

FCC PART 15.247
INDUSTRY CANADA RSS-210, ISSUE 7, JUNE 2007
MEASUREMENT AND TEST REPORT

For

Psion Teklogix Inc.

2100 Meadowvale Boulevard
Mississauga, Ontario, Canada L5N 7J9

FCC ID: GM37535G2BTRA2043
IC ID: 2739D-7535G2B3

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Test Engineer(s):	Victor Zhang 		
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Reviewed By:	Boni Baniqued 		
Prepared By: (12)	Bay Area Compliance Laboratories Corp. (BACL) 1274 Anvilwood Ave. Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164		

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1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The Psion Teklogix Inc. Product, FCC ID: GM37535G2BTRA2043, IC: 2739D-7535G2B3, model: 7535 G2 or the "EUT" as referred to this report is a Benchmark in Hand-Held Computing. It was engineered to meet the performance and durability requirements for data collection in some of the harshest environments. It has been ergonomically crafted with the user in mind in order to combine usability with performance.

* Testing was performed on a post production sample provided by Psion Teklogix Inc.

1.2 Mechanical Description of EUT

The Psion Teklogix Inc. product, model: 7535 G2 is of plastic construction and measures approximately 248 mm (L) x 97 mm (W) x 71 mm (H), weighing approximately 704.5 g.

1.3 Antenna Description

Item Number	Model/Type	
Antenna	Model number:	C802-510001-A
	Manufacturer:	Symbol
	Frequency Range:	2400-2500 MHz; 5150-5850 MHz
	Connector Type	RP-SMA MALE
	Antenna Type	Dual Band Antenna (4dBi for 2.4 GHz; 3 dBi for 5 GHz)

1.4 EUT Photo



Please refer to Exhibit C for addition EUT photographs.

1.5 Objective

This report is prepared on behalf of *Psion Teklogix Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules and Industry Canada RSS-210 Issue 7, June 2007.

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

- Output Power
- Power Spectral Density
- 6 dB (99%) Bandwidth
- Radiated Spurious Emission [Restricted bands, Harmonics & Spurious]
- Band Edge
- AC line Conducted Emission
- Unwanted Spurious Emission & Receiving Spurious Emission

1.6 Related Submittal(s)/Grant(s)

No related submittals.

1.7 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.

1.8 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.

1.9 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 testing mode to represent *worst-case* results during the final qualification test.

2.2 EUT Exercise Software

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

Type	Frequency (MHz)		
	Low	Middle	High
WI-FI (802.11 a)	5745	5785	5825
WI-FI (802.11 b)	2412	2437	2462
WI-FI (802.11 g)	2412	2437	2462

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

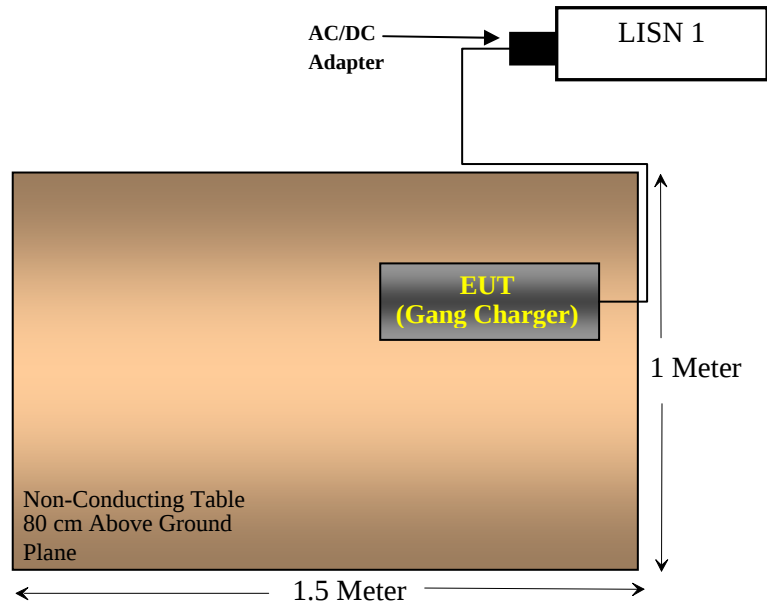
Manufacturer	Description	Model	Serial Number
TOSHIBA	Laptop	Satellite Pro 4200 Series	20016067J

2.6 Interface Ports and Cabling

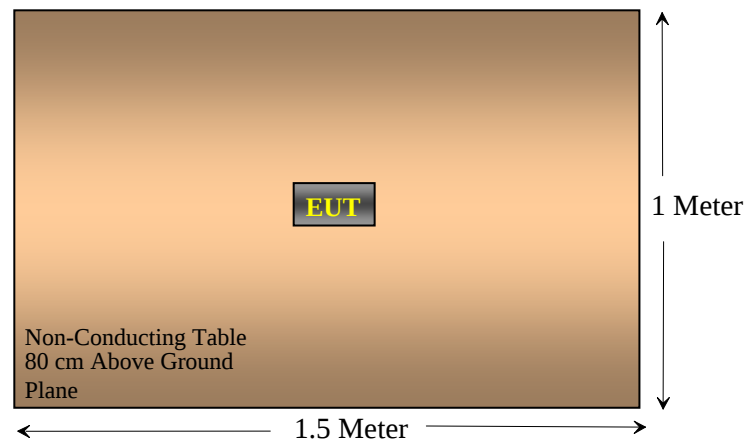
Cable Description	Length (m)	From	To
N/A	N/A	N/A	N/A

2.7 Test Setup Block Diagrams

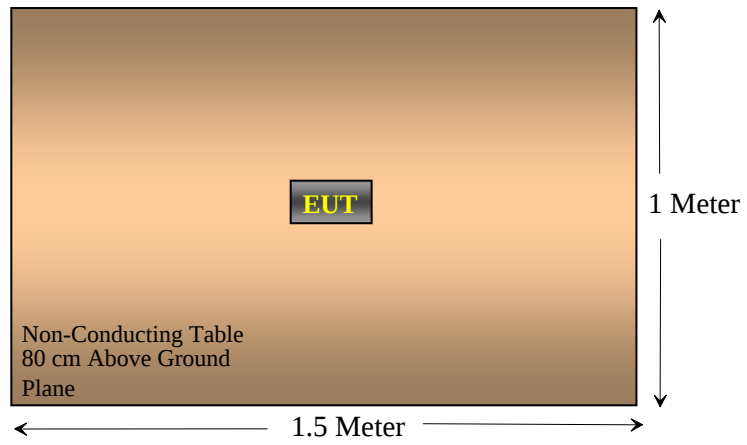
Conducted Emissions



Receiver Radiated Emissions



Transmitter Spurious Radiated Emissions



3 SUMMARY OF TEST RESULTS

Results reported relate only to the product tested.

FCC & RSS-210 Rules	Description of Test	Result	Note
§ 15.247 (b)(3); RSS-210 A8.2 (a)	6 dB (99%) Bandwidth	N/A	Refer to FCC ID H9PLA5137A2/IC: 1549D-LA5137A2 reports
§ 15.247 (b); RSS- 210 A8.4	Output Power	N/A	Refer to FCC ID H9PLA5137A2/IC: 1549D-LA5137A2 reports
§ 15.247 (e); RSS- 210 A8.2 (b)	Power Spectral Density	N/A	Refer to FCC ID H9PLA5137A2/IC: 1549D-LA5137A2 reports
§ 15.247 (d), §15.205, §15.209 RSS-210 A8.5	Radiated Spurious Emission [Restricted bands, Harmonics & Spurious]	Compliant	
§ 15.247 (d), §15.209 RSS-210	Band Edge	N/A	Refer to FCC ID H9PLA5137A2/IC: 1549D-LA5137A2 reports

4 FCC §15.203 & IC RSS-Gen §7.1.4- ANTENNA REQUIREMENT

4.1 Applicable Standard

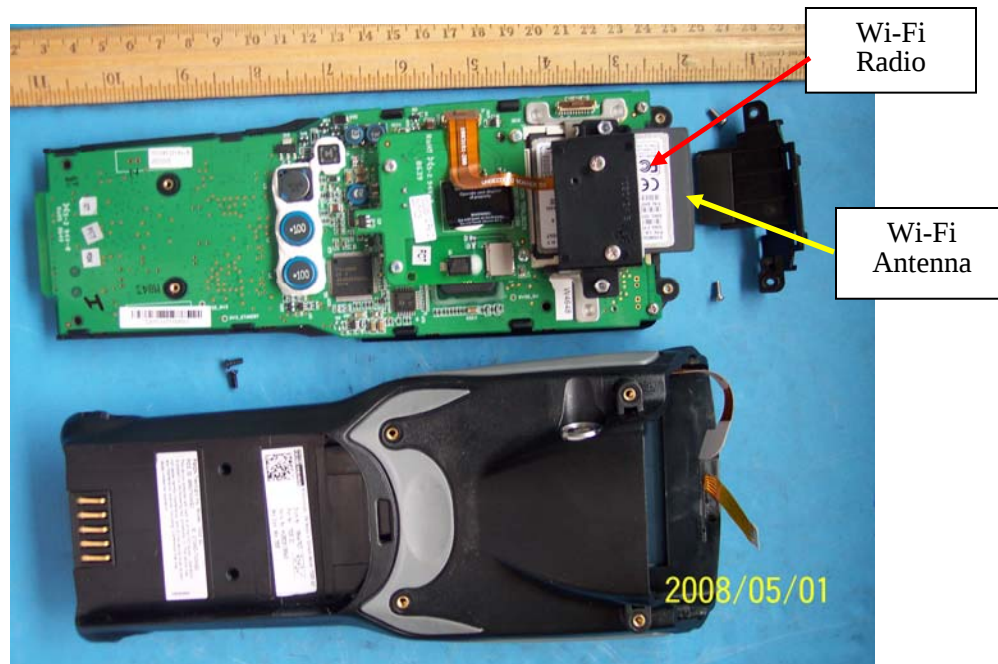
According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered 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 § 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.

According to RSS-Gen§7.1.4, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

4.2 Antenna Connected Construction

The integral antenna is permanently mounted on the printed circuit board and located inside the enclosure, please refer to the EUT internal photos.



5 FCC §15.205, §15.209 & §15.247(d), IC RSS-210 - RADIATED SPURIOUS EMISSIONS

5.1 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 FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

IC RSS-210 the measurement method shall be described in the test report. The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements. The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

5.2 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.

5.3 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.

5.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Mini-Circuits	Pre amplifier	ZKL-2	7786100643	2008-01-02
HP	Pre amplifier	8449B	3147A00400	2007-11-02
Sunol Science Corp	Combination Antenna	JB1 Antenna	A103105-3	2008-03-25
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2007-06-07
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.

5.5 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: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
- (2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

5.6 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:

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

5.7 Environmental Conditions

Temperature:	16 °C
Relative Humidity:	40 %
ATM Pressure:	102.0 kPa

*The testing was performed by Victor Zhang from 2008-05-10

5.8 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:

Wi-Fi 802.11a Harmonics & Spurious

30-1000 MHz

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
-8.17	800.009	Vertical	Low, 30 MHz – 1GHz
-6.46	519.974	Vertical	Mid, 30 MHz – 1GHz
-7.02	519.975	Vertical	High, 30 MHz – 1GHz

Above 1GHz

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
-0.98	11490	Vertical	Low, 1GHz – 40GHz
-1.47	11570	Vertical	Mid, 1GHz – 40GHz
-1.44	11650	Vertical	High, 1GHz – 40GHz

Wi-Fi 802.11b Harmonics & Spurious**30-1000 MHz:**

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
-8.83	880.003	Vertical	Low, 30 MHz – 1GHz
-9.76	799.993	Vertical	Mid, 30 MHz – 1GHz
-8.18	879.994	Vertical	High, 30 MHz – 1GHz

Above 1GHz:

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
-5.15	4820	Vertical	Low, 1GHz – 25GHz
-4.82	4874	Vertical	Mid, 1GHz – 25GHz
-9.08	4924	Vertical	High, 1GHz – 25GHz

Wi-Fi 802.11g Harmonics & Spurious**30-1000 MHz:**

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
-8.18	519.953	Vertical	Low, 30 MHz – 1GHz
-7.12	519.969	Vertical	Mid, 30 MHz – 1GHz
-6.98	879.885	Vertical	High, 30 MHz – 1GHz

Above 1GHz:

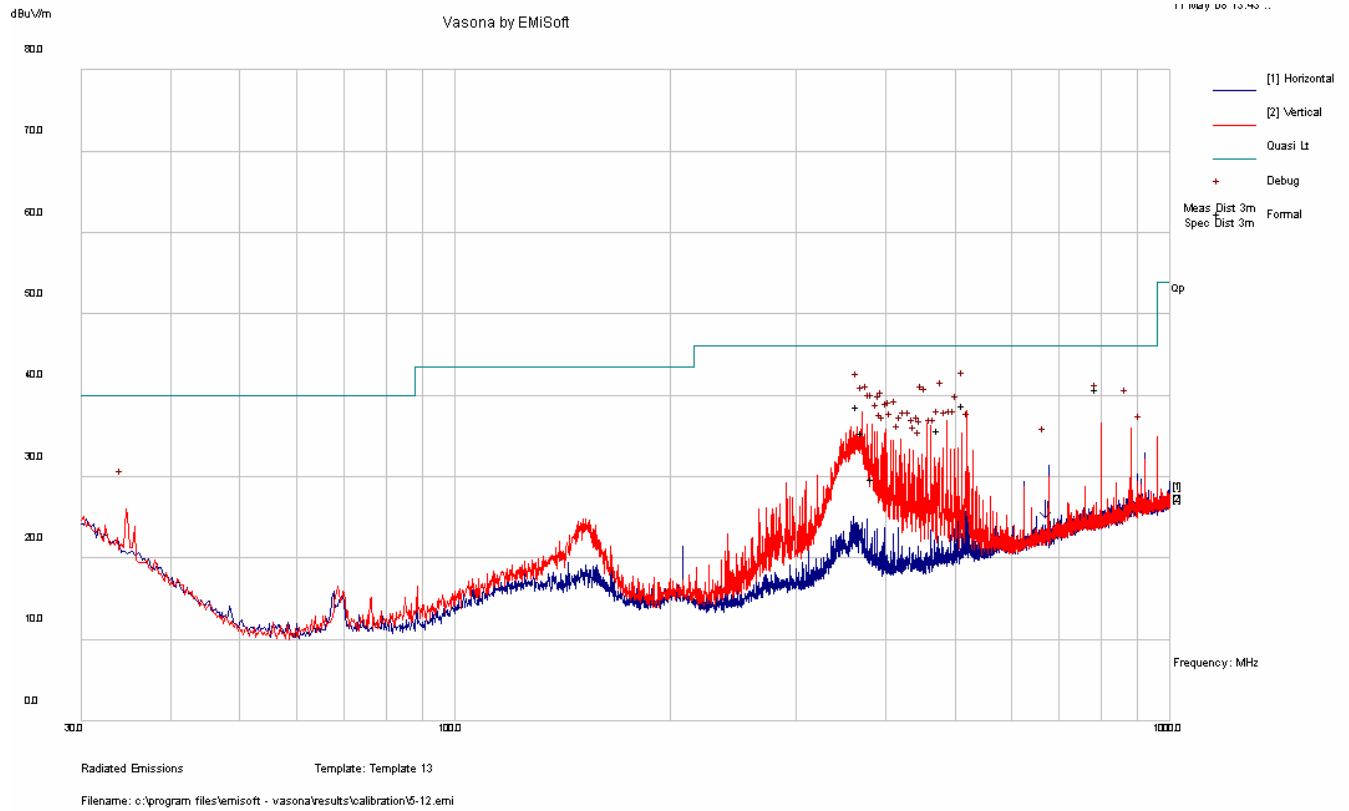
Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
-11.53	4820	Vertical	Low, 1GHz – 25GHz
-10.19	4874	Vertical	Mid, 1GHz – 25GHz
-10.01	4924	Vertical	High, 1GHz – 25GHz

5.9 Radiated Emissions Test plot & data:

Wi-Fi 802.11a

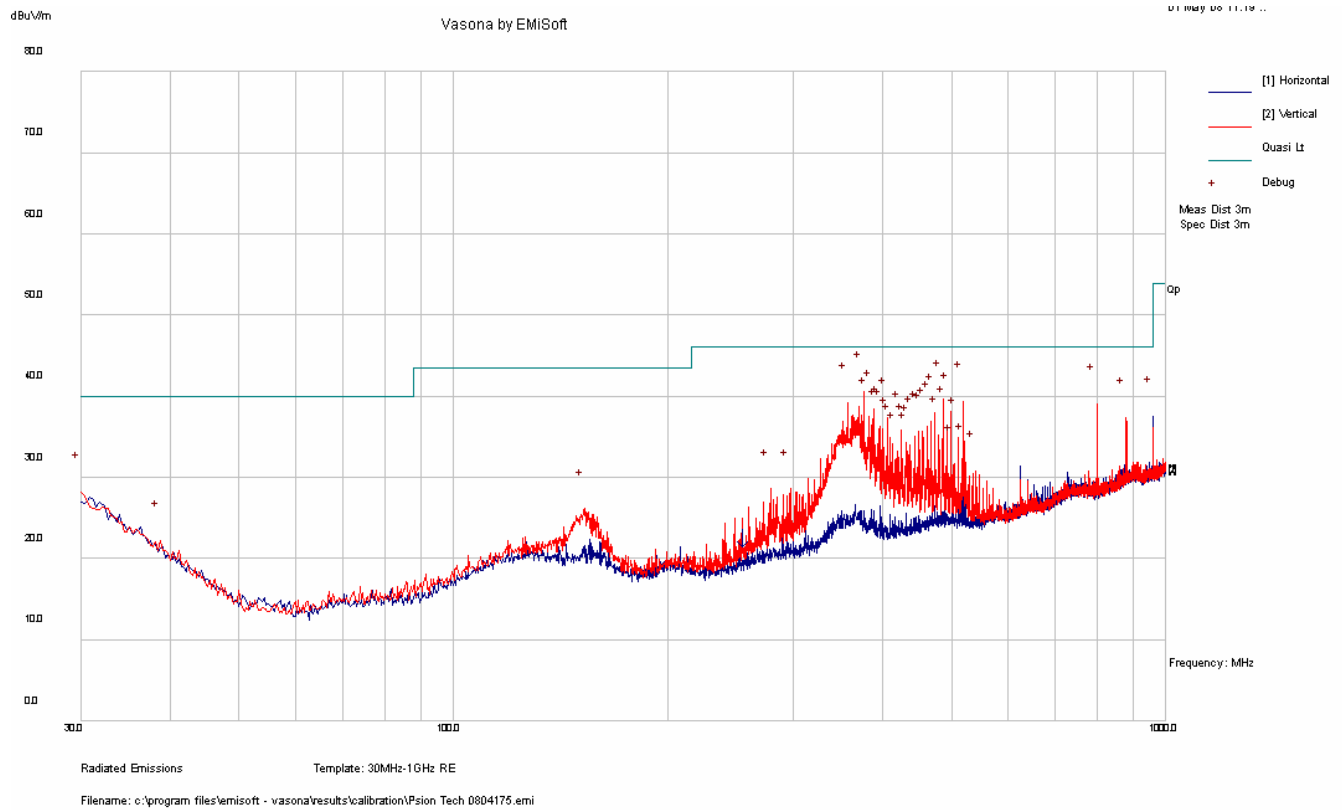
30MHz -1GHz

Low channel 5745 MHz

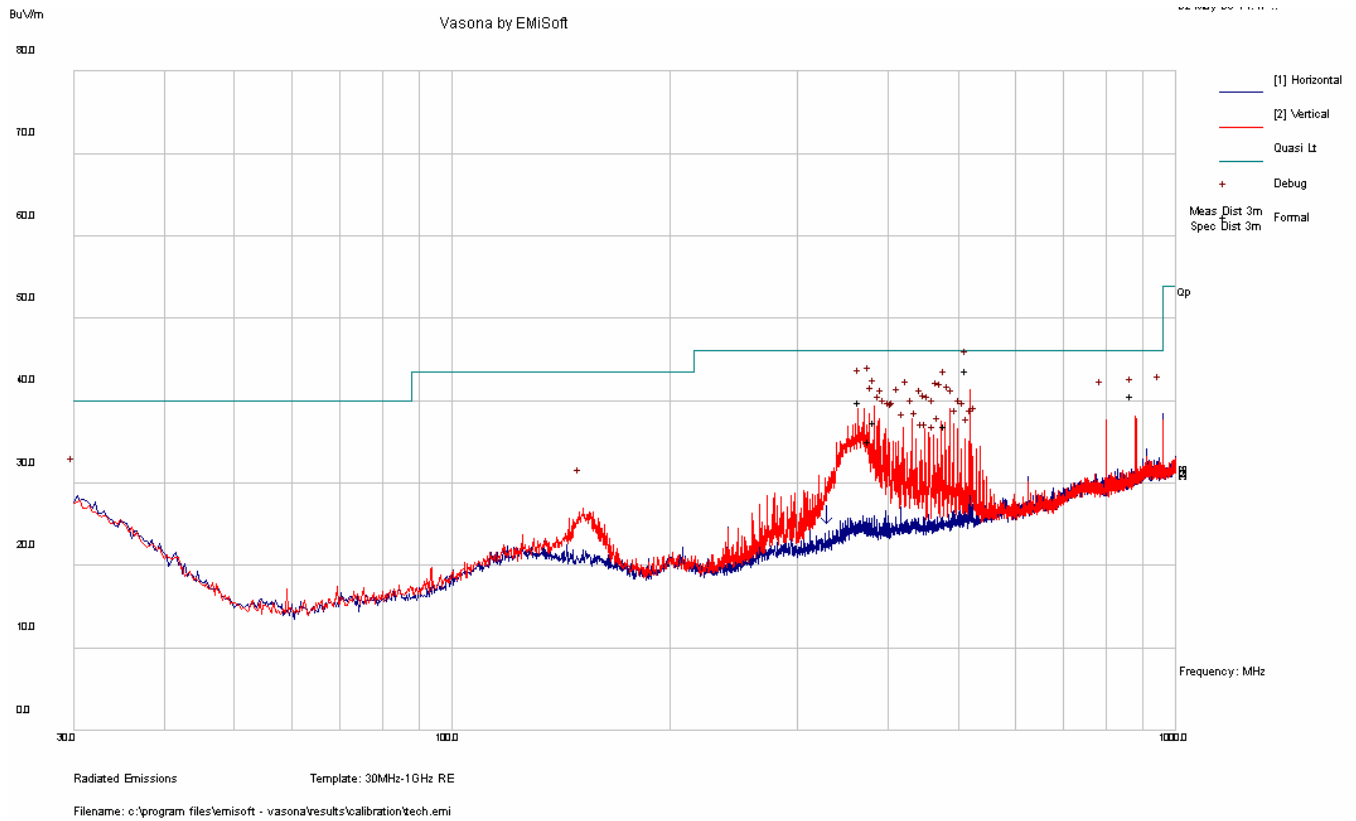


Frequency (MHz)	Quasi-Peak (dBuV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBuV/m)	Margin (dB)
800.009	37.83	167	-8.48	V	0	46	-8.17
382.327	33.39	106	-13.44	V	0	46	-12.61
519.945	32.35	236	-12.3	V	180	46	-13.65
388.459	32.02	125	-13.42	V	106	46	-13.98
357.872	30.62	179	-13.85	V	228	46	-15.38
829.75	23.69	128	-8.06	V	226	46	-22.31

Middle channel 5785 MHz



Frequency (MHz)	Quasi-Peak (dBuV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBuV/m)	Margin (dB)
519.974	39.54	91	-12.3	V	191	46	-6.46
388.431	38.37	100	-13.42	V	36	46	-7.63
799.989	38.23	99	-8.48	V	2	46	-7.77
357.855	34.88	139	-13.85	V	330	46	-11.12
376.224	32.52	109	-13.42	V	244	46	-13.48
486.343	29.76	117	-12.35	V	342	46	-16.24

High channel 5825 MHz

Frequency (MHz)	Quasi-Peak (dBμV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)
519.975	38.98	105	-12.3	V	179	46	-7.02
880.01	35.83	98	-7.38	V	195	46	-10.17
370.112	35.14	125	-13.52	V	296	46	-10.86
486.331	32.23	99	-12.35	V	352	46	-13.77
382.313	30.42	174	-13.44	V	328	46	-15.58

Wi-Fi 802.11a Measured at 3 meters, 1 GHz – 40 GHz**Low channel 5745 MHz**

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
5745	65.67	267	1.14	V	34.7	8.68	0	109.05			Fund/Peak
5745	63.19	267	1.14	V	34.7	8.68	0	106.57			Fund/Ave.
5745	63.84	200	1.7	H	34.7	8.68	0	107.22			Fund/Peak
5745	63.08	200	1.7	H	34.7	8.68	0	106.46			Fund/Ave.
11490	39.07	292	2.01	V	41.2	8.33	35.58	53.02	54	-0.98	Ave
17235	34.81	16	1.19	V	43	10.52	35.86	52.47	54	-1.53	Ave
17235	42.7	16	1.19	V	43	10.52	35.86	60.36	74	-13.64	Peak
11490	43.66	292	2.01	V	41.2	8.33	35.58	57.61	74	-16.39	Peak

Middle channel 5785 MHz

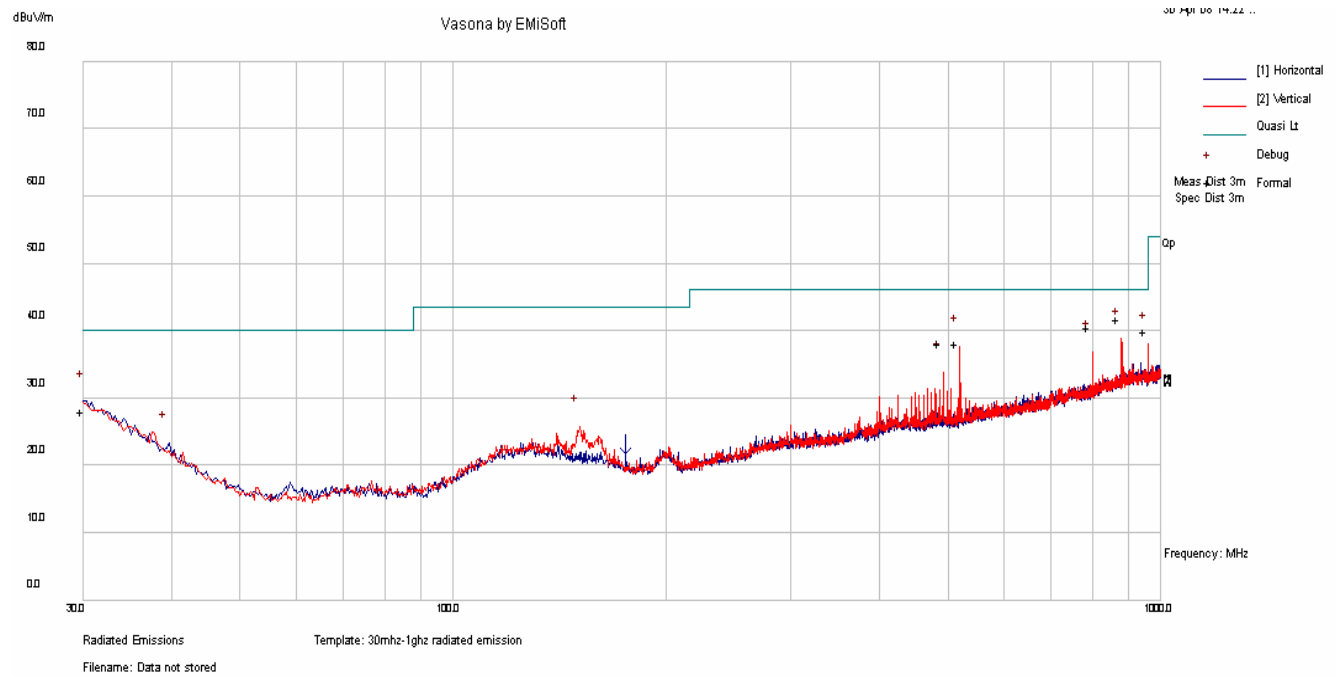
Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
5785	64	265	1.37	V	34.7	8.7	0	107.4			Fund/Peak
5785	63.23	265	1.37	V	34.7	8.7	0	106.63			Fund/Ave.
5785	64.22	210	1.34	H	34.7	8.7	0	107.62			Fund/Peak
5785	63.48	210	1.34	H	34.7	8.7	0	106.88			Fund/Ave.
11570	38.58	305	1.77	V	41.2	8.35	35.6	52.53	54	-1.47	Ave
17355	33.5	344	1.17	V	43	10.71	35.89	51.32	54	-2.68	Ave
11570	45.26	305	1.77	V	41.2	8.35	35.6	59.21	74	-14.79	Peak
17355	40.12	344	1.17	V	43	10.71	35.89	57.94	74	-16.06	Peak

High channel 5825 MHz

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
5825	61.92	265	1.77	V	34.7	8.72	0	105.34			Fund/Peak
5825	59.36	265	1.77	V	34.7	8.72	0	102.78			Fund/Ave.
5825	64.93	210	1.25	H	34.7	8.72	0	108.35			Fund/Peak
5825	64.16	210	1.25	H	34.7	8.72	0	107.58			Fund/Ave.
11650	38.52	191	1.8	V	41.2	8.43	35.59	52.56	54	-1.44	Ave
17475	30.99	138	1	V	46.1	10.93	35.93	52.09	54	-1.91	Ave
17475	40.51	138	1	V	46.1	10.93	35.93	61.61	74	-12.39	Peak
11650	43.68	191	1.8	V	41.2	8.43	35.59	57.72	74	-16.28	Peak

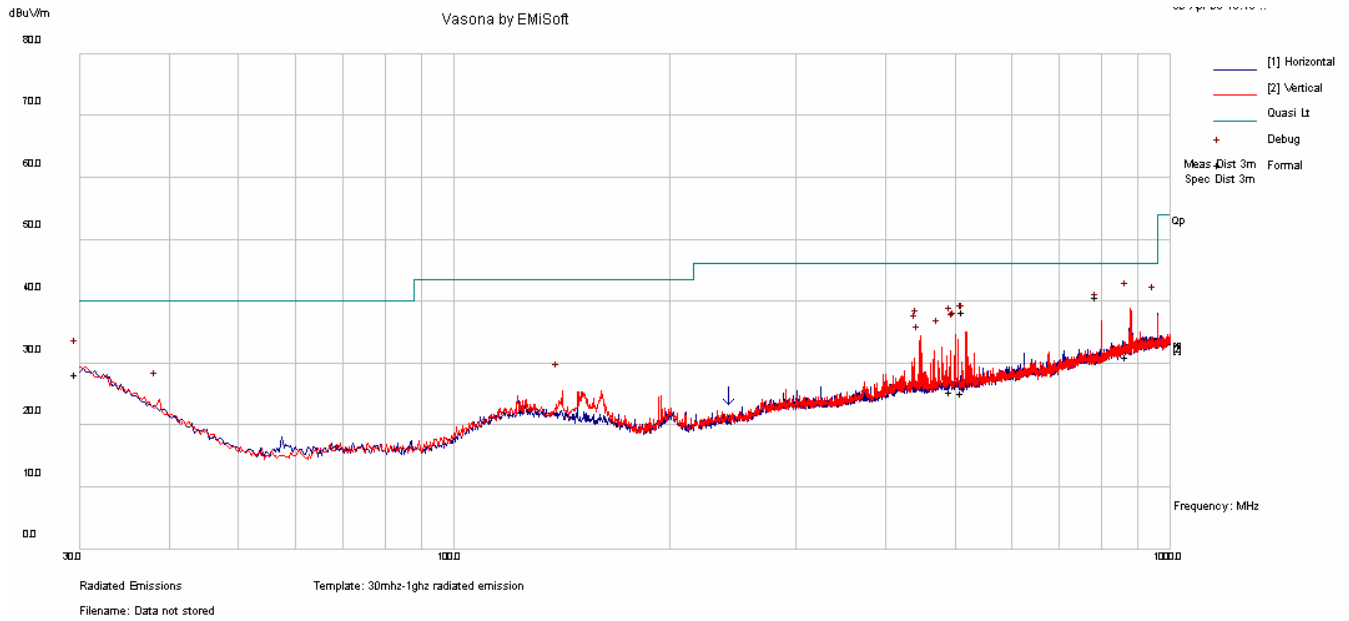
Restricted Band Edge (Near Band Edge): Low channel

Frequency (MHz)	Receiver Reading (dBµV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Comments
5445.789	43.66	200	1	V	34.6	5.4	37.6	46.06	54	-7.94	Ave
5445.446	41.07	304	1.02	H	34.6	5.4	37.6	43.47	54	-10.53	Ave
5445.789	47.15	200	1	V	34.6	5.4	37.6	49.55	74	-24.45	Peak
5445.446	44.98	304	1.02	H	34.6	5.4	37.6	47.38	74	-26.62	Peak

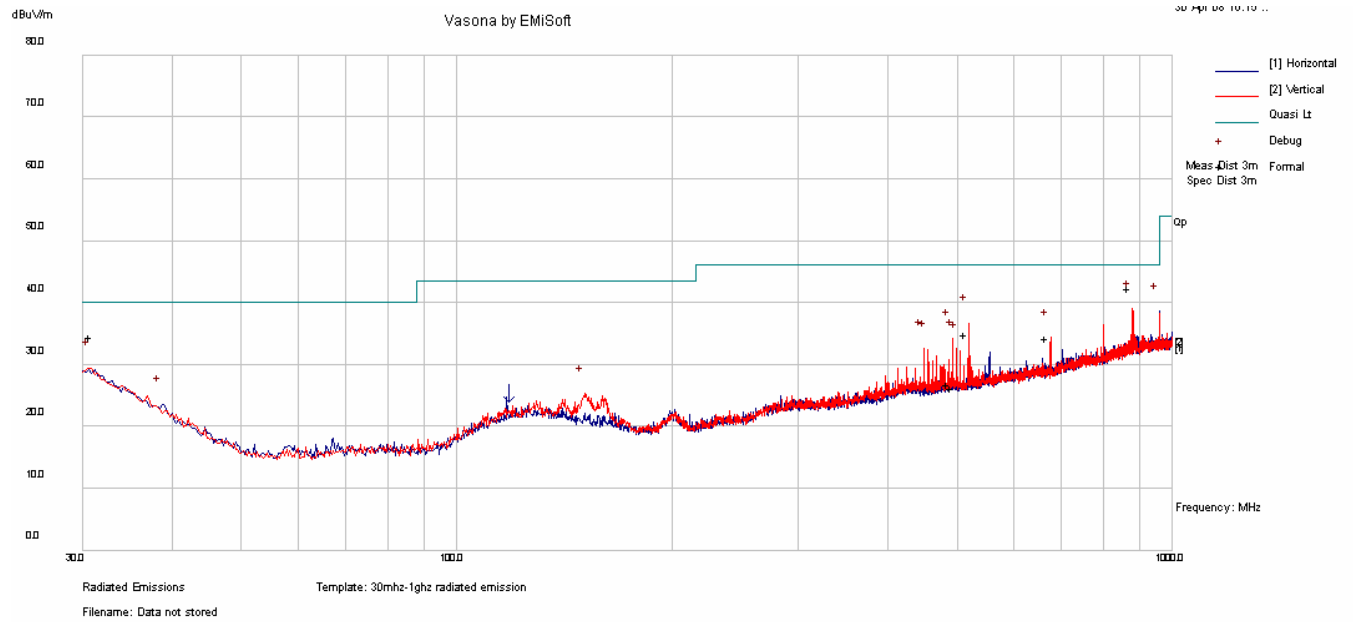
Wi-Fi 802.11b**30MHz -1GHz****Low channel 2410 MHz**

Frequency (MHz)	Quasi-Peak (dB μ V/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dB μ V/m)	Margin (dB)
880.003	37.17	186	-5.4	V	186	46	-8.83
799.997	36.09	12	-6.5	V	12	46	-9.91
519.979	33.63	134	-10.6	V	134	46	-12.37
492.445	33.55	344	-10.47	V	344	46	-12.45
30.352	23.53	99	-6.48	H	99	40	-16.47
960.005	35.38	218	-4.46	V	218	54	-18.62

Middle channel 2437 MHz



Frequency (MHz)	Quasi-Peak (dBuV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBuV/m)	Margin (dB)
799.993	36.24	103	-6.5	V	8	46	-9.76
519.971	33.74	100	-10.6	V	140	46	-12.26
30	23.73	301	-6.2	V	336	40	-16.27
879.682	26.52	211	-5.4	V	318	46	-19.48
500.551	20.82	181	-10.5	V	214	46	-25.18
518.1	20.71	304	-10.6	V	342	46	-25.29

High channel 2462 MHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBuV/m)	Margin (dB)
879.994	37.82	96	-5.4	V	182	46	-8.18
31.108	30.06	118	-7.09	V	342	40	-9.94
519.999	30.3	210	-10.6	V	188	46	-15.7
675.246	29.74	108	-8.3	V	216	46	-16.26
492.477	22.35	187	-10.47	V	24	46	-23.65
498.545	21.64	190	-10.49	V	298	46	-24.36

Wi-Fi 802.11b Measured at 3 meters, 1 GHz – 25 GHz**Low channel 2410 MHz**

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2410	76.41	209	1.22	V	29.1	5.66	0	111.17			Fund/Peak
2410	75.64	209	1.22	V	29.1	5.66	0	110.4			Fund/Ave.
2410	79.51	160	1.26	H	29.1	5.66	0	114.27			Fund/Peak
2410	78.33	160	1.26	H	29.1	5.66	0	113.09			Fund/Ave.
4820	48.9	171	1.07	V	33.5	4.99	38.54	48.85	54	-5.15	Ave.
4820	38.64	158	1.03	H	33.5	4.99	38.54	38.59	54	-15.41	Ave
4820	51.66	171	1.07	V	33.5	4.99	38.54	51.61	74	-22.39	Peak
4820	42.59	158	1.03	H	33.5	4.99	38.54	42.54	74	-31.46	Peak

Middle channel 2437 MHz

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2437	78.39	225	1.11	V	29.2	5.68	0	113.27			Fund/Peak
2437	77.93	225	1.11	V	29.2	5.68	0	112.81			Fund/Ave.
2437	78.78	170	1.25	H	29.2	5.68	0	113.66			Fund/Peak
2437	78.3	170	1.25	H	29.2	5.68	0	113.18			Fund/Ave.
4874	49.27	220	1	V	33.4	4.92	38.4	49.19	54	-4.81	Ave.
7311	38.74	157	1	H	38	6.44	36.17	47.01	54	-6.99	Ave
4874	52.25	220	1	V	33.4	4.92	38.4	52.17	74	-21.83	Peak
7311	42.51	157	1	H	38	6.44	36.17	50.78	74	-23.22	Peak

High channel 2462 MHz

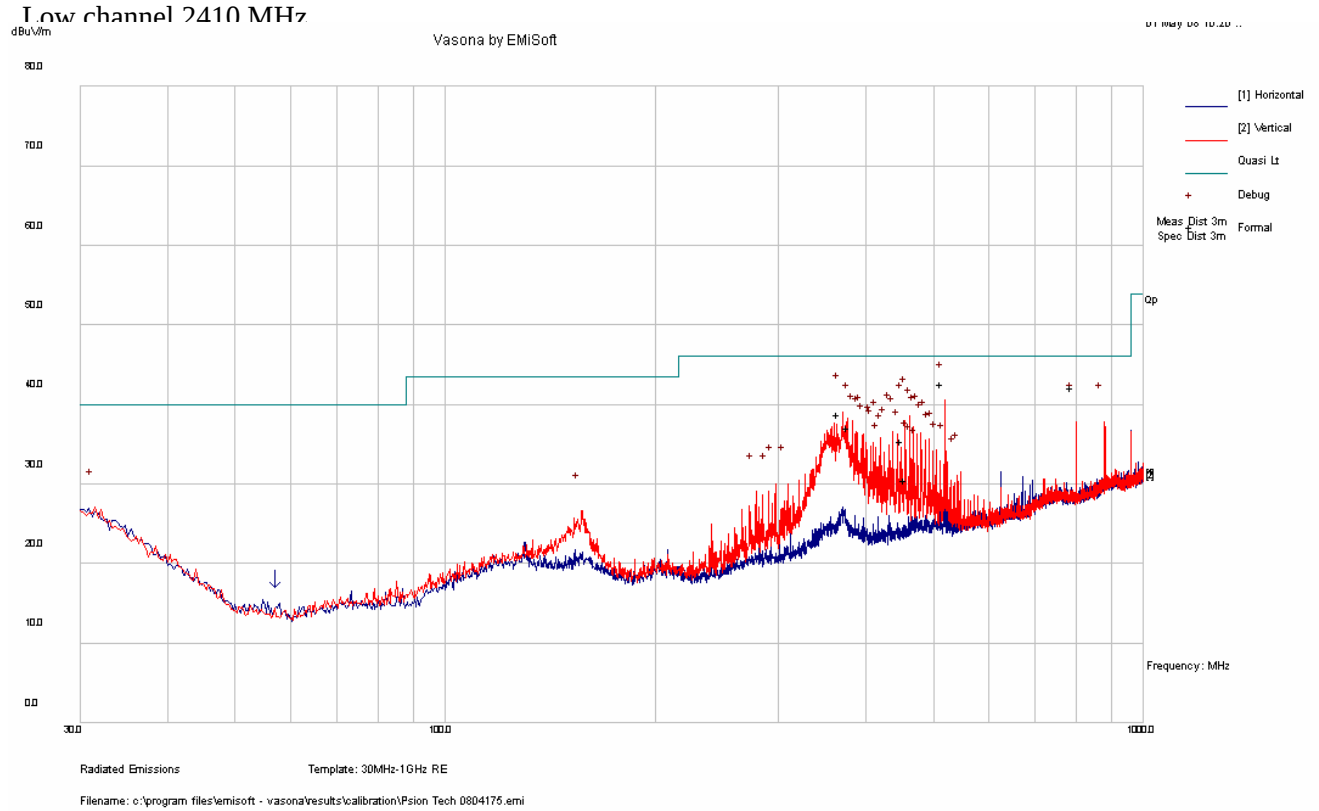
Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2462	76.69	220	1.11	V	29.2	5.7	0	111.59			Fund/Peak
2462	75.23	220	1.11	V	29.2	5.7	0	110.13			Fund/Ave.
2462	77.19	170	1	H	29.2	5.7	0	112.09			Fund/Peak
2462	75.54	170	1	H	29.2	5.7	0	110.44			Fund/Ave.
4924	44.8	220	1	V	33.6	4.92	38.4	44.92	54	-9.08	Ave.
4924	39.26	170	1	H	33.6	4.92	38.4	39.38	54	-14.62	Ave
4924	49.21	220	1	V	33.6	4.92	38.4	49.33	74	-24.67	Peak
4924	42.85	170	1	H	33.6	4.92	38.4	42.97	74	-31.03	Peak

Restricted Band Edge (Near Band Edge): Low channel

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2389.75	41.64	258	1.28	V	29	3.68	39.02	35.3	54	-18.7	Ave
2389.03	38.64	208	1.17	H	29	3.68	39.02	32.3	54	-21.7	Ave
2389.75	44.65	258	1.28	V	29	3.68	39.02	38.31	74	-35.69	Peak
2389.03	42.59	208	1.17	H	29	3.68	39.02	36.25	74	-37.75	Peak

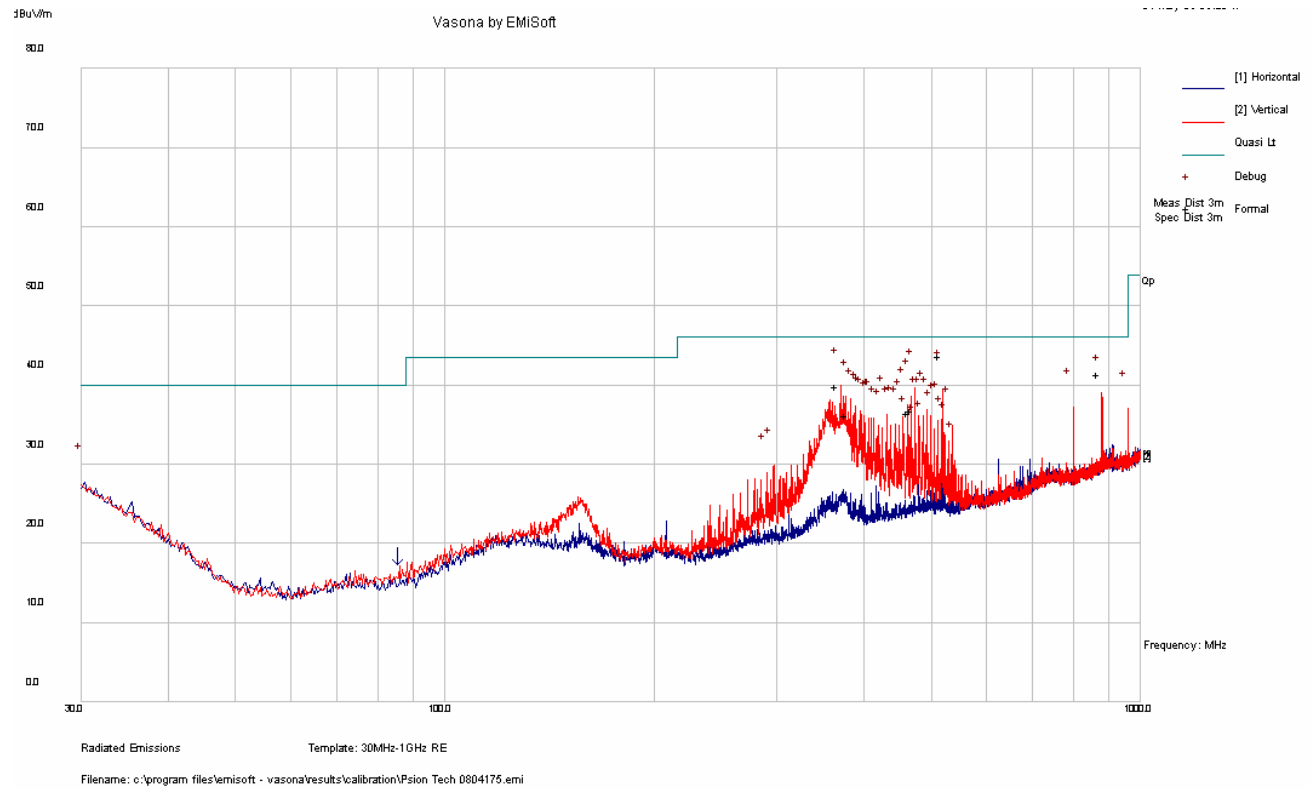
Restricted Band Edge (Near Band Edge): High channel

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2489.73	41.87	208	1	V	29.2	3.72	39.25	35.54	54	-18.46	Ave
2488.69	40.78	243	1.39	H	29.2	3.72	39.25	34.45	54	-19.55	Ave
2489.73	45.24	208	1	V	29.2	3.72	39.25	38.91	74	-35.09	Peak
2488.69	44.65	243	1.39	H	29.2	3.72	39.25	38.32	74	-35.68	Peak

Wi-Fi 802.11g**30MHz -1GHz**

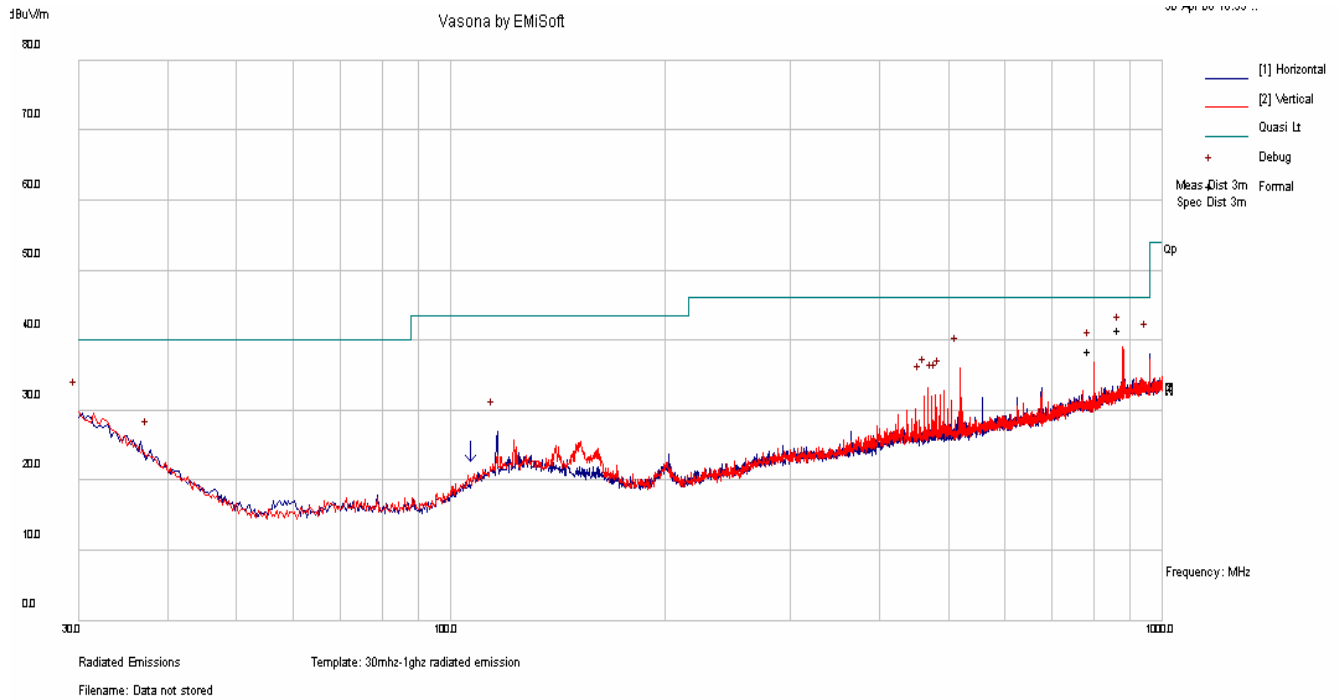
Frequency (MHz)	Quasi-Peak (dBμV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)
519.953	37.82	98	-12.3	V	184	46	-8.18
799.995	37.43	99	-8.48	V	167	46	-8.57
370.083	34.1	161	-13.52	V	20	46	-11.9
382.316	32.36	115	-13.44	V	289	46	-13.64
455.764	30.59	99	-12.91	V	62	46	-15.41
461.873	25.8	193	-12.78	V	28	46	-20.2

Middle channel 2437 MHz



Frequency (MHz)	Quasi-Peak (dBμV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)
519.969	38.88	98	-12.3	V	178	46	-7.12
880.024	36.68	98	-7.38	V	188	46	-9.32
370.152	35.16	116	-13.52	V	323	46	-10.84
474.089	31.99	99	-12.55	V	18	46	-14.01
467.963	31.66	100	-12.67	V	350	46	-14.34
382.311	31.47	101	-13.44	V	114	46	-14.53

High channel 2462 MHz



Frequency (MHz)	Quasi-Peak (dBμV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)
879.885	39.02	107	-5.4	V	338	46	-6.98
800.009	36.88	123	-6.5	V	12	46	-9.12
519.841	35.96	101	-10.6	V	20	46	-10.04
30	29.7	208	-6.2	V	0	46	-10.3
468.104	33.09	100	-11.05	V	178	46	-12.91
492.308	32.8	144	-10.47	V	338	46	-13.2

WI-FI 802.11g, Measured at 3 meters, 1 GHz – 25 GHz**Low channel 2410 MHz**

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2410	78.21	205	1.14	V	29.1	5.66	0	112.97			Fund/Peak
2410	76.51	205	1.14	V	29.1	5.66	0	111.27			Fund/Ave.
2410	83.91	170	1.25	H	29.1	5.66	0	118.67			Fund/Peak
2410	82.97	170	1.25	H	29.1	5.66	0	117.73			Fund/Ave.
4820	42.52	210	1.19	V	33.5	4.99	38.54	42.47	54	-11.53	Ave.
4820	38.25	318	1.19	H	33.5	4.99	38.54	38.2	54	-15.8	Ave
4820	46.24	210	1.19	V	33.5	4.99	38.54	46.19	74	-27.81	Peak
4820	42.17	318	1.65	H	33.5	4.99	38.54	42.12	74	-31.88	Peak

Middle channel 2437 MHz

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2437	78.64	208	1.17	V	29.2	5.68	0	113.52			Fund/Peak
2437	77.5	208	1.17	V	29.2	5.68	0	112.38			Fund/Ave.
2437	76.18	175	1.14	H	29.2	5.68	0	111.06			Fund/Peak
2437	75.23	175	1.14	H	29.2	5.68	0	110.11			Fund/Ave.
4874	43.89	208	1.17	V	33.4	4.92	38.4	43.81	54	-10.19	Ave.
4874	38.65	117	1.9	H	33.4	4.92	38.4	38.57	54	-15.43	Ave
4874	47.28	208	1.17	V	33.4	4.92	38.4	47.2	74	-26.8	Peak
4874	41.32	117	1.9	H	33.4	4.92	38.4	41.24	74	-32.76	Peak

High channel 2462 MHz

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2462	73.89	220	1.34	V	29.2	5.7	0	108.79			Fund/Peak
2462	72.6	220	1.34	V	29.2	5.7	0	107.5			Fund/Ave.
2462	73.67	170	1.04	H	29.2	5.7	0	108.57			Fund/Peak
2462	72.24	170	1.04	H	29.2	5.7	0	107.14			Fund/Ave.
4924	43.87	202	1.46	V	33.6	4.92	38.4	43.99	54	-10.01	Ave.
4924	42.76	174	1.33	H	33.6	4.92	38.4	42.88	54	-11.12	Ave
4924	46.02	202	1.46	V	33.6	4.92	38.4	46.14	74	-27.86	Peak
4924	43.78	174	1.33	H	33.6	4.92	38.4	43.9	74	-30.1	Peak

Restricted Band Edge (Near Band Edge): Low channel

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2390.45	41.28	217	1.24	V	29	3.68	39.02	34.94	54	-19.06	Ave
2389.17	40.13	265	1.32	H	29	3.68	39.02	33.79	54	-20.21	Ave
2390.45	45.83	217	1.24	V	29	3.68	39.02	39.49	74	-34.51	Peak
2389.17	44.77	265	1.32	H	29	3.68	39.02	38.43	74	-35.57	Peak

Restricted Band Edge (Near Band Edge): High channel

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
2487.13	42.76	174	1.33	V	29.2	3.72	39.25	36.43	54	-17.57	Ave
2488.52	38.41	202	1.08	H	29.2	3.72	39.25	32.08	54	-21.92	Ave
2487.13	44.26	174	1.33	V	29.2	3.72	39.25	37.93	74	-36.07	Peak
2488.52	43.78	202	1.08	H	29.2	3.72	39.25	37.45	74	-36.55	Peak

6 FCC §15.109, RSS-GEN – UNWANTED SPURIOUS EMISSIONS AND RECEIVER SPURIOUS EMISSIONS

6.1 Applicable Standard

According to §15.247(a)(2), Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field strength (microvolt/meter)
30-88	100
88-216	150
216-960	200
Above 960	500

6.2 Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date
Mini-Circuits	Pre amplifier	ZKL-2	7786100643	2008-01-02
HP	Pre amplifier	8449B	3147A00400	2007-11-02
Sunol Science Corp	Combination Antenna	JB1 Antenna	A103105-3	2008-03-25
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2007-06-07
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28

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

6.3 Environmental Conditions

Temperature:	16 °C
Relative Humidity:	40 %
ATM Pressure:	102.0 kPa

**The testing was performed by Victor Zhang on 2008-05-10.*

6.4 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:

Wi-Fi 802.11a Unwanted Emissions and Receiving Spurious Emission

30-1000 MHz:

Mode: Receiving			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range (MHz)
-5.36	382.352	Vertical	30 to 1000 MHz

Above 1GHz:

Mode: Receiving			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range (GHz)
-11.46	5784.625	Vertical	1 – 40GHz

Wi-Fi 802.11b Unwanted Emissions and Receiving Spurious Emission**30-1000 MHz:**

Mode: Receiving			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range (MHz)
-8.57	520.002	Vertical	30 to 1000 MHz

Above 1GHz:

Mode: Receiving			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range (GHz)
-11.01	4873.874	Vertical	1 – 25GHz

Wi-Fi 802.11g Unwanted Emissions and Receiving Spurious Emission**30-1000 MHz:**

Mode: Receiving			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range (MHz)
-7.79	519.977	Vertical	30 to 1000 MHz

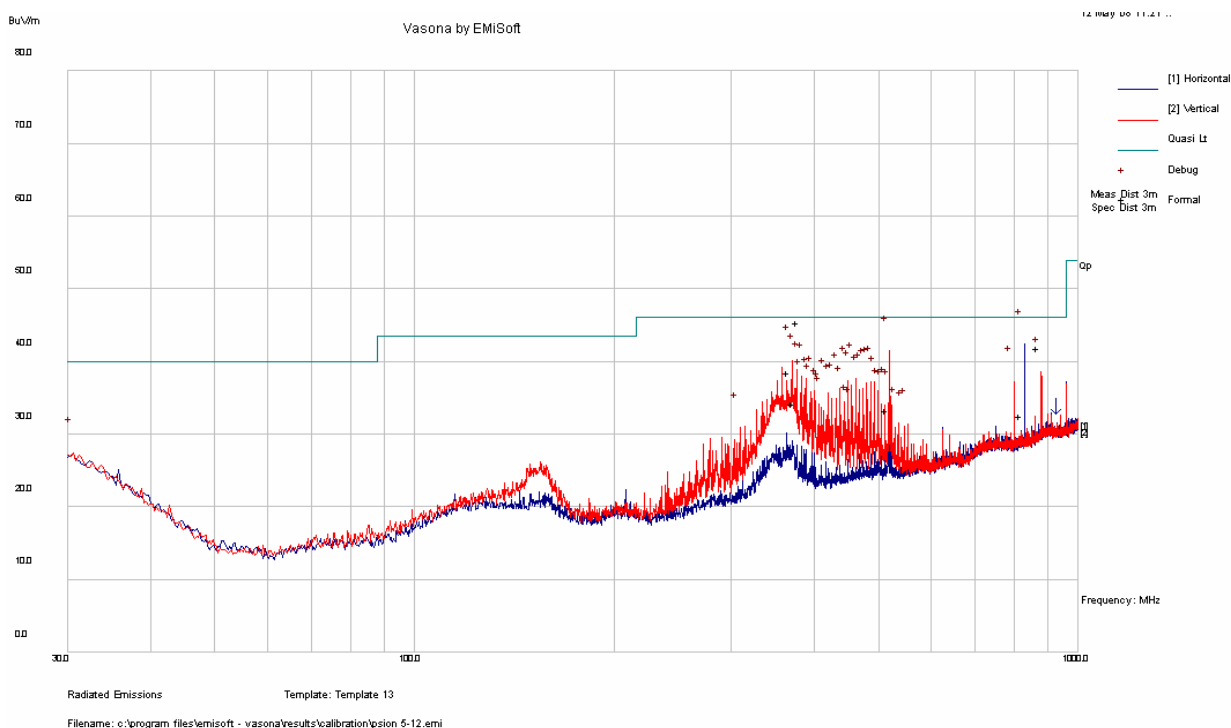
Above 1GHz:

Mode: Receiving			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Range (GHz)
-13.8	4874.59	Vertical	1 – 25GHz

6.5 Radiated Emissions Test plot & data:

Wi-Fi 802.11a

30MHz -1GHz

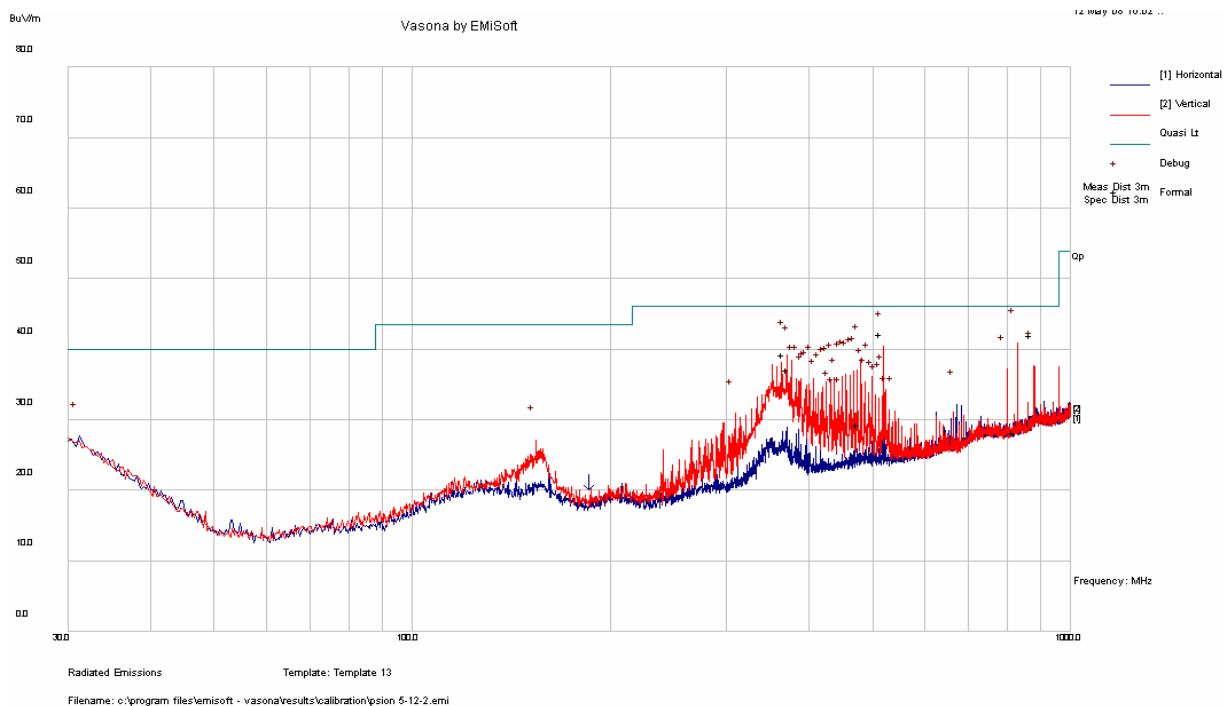


Frequency (MHz)	Quasi-Peak (dBμV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)
382.352	40.64	143	-13.44	V	43	46	-5.36
880.011	37.17	98	-7.38	V	163	46	-8.83
370.108	33.72	100	-13.52	V	310	46	-12.28
376.239	29.5	170	-13.42	V	99	46	-16.5
519.993	28.58	199	-12.3	V	40	46	-17.42
829.868	27.82	383	-8.06	H	35	46	-18.18

Wi-Fi 802.11a, Measured at 3 meters, 1 GHz – 40 GHz

Receiving Mode (Middle Channel)

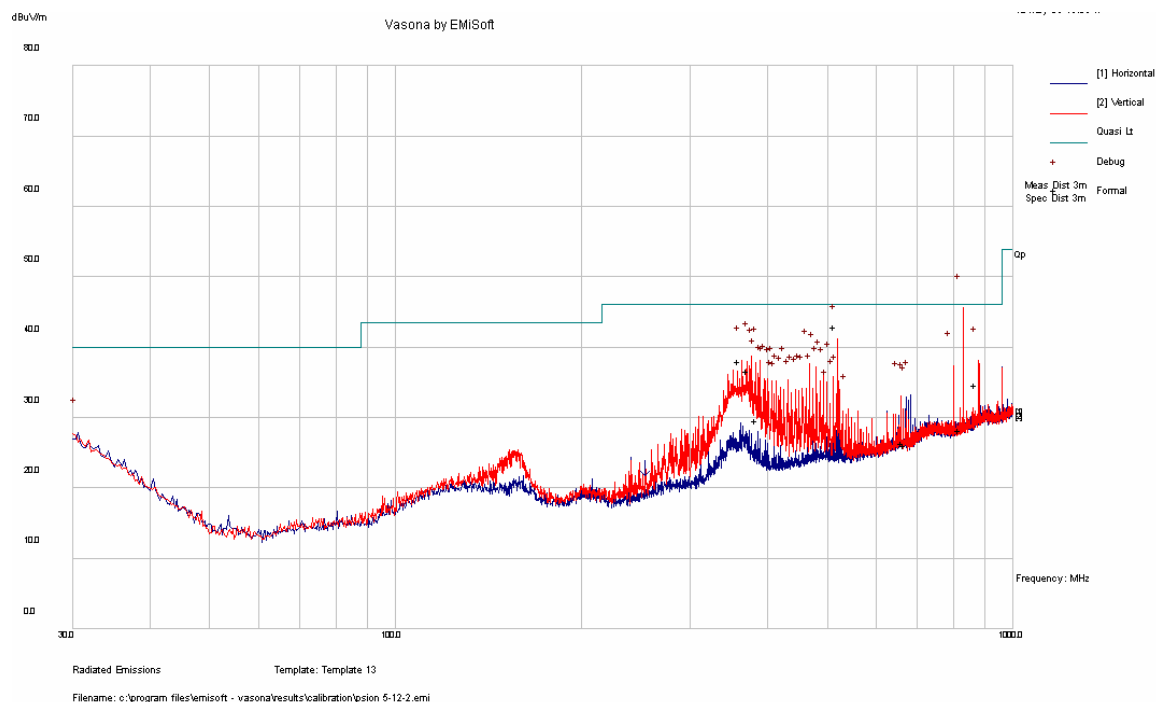
Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
5784.625	40.08	235	1.2	V	34.7	5	37.24	42.54	54	-11.46	Ave
5784.625	44.29	235	1.2	V	34.7	5	37.24	46.75	74	-27.25	Peak

Wi-Fi 802.11b**30MHz -1GHz**

Frequency (MHz)	Quasi-Peak (dBμV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)
520.002	37.43	105	-12.3	V	195	46	-8.57
880.011	37.17	99	-7.38	V	185	46	-8.83
370.106	34.41	116	-13.52	V	62	46	-11.59
376.215	32.28	120	-13.42	V	125	46	-13.72
480.229	24.52	278	-12.44	V	311	46	-21.48
829.931	23.4	178	-8.06	V	207	46	-22.6

WI-FI 802.11b, Measured at 3 meters, 1 GHz – 25 GHz**Receiving Mode (Middle Channel)**

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
4873.874	43.07	154	1.85	V	33.4	4.92	38.4	42.99	54	-11.01	Ave
4920.125	36.6	0	1.49	H	33.4	4.92	38.4	36.52	54	-17.48	Ave
4873.874	43.68	154	1.85	V	33.4	4.92	38.4	43.6	74	-30.4	Peak
4920.125	39.12	0	1.49	H	33.4	4.92	38.4	39.04	74	-34.96	Peak

Wi-Fi 802.11g**30MHz -1GHz**

Frequency (MHz)	Quasi-Peak (dBμV/m)	Antenna Height (cm)	Correction Factor (dB)	Ant. Polarity (H/V)	Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)
519.977	38.21	100	-12.3	V	198	46	-7.79
364	33.23	142	-13.68	V	298	46	-12.77
376.231	31.94	106	-13.42	V	113	46	-14.06
879.995	29.95	100	-7.38	V	348	46	-16.05
388.467	24.84	293	-13.42	V	-28	46	-21.16
829.867	23.51	231	-8.06	V	61	46	-22.49

Wi-Fi 802.11g, Measured at 3 meters, 1 GHz – 25 GHz**Receiving Mode (Middle Channel)**

Frequency (MHz)	Receiver Reading (dBμV)	Azimuth Degrees	Ant. Height (m)	Ant. Polar. (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Corrected Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comments
4874.59	40.28	65	1.93	V	33.4	4.92	38.4	40.2	54	-13.8	Ave
4874.32	39.99	174	1.33	H	33.4	4.92	38.4	39.91	54	-14.09	Ave
4874.59	44.57	65	1.93	V	33.4	4.92	38.4	44.49	74	-29.51	Peak
4874.32	43.66	174	1.33	H	33.4	4.92	38.4	43.58	74	-30.42	Peak