	PK	0	10.6	44.64	56	-11.36	46	-1.36
1.7461	34.54	PK	0	10.6	45.14	56	-10.86	46	-0.86
1.88011	35.91	PK	0	10.6	46.51	56	-9.49	46	0.51
2.1445	33.97	PK	0	10.6	44.57	56	-11.43	46	-1.43
2.1952	35.18	PK	0	10.6	45.78	56	-10.22	46	-0.22
2.3437	36.31	PK	0	10.6	46.91	56	-9.09	46	0.91
2.50306	36.82	PK	0	10.6	47.42	56	-8.58	46	1.42
2.53928	36.28	PK	0	10.6	46.88	56	-9.12	46	0.88
2.9739	35.87	PK	0	10.6	46.47	56	-9.53	46	0.47
3.0572	35.58	PK	0	10.6	46.18	56	-9.82	46	0.18
3.11515	34.91	PK	0	10.6	45.51	56	-10.49	46	-0.49
Line - L2									
0.15	42.11	PK	0.1	12.9	55.11	66	-10.89	56	-0.89
0.19969	39.82	PK	0.1	11.5	51.42	63.6	-12.18	53.6	-2.18
0.24216	42.73	PK	0.1	11.3	54.13	62	-7.87	52	2.13
0.29015	37.2	PK	0.1	11	48.3	60.5	-12.2	50.5	-2.2
0.58211	33.46	PK	0.1	10.6	44.16	56	-11.84	46	-1.84
0.7282	37.53	PK	0	10.6	48.13	56	-7.87	46	2.13
0.96029	34.96	PK	0	10.6	45.56	56	-10.44	46	-0.44
1.32234	34.44	PK	0	10.6	45.04	56	-10.96	46	-0.96
1.7968	35.04	PK	0	10.6	45.64	56	-10.36	46	-0.36
1.92357	35.35	PK	0.1	10.6	46.05	56	-9.95	46	0.05
2.21331	36.25	PK	0.1	10.6	46.95	56	-9.05	46	0.95
2.34008	37.57	PK	0	10.6	48.17	56	-7.83	46	2.17
2.55739	36.15	PK	0	10.6	46.75	56	-9.25	46	0.75
2.91595	36.71	PK	0	10.7	47.41	56	-8.59	46	1.41
PK - Peak detector									

Sony										
Spark-U Headset										
TX Mid Ch w/ VAIO laptop										
120Vac 60Hz										
Red:Line1, Green:Neutral										
Line - L1										
Test Frequency	Meter Reading	Detector	LISN Factor	Cable Factor	(dB(uVolts))	Class B QP	Margin	Class B AV	Margin	
0.15123	15.06	Av	0.1	12.9	28.06	65.93	-37.87	55.93	-27.87	
0.24531	17.82	Av	0	11.3	29.12	61.91	-32.79	51.91	-22.79	
0.72753	17.81	Av	0	10.6	28.41	56	-27.59	46	-17.59	
0.89187	10.47	Av	0	10.6	21.07	56	-34.93	46	-24.93	
0.93353	6.77	Av	0	10.6	17.37	56	-38.63	46	-28.63	
0.95349	6.46	Av	0	10.6	17.06	56	-38.94	46	-28.94	
1.75316	14.95	Av	0	10.6	25.55	56	-30.45	46	-20.45	
1.86838	14.75	Av	0	10.6	25.35	56	-30.65	46	-20.65	
2.14696	10.2	Av	0	10.6	20.8	56	-35.2	46	-25.2	
2.20294	15.14	Av	0	10.6	25.74	56	-30.26	46	-20.26	
2.32909	15.92	Av	0	10.6	26.52	56	-29.48	46	-19.48	
2.51559	15.68	Av	0	10.6	26.28	56	-29.72	46	-19.72	
2.54285	12.31	Av	0	10.6	22.91	56	-33.09	46	-23.09	
2.95867	11	Av	0	10.6	21.6	56	-34.4	46	-24.4	
3.06961	15.14	Av	0	10.6	25.74	56	-30.26	46	-20.26	
3.12199	12.76	Av	0	10.6	23.36	56	-32.64	46	-22.64	
Line - L2										
Test Frequency	Meter Reading	Detector	LISN Factor	Cable Factor	(dB(uVolts))	Class B QP	Margin	Class B AV	Margin	
0.15063	18.39	Av	0.1	12.9	31.39	65.97	-34.58	55.97	-24.58	
0.19896	0.25	Av	0.1	11.5	11.85	63.65	-51.8	53.65	-41.8	
0.24338	24.87	Av	0.1	11.3	36.27	61.98	-25.71	51.98	-15.71	
0.28972	8.72	Av	0.1	11	19.82	60.53	-40.71	50.53	-30.71	
0.58177	5.38	Av	0.1	10.6	16.08	56	-39.92	46	-29.92	
0.72797	13.65	Av	0	10.6	24.25	56	-31.75	46	-21.75	
0.95963	4.67	Av	0	10.6	15.27	56	-40.73	46	-30.73	
1.33707	12.86	Av	0	10.6	23.46	56	-32.54	46	-22.54	
1.78578	12.58	Av	0	10.6	23.18	56	-32.82	46	-22.82	
1.91783	14.64	Av	0.1	10.6	25.34	56	-30.66	46	-20.66	
2.21498	15.38	Av	0	10.6	25.98	56	-30.02	46	-20.02	
2.33635	14.96	Av	0	10.6	25.56	56	-30.44	46	-20.44	
2.57393	16.38	Av	0	10.6	26.98	56	-29.02	46	-19.02	
2.92346	11.75	Av	0.1	10.7	22.55	56	-33.45	46	-23.45	
PK - Peak detector										
QP - Quasi-Peak detector										
Av - Average detector										

# **LINE 1 RESULTS**



## LINE 2 RESULTS



## 10. MAXIMUM PERMISSIBLE EXPOSURE

### FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....			f/300	6
1500–100,000 .....			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
30–300 .....	27.5	0.073	0.2	30
300–1500 .....			f/1500	30
1500–100,000 .....			1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.



## IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

**Table 5**  
**Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)**

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m <sup>2</sup> )	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

\* Power density limit is applicable at frequencies greater than 100 MHz.

**Notes:**

1. Frequency,  $f$ , is in MHz.
2. A power density of 10 W/m<sup>2</sup> is equivalent to 1 mW/cm<sup>2</sup>.
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

## **EQUATIONS**

Power density is given by:

$$S = \text{EIRP} / (4 * \pi * D^2)$$

where

S = Power density in W/m<sup>2</sup>

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m<sup>2</sup> is converted to units of mW/cm<sup>2</sup> by dividing by 10.

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \pi * S))$$

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m<sup>2</sup>

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

## **LIMITS**

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm<sup>2</sup>

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m<sup>2</sup>

RSS-102 Clause 2.5.2 RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 2.5 W;
- at or above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W.

## **RESULTS**

(No simultaneous co-located transmitters, MPE distance equals 20 cm)

Band	Mode	Separation Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	Source Based EIRP (mW)	FCC Power Density (mW/cm <sup>2</sup> )	IC Power Density (W/m <sup>2</sup> )
2.4 GHz	DTS	20	3.34	0.80	100	2.594	0.0005	0.0052

The device operates above 1.5 GHz with a maximum EIRP less than or equal to 5 Watts as a mobile device with a minimum separation distance of 20 cm, therefore it is exempt from routine RF Exposure Evaluation under RSS-102.