

FCC PART 15.249

MEASUREMENT AND TEST REPORT

For

Wireless eSystems, Inc.

8100 Armstrong Road
Milton, FL 32583, USA

FCC ID: OYICC2500DIPOLE

Report Type: ☒ Original Report		Product Type: Student Assessment Remote
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Report Number:	R0805135	
Report Date:	2008-06-26	
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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk “*” (Rev.2)

DOCUMENT REVISION HISTORY

Revision #	Report Number	Description of Revision	Date of Revision
0	R0805135	Original Report	2008-06-26

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1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The *Wireless eSystems, Inc.* product, FCC ID: *OYICC2500DIPOLE* or the "EUT" as referred to in this report is one ID for three models, Touch Remote (TR102), Lite Remote (LR102) and Ultra-Lite Remote (Ultra-101) operating from frequencies 2433.175-2436.1 MHz.

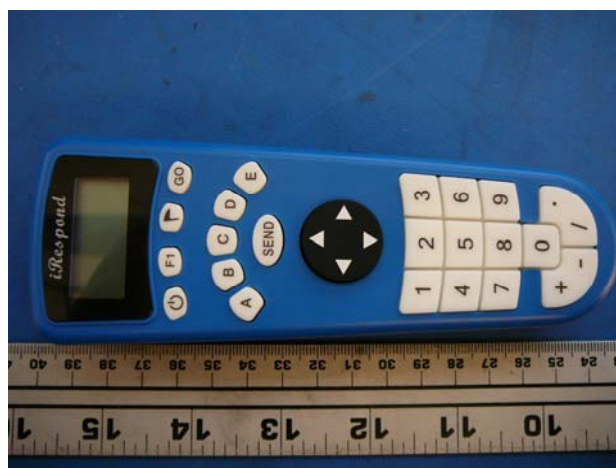
1.2 Mechanical Description of EUT

The *Wireless e Systems, Inc.* product, FCC ID: *OTICC2500DIPOLE*. Model name TR102 measures approximately 15 cm (L) x 10.5 cm (W) x 3.5 cm (H). Model name LR102 measures approximately 14.5 cm (L) x 5 cm (W) x 2.5 cm (H). Model name Ultra-101 measures approximately 8 cm (L) x 5 cm (W) x 2 cm (H).

1.3 EUT Photo



Model Name: TR102



Model Name: LR102



Model Name: Ultra-101

Please refer to Exhibit C for addition EUT photographs.

1.4 Objective

This measurement and test report has been prepared on behalf of *Wireless eSystems Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC and IC standards, rules and limits for this device including:

- Antenna Requirement
- Conducted Emissions
- Receiver Spurious Emissions
- Field Strength of Spurious Emissions
- Out of Band Emissions

1.5 Related Submittal(s)/Grant(s)

N/A

1.6 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.7 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from ± 2.0 for Conducted Emissions tests and ± 4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.8 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and

December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2001670.htm>.

2 SYSTEM TEST CONFIGURATION

2.1 Justification

The host system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the normal operation mode to represent *worst-case* results during the final qualification test.

2.2 EUT Exercise Software

The EUT is programmed with the following data settings that were used during testing:

Channel	Low (CH0)	Middle (CH7)	High (CH15)
Frequency (MHz)	2433.175	2434.508	2436.1
Power setting (dBm)	0	0	0

2.3 Special Accessories

There were no special accessories were required, included, or intended for use with EUT during these tests.

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment List and Details

N/A

2.6 Interface Ports and Cabling

N/A

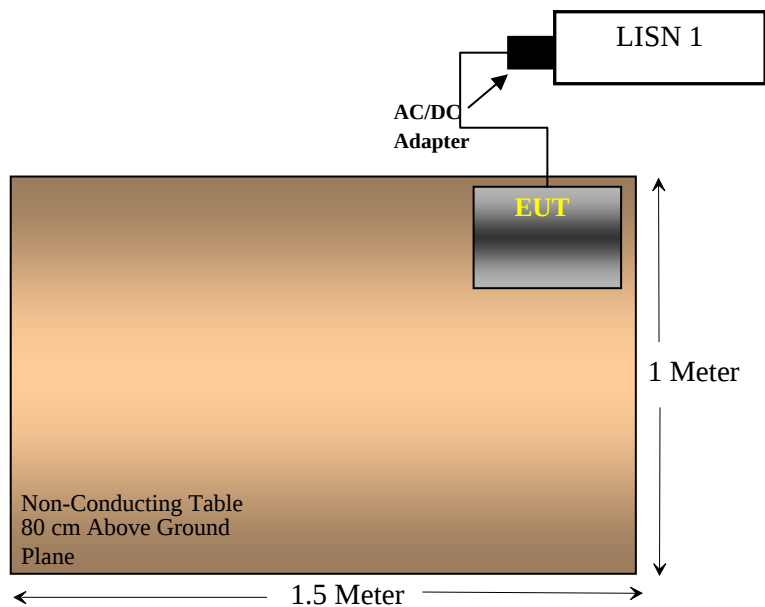
2.7 Power Supply

Manufacturer	Description	Model	Serial Number
-	AC/DC Adapter Class 2 Transformer	MW41-0800700	0512

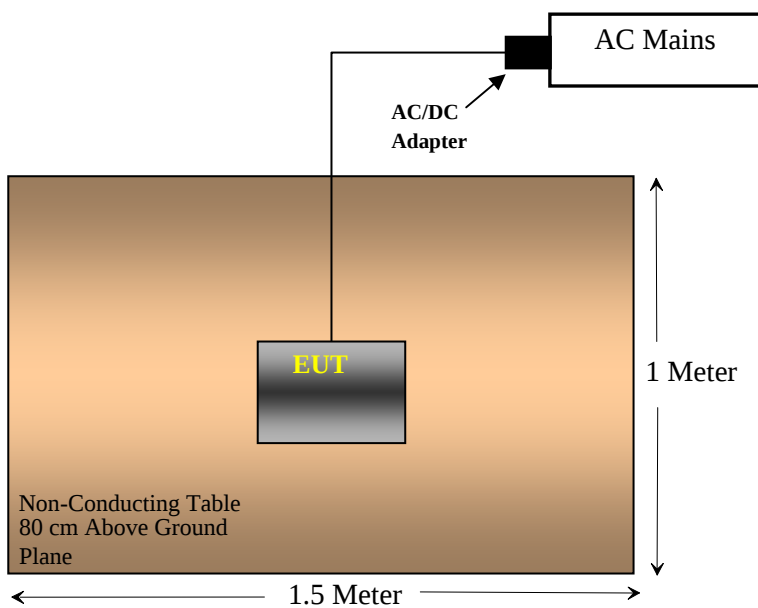
2.8 Test Setup Block Diagrams

For TR102

Conducted Emissions

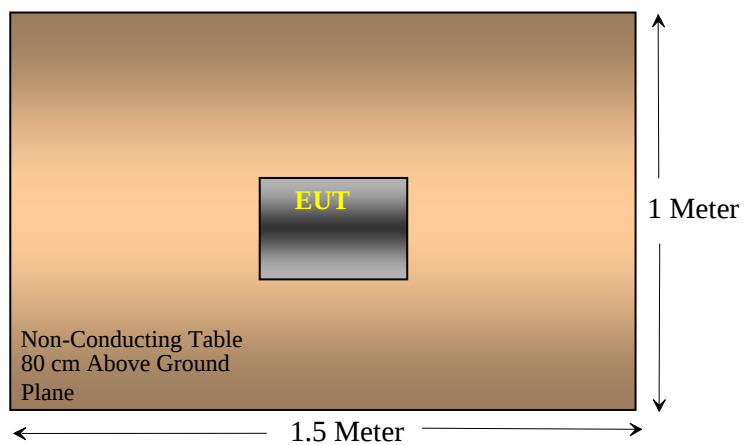


Radiated Emissions



For LR102 and Ultra-101

Radiated Emissions



3 SUMMARY OF TEST RESULTS

Results reported relate only to the product tested.

FCC Rules	Description of Test	Result	Note
FCC §15.203,	Antenna Requirement	Compliant	-
FCC §15.207,	Conducted Emissions	Compliant	-
§15.205, §15.209 & §15.249(a)	Field Strength of Spurious Emissions	Compliant	-
§15.249 (d)	Out of Band Emissions	Compliant	-

4 FCC §15.203 – ANTENNA REQUIREMENT

4.1 Applicable Standard

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2 Result

The antenna is a dipole PCB antenna which, in accordance to the above section, is considered sufficient to comply with the provision of this section.

☒ **Compliant**

☐ **N/A**

5 FCC §15.207 - CONDUCTED EMISSIONS

5.1 Applicable Standard

As per FCC Part15.207 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

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.

5.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4 – 2003 measurement procedure. The specification used was FCC consumer device limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The EUT was powered by 8 VDC provided by an AC/DC adapter connected to 120 V/60 Hz power provided by LISN-1.

5.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Solar Electronics	LISN	9252-R-24-BNC	511205	2007-07-07
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	20-174821	2008-03-24

* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

5.4 Test Procedure

During the conducted emissions test, the power cord of the system was connected to the main outlet of the LISN-1.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a “QP”. Average readings are distinguished with an “Ave”.

5.5 Environmental Conditions

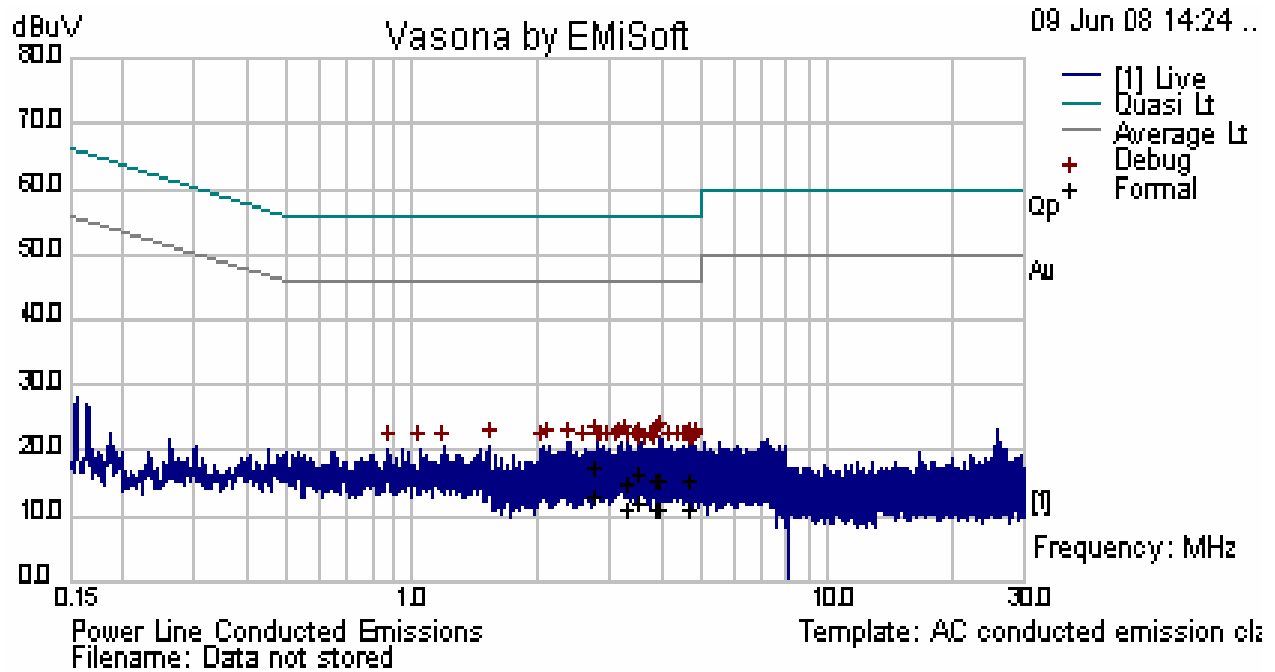
Temperature:	20 °C
Relative Humidity:	40 %
ATM Pressure:	102.0 kPa

**The testing was performed by Xiao Ming Hu on 2008-06-09.*

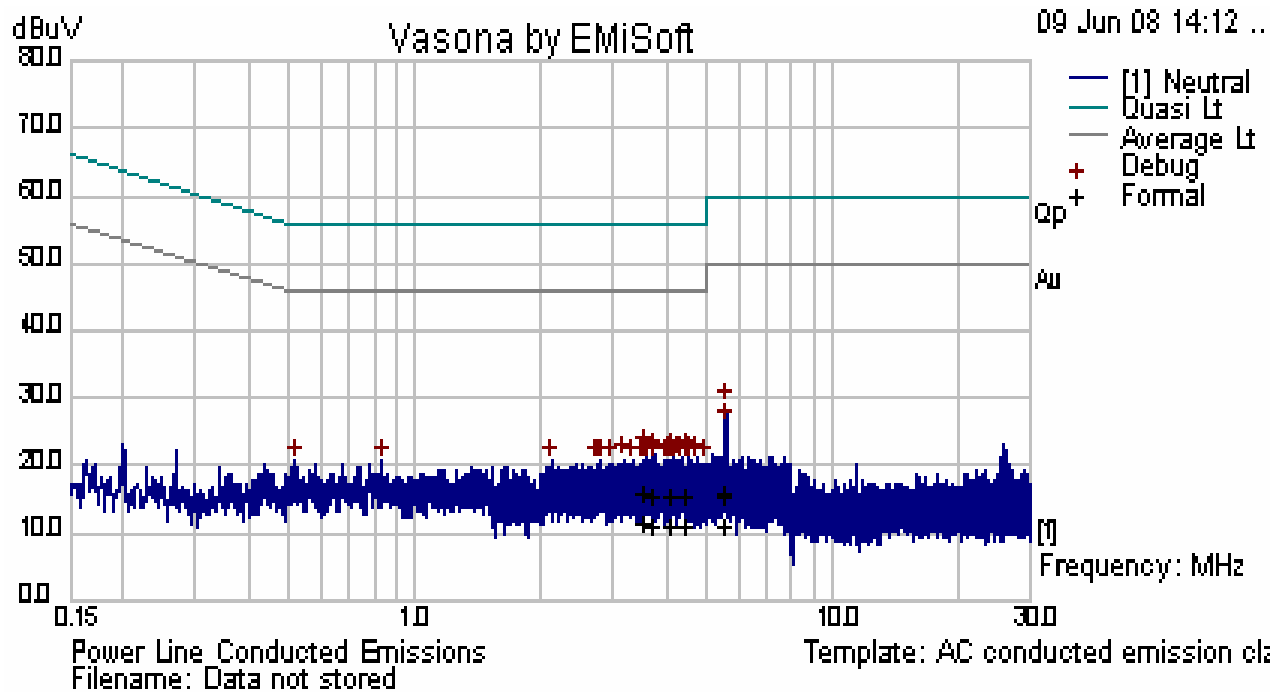
5.6 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC standard's conducted emissions limits for consumer devices, with the *worst* margin reading of:

Connection: 5 VDC from AC/DC adapter connected to LISN-1			
Margin (dB)	Frequency (MHz)	Conductor (Live/Neutral)	Range (MHz)
-35.23	2.777	Live	0.150 MHz to 30 MHz

For TR102 only:**120V/60 Hz Live (Transmitting mode):****Quasi-Peak and Average Measurements:**

Frequency (MHz)	Corrected Reading (dBuV)	Measurement Type (QP/AV)	Line (Live/Neutral)	Limit (dBuV)	Margin (dB)
2.777	10.77	AV	Live	46	-35.23
3.576	9.5	AV	Live	46	-36.5
4.006	8.67	AV	Live	46	-37.33
4.749	8.62	AV	Live	46	-37.38
3.941	8.6	AV	Live	46	-37.4
3.314	8.54	AV	Live	46	-37.46
2.777	15.31	QP	Live	56	-40.69
3.576	14.07	QP	Live	56	-41.93
3.941	13.2	QP	Live	56	-42.8
4.749	13.05	QP	Live	56	-42.95
4.006	13.03	QP	Live	56	-42.97
3.314	12.77	QP	Live	56	-43.23

120V/60 Hz Neutral (Transmitting mode):**Quasi-Peak and Average Measurements:**

Frequency (MHz)	Corrected Reading (dBuV)	Measurement Type (QP/AV)	Line (Live/Neutral)	Limit (dBuV)	Margin (dB)
3.594	9.09	AV	Neutral	46	-36.91
4.52	8.71	AV	Neutral	46	-37.29
4.148	8.63	AV	Neutral	46	-37.37
3.732	8.56	AV	Neutral	46	-37.44
5.564	8.81	AV	Neutral	50	-41.19
5.562	8.74	AV	Neutral	50	-41.26
3.594	13.64	QP	Neutral	56	-42.36
4.52	13.03	QP	Neutral	56	-42.97
4.148	12.92	QP	Neutral	56	-43.08
3.732	12.92	QP	Neutral	56	-43.08
5.564	13.42	QP	Neutral	60	-46.58
5.562	13.33	QP	Neutral	60	-46.67

6 FCC §15.109, §15.205, §15.209 & §15.249(a) - SPURIOUS RADIATED EMISSIONS

6.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5.35 – 5.46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 – 167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3.3458 – 3.358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per 15.249(a) except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

6.2 Test Setup

The radiated emissions tests were performed in the 3-meter open area test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

6.3 EUT Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

6.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
HP	Pre amplifier	8447D	2944A07030	2007-11-12
Agilent	Pre amplifier	8449B	3008A01978	2007-11-02
Antenna Research Associates, Inc.	Horn Antenna	DRG-118/A	1132	2007-06-18
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	1000337	2008-04-21
Sunol Science	System Controller	SC99V	122303-1	NR
Agilent	Spectrum analyzer	E4440A	MY44303352	2008-04-28

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

6.5 Test Procedure

For the radiated emissions test, the EUT, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meters away from the testing antenna, which is varied from 1-4 meters, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000MHz:

$$\text{RBW} = 100 \text{ kHz} / \text{VBW} = 300 \text{ kHz} / \text{Sweep} = \text{Auto}$$

Above 1000MHz:

- (1) Peak: $\text{RBW} = 1\text{MHz} / \text{VBW} = 1\text{MHz} / \text{Sweep} = \text{Auto}$
- (2) Average: Corrected Peak Amplitude – Duty Cycle Factor
- (3) Correction Factor = Cable loss + Antenna Correction Factor – Pre Amp Gain
- (4) Corrected Reading = Raw Data + Correction Factor

6.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

6.7 Environmental Conditions

Temperature:	20 °C
Relative Humidity:	40 %
ATM Pressure:	102.0 kPa

**The testing was performed by Xiao Ming Hu on 2008-06-11~2008-06-27.*

6.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC and IC requirements, and had the worst margin readings of:

For TR102

Radiated Emissions (30-1000 MHz):

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
-12.78	129.03	Horizontal	Low, 30 MHz to 1GHz
-10.36	45.664	Vertical	Mid, 30 MHz to 1GHz
-11.07	267.011	Horizontal	High, 30 MHz to 1GHz

Out of Band Emissions:

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
-15.76	4866.35	Horizontal	Low, 1GHz – 10GHz
-13.28	4869.016	Horizontal	Mid, 1GHz – 10GHz
-13.13	4872.2	Horizontal	High, 1GHz – 10GHz

For LR102**Radiated Emissions (30-1000 MHz):**

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
-14.19	689.05	Horizontal	Low, 30 MHz to 1GHz
-20.92	689.104	Horizontal	Mid, 30 MHz to 1GHz
-15.87	688.999	Horizontal	High, 30 MHz to 1GHz

Out of Band Emissions:

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
-18.65	4866.35	Horizontal	Low, 1GHz – 10GHz
-9.72	4869.016	Horizontal	Mid, 1GHz – 10GHz
-14.9	4872.2	Horizontal	High, 1GHz – 10GHz

For Ultra-101**Radiated Emissions (30-1000 MHz):**

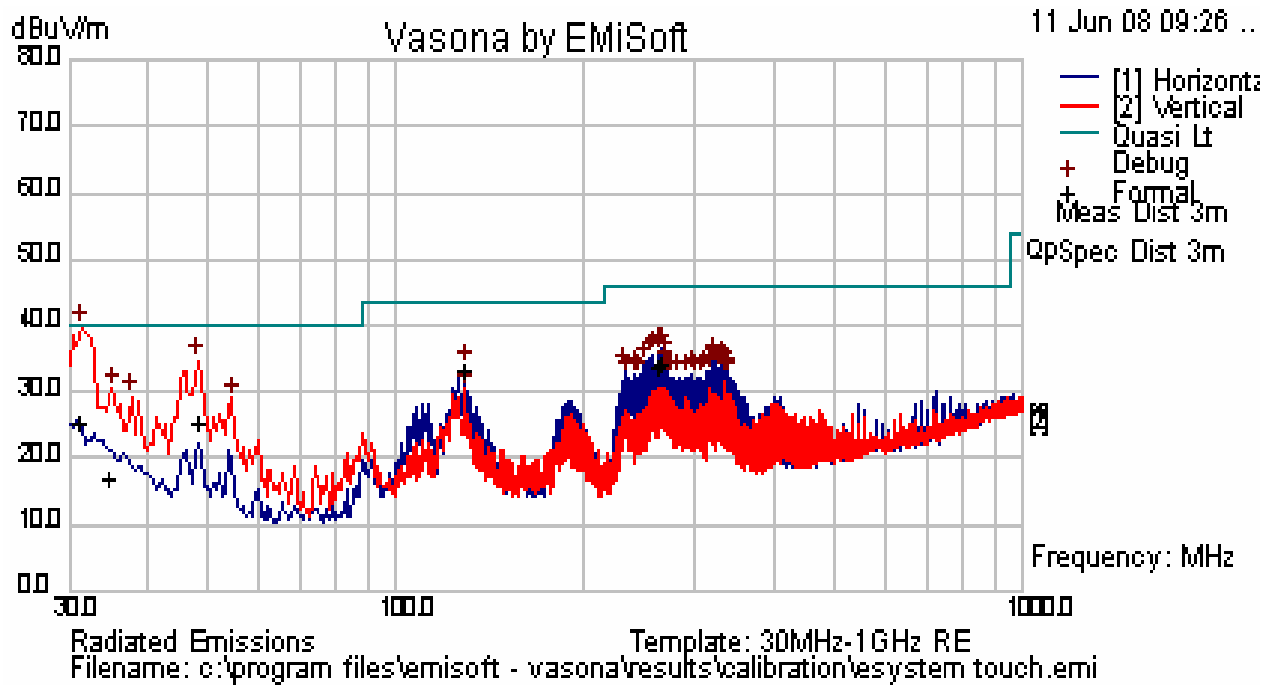
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
-21.94	30.696	Horizontal	Low, 30 MHz to 1GHz
-23.91	33.302	Horizontal	Mid, 30 MHz to 1GHz
-21.67	30.285	Horizontal	High, 30 MHz to 1GHz

Out of Band Emissions:

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
-14.91	4866.35	Horizontal	Low, 1GHz – 10GHz
-12.72	4869.016	Horizontal	Mid, 1GHz – 10GHz
-12.62	4872.2	Vertical	High, 1GHz – 10GHz

6.9 Radiated Emissions Test plot & data (TR102):

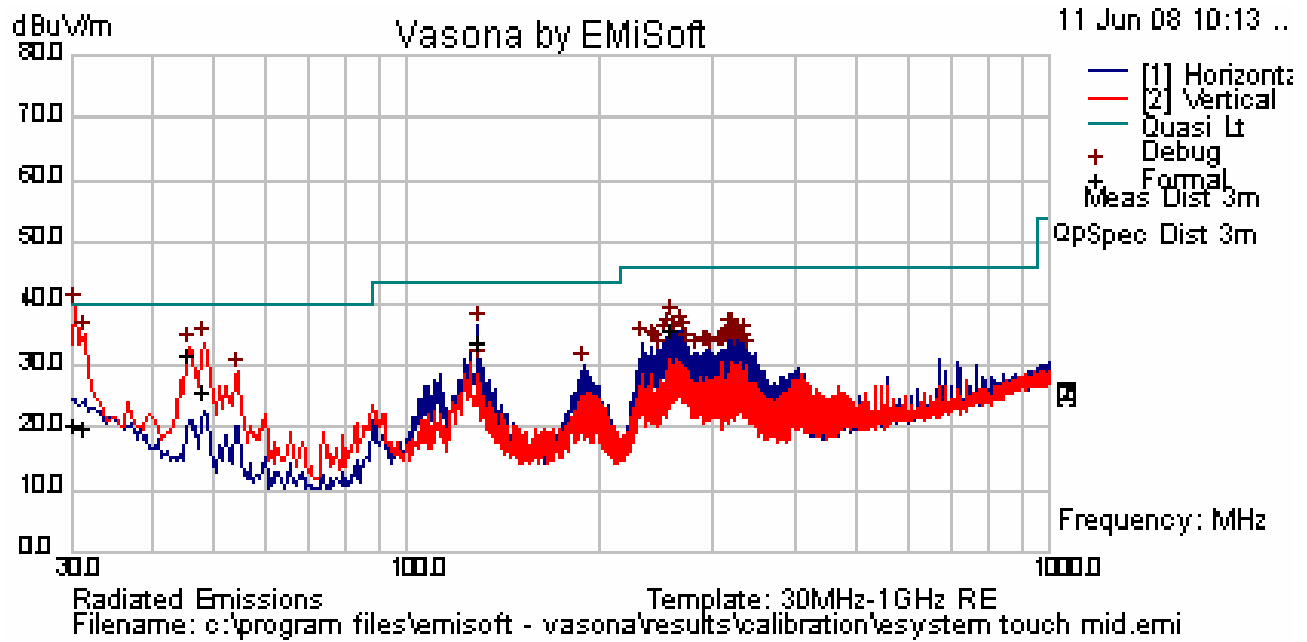
Low Channel, 30MHz -1GHz



Quasi-Peak Measurements:

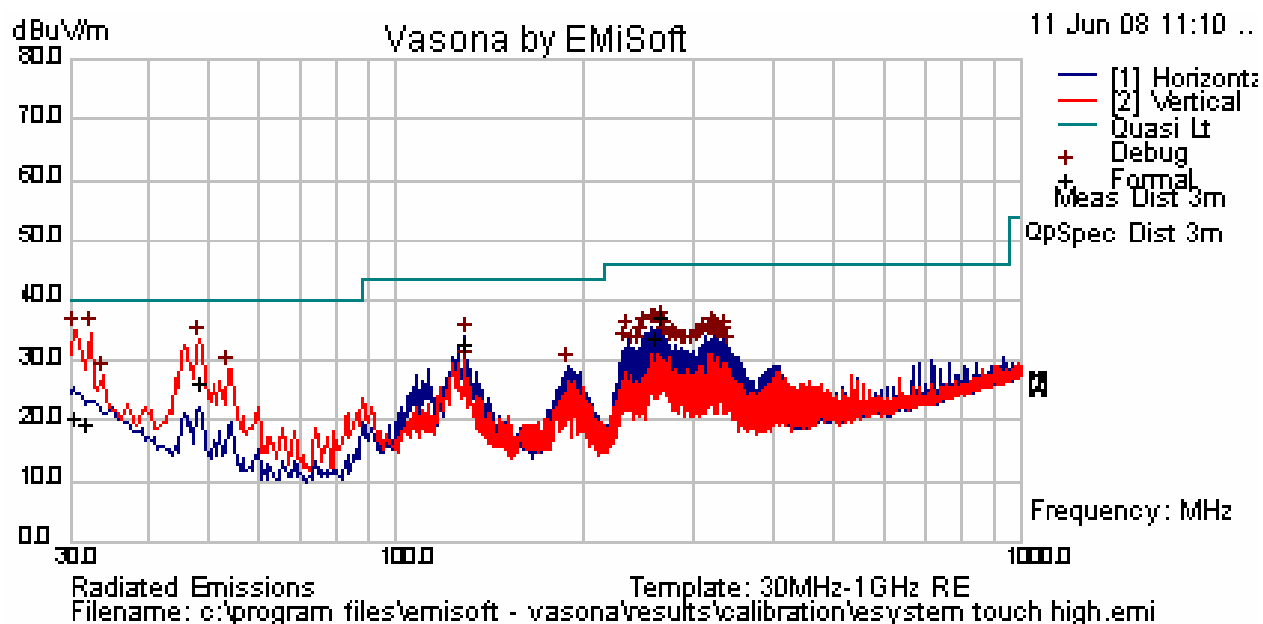
Frequency (MHz)	Raw data (dBuV/m)	Cable Loss (dB)	AF & PA (dB)	Measurement Type (QP/AV)	Ant. Polar (V/H)	Ant. Height (cm)	Azt (Deg)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
129.03	35.54	10.62	-15.44	QP	H	284	77	30.72	43.5	-12.78
267.012	36.47	10.94	-15.61	QP	H	175	146	31.8	46	-14.2
264.977	36.03	10.94	-15.69	QP	H	95	132	31.28	46	-14.72
48.667	33.47	10.47	-20.88	QP	V	122	158	23.06	40	-16.94
31.376	21.58	10.42	-8.98	QP	V	144	24	23.02	40	-16.98
35.116	16.21	10.44	-11.86	QP	V	175	128	14.79	40	-25.21

Middle Channel, 30MHz -1GHz



Quasi-Peak Measurements:

Frequency (MHz)	Raw data (dBuV/m)	Cable Loss (dB)	AF & PA (dB)	Measurement Type (QP/AV)	Ant. Polar (V/H)	Ant. Height (cm)	Azt (Deg)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
45.664	38.52	10.46	-19.35	QP	V	99	303	29.64	40	-10.36
129.057	36.49	10.62	-15.44	QP	H	230	243	31.67	43.5	-11.83
259.056	39.11	10.93	-16.44	QP	H	137	131	33.6	46	-12.4
48.396	33.65	10.47	-20.74	QP	V	107	80	23.37	40	-16.63
30.481	16.12	10.42	-8.27	QP	V	366	285	18.27	40	-21.73
31.51	16.24	10.43	-9.09	QP	V	269	28	17.58	40	-22.42

High Channel, 30MHz -1GHz**Quasi-Peak Measurements:**

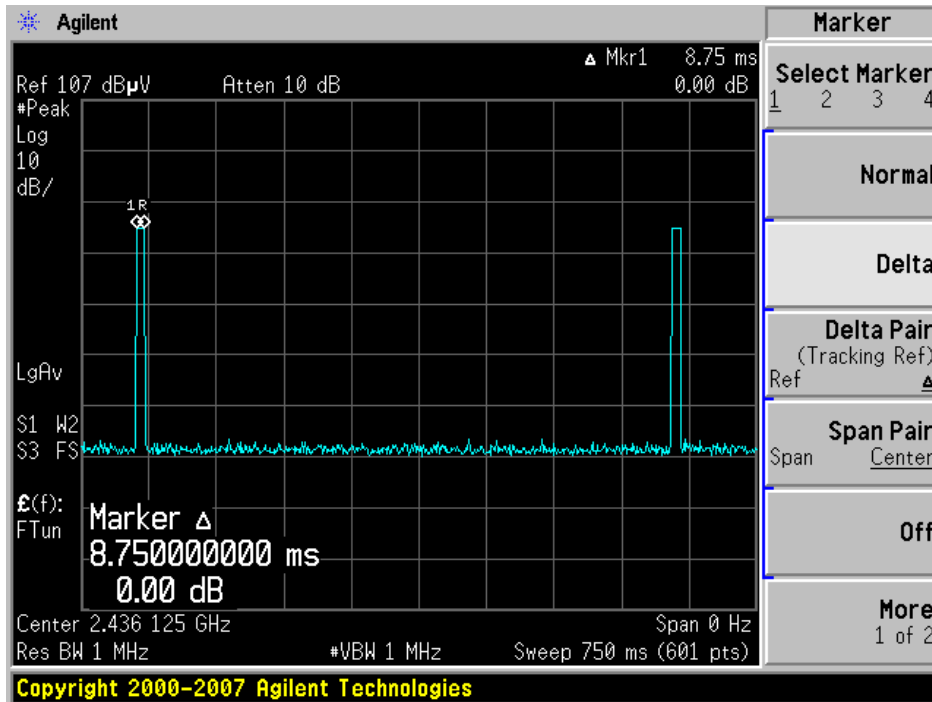
Frequency (MHz)	Raw data (dBuV/m)	Cable Loss (dB)	AF & PA (dB)	Measurement Type (QP/AV)	Ant. Polar (V/H)	Ant. Height (cm)	Azt (Deg)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
267.011	39.6	10.94	-15.61	QP	H	100	123	34.93	46	-11.07
129.058	35.37	10.62	-15.44	QP	H	326	87	30.55	43.5	-12.95
261.036	36.67	10.93	-16.22	QP	H	99	270	31.38	46	-14.62
48.659	34.67	10.47	-20.87	QP	V	108	43	24.26	40	-15.74
30.609	16.28	10.42	-8.37	QP	V	246	77	18.34	40	-21.66
32.262	16.19	10.43	-9.69	QP	V	237	250	16.93	40	-23.07

Above 1GHz scan at 3m distance

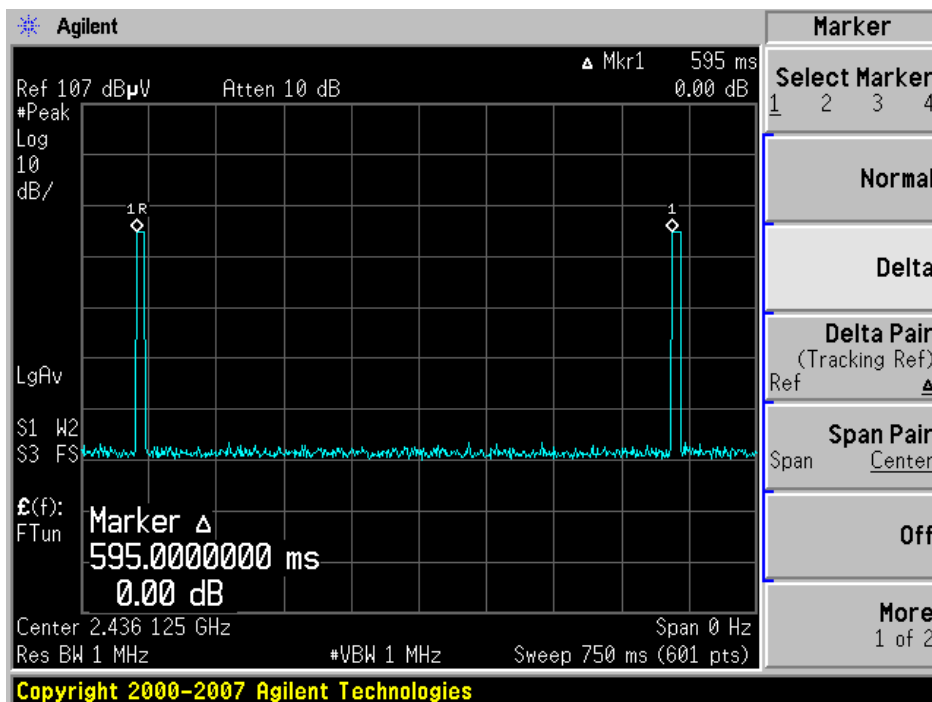
Duty Cycle Factor = $20 \times \text{Log}(\text{on time}/\text{total time}) = 20 \times \text{Log}(8.75/100) = -21.16\text{dB}$

*If Total time is greater than 100ms, use 100ms.

On time = 8.75ms



Total time = 595ms > 100ms



Low Channel, 2433.175 MHz

Frequency (MHz)	Raw Data (dBμV/m)	Cord. Factor (dB)	Ant. Azt. (Deg)	Ant. Hgt. (m)	Ant. Pol. (V/H)	DC Factor (dB)	Corrected Reading (dBμV/m)	FCC15.249 Limit (dBμV/m)	Margin (dB)	Measurements Type
2433.175	86.31	-0.67	203	1.00	H	-	85.64	114	-28.36	Fund. Peak
2433.175	88.99	-0.67	202	1.03	V	-	88.32	114	-25.68	Fund. Peak
2433.175	86.31	-0.67	203	1.00	H	-21.16	64.48	94	-29.52	Fund. AV
2433.175	88.99	-0.67	202	1.03	V	-21.16	67.16	94	-26.84	Fund. AV
4866.35	51.98	6.86	314	1.59	H	-	58.84	74	-15.16	Peak
4866.35	51.98	6.86	314	1.59	H	-21.16	37.68	54	-16.32	AV
4866.35	50.59	6.86	88	1.63	V	-	57.45	74	-16.55	Peak
4866.35	50.59	6.86	88	1.63	V	-21.16	36.29	54	-17.71	AV

Middle Channel, 2434.508 MHz

Frequency (MHz)	Raw Data (dBμV/m)	Cord. Factor (dB)	Ant. Azt. (Deg)	Ant. Hgt. (m)	Ant. Pol. (V/H)	DC Factor (dB)	Corrected Reading (dBμV/m)	FCC15.249 Limit (dBμV/m)	Margin (dB)	Measurements Type
2434.508	81.94	-0.67	206	1.00	H	-	81.27	114	-32.73	Fund. Peak
2434.508	90.00	-0.67	200	1.00	V	-	89.33	114	-24.67	Fund. Peak
2434.508	81.94	-0.67	206	1.00	H	-21.16	60.11	94	-33.89	Fund. AV
2434.508	90.00	-0.67	200	1.00	V	-21.16	68.17	94	-25.83	Fund. AV
4869.016	53.86	6.86	63	1.40	H	-	60.72	74	-13.28	Peak
4869.016	53.86	6.86	63	1.40	H	-21.16	39.56	54	-14.44	AV
4869.016	48.82	6.86	203	1.57	V	-	55.68	74	-18.32	Peak
4869.016	48.82	6.86	203	1.57	V	-21.16	34.52	54	-19.48	AV

High Channel, 2436.1 MHz

Frequency (MHz)	Raw Data (dBμV/m)	Cord. Factor (dB)	Ant. Azt. (Deg)	Ant. Hgt. (m)	Ant. Pol. (V/H)	DC Factor (dB)	Corrected Reading (dBμV/m)	FCC15.249 Limit (dBμV/m)	Margin (dB)	Measurements Type
2436.1	86.86	-0.67	206	1.79	H	-	86.19	114	-27.81	Fund. Peak
2436.1	89.80	-0.67	209	1.00	V	-	89.13	114	-24.87	Fund. Peak
2436.1	86.86	-0.67	206	1.79	H	-21.16	65.03	94	-28.97	Fund. AV
2436.1	89.80	-0.67	209	1.00	V	-21.16	67.97	94	-26.03	Fund. AV
4872.2	54.01	6.86	62	1.41	H	-	60.87	74	-13.13	Peak
4872.2	54.01	6.86	62	1.41	H	-21.16	39.71	54	-14.29	AV
4872.2	49.95	6.86	80	1.69	V	-	56.81	74	-17.19	Peak
4872.2	49.95	6.86	80	1.69	V	-21.16	35.65	54	-18.35	AV

NOTE: Average Level is calculated based on the Peak measured levels and the duty cycle correction factor of -21.16 dB.

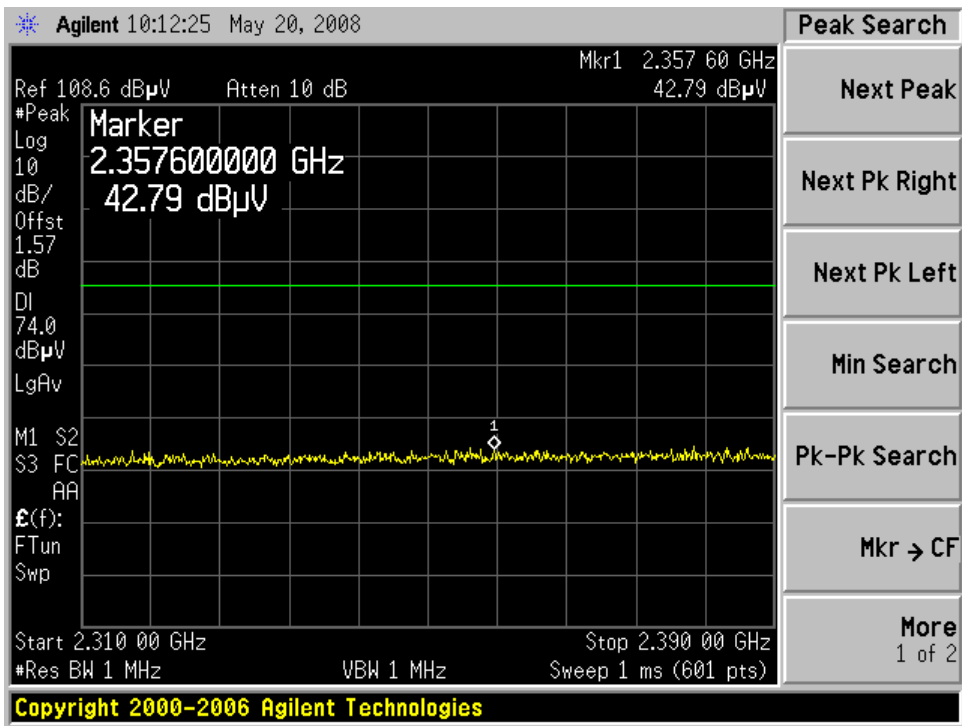
Band Edge:

Frequency (MHz)	Reading (dBuV/m)	Correction Factor (dB)	Corrected Amplitude (dBuV/m) @3m	15.209 Limit (dBuV)	Margin (dB)
Low channel					
2400	32.96	-0.67	32.29	54.0	-21.71
High channel					
2483.5	33.53	-0.67	32.86	54.0	-21.14

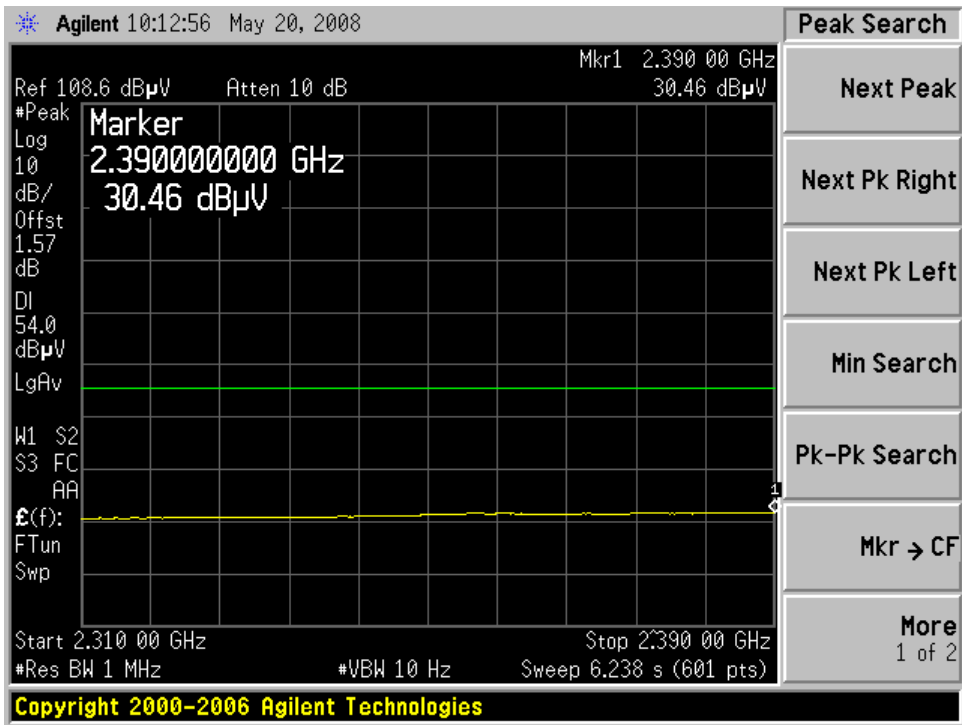
Restricted Band:

Please refer to the following plots.

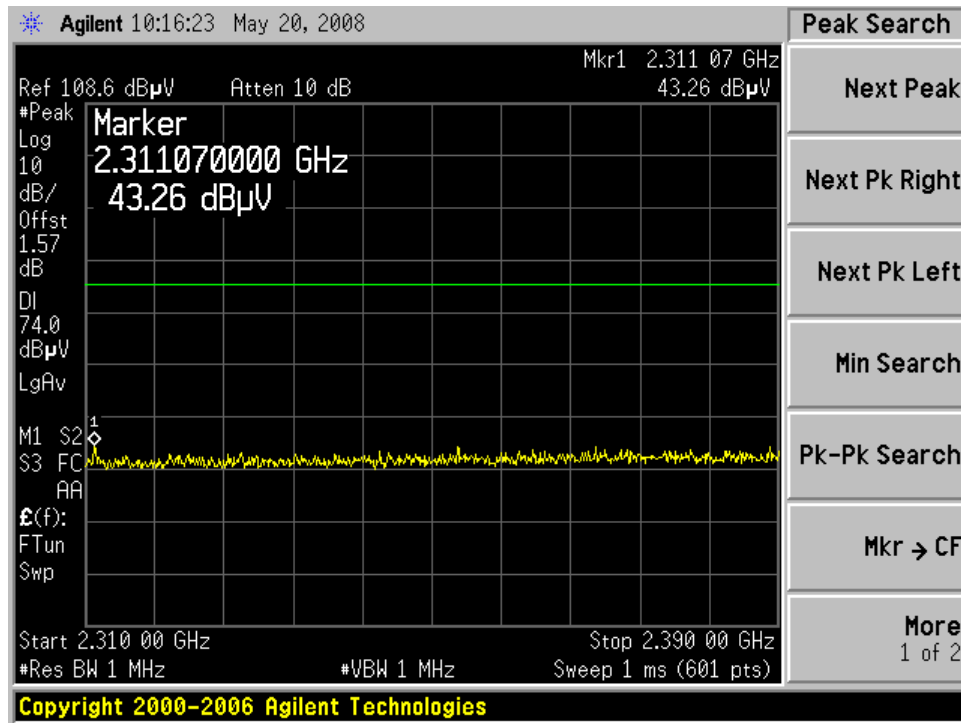
Low Channel – Peak, Horizontal



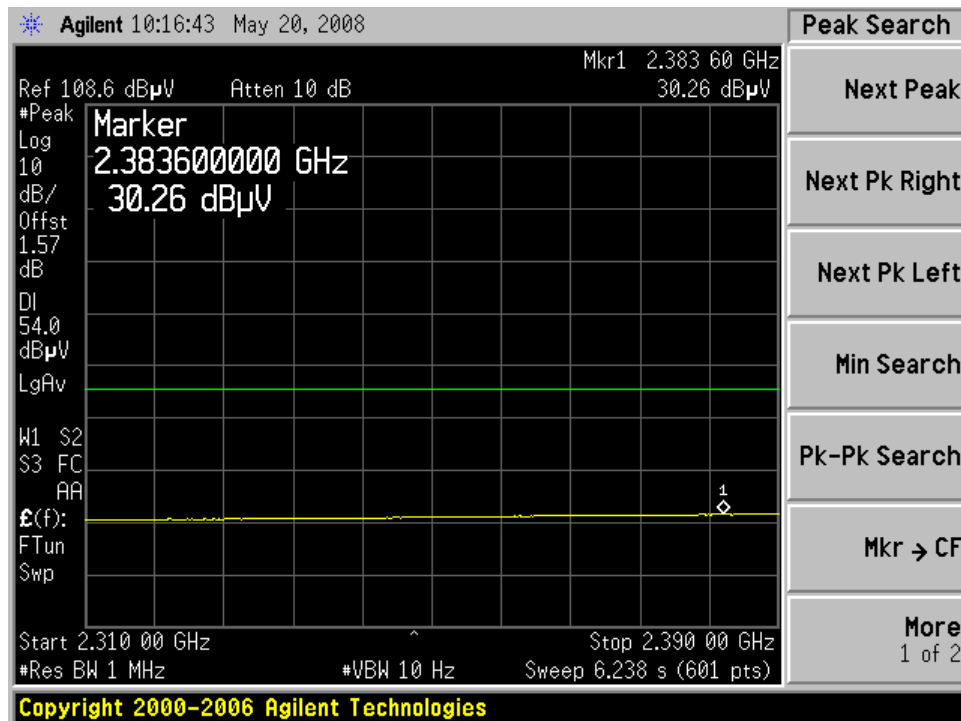
Low Channel – Average, Horizontal



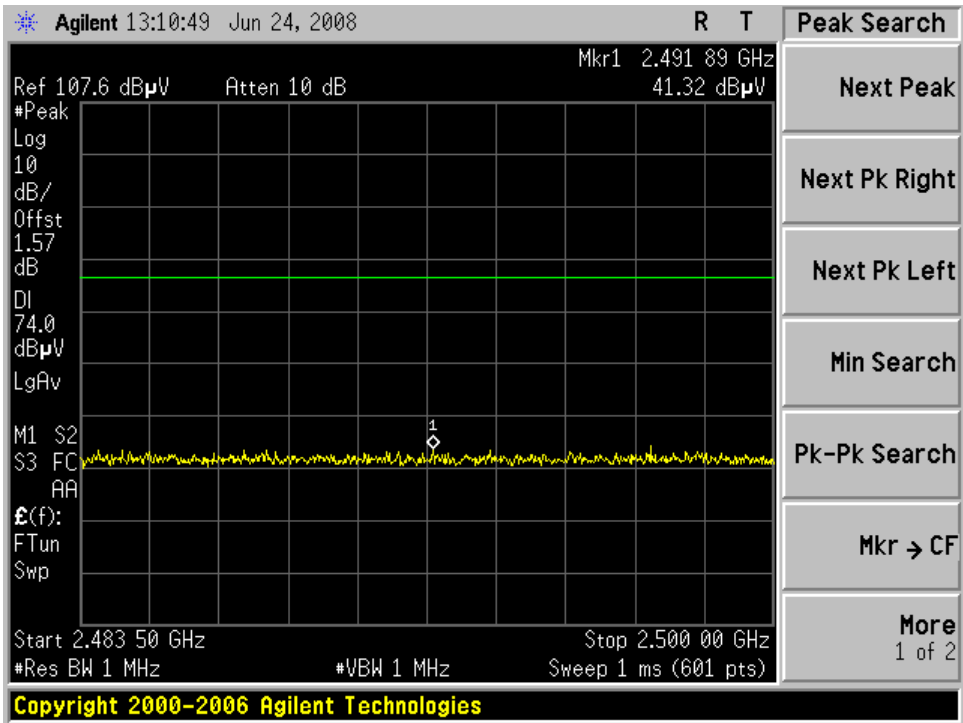
Low Channel – Peak, Vertical



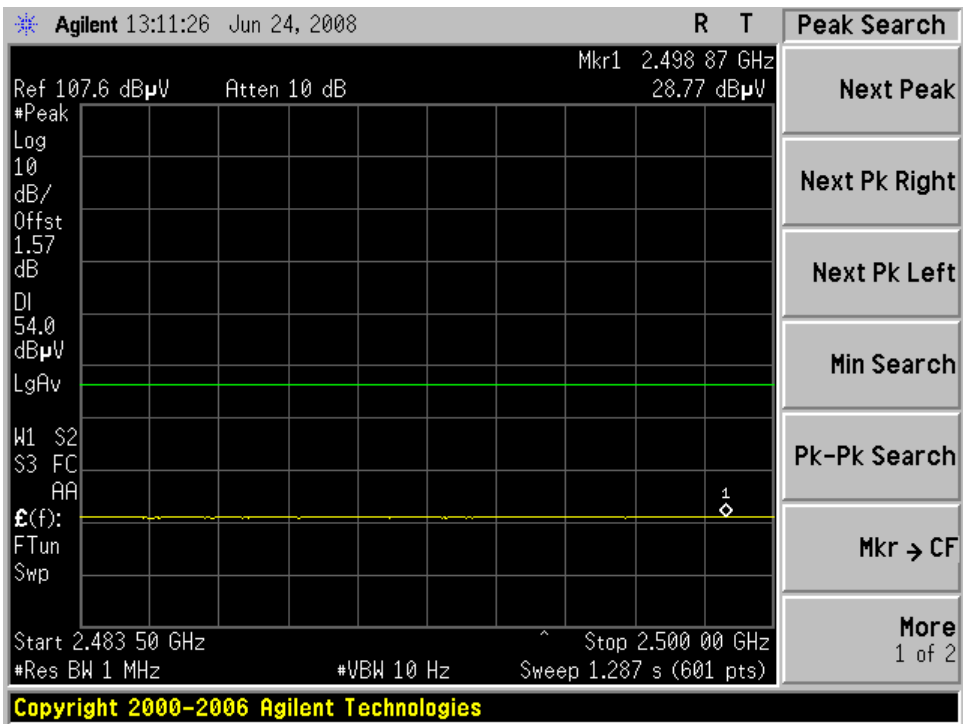
Low Channel – Average, Vertical



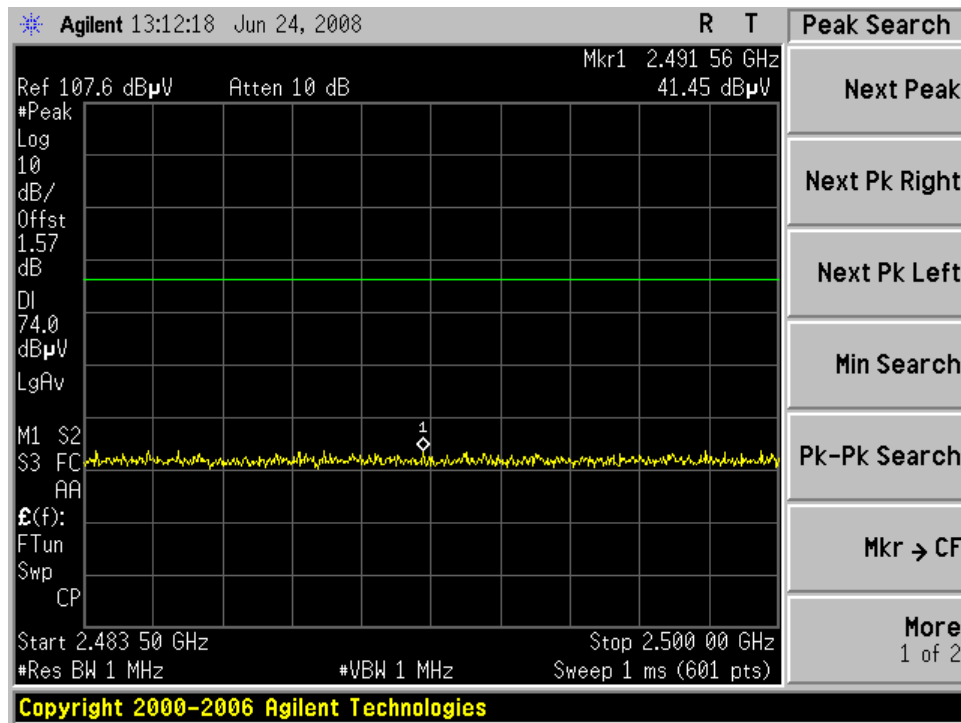
High Channel – Peak, Horizontal



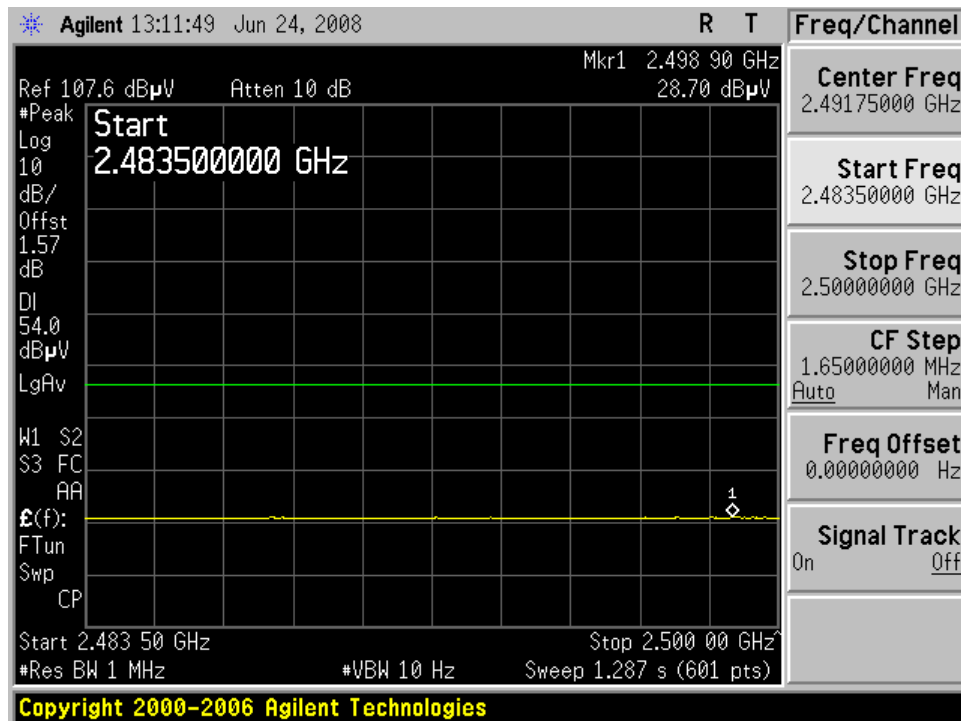
High Channel – Average, Horizontal



High Channel – Peak, Vertical

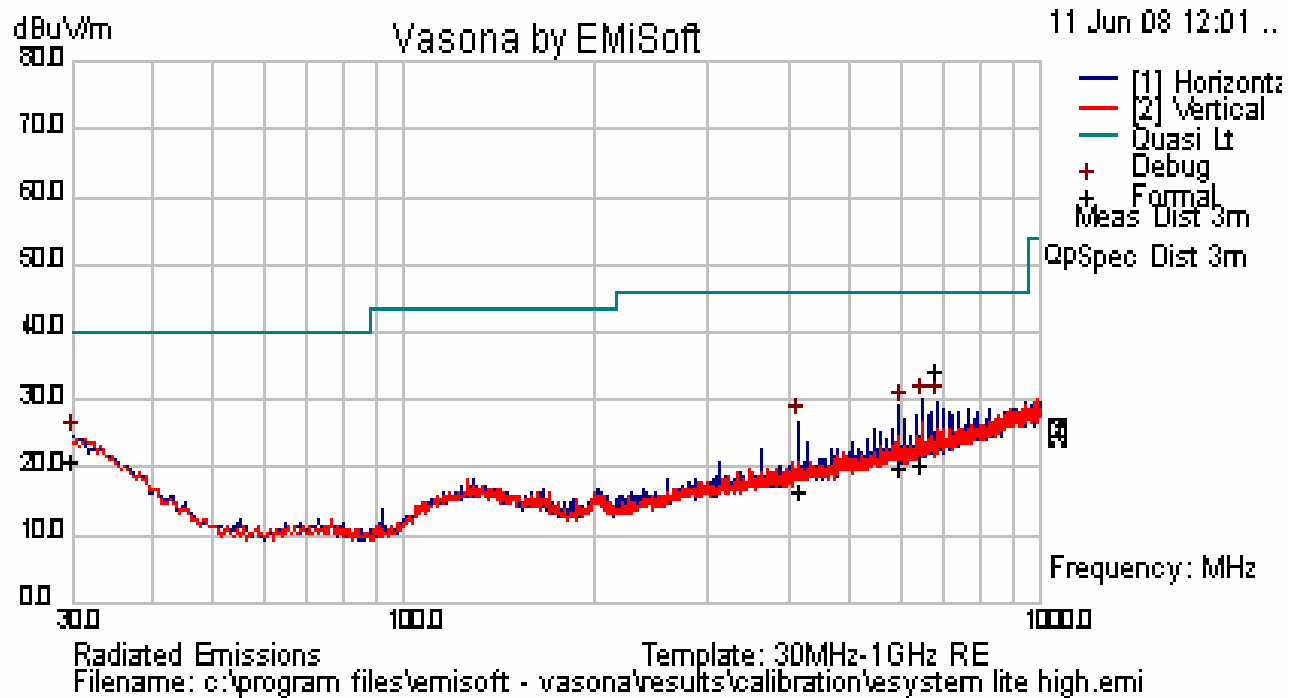


High Channel – Average, Vertical



6.10 Radiated Emissions Test plot & data (LR102)

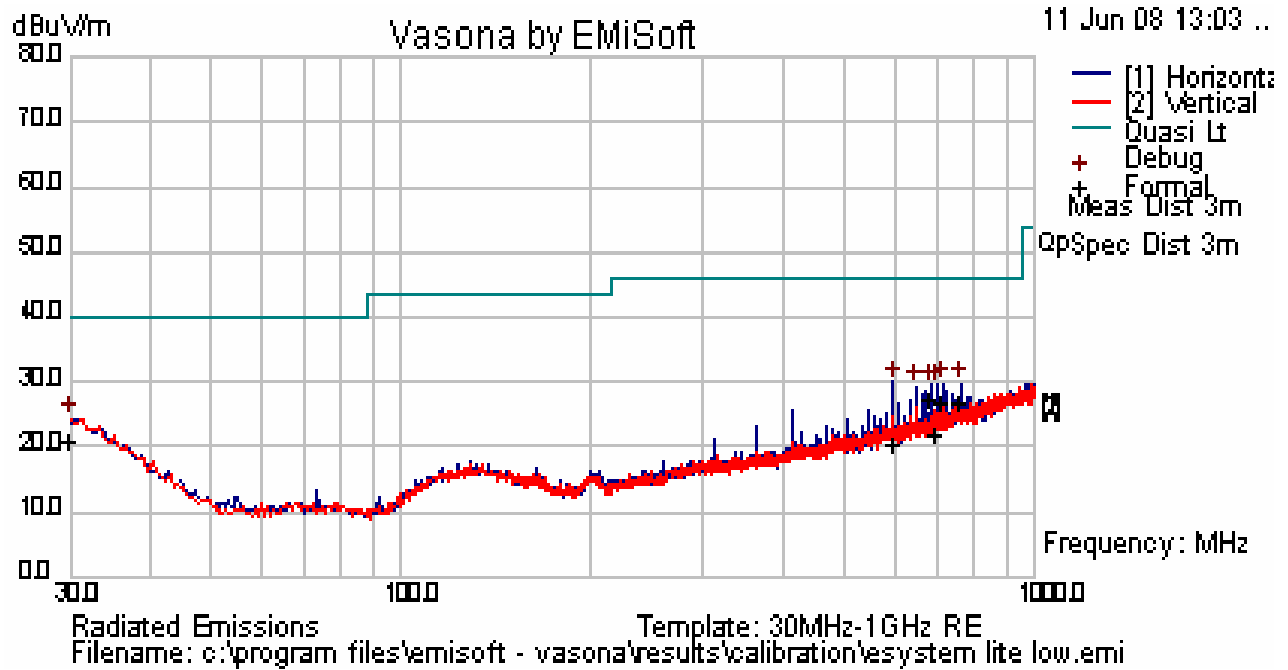
Low Channel, 30MHz -1GHz



Quasi-Peak Measurements:

Frequency (MHz)	Raw data (dBuV/m)	Cable Loss (dB)	AF & PA (dB)	Measurement Type (QP/AV)	Ant. Polar (V/H)	Ant. Height (cm)	Azt (Deg)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
689.050	29.80	11.73	-9.71	QP	H	126	248	31.81	46	-14.19
30.000	16.28	10.42	-7.88	QP	H	245	259	18.82	40	-21.18
650.369	16.36	11.65	-10.16	QP	H	366	310	17.85	46	-28.15
598.322	17.12	11.6	-11	QP	H	136	82	17.72	46	-28.28
416.215	16.24	11.25	-13.17	QP	H	99	67	14.32	46	-31.68
689.050	29.80	11.73	-9.71	QP	H	126	248	31.81	46	-14.19

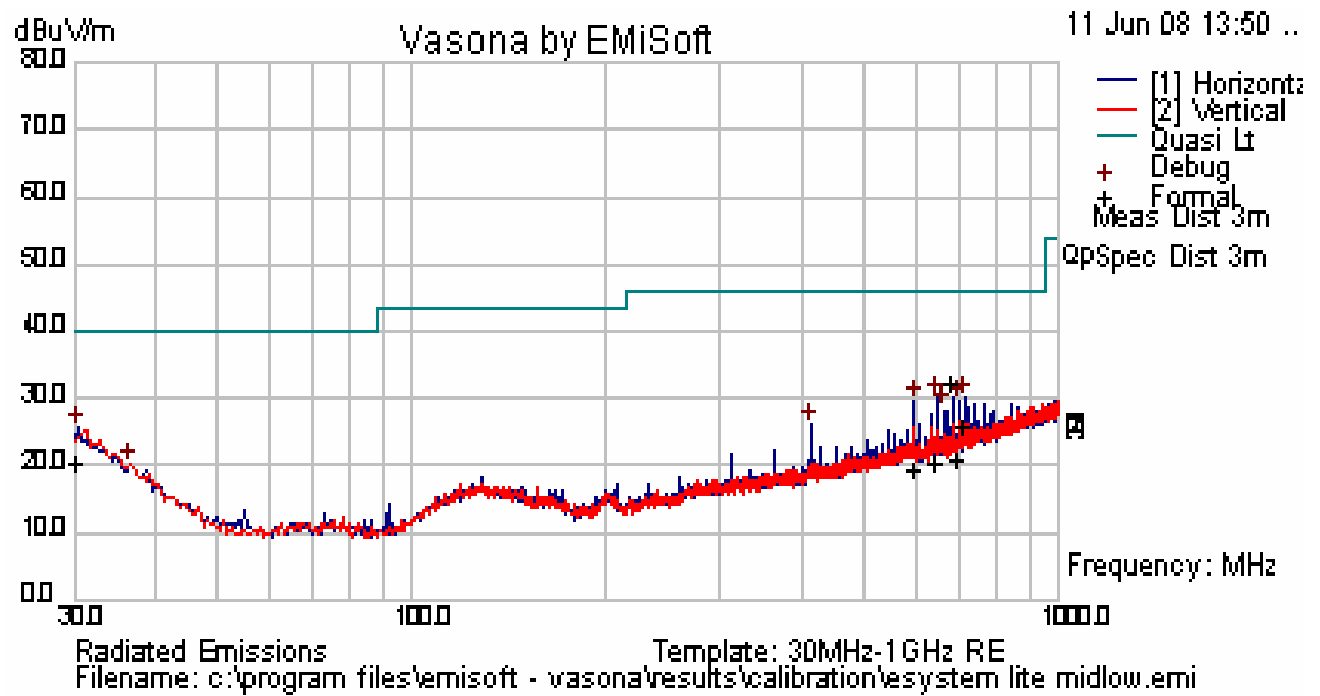
Middle Channel, 30MHz -1GHz



Quasi-Peak Measurements:

Frequency (MHz)	Raw data (dBuV/m)	Cable Loss (dB)	AF & PA (dB)	Measurement Type (QP/AV)	Ant. Polar (V/H)	Ant. Height (cm)	Azt (Deg)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
689.104	23.06	11.73	-9.71	QP	H	127	242	25.08	46	-20.92
766.984	21.34	11.85	-8.44	QP	H	117	233	24.76	46	-21.24
30.009	16.04	10.42	-7.89	QP	V	145	266	18.58	40	-21.42
715.092	21.83	11.77	-9.31	QP	H	98	246	24.29	46	-21.71
702.215	17.40	11.75	-9.56	QP	H	127	250	19.59	46	-26.41
598.357	17.42	11.6	-11.00	QP	H	150	272	18.02	46	-27.98

High Channel, 30MHz -1GHz



Quasi-Peak Measurements:

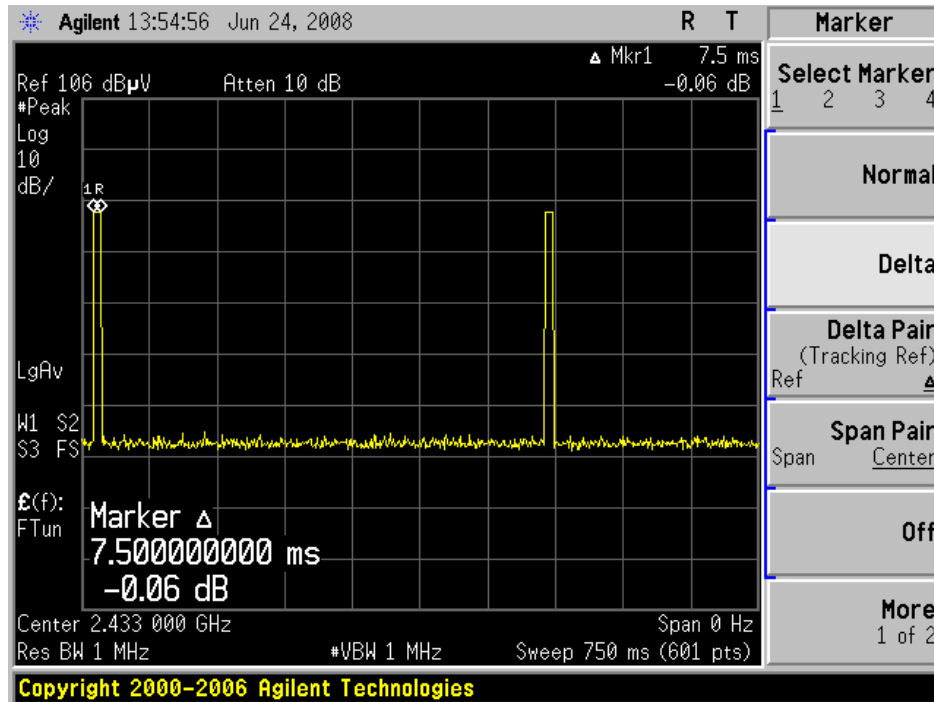
Frequency (MHz)	Raw data (dBuV/m)	Cable Loss (dB)	AF & PA (dB)	Measurement Type (QP/AV)	Ant. Polar (V/H)	Ant. Height (cm)	Azt (Deg)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
688.999	28.12	11.73	-9.71	QP	H	116	245	30.13	46	-15.87
30.493	16.10	10.42	-8.28	QP	H	182	8	18.24	40	-21.76
715.105	21.12	11.77	-9.31	QP	H	137	256	23.59	46	-22.41
702.336	16.59	11.75	-9.56	QP	H	245	224	18.78	46	-27.22
650.479	16.36	11.65	-10.16	QP	H	348	230	17.85	46	-28.15
598.466	16.58	11.60	-11.00	QP	H	109	350	17.18	46	-28.82

Above 1GHz scan at 3m distance

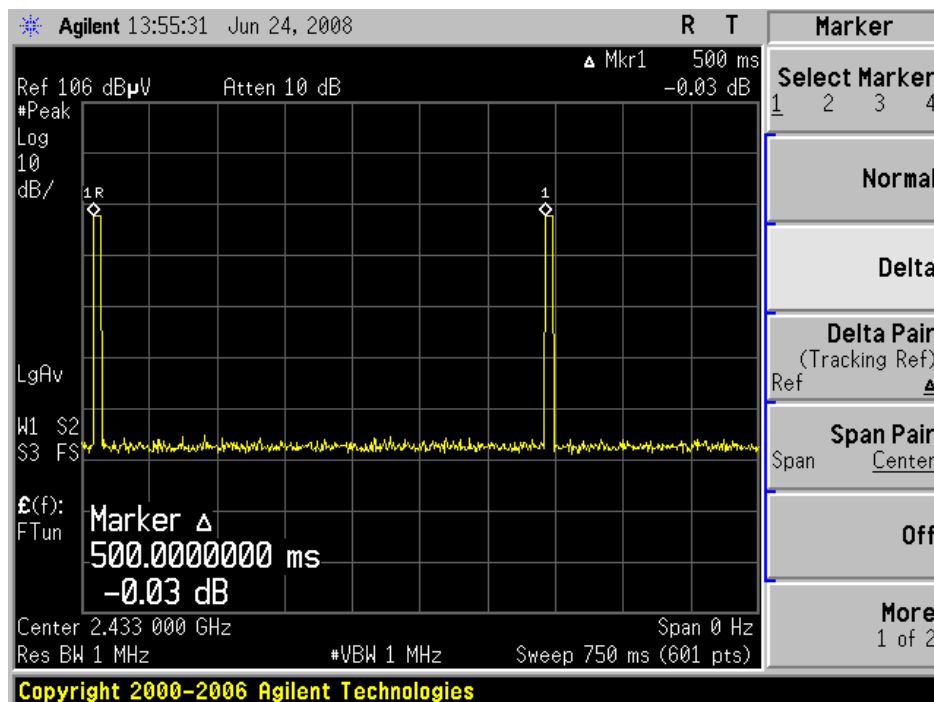
Duty Cycle Factor = $20 * \text{Log}(\text{on time}/\text{total time}) = 20 * \text{Log}(7.5/100) = -22.5\text{dB}$

*If Total time is greater than 100ms, use 100ms.

On time = 7.5ms



Total time = 500ms > 100ms



Low Channel, 2433.175 MHz

Frequency (MHz)	Raw Data (dBμV/m)	Correction Factor (dB)	Ant. Azt. (Deg)	Ant. Hgt. (m)	Ant. Polar (V/H)	DC Factor (dB)	Corrected Reading (dBμV/m)	FCC15.249 Limit (dBμV/m)	Margin (dB)	Measurements Type
2433.175	85.39	-0.67	194	1.0	H	-	84.72	114	-29.28	Fund. Peak
2433.175	81.24	-0.67	211	1.1	V	-	80.57	114	-33.43	Fund. Peak
2433.175	85.39	-0.67	194	1.0	H	-22.50	62.22	94	-31.78	Fund. AV
2433.175	81.24	-0.67	211	1.1	V	-22.50	58.07	94	-35.93	Fund. AV
4866.35	48.49	6.86	338	1.3	H	-	55.35	74	-18.65	Peak
4866.35	48.49	6.86	338	1.3	H	-22.50	32.85	54	-21.15	AV
4866.35	45.17	6.86	178	1.4	V	-	52.03	74	-21.97	Peak
4866.35	45.17	6.86	178	1.4	V	-22.50	29.53	54	-24.47	AV

Middle Channel, 2434.508 MHz

Frequency (MHz)	Raw Data (dBμV/m)	Correction Factor (dB)	Ant. Azt. (Deg)	Ant. Hgt. (m)	Ant. Polar (V/H)	DC Factor (dB)	Corrected Reading (dBμV/m)	FCC15.249 Limit (dBμV/m)	Margin (dB)	Measurements Type
2434.508	86.08	-0.67	167	1.0	H	-	85.41	114	-28.59	Fund. Peak
2434.508	82.07	-0.67	148	1.0	V	-	81.40	114	-32.60	Fund. Peak
2434.508	86.08	-0.67	167	1.0	H	-22.50	62.91	94	-31.09	Fund. AV
2434.508	82.07	-0.67	148	1.0	V	-22.50	58.90	94	-35.10	Fund. AV
4869.016	57.42	6.86	19	1.3	H	-	64.28	74	-9.72	Peak
4869.016	57.42	6.86	19	1.3	H	-22.50	41.78	54	-12.22	AV
4869.016	48.91	6.86	150	1.0	V	-	55.77	74	-18.23	Peak
4869.016	48.91	6.86	150	1.0	V	-22.50	33.27	54	-20.73	AV

High Channel, 2436.1 MHz

Frequency (MHz)	Raw Data (dBμV/m)	Correction Factor (dB)	Ant. Azt. (Deg)	Ant. Hgt. (m)	Ant. Polar (V/H)	DC Factor (dB)	Corrected Reading (dBμV/m)	FCC15.249 Limit (dBμV/m)	Margin (dB)	Measurements Type
2436.1	85.69	-0.67	176	1.0	H	-	85.02	114	-28.98	Fund. Peak
2436.1	81.41	-0.67	89	1.0	V	-	80.74	114	-33.26	Fund. Peak
2436.1	85.69	-0.67	176	1.0	H	-22.50	62.52	94	-31.48	Fund. AV
2436.1	81.41	-0.67	89	1.0	V	-22.50	58.24	94	-35.76	Fund. AV
4872.2	52.24	6.86	43	1.0	H	-	59.10	74	-14.90	Peak
4872.2	52.04	6.86	180	1.0	V	-	58.90	74	-15.10	Peak
4872.2	52.24	6.86	43	1.0	H	-22.50	36.60	54	-17.40	AV
4872.2	52.04	6.86	180	1.0	V	-22.50	36.40	54	-17.60	AV

NOTE: Average Level is calculated based on the Peak measured levels and the duty cycle correction factor of -22.50 dB.

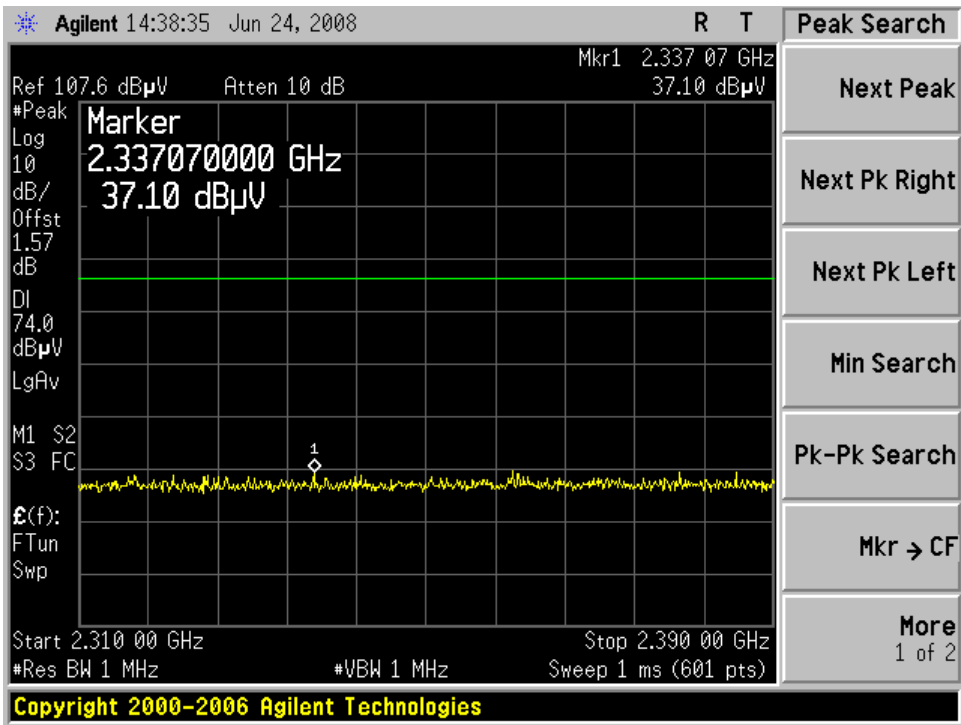
Out of Band Emissions:

Frequency (MHz)	Reading (dBuV/m)	Correction Factor (dB)	Corrected Amplitude (dBuV/m) @3m	15.209 Limit (dBuV)	Margin (dB)
Low channel					
2400	33.07	-0.67	32.4	54.0	-21.6
High channel					
2483.5	35.07	-0.67	34.4	54.0	-19.6

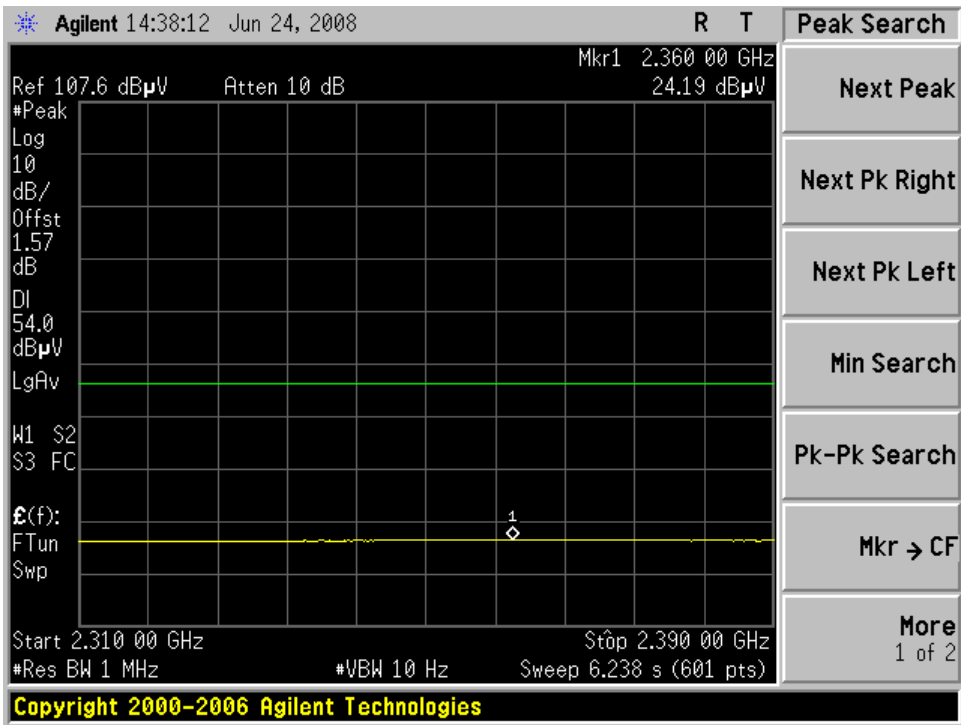
Restricted Band:

Please refer to the following plots.

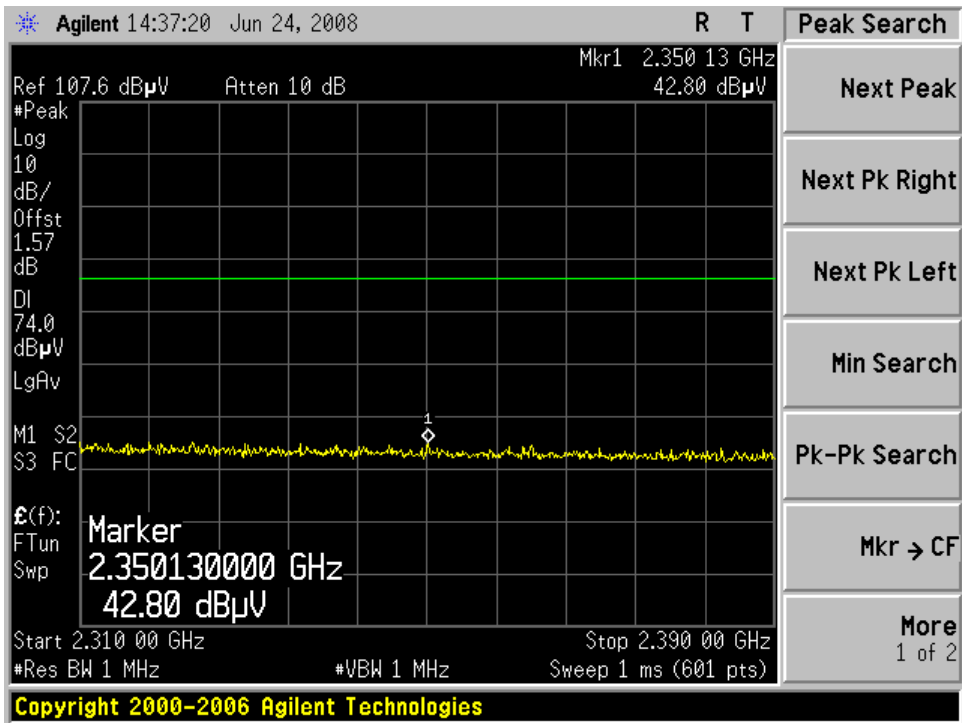
Low Channel – Peak, Horizontal



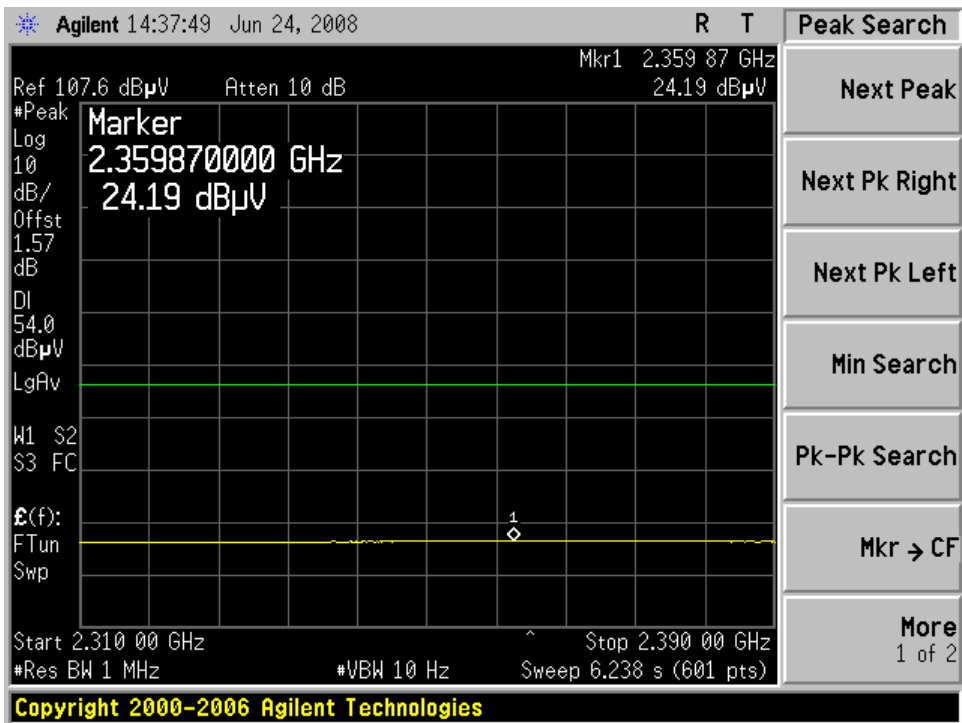
Low Channel – Average, Horizontal



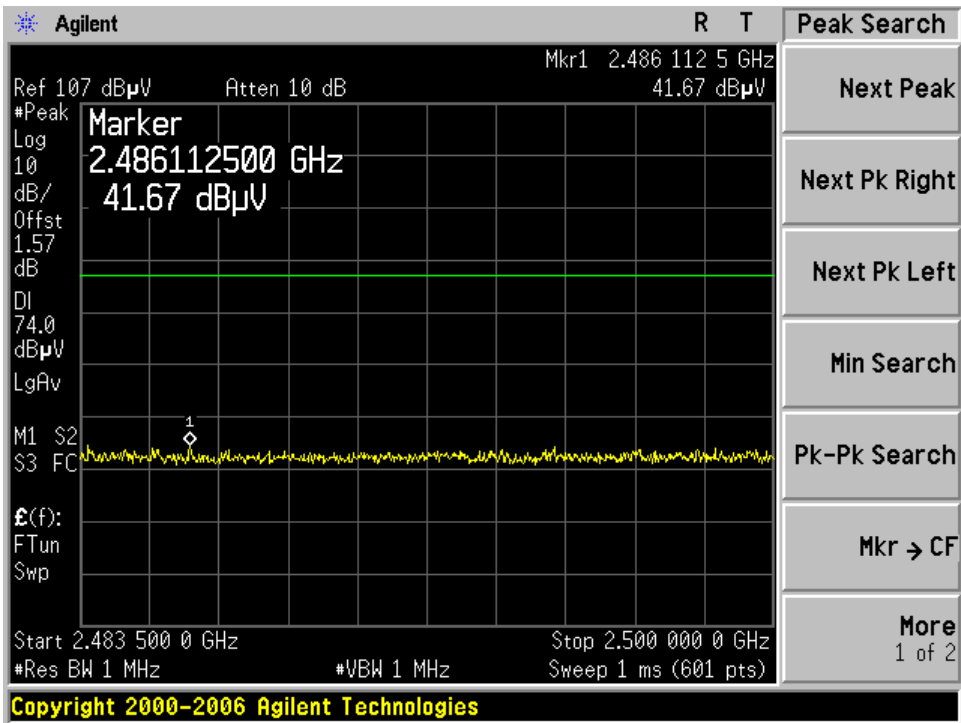
Low Channel – Peak, Vertical



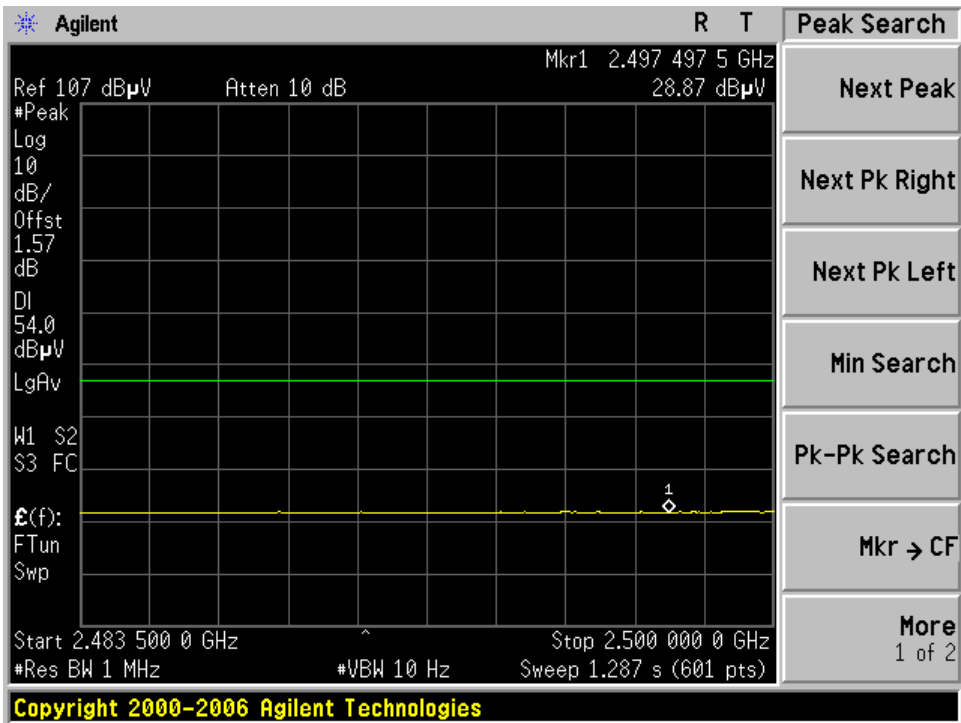
Low Channel – Average, Vertical



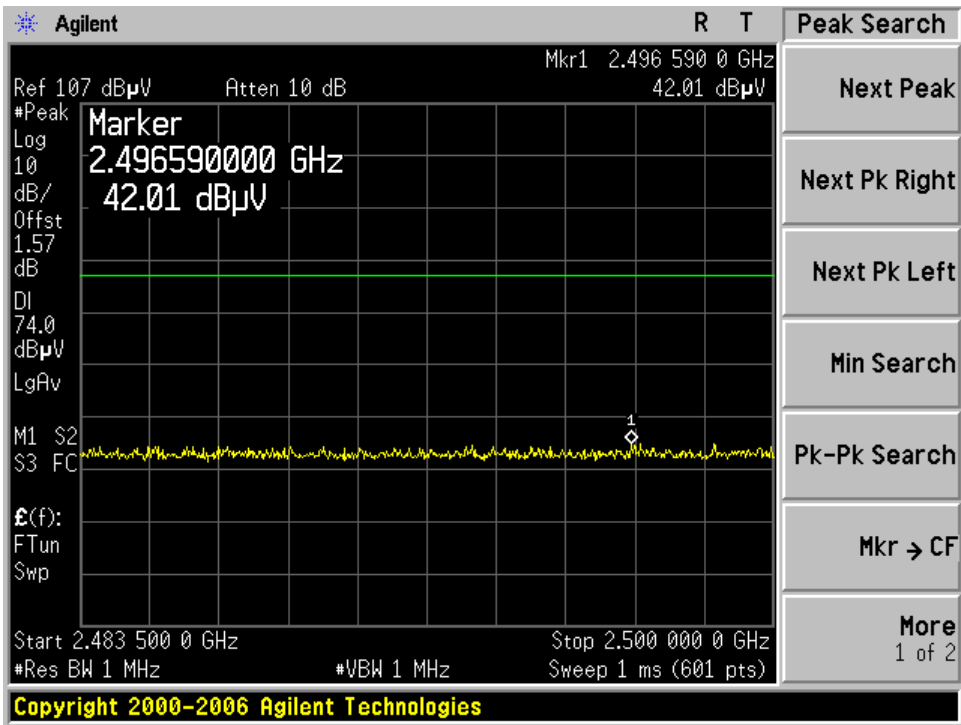
High Channel – Peak, Horizontal



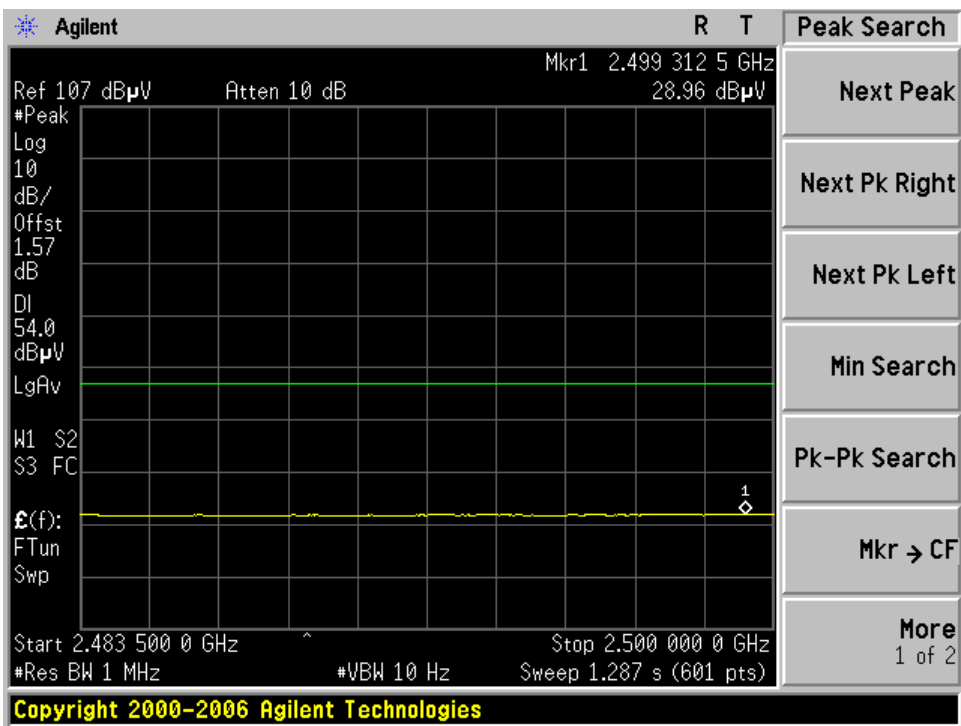
High Channel – Average, Horizontal



High Channel – Peak, Vertical

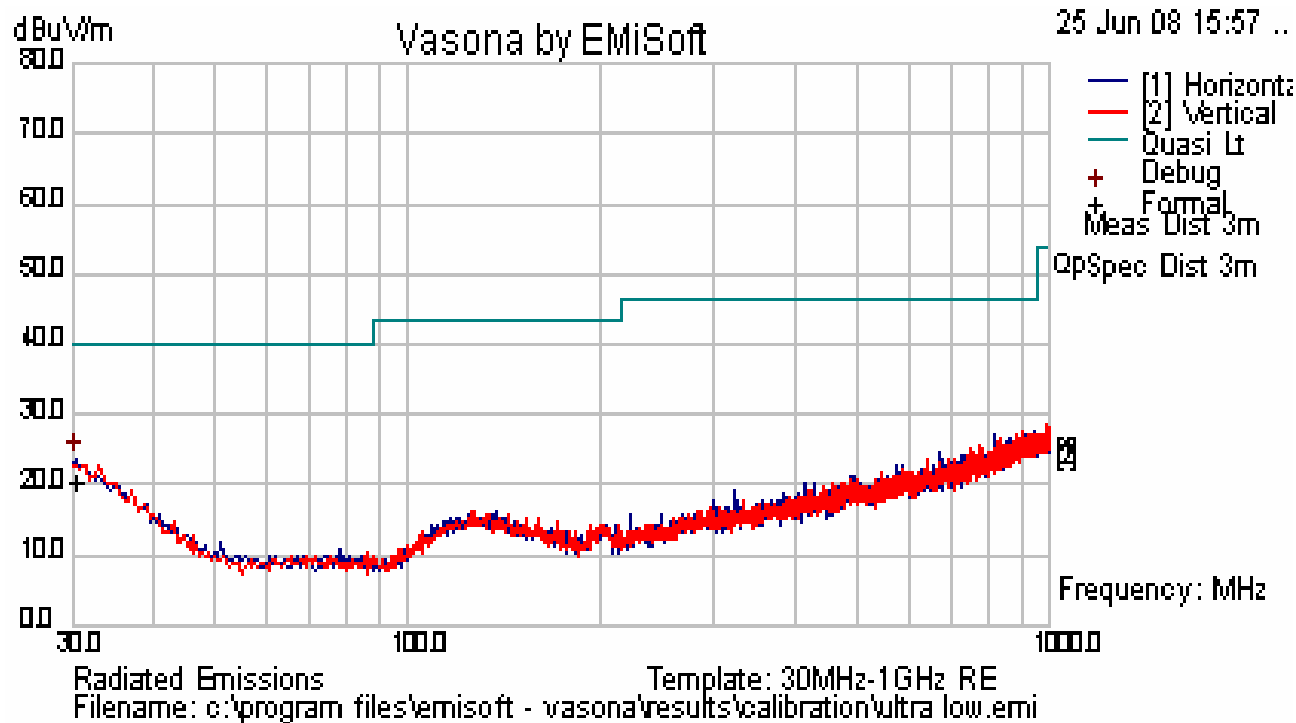


High Channel – Average, Vertical



6.11 Radiated Emissions Test plot & data (Ultra-101)

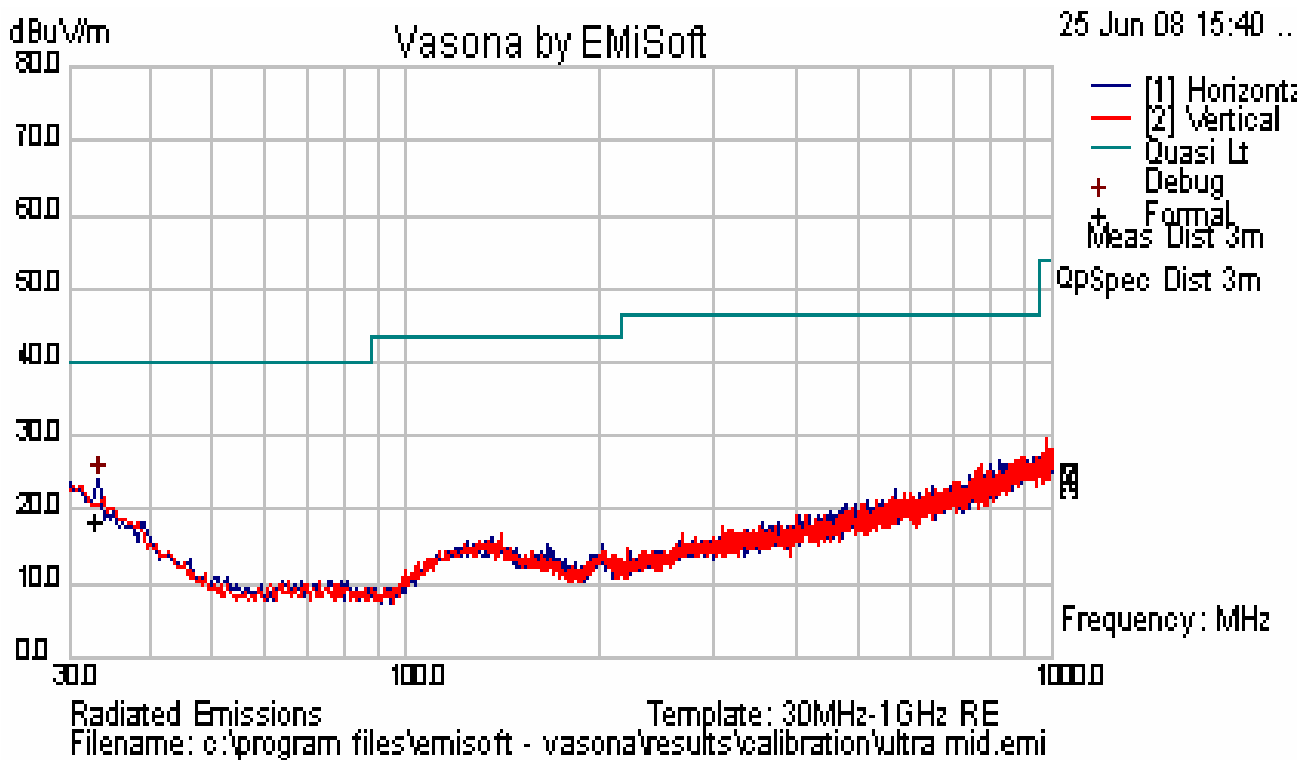
Low Channel, 30MHz -1GHz



Quasi-Peak Measurements:

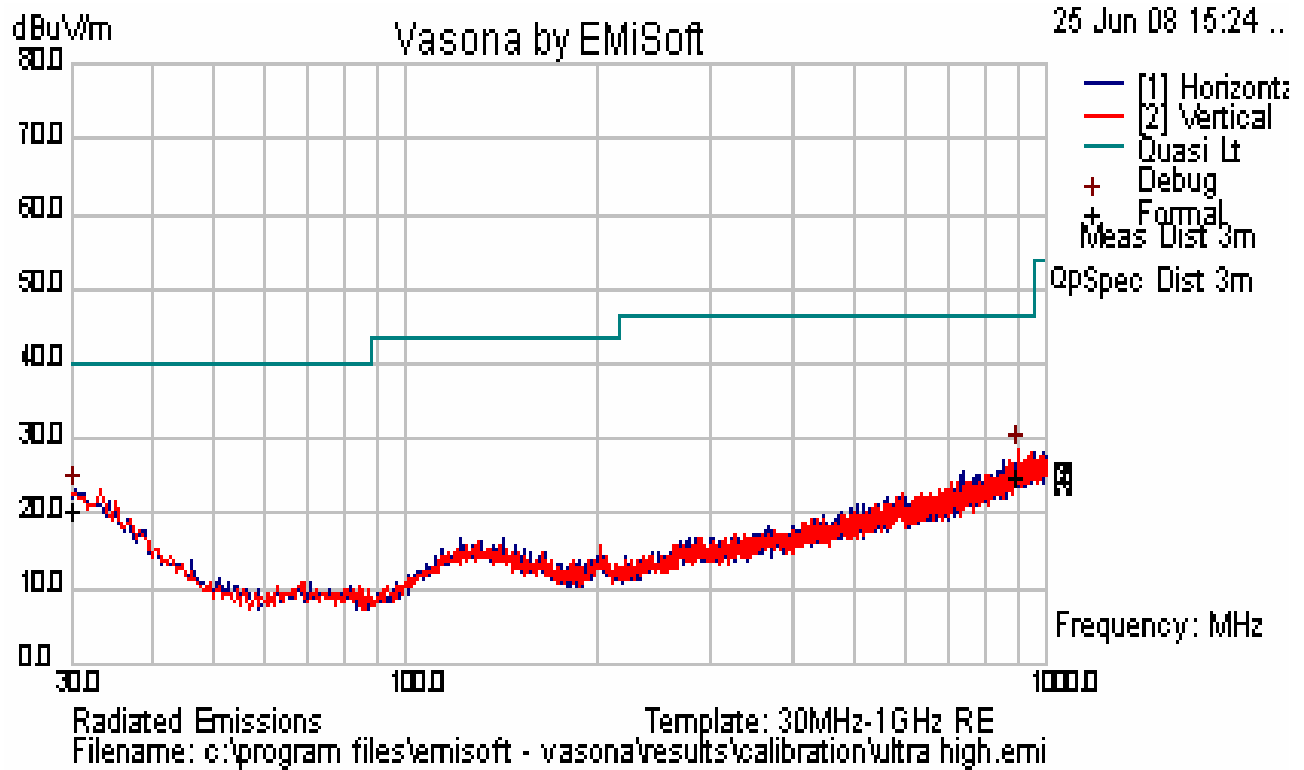
Frequency (MHz)	Raw data (dBuV/m)	Cable Loss (dB)	AF & PA (dB)	Measurement Type (QP/AV)	Ant. Polar (V/H)	Ant. Height (cm)	Azt (Deg)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.696	16.08	10.42	-8.44	QP	H	128	289	18.06	40	-21.94

Middle Channel, 30MHz -1GHz



Quasi-Peak Measurements:

Frequency (MHz)	Raw data (dBuV/m)	Cable Loss (dB)	AF & PA (dB)	Measurement Type (QP/AV)	Ant. Polar (V/H)	Ant. Height (cm)	Azt (Deg)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
33.302	16.14	10.43	-10.49	QP	H	134	300	16.09	40	-23.91

High Channel 30MHz -1GHz**Quasi-Peak Measurements:**

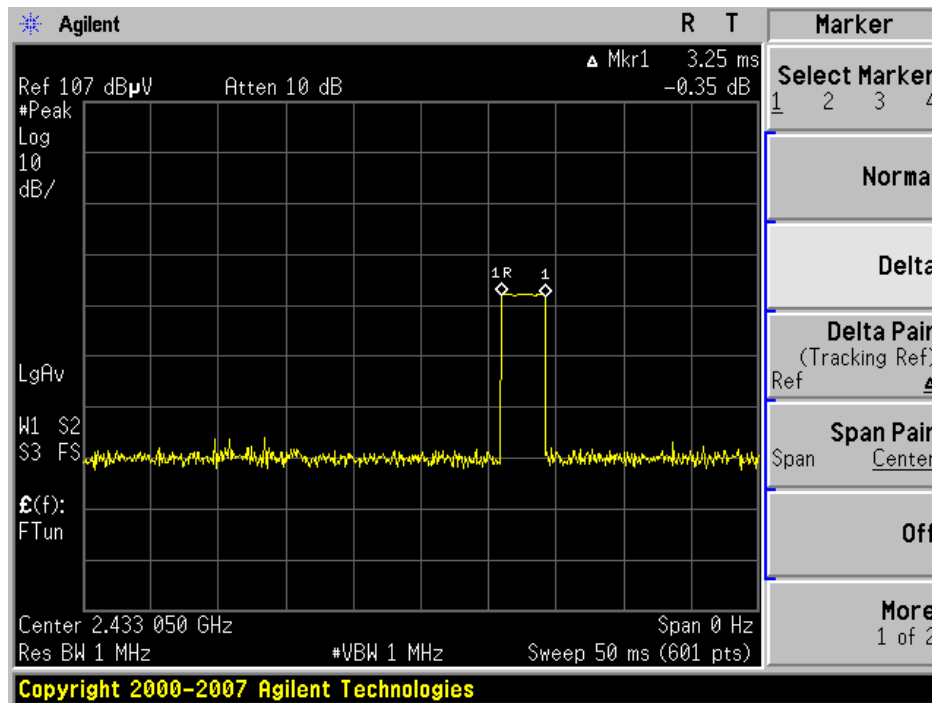
Frequency (MHz)	Raw data (dBuV/m)	Cable Loss (dB)	AF & PA (dB)	Measurement Type (QP/AV)	Ant. Polar (V/H)	Ant. Height (cm)	Azt (Deg)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.285	16.02	10.42	-8.11	QP	H	137	35	18.33	40	-21.67
903.275	16.84	12.12	-6.48	QP	V	164	203	22.47	46.5	-24.03

Above 1GHz scan at 3m distance

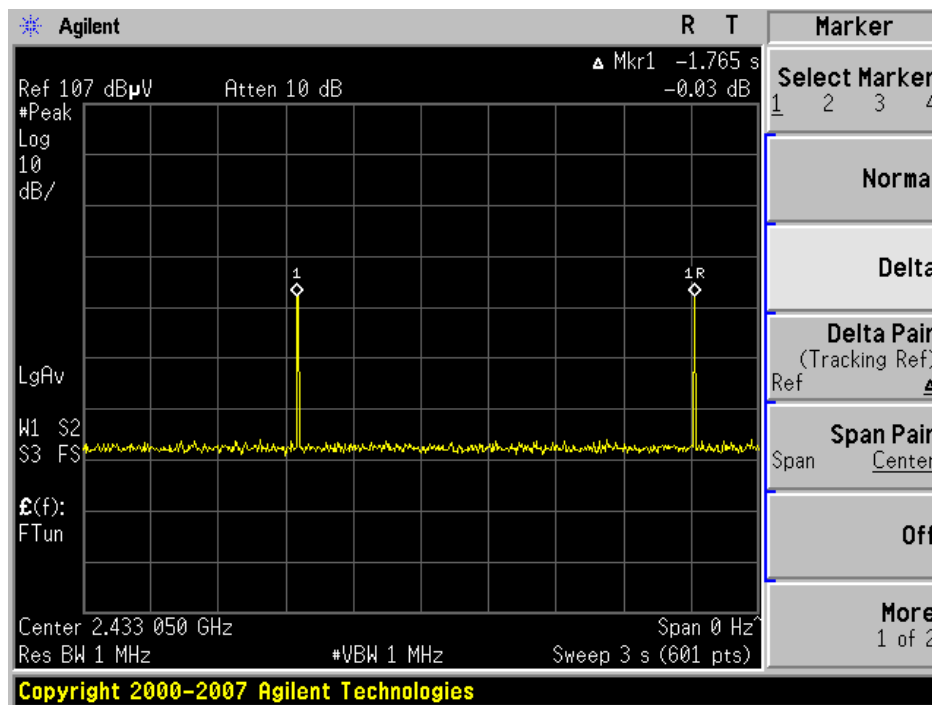
Duty Cycle Factor = $20 \cdot \log(\text{on time}/\text{total time}) = 20 \cdot \log(3.25/100) = -29.76\text{dB}$

*If Total time is greater than 100ms, use 100ms.

On time = 3.25ms



Total time = 1765ms > 100ms



Low Channel, 2433.175 MHz

Frequency (MHz)	Raw Data (dBµV/m)	Correction Factor (dB)	Ant. Azt. (Deg)	Ant. Hgt. (m)	Ant. Polar (V/H)	DC Factor (dB)	Corrected Reading (dBµV/m)	FCC15.249 Limit (dBµV/m)	Margin (dB)	Measurements Type
2433.175	90.14	-0.67	78	1.07	H	-	89.47	114	-24.53	Fund. Peak
2433.175	93.16	-0.67	0	1.00	V	-	92.49	114	-21.51	Fund. Peak
2433.175	89.47	-0.67	78	1.07	H	-29.76	59.71	94	-34.29	Fund. AV
2433.175	92.49	-0.67	0	1.00	V	-29.76	62.73	94	-31.27	Fund. AV
4866.35	52.23	6.86	161	1.00	H	-	59.09	74	-14.91	Peak
4866.35	51.31	6.86	139	1.57	V	-	58.17	74	-15.83	Peak
4866.35	59.09	6.86	161	1.00	H	-29.76	29.33	54	-24.67	AV
4866.35	51.31	6.86	139	1.57	V	-29.76	21.55	54	-32.45	AV

Middle Channel, 2434.508 MHz

Frequency (MHz)	Raw Data (dBµV/m)	Correction Factor (dB)	Ant. Azt. (Deg)	Ant. Hgt. (m)	Ant. Polar (V/H)	DC Factor (dB)	Corrected Reading (dBµV/m)	FCC15.249 Limit (dBµV/m)	Margin (dB)	Measurements Type
2434.508	93.31	-0.67	0	1.87	H	-	92.64	114	-21.36	Fund. Peak
2434.508	87.97	-0.67	26	1.00	V	-	87.30	114	-26.70	Fund. Peak
2434.508	92.64	-0.67	0	1.87	H	-29.76	62.88	94	-31.12	Fund. AV
2434.508	87.30	-0.67	26	1.00	V	-29.76	57.54	94	-36.46	Fund. AV
4869.016	54.42	6.86	207	1.60	H	-	61.28	74	-12.72	Peak
4869.016	52.10	6.86	140	1.90	V	-	58.96	74	-15.04	Peak
4869.016	61.28	6.86	207	1.60	H	-29.76	31.52	54	-22.48	AV
4869.016	58.96	6.86	140	1.90	V	-29.76	29.20	54	-24.80	AV

High Channel, 2436.1 MHz

Frequency (MHz)	Raw Data (dBµV/m)	Correction Factor (dB)	Ant. Azt. (Deg)	Ant. Hgt. (m)	Ant. Polar (V/H)	DC Factor (dB)	Corrected Reading (dBµV/m)	FCC15.249 Limit (dBµV/m)	Margin (dB)	Measurements Type
2436.1	92.61	-0.67	327	1.00	H	-	91.94	114	-22.06	Fund. Peak
2436.1	87.97	-0.67	30	1.00	V	-	87.30	114	-26.70	Fund. Peak
2436.1	91.94	-0.67	327	1.00	H	-29.76	62.18	94	-31.82	Fund. AV
2436.1	87.97	-0.67	30	1.00	V	-29.76	58.21	94	-35.79	Fund. AV
4872.2	54.52	6.86	131	1.97	V	-	61.38	74	-12.62	Peak
4872.2	51.17	6.86	209	1.00	H	-	58.03	74	-15.97	Peak
4872.2	61.38	6.86	131	1.97	V	-29.76	31.62	54	-22.38	AV
4872.2	58.03	6.86	209	1.00	H	-29.76	28.27	54	-25.73	AV

NOTE: Average Level is calculated based on the Peak measured levels and the duty cycle correction factor of -29.76 dB.

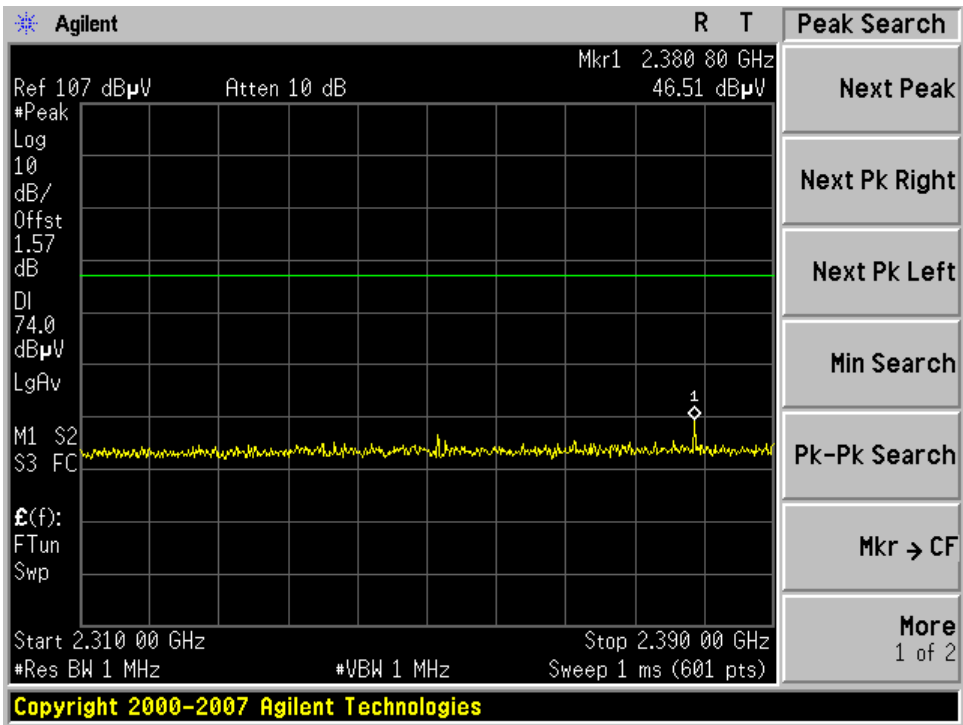
Out of Band Emissions:

Frequency (MHz)	Reading (dBuV/m)	Correction Factor (dB)	Corrected Amplitude (dBuV/m) @3m	15.209 Limit (dBuV)	Margin (dB)
Low channel: 2400 MHz					
2400	32.67	-0.67	32.0	54	-22.0
High channel: 2483.5 MHz					
2483.5	30.79	-0.67	30.12	54	-23.88

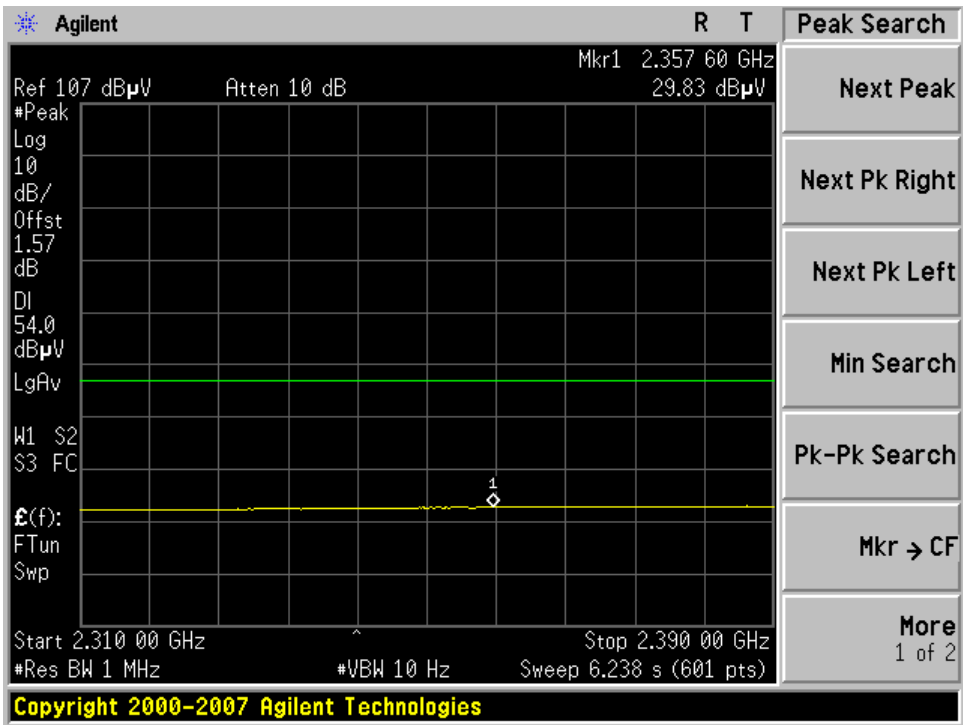
Restricted Band:

Please refer to the following plots.

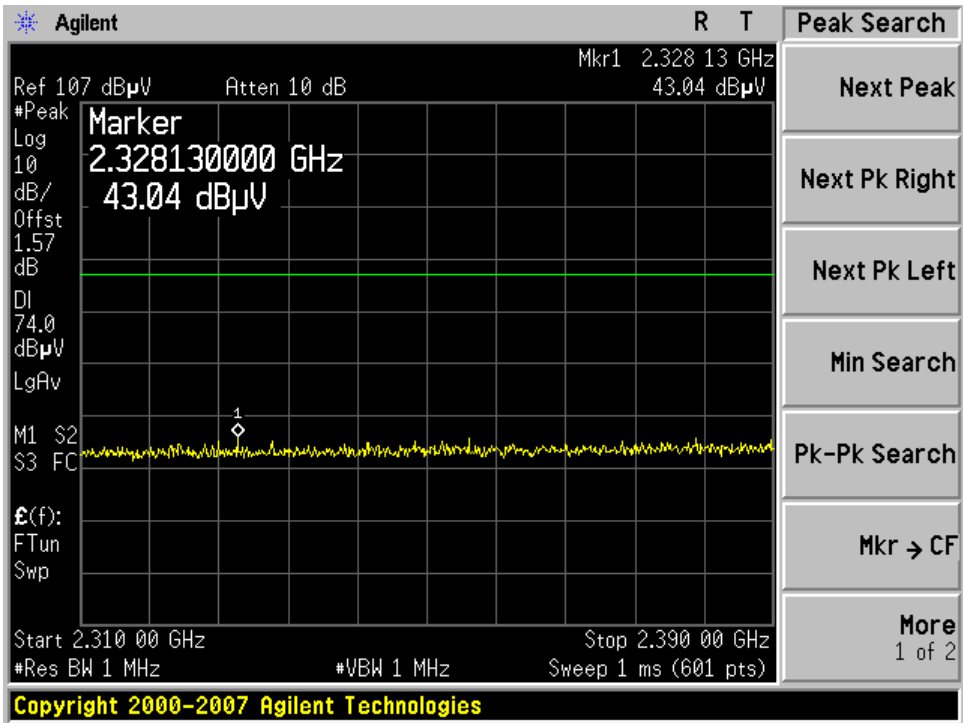
Low Channel – Peak, Horizontal



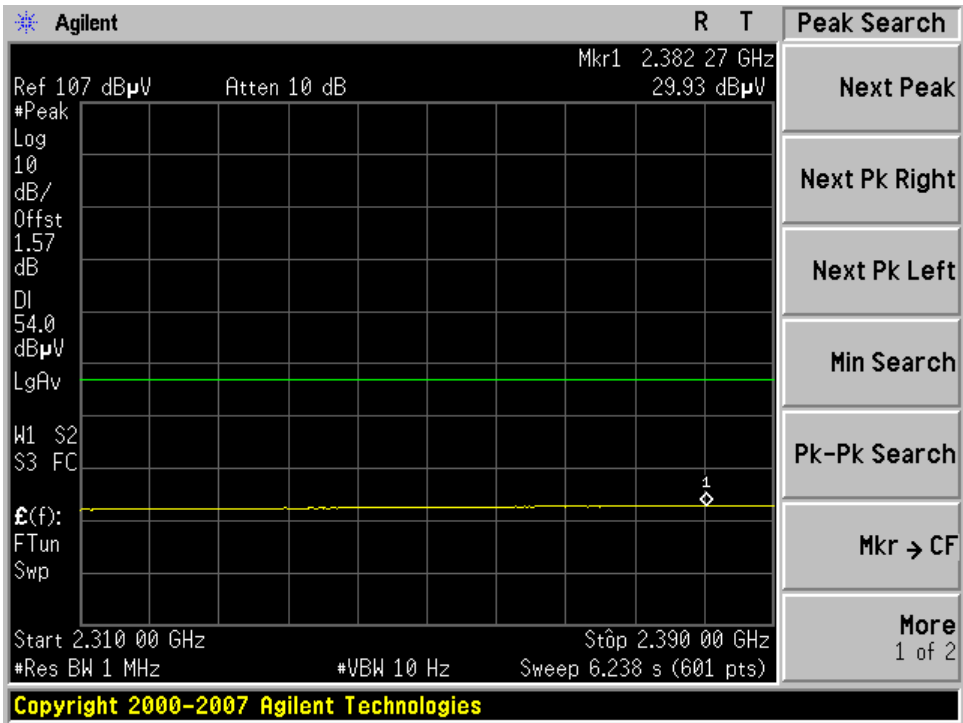
Low Channel – Average, Horizontal



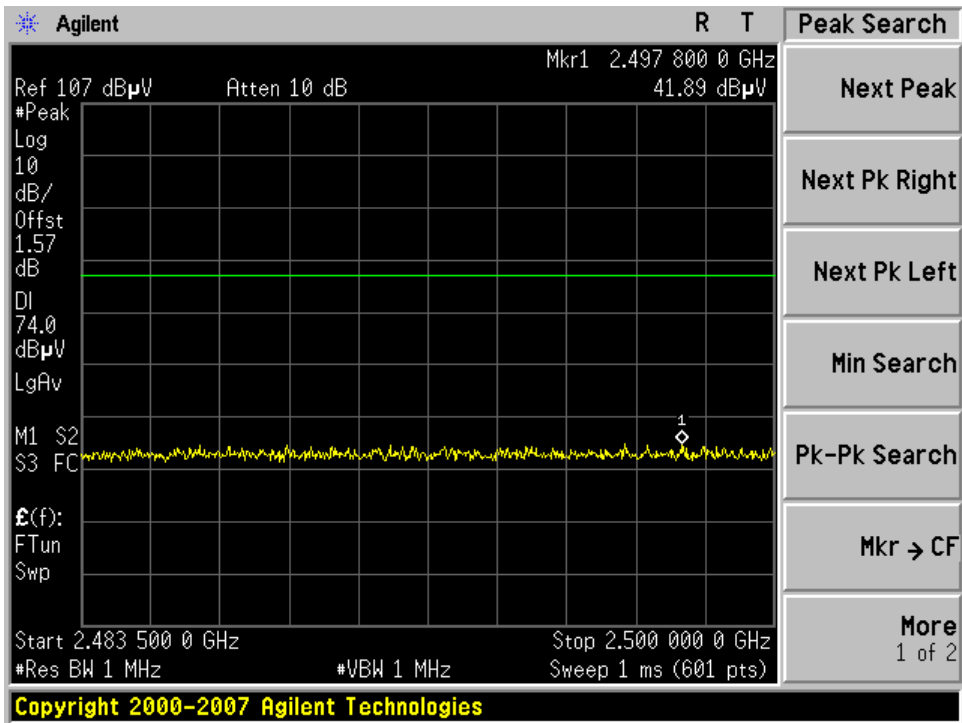
Low Channel – Peak, Vertical



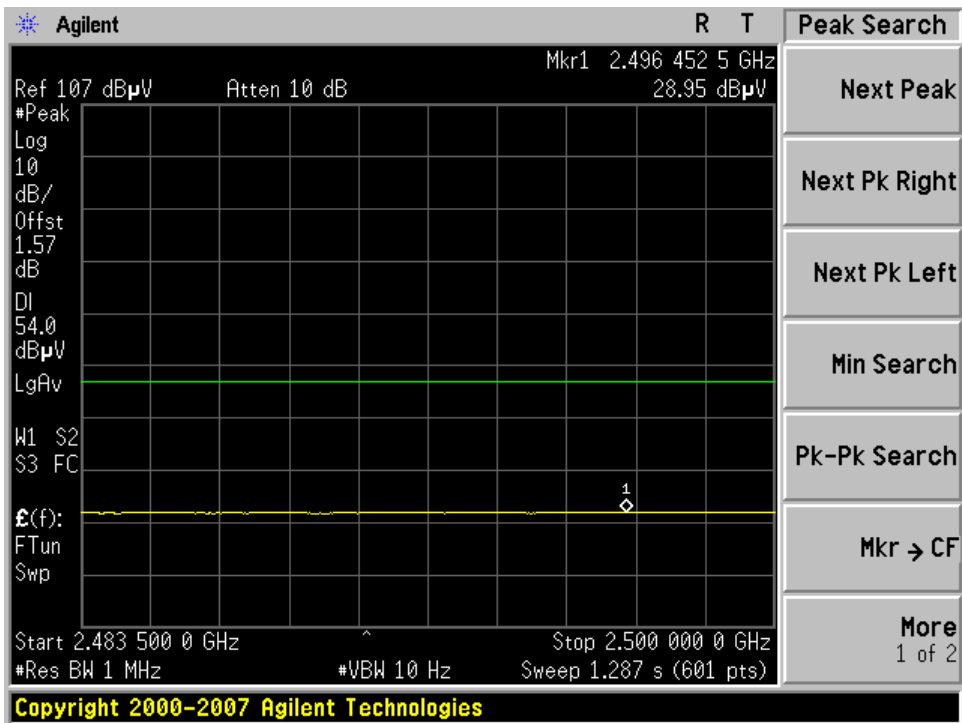
Low Channel – Average, Vertical



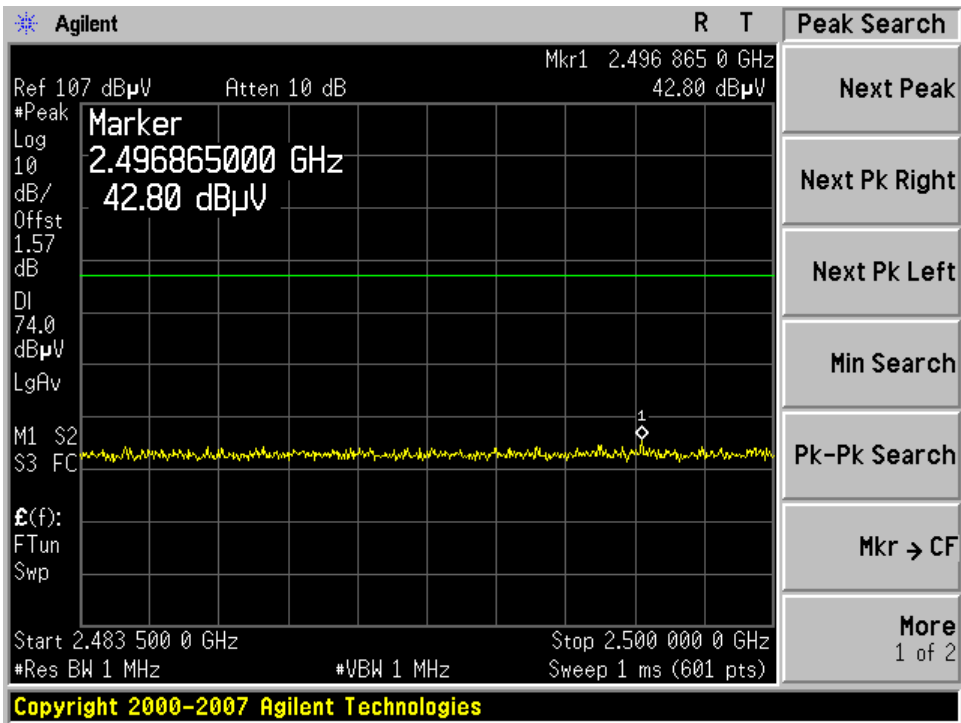
High Channel – Peak, Horizontal



High Channel – Average, Horizontal



High Channel – Peak, Vertical



High Channel – Average, Vertical

