FCC PART 15 SUBPART C
IC RSS-210 ISSUE 8, DEC 2010
TEST AND MEASUREMENT REPORT

For

Trimble Navigation Limited

935 Stewart Drive,

Sunnyvale, CA 94085, USA

FCC ID: JUP-9090991
IC: 1756A-9090991

Report Type:	**Product Type:**
Original Report	GPS Receiver with 900 MHz Transceiver

Prepared By: Quinn Jiang

Report Number: R1202142-247

Report Date: 2012-07-02

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1202142-247	Original Report	2012-07-02

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Trimble Navigation* and their product, *model number: SBSMA-110B, P/N: 90909-91, FCC ID: JUP-9090991, IC: 1756A-9090991* or the "EUT" as referred to this report. The EUT is a 900 MHz FHSS transceiver which consists of GPS receiver, 2.4 GHz Wi-Fi+ Bluetooth and UMTS/GSM radio modules inside. Both 2.4 GHz 802.11+Bluetooth combo module and UMTS/GSM module obtain the modular approval.

1.2 Mechanical Description of EUT

The EUT measures approximately 11.2 cm **(L)** x 11.2 cm **(W)** x 19.2 cm **(H)** and weighs approximately 1.15 kg.

The data gathered are from a typical production sample with serial 5148100030, provided by the manufacturer.

1.3 Objective

This report is prepared on behalf of *Trimble Navigation Ltd* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rules and IC RSS-210 Issue 8, Dec 2010.

This device has an identical RF portion compare to the FCC ID: JUP-6829395, IC: 1756A-6829395 with no RF parameter change, all parameter taken for this project are all for radiated performance, share will the conducted parameter from FCC ID: JUP-6829395, IC: 1756A-6829395. Please refer to declaration of similarity for more detail information on the RF portion.

1.4 Related Submittal(s)/Grant(s)

FCC ID: JUP-6829395, IC: 1756A-6829395

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the 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 CISPR16-4-2:2003, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 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 site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have 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 test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is **a**n American Association for laboratory Accreditation (A2LA**)** accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

2 System Test Configuration

2.1 Justification

The system was configured for testing in accordance with 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 software used, CommSet.EXE version 1.27 was provided by client and verified by Quinn Jiang to comply with the standard requirements being tested against.

2.3 Special Accessories

N/A.

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
DELL	Laptop	PP18L	-

2.6 Internal Parts List and Details

Manufacturers	Descriptions	Models	Serial Numbers
Trimble Navigation	900 MHz Module	80385-B	-
Trimble Navigation	GNSS Receiver Board	68432-C	-
Trimble Navigation	GSM/UMTS Board	68604-D	-
Trimble Navigation	GSM/UMTS Radio	UC864-G	-
Taoglass	BT and Wi-Fi Antenna	SWLP-12	-
Trimble Navigation	Interface Board	78834-C	-

2.7 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
Delta Electronics Inc.	AC/DC Adapter	ADP-65JH AB	67JW1CG0080

2.8 Interface Ports and Cabling

Cable Description	Length (m)	From	To
-	-	-	-

3 Summary of Test Results

FCC & IC Rules	Description of Test	Result
FCC §15.247 (i), §2.1091 IC RSS-102	RF Exposure	Compliant
FCC §15.203 IC RSS-Gen §7.1.2	Antenna Requirements	Compliant
FCC §15.207 (a) IC RSS-Gen §7.2.4	AC Line Conducted Emissions	Compliant
FCC §15.247(d) IC RSS-210 §A8.5	Spurious Emissions at Antenna Port	Note[1]
FCC §15.205, §15.209, §15.247(d) IC RSS-210 §2.2, §A8.5	Restricted Bands, Spurious Radiated Emissions	Compliant
FCC §15.247 (a)(1)(i) IC RSS-210 §A8.1(c)	20 dB Channel Bandwidth	Note[1]
FCC §15.247 (a)(1) IC RSS-210 §A8.1(b)	Hopping Channel Separation	Note[1]
FCC §15.247 (a)(1)(i) IC RSS-210 §A8.1(c)	Dwell Time	Note[1]
FCC §15.247(a)(1)(i) IC RSS-210 §A8.1(c)	Number of Hopping Channels	Note[1]
FCC §15.247(b)(2) IC RSS-210 §A8.4 (1)	Maximum Peak Output Power	Note[1]
FCC §15.247(d) IC RSS-210 §A8.5	Band Edge	Note[1]
FCC Part 15.109 IC RSS-Gen §6	Receiver Spurious Emission	Compliant

Note[1]*: Please refer to FCC ID: JUP-6829395, IC: 1756A-6829395*

4 FCC §15.203 & IC RSS-Gen §7.1.2 – Antenna Requirements

4.1 Applicable Standard

For intentional device, according to FCC Part §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

Per IC RSS-Gen §7.1.2, A transmitter can only be sold or operated with antennas with which it was certified. A transmitter maybe 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.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in IC RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to IC RSS-210 Annex 8 or RSS-210 Annex 9, the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to IC RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

4.2 Result

The EUT has maximum gain of 3 dBi antenna with the reverse-polarity SMA connector, which in accordance to sections FCC Part 15.203 and IC RSS-Gen §7.1.2, is considered sufficient to comply with the provisions of these sections. Please refer to the EUT photos.

5 FCC §15.207 & IC RSS-Gen §7.2.4 – AC Line Conducted Emissions

5.1 Applicable Standards

As per FCC §15.207 & IC RSS-Gen §7.2.4 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 µH/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 [1]	56 to 46 [1]
0.5-5	56	46
5-30	60	50

***Note* [1]:** *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 Part15.207 and IC RSS-Gen limits.

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

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V/60 Hz AC power.

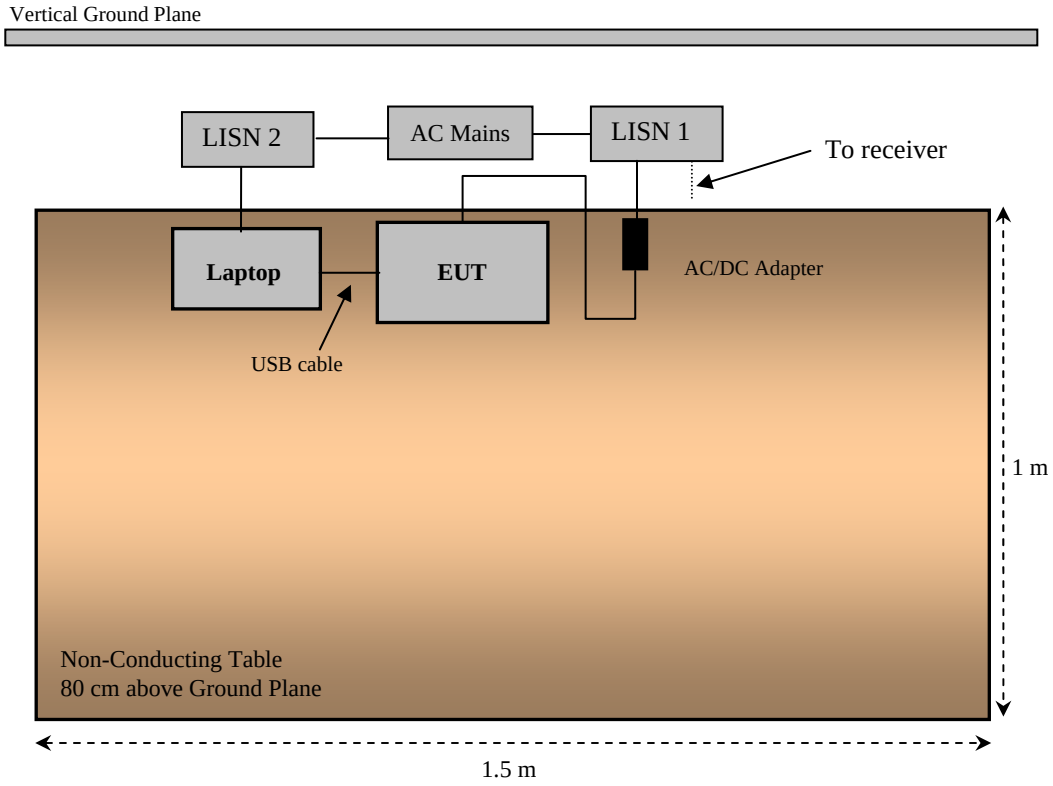
5.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-2.

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”.

5.4 Test Setup Block Diagram



5.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL) plus the High Pass Filter/Attenuator value (HA) and subtracting the Amplifier Gain (Ga) to the indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + CL + HA – Ga

For example, a corrected amplitude (CA) of 36 dBuV = Indicated Amplitude reading (Ai) of 50.0 dBuV + Cable Loss (CL) 1.0 dB + High Pass Filter/Attenuator (IA) 5 dB - Amplifier Gain (Ga) 20 dB

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

Margin (dB) = Corrected Amplitude (dBuV) - Limit (dBuV)

5.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2011-04-14
Solar Electronics	LISN	9252-R-24-BNC	511205	2011-06-25
TTE	Filter, High Pass	H9962-150K-50-21378	K7133	2011-06-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.

5.7 Test Environmental Conditions

Temperature:	22 °C
Relative Humidity:	35 %
ATM Pressure:	101.2kPa

The testing was performed by Quinn Jiang on 2012-03-06 in 5 meter chamber #3.

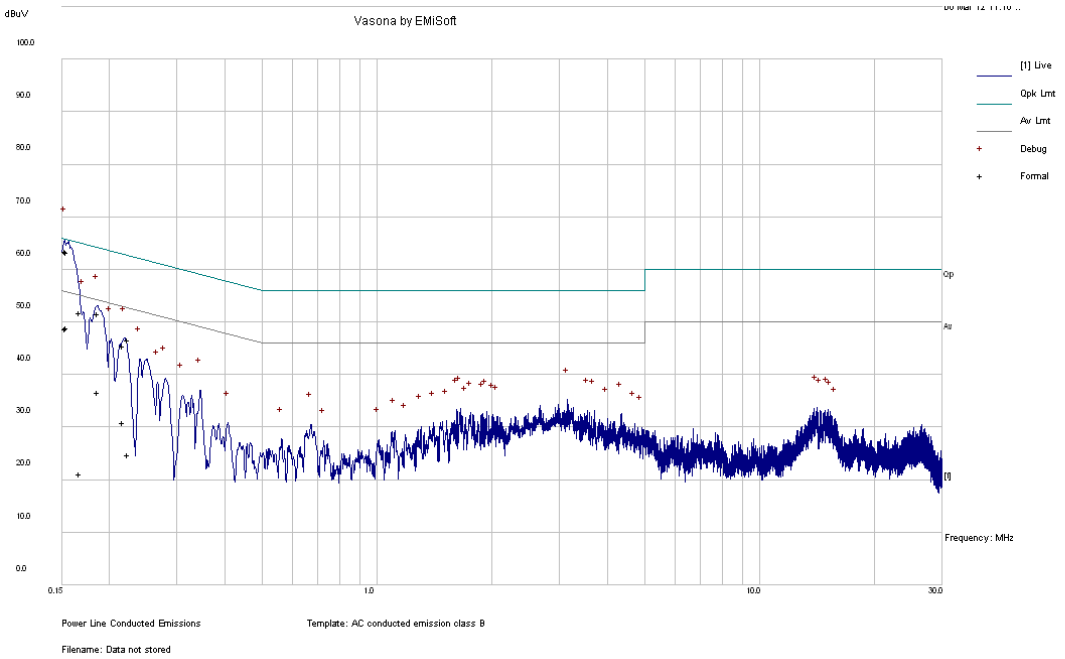
5.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC/IC standard's conducted emissions limits, with the margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-2.34	0.154257	Line	0.15-30 MHz

5.9 Conducted Emissions Test Plots and Data

120V/60 Hz Line:



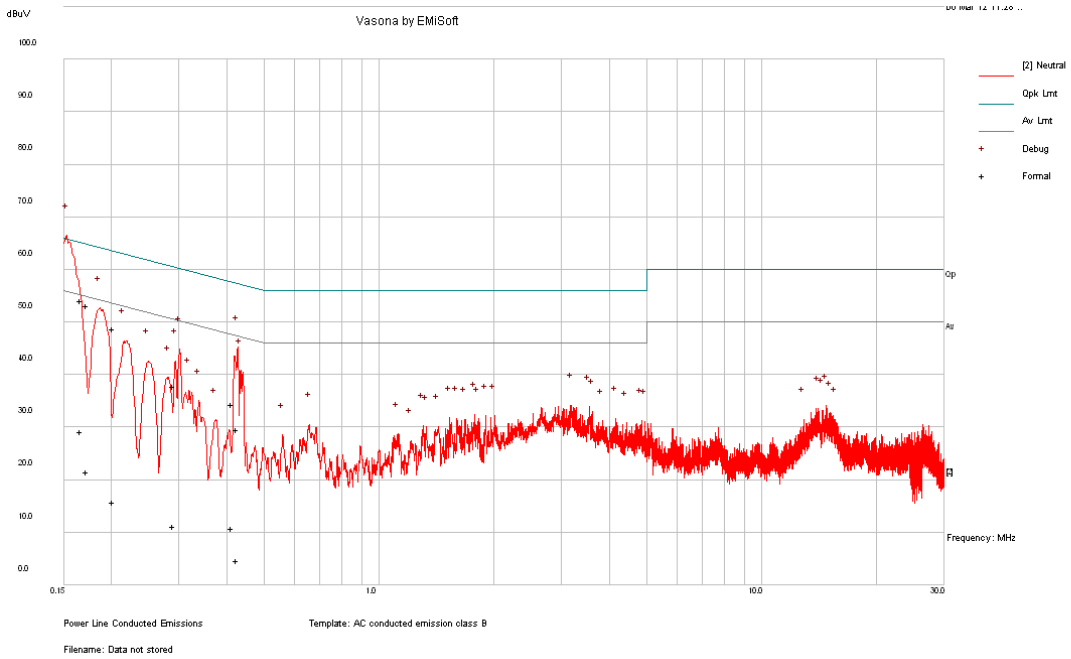
Quasi-Peak Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)
0.154257	63.43	Line	65.77	-2.34
0.154542	63.38	Line	65.75	-2.38
0.186573	51.65	Line	64.19	-12.54
0.167688	51.74	Line	65.07	-13.33
0.223998	46.68	Line	62.67	-15.99
0.217314	45.57	Line	62.92	-17.35

Average Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)
0.154542	48.97	Line	55.75	-6.78
0.154257	48.75	Line	55.77	-7.02
0.186573	36.78	Line	54.19	-17.41
0.217314	30.98	Line	52.92	-21.94
0.223998	24.88	Line	52.67	-27.79
0.167688	21.1	Line	55.07	-33.97

120V/60 Hz Neutral:



Quasi-Peak Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)
0.166389	54.19	Neutral	65.14	-10.95
0.173067	53.12	Neutral	64.81	-11.70
0.202224	48.81	Neutral	63.52	-14.71
0.290724	37.84	Neutral	60.5	-22.66
0.412323	34.47	Neutral	57.6	-23.13
0.425025	29.65	Neutral	57.35	-27.70

Average Measurement:

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Line/Neutral)	Limit (dBuV)	Margin (dB)
0.166389	29.15	Neutral	55.14	-25.99
0.173067	21.58	Neutral	54.81	-33.23
0.412323	10.89	Neutral	47.6	-36.71
0.290724	11.23	Neutral	50.5	-39.28
0.425025	4.73	Neutral	47.35	-42.62
0.202224	15.73	Neutral	53.52	-37.79

6 FCC §15.205, §15.209, §15.247(d) & IC RSS-210 §2.2, §A8.5 – 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) and RSS-210: 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 Note 1	3
88 – 216	150 Note 1	3
216 – 960	200 Note 1	3
Above 960	500	3

Note 1: 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).

As per IC RSS-210 §A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

6.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15C and IC RSS-210 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.

6.3 Test Procedure

For the radiated emissions test, the EUT host, 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 meter away from the testing antenna, which is varied from 1-4 meter, 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 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

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

6.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to the indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, the Corrected Amplitude (CA) of 40.3 dBuV/m = indicated Amplitude reading (Ai) 32.5 dBuV + Antenna Factor (AF) 23.5dB + Cable Loss (CL) 3.7 dB + Attenuator (Atten) 10 dB - Amplifier Gain (Ga) 29.4 dB

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

Margin (dB) = Corrected Amplitude (dBuV/m) - Limit (dBuV/m)

6.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
A.H Systems	Antenna, Horn	SAS-200/571	261	2012-01-18
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2011-06-09
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2011-08-10
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2011-03-21
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10
HP	Pre-amplifier	8449B	3147A00400	2012-02-03

Statement of Traceability: BACL attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.

6.6 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	34 %
ATM Pressure:	101.2kPa

The testing was performed by Quinn Jiang on 2012-03-05 in 5 meter chamber #3.

6.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15C and IC RSS-210 standard's radiated emissions limits, and had the worst margin of:

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-11.46	166.626	Vertical	High, 30 MHz– 1 GHz

Above 1 GHz:

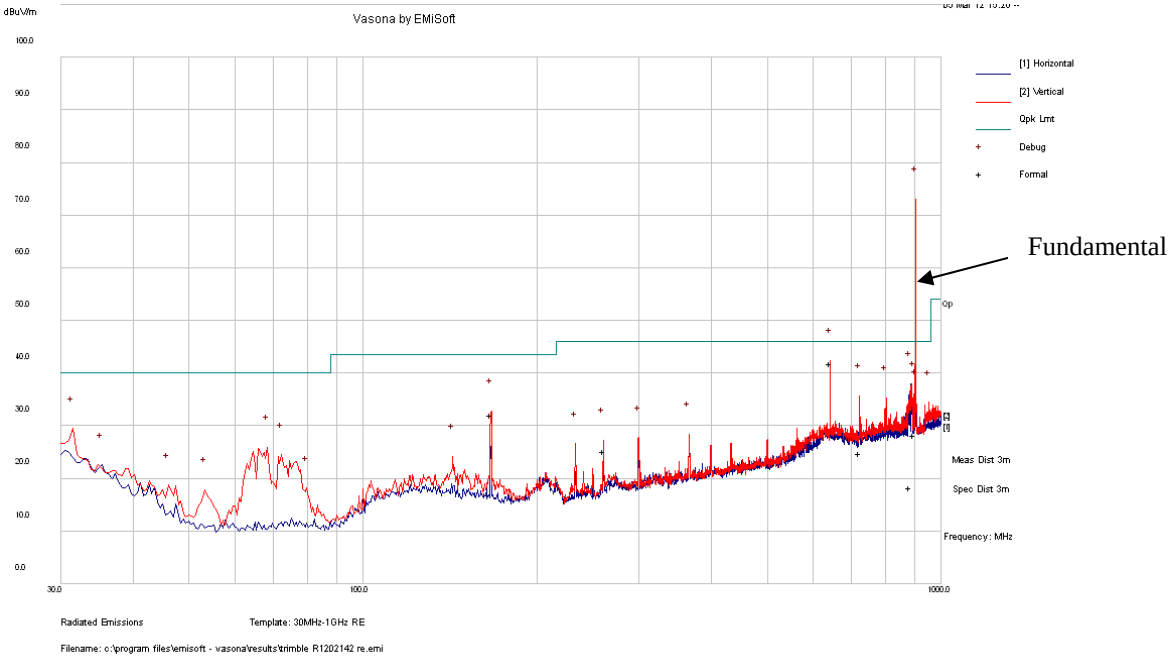
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel, Range**
-	-	-	Low, 1GHz – 25GHz
-	-	-	Mid, 1GHz – 25GHz
-	-	-	High, 1GHz – 25GHz

Note: *All emissions are 20 dB below the limit or are on the noise floor level*
Please refer to the following table and plots for specific test result details

6.8 Radiated Emissions Test Result Data

30 MHz – 1 GHz, Radiated Spurious Emissions Measured at 3 meters

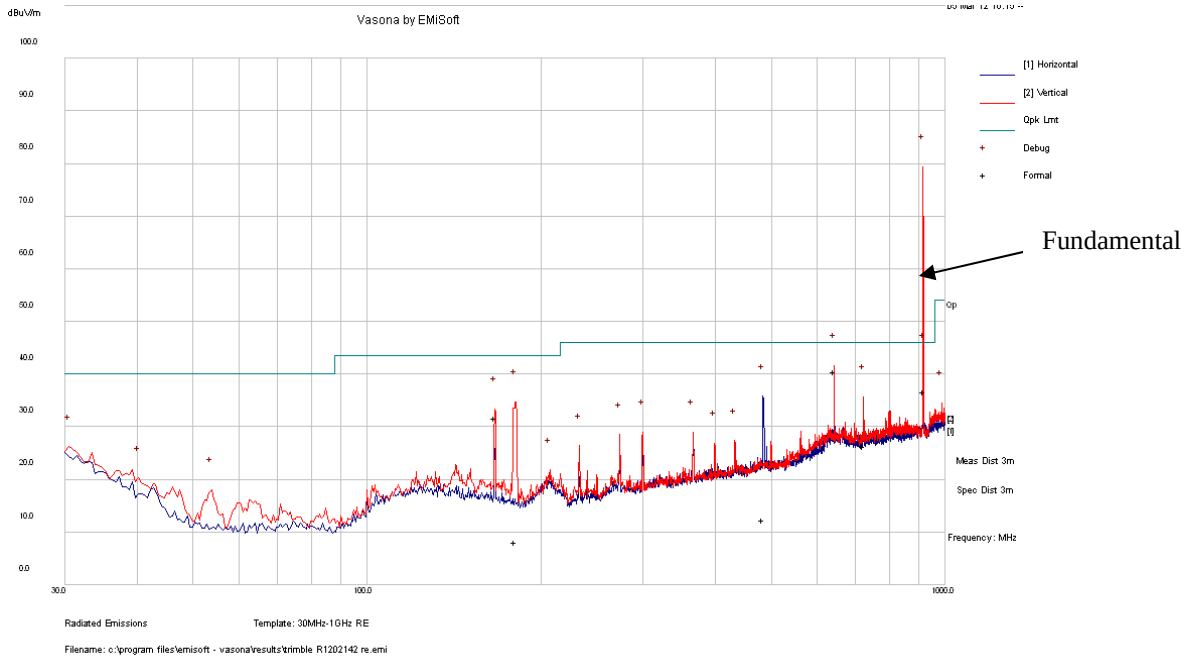
Low Channel



Quasi-Peak Measurement:

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
166.626	32.04	102	V	171	43.5	-11.46
260.6223	25.27	219	V	132	46	-20.73

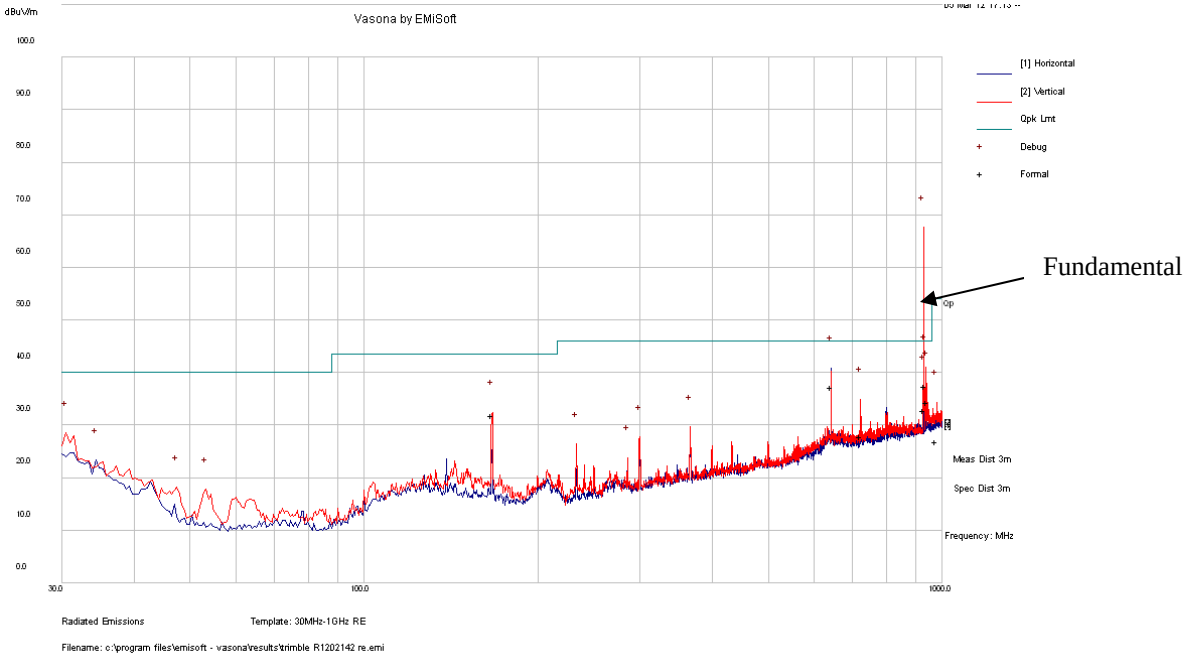
Middle Channel



Quasi-Peak Measurement:

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
166.2788	31.72	100	V	151	43.5	-11.78

High Channel



Quasi-Peak Measurement:

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
166.609	31.83	102	V	171	43.5	-11.67

2) 1–25 GHz, Radiated Spurious Emissions Measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC & IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel (902.6 MHz)											
-	-	-	-	-	-	-	-	-	-	-	-[1]
Middle Channel (915.4 MHz)											
-	-	-	-	-	-	-	-	-	-	-	-[1]
High Channel (927.6 MHz)											
-	-	-	-	-	-	-	-	-	-	-	-[1]

Note [1]: *All spurious emissions are 20 dB below the limit or are on the noise floor level*

7 IC RSS-Gen §6 – Receiver Radiated Spurious Emissions

7.1 Applicable Standards

According to IC RSS-Gen §6, receiver spurious emission shall not exceed the radiated limits shown in the table below:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

7.2 EUT Setup

The radiated emissions tests were performed in the 3 meter chamber, using the setup in accordance with ANSI C63.4-2003.

7.3 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emissions was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**QP**" in the data table.

7.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to the indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, the Corrected Amplitude (CA) of 40.3 dBuV/m = indicated Amplitude reading (Ai) 32.5 dBuV + Antenna Factor (AF) 23.5dB + Cable Loss (CL) 3.7 dB + Attenuator (Atten) 10 dB – Amplifier Gain (Ga) 29.4 dB

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

Margin (dB) = Corrected Amplitude (dBuV/m) – Limit (dBuV/m)

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
A.H Systems	Antenna, Horn	SAS-200/571	261	2012-01-18
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2011-06-09
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2011-08-10
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2011-03-21
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Agilent	PSA Spectrum Analyzer	E4440A	MY44303352	2011-05-10
Mini-Circuits	Pre-amplifier	ZVA-183-S	667400960	2011-05-08

Statement of Traceability: BACL attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.

7.6 Test Environmental Conditions

Temperature:	21 °C
Relative Humidity:	34 %
ATM Pressure:	101.2kPa

The testing was performed by Quinn Jiang on 2012-03-05 in 5 meter chamber #3.

7.7 Summary of Test Results

According to the test data,, the EUT complied with the FCC Part 15.109 and IC RSS-Gen, with the closest margins from the limit listed below:

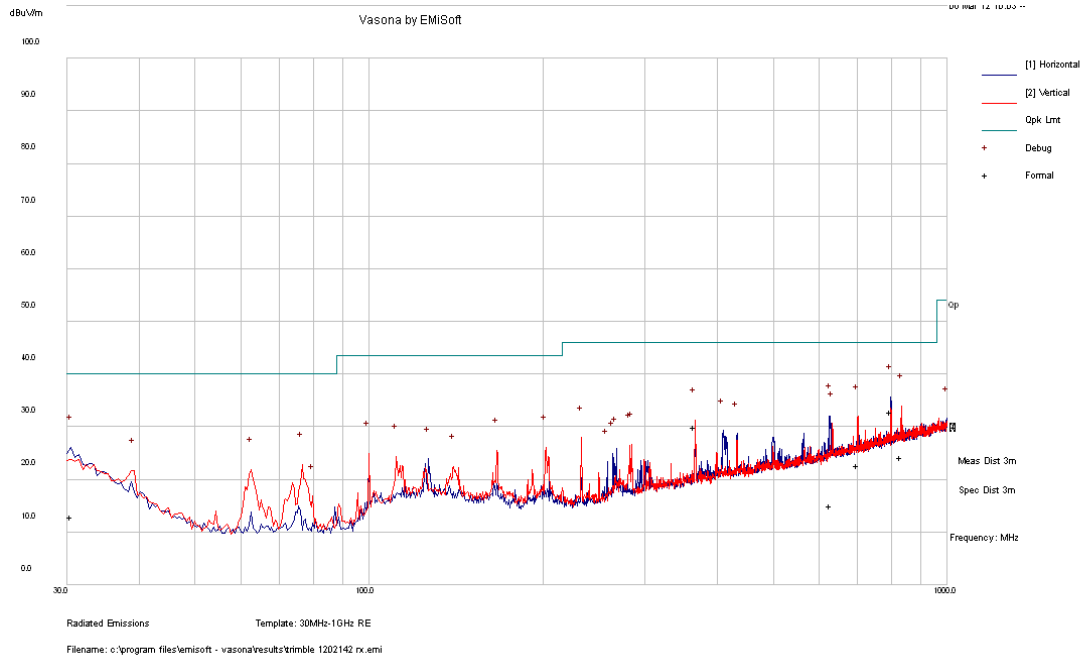
Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range**
-13.12	798.1665	Horizontal	30 to 1000 MHz
-	-	-[1]	1 – 5 GHz

Note [1]: *All spurious emissions are 20 dB below the limit or are on the noise floor level*

Please refer to the following table and plots for specific test result details

7.8 Test Results

1) 30 MHz -1 GHz, measured at 3 meters



Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
798.1665	32.88	246	H	230	46	-13.12
365.754	29.94	99	V	219	46	-16.06
833.0593	24.17	108	V	244	46	-21.83
700.0578	22.76	195	V	134	46	-23.24
30.57225	12.87	99	H	285	40	-27.13
627.0895	15.1	161	H	314	46	-30.90

Above 1 GHz, measured at 3 meters

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
-	-	-	-	-	-	-[1]

Note [1]: *All spurious emissions are 20 dB below the limit or are on the noise floor level*

8 FCC §15.247(i), §2.1091 & IC RSS-102 – RF Exposure Information

8.1 Applicable Standards

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	$*(180/f^2)$	30
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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF fields.

According to IC RSS-102 Issue 2 section 4.1, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Averaging Time (Minutes)
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	$1.585\ f^{0.5}$	$0.0042\ f^{0.5}$	f/150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616000 / f^{1.2}$
150 000-300 000	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000 / f^{1.2}$

Note: f is frequency in MHz
22. ┌ Power density limit is applicable at frequencies greater than 100 MHz

8.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

8.3 MPE Results

1) MPE Calculation of 900 MHz Radio:

Maximum peak output power at antenna input terminal (dBm):	28.49
Maximum peak output power at antenna input terminal (mW):	706.32
Prediction distance (cm):	20
Prediction frequency (MHz):	927.6
Maximum Antenna Gain, typical (dBi):	3
Maximum Antenna Gain (numeric):	2
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.28
Power density of prediction frequency at 20.0 cm (W/m^2):	2.8
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.618
MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	6.18

2) MPE Calculation of Co-location of 2.4 GHz Wi-Fi, Bluetooth Radio (FCC ID: JUP-76577WFBT) and GSM/UMTS radio (FCC ID: RI7UC864G)

Radio Type	Operating Frequency (MHz)	MPE Limit	Conducted Power (mW)	Duty Cycle	Antenna Gain (dBi)	Gain (numeric)	Power Density at 20cm (mW/cm^2)	% of MPE	Co-located % of MPE @ 20 cm
900 MHz Radio On									
900 MHz Radio	927.6	0.618	706.32	100%	3	2	0.28	45.37%	-
900 MHz Radio with 2.4 GHz Wi-Fi Radio on									
2.4 GHz Wi-Fi Radio FCC ID: JUP-76577WFBT	2412	1	74.30	100%	2	1.58	0.023	2.34%	47.71%
900 MHz Radio with 2.4 GHz BT Radio On									
2.4 GHz FHSS Radio FCC ID: JUP-76577WFBT	2402	1	0.92	100%	2	1.58	0.0003	0.03%	45.4%
900 MHz Radio with GSM 850 MHz Radio on									
GSM 850 MHz Radio FCC ID: RI7UC864G	824.2	0.549	1633.05	25%	-4.7	0.34	0.028	5%	50.37%
900 MHz Radio with PCS 1900 MHz Radio on									
PCS 1900 MHz Radio FCC ID: RI7UC864G	1880	1	818.46	100	-1.2	0.76	0.123	12.35%	57.72%

8.4 Test Result

This device complies with the MPE limit at 20 cm for uncontrolled exposure environment.