



TEST REPORT

For

Wireless Environment LLC

151 Innovation Drive, Elyria, Ohio 44035, USA

FCC Part 15.231

FCC ID: W7DMB220

Report Type: Original Report	Product Type: Power Failure Detector
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Report Number: RDG110616001-00	
Report Date: 2011-07-29	
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Note: This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP*, or any agency of the Federal Government.

* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Wireless Environment LLC*'s product, model: *MB220* (FCC ID: *W7DMB220*) (the "EUT") in this report is a *Power Failure Detector*, which measures approximately: 11.8 cm (L) x 5.5 cm (W) x 2.8 cm (H), rated input voltage: AC 120V/50Hz., and 3.6V NiMH battery.

** All measurement and test data in this report was gathered from production sample serial number: 1106032 (Assigned by BACL, Shenzhen). The EUT was received on 2011-06-16.*

Objective

This test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4-2009.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.107, 15.109, 15.209, 15.35(c) and 15.231 rules.

Related Submittal(s)/Grant(s)

N/A

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 - 2009, 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. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

Special Accessories

The special accessories were provided by Bay Area Compliance Laboratories Corp. (Shenzhen).

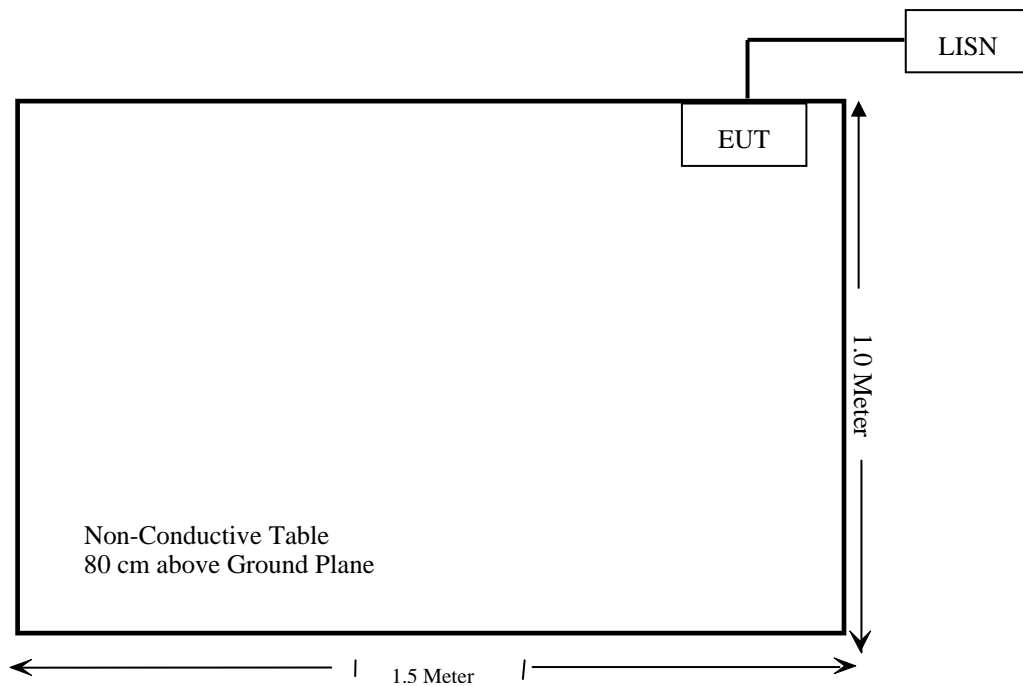
Equipment Modifications

No modifications were made to the unit tested.

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.107 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.109, §15.209, §15.231 (b)	Radiated Emissions	Compliance
§15.231(c)	20 dB Emission Bandwidth	Compliance
§15.231 (a)(1)	Deactivation Testing	Compliance
§15.231	Duty Cycle	Compliance

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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.

Result: Compliant.

The EUT has a printed antenna on PCB. Please refer to the EUT Internal photos.

FCC §15.107 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

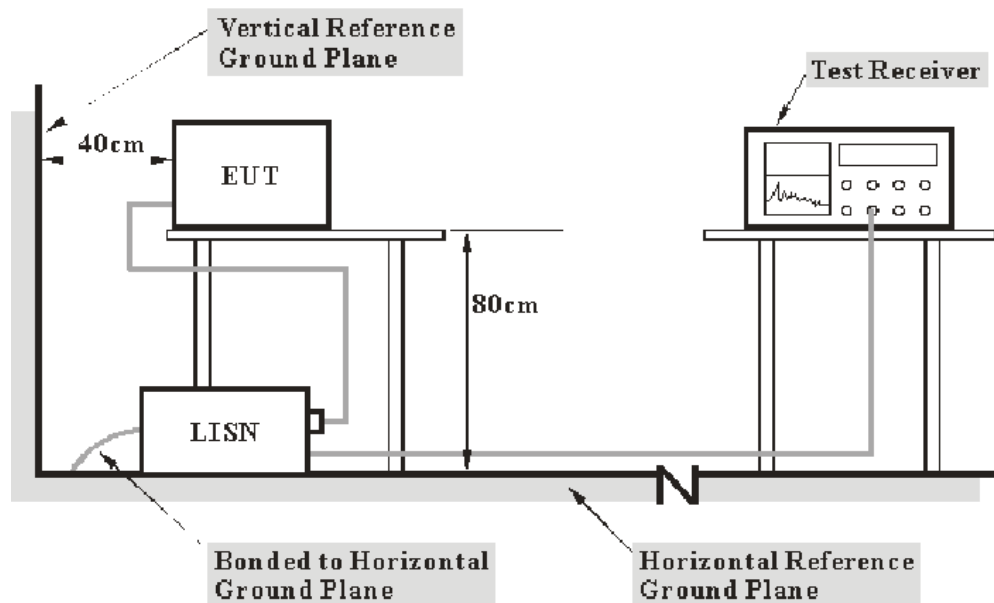
FCC §15.107

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Laboratory Corp. (Shenzhen) is ± 2.4 dB (k=2, 95% level of confidence).

EUT Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2009 measurement procedure. The specification used was with the FCC Part 15.107 limits.

The EUT was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

<i>Frequency Range</i>	<i>IF B/W</i>
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the EUT was connected to the LISN.

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

All data was recorded in the Quasi-peak and average detection mode.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245/006	2011-03-03	2012-03-02
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2011-03-09	2012-03-08

* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.107, with the worst margin reading of:

23.82 dB at 1.730 MHz in the **Line** conducted mode

Test Data

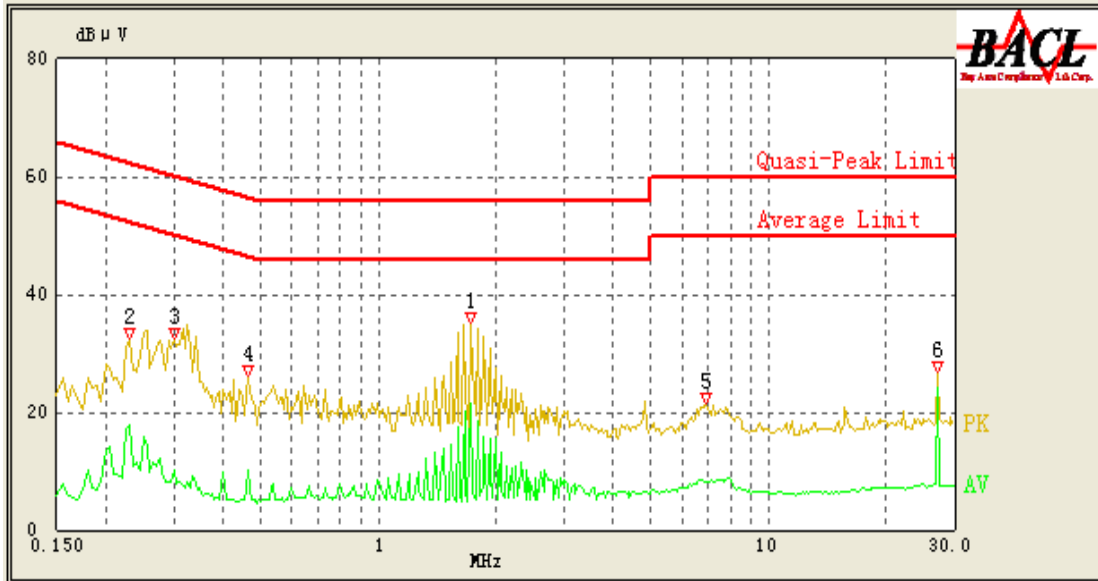
Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	48 %
ATM Pressure:	100.0 kPa

The testing was performed by Eric Lee on 2011-07-14.

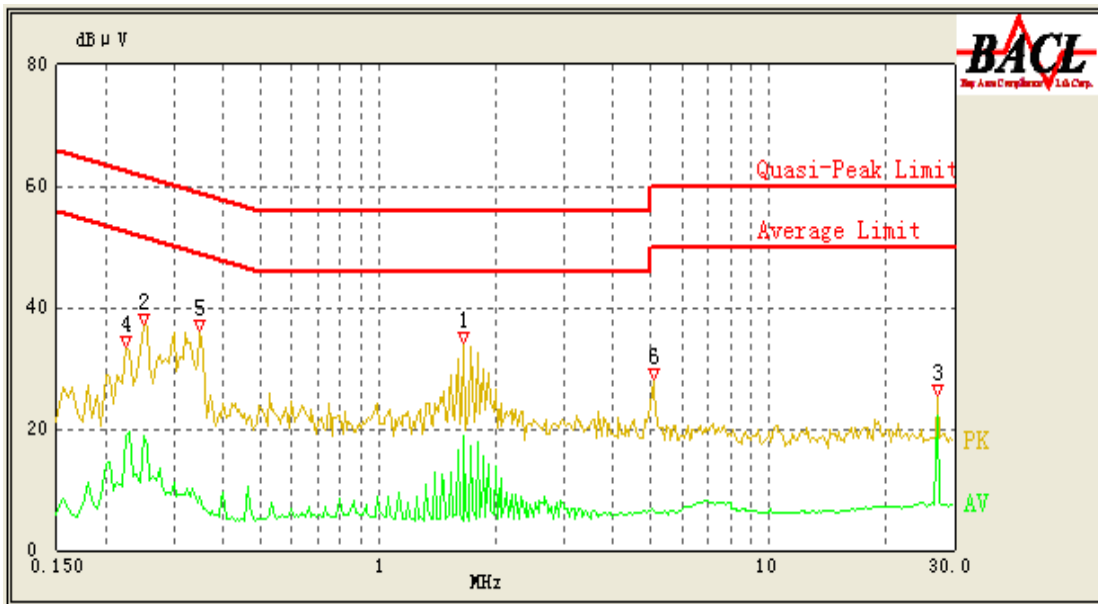
Test Mode: Charging and Operating

AC 120 V, 60 Hz, Line:



Conducted Emissions			FCC Part 15.107		
Frequency (MHz)	Corrected Result (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Remark (PK/QP/Ave.)
1.730	32.18	10.13	56.00	23.82	QP
1.730	21.58	10.13	46.00	24.42	Ave.
27.120	24.29	10.20	50.00	25.71	Ave.
27.120	24.83	10.20	60.00	35.17	QP
0.230	27.79	10.10	63.71	35.92	QP
0.230	17.78	10.10	53.71	35.93	Ave.
0.465	10.13	10.10	47.00	36.87	Ave.
0.300	23.99	10.10	61.71	37.72	QP
0.465	18.48	10.10	57.00	38.52	QP
0.300	10.13	10.10	51.71	41.58	Ave.
6.975	8.06	10.20	50.00	41.94	Ave.
6.920	14.76	10.20	60.00	45.24	QP

AC 120V, 60 Hz, Neutral:



Conducted Emissions			FCC Part 15.107		
Frequency (MHz)	Corrected Result (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Remark (PK/QP/Ave.)
1.660	30.73	10.13	56.00	25.27	QP
1.660	18.80	10.13	46.00	27.20	Ave.
27.120	22.18	10.20	50.00	27.82	Ave.
0.250	32.94	10.10	63.14	30.20	QP
0.225	29.69	10.10	63.86	34.17	QP
0.250	18.93	10.10	53.14	34.21	Ave.
0.225	18.94	10.10	53.86	34.92	Ave.
27.120	23.43	10.20	60.00	36.57	QP
0.350	23.51	10.10	60.29	36.78	QP
0.350	8.88	10.10	50.29	41.41	Ave.
5.050	6.81	10.20	50.00	43.19	Ave.
5.070	10.73	10.20	60.00	49.27	QP

FCC §15.109, §15.205, §15.209, §15.231 (b) - RADIATED EMISSIONS

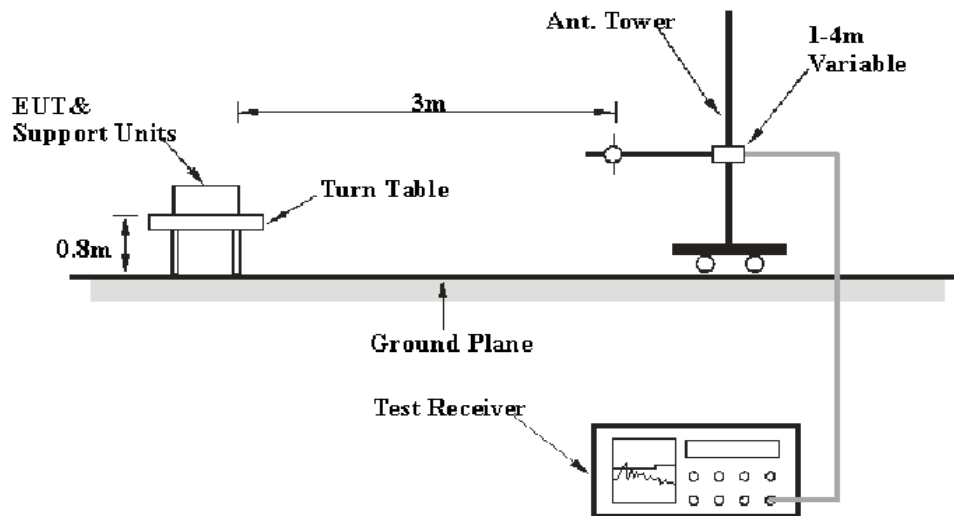
Measurement Uncertainty

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.

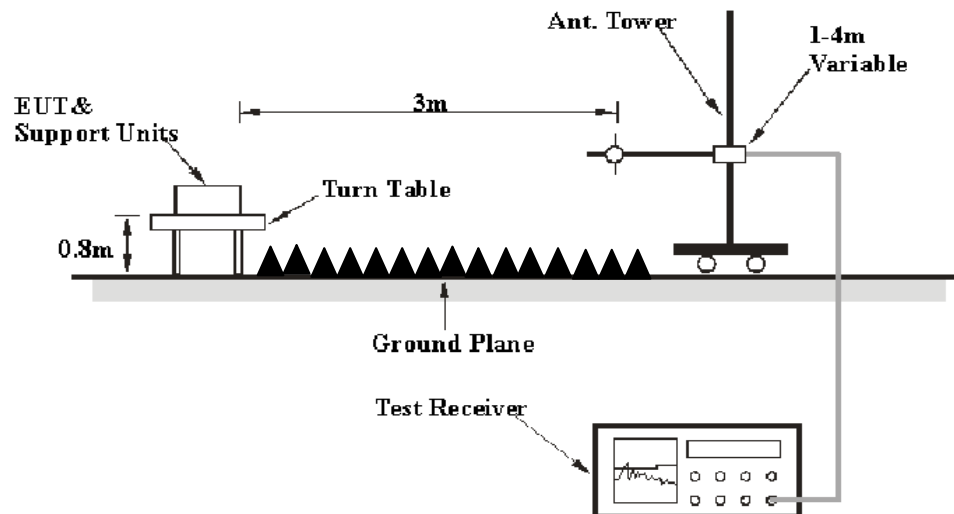
Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emission measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is ± 4.0 dB (k=2, 95% level of confidence).

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the test receiver was set with the following configurations:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>	<i>Detector</i>
30MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 5000 MHz	1 MHz	3 MHz	PK

Test Procedure

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

All data was recorded in the Quasi-peak detection mode from 30 MHz to 1 GHz, Peak and average detection mode above 1 GHz.

Applicable Standard

According to §15.231 (b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,370 *	125 to 375 *
174-260	3,750	375
260-470	3,750 to 12, 500*	375 to 1,250*
Above 470	12,500	1,250

*Linear interpolations.

The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

Corrected Amplitude & Margin Calculation

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

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

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 5.8 dB means the emission is 5.8 dB below the limit. The equation for margin calculation is as follows:

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447E	1937A01046	2010-08-02	2011-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-03-11	2012-03-10
HP	Spectrum Analyzer	8593A	2919A00242	2011-07-08	2012-07-07
Mini-circuits	Amplifier	ZVA-213+	T-E27H	2010-09-12	2011-09-11
SUNOL SCIENCES	Horn Antenna	DRH-118	A052604	2011-05-05	2012-05-04

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.205, §15.209, §15.231 (b), with the worst margin reading of:

10.19 dB at 433.98 MHz in the Horizontal polarization

Test Data

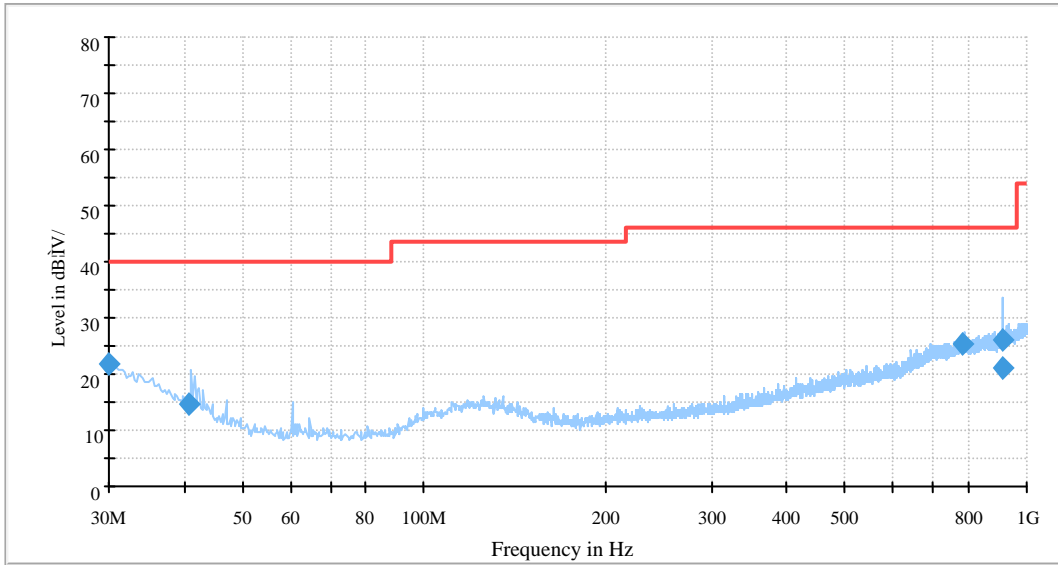
Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Eric Lee on 2011-07-19.

Test mode: Charging and Operating

Auto Test (FCC 15.109)



Note: The date which below the limit 20 dB was not recorded.

Test mode: Transmitting

Frequency (MHz)	Receiver Reading (dBµV)	Detector (PK/Ave.)	Direction (Degree)	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBµV/m)	FCC Part 15.231(b)/209/205		
				Height (m)	Polar (H/V)	Factor (dB)				Limit (dBµV/m)	Margin (dB)	Remarks
30 MHz – 1000 MHz												
433.98	88.18	PK	272	1.00	H	14.5	1.73	25.96	78.45	100.8	22.35	Fund.
867.95	60.33	PK	161	1.07	H	19.9	3.86	25.64	58.45	80.8	22.35	Harmonic
867.95	56.48	PK	206	1.46	V	19.9	3.86	25.64	54.6	80.8	26.20	Harmonic
433.98	80.70	PK	0	1.87	V	14.5	1.73	25.96	70.97	100.8	29.83	Fund.
Above 1 GHz												
1735.87	61.17	PK	223	1.03	V	26.2	4.88	34.2	58.05	80.8	22.75	Harmonic
1301.88	56.12	PK	9	1.04	H	25.0	4.25	34.5	50.87	74	23.13	Harmonic
1735.87	59.96	PK	43	1.53	H	26.2	4.88	34.2	56.84	80.8	23.96	Harmonic
1301.88	54.28	PK	124	1.09	V	25.0	4.25	34.5	49.03	74	24.97	Harmonic

Field Strength (Average)

Frequency (MHz)	Peak Measurement @ 3m (dBµV/m)	Antenna Polar (H/V)	Duty Cycle Correction (dB)	Average Amp. (dBµV/m)	FCC 15.231(b)/209/205		Comment
					Limit (dBµV/m)	Margin (dB)	
30 MHz – 1000 MHz							
433.98	78.45	H	-7.84	70.61	80.8	10.19	Fund.
867.95	58.45	H	-7.84	50.61	60.8	10.19	Harmonic
867.95	54.6	V	-7.84	46.76	60.8	14.04	Harmonic
433.98	70.97	V	-7.84	63.13	80.8	17.67	Fund.
Above 1 GHz							
1735.87	58.05	V	-7.84	50.21	60.8	10.59	Harmonic
1301.88	50.87	H	-7.84	43.03	54.0	10.97	Harmonic
1735.87	56.84	H	-7.84	49.00	60.8	11.80	Harmonic
1301.88	49.03	V	-7.84	41.19	54.0	12.81	Harmonic

Note:

Duty Cycle = $Ton / (Ton + Toff) = 9.98 / 24.6 = 0.4057$

Duty Cycle Factor = $20lg(Duty Cycle) = 20lg0.4057 = -7.84 dB$

Average = Peak + Duty Cycle Factor

FCC §15.231(c) – 20 dB BANDWIDTH TESTING

Requirement

Per FCC §15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10
HP	Amplifier	HP8447E	1937A01046	2010-08-02	2011-08-02
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2011-07-05	2012-07-04

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

With the EUT's antenna attached, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Eric Lee on 2011-07-15.

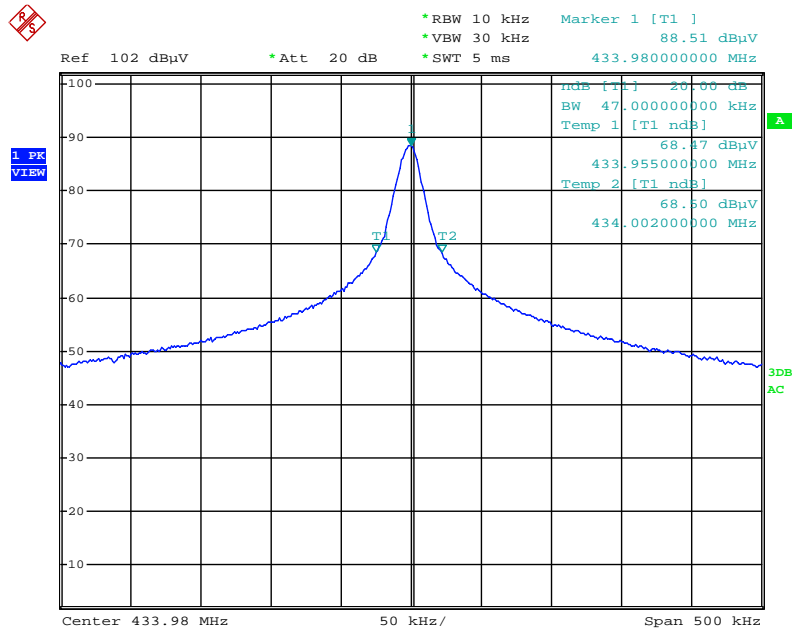
Test Mode: Transmitting

Please refer to following table and plot.

Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Result
433.98	47	1084.95	Pass

Note: Limit = 0.25% * center frequency = 0.25% * 433.98 MHz = 1.08495 MHz = 1084.95 kHz
20 dB Bandwidth = 47 kHz < 1084.95 kHz

20 dB Bandwidth



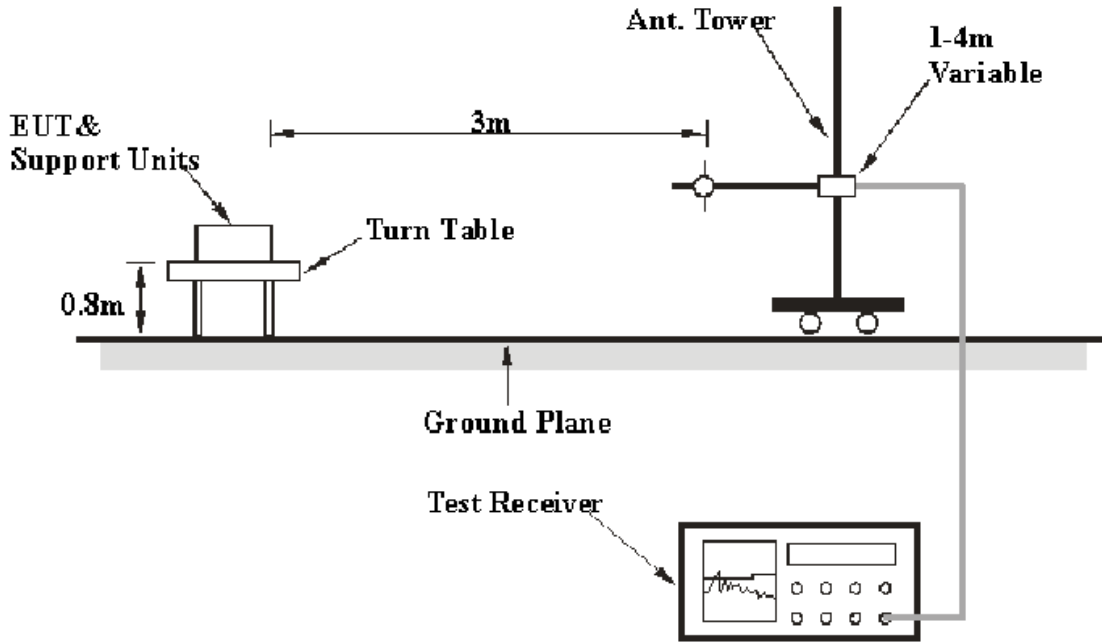
Date: 15.JUL.2011 09:03:50

FCC §15.231(a) - DEACTIVATION TESTING

Applicable Standard

Per FCC §15.231(a) (1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

EUT Setup



The deactivation test was performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4 - 2003. The specification used was the FCC 15.231(a) limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10
HP	Amplifier	8447E	1937A01046	2010-11-15	2011-11-15
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2011-07-05	2012-07-04

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Data

Environmental Conditions

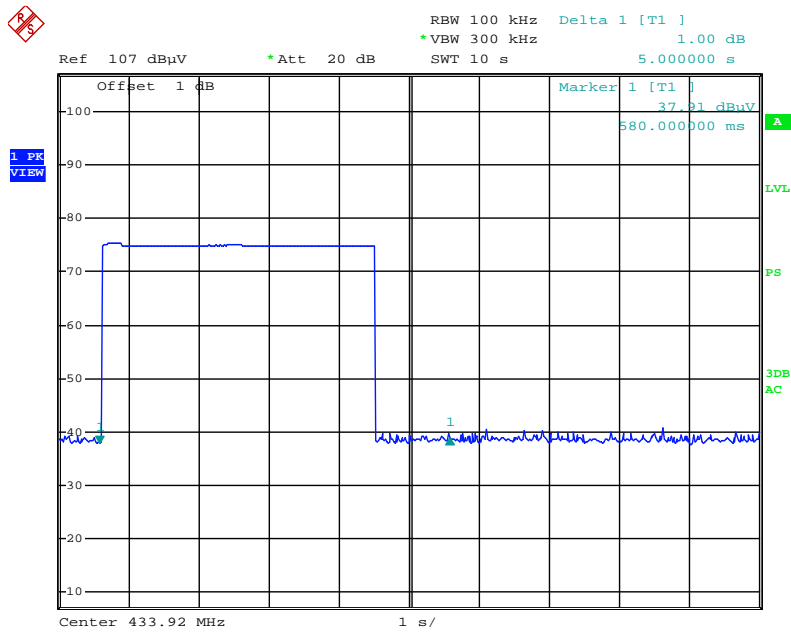
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101 kPa

The testing was performed by Eric Lee on 2011-07-15.

Test Mode: Transmitting

Test Result: Compliance.

Please refer to following plot



Date: 15.JUL.2011 13:35:29

FCC §15.231 - DUTY CYCLE

Limit

Nil (No dedicated limit specified in the Rules).

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2010-11-11	2011-11-10

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer=operating frequency.
4. Set the spectrum analyzer as RBW=10 kHz, VBW=30 kHz, Span=0 Hz.
5. Repeat above procedures until all frequency measured was complete.

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Eric Lee on 2011-07-19.

Test Mode: Transmitting

Test Result:

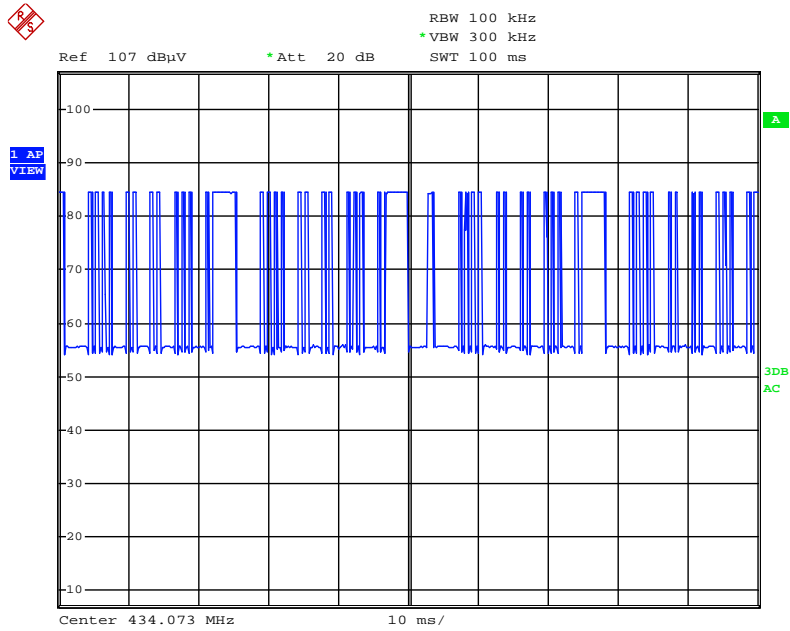
Compliance, please refer to following plots.

$$T_{on} = T_{on_1}N_1 + T_{on_2}N_2 + \dots + T_{on_n}N_n = 0.54\text{ms} * 12 + 3.5 \text{ ms} = 9.98 \text{ ms}$$

$$T_p = 24.6\text{ms}$$

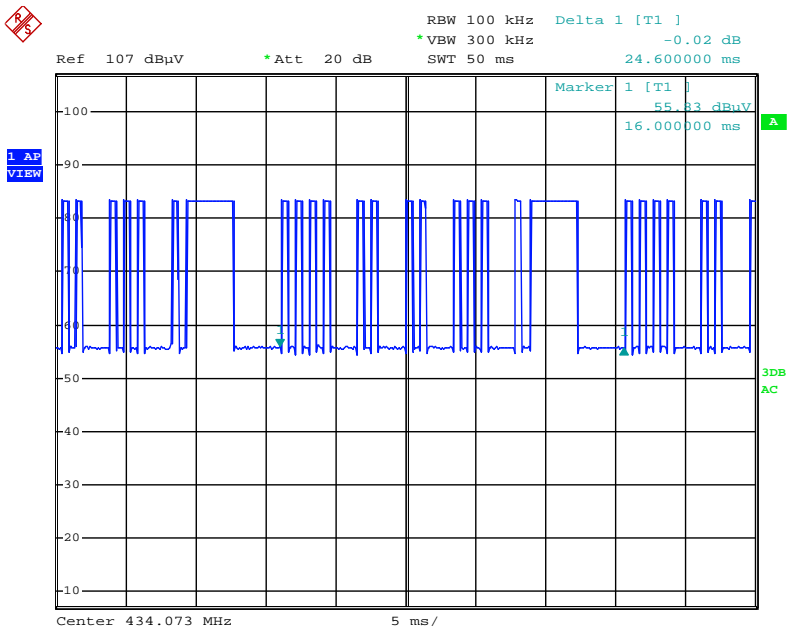
$$\text{Duty cycle factor} = 20\log(T_{on}/T_p) = 20 * \log(9.98/24.6) = -7.84 \text{ dB}$$

Duty Cycle 1



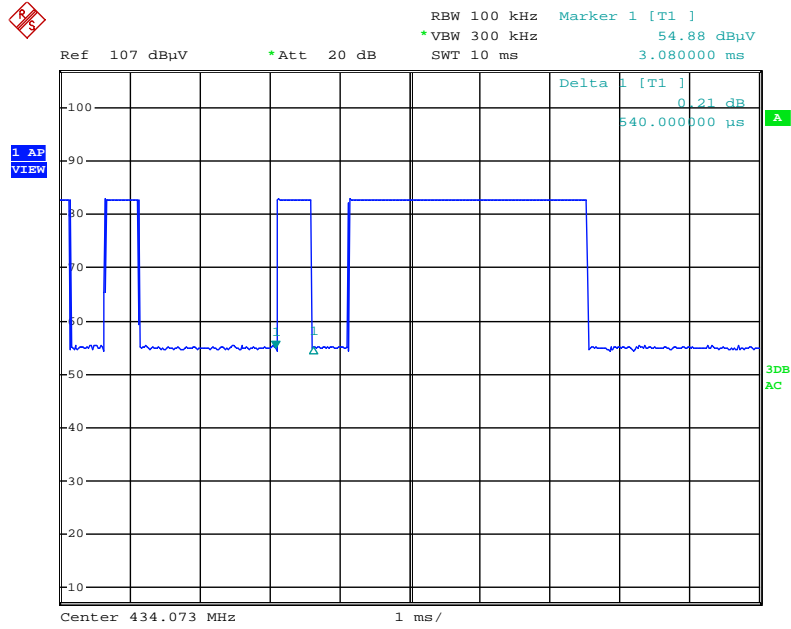
Date: 19.JUL.2011 12:50:46

Duty Cycle 2



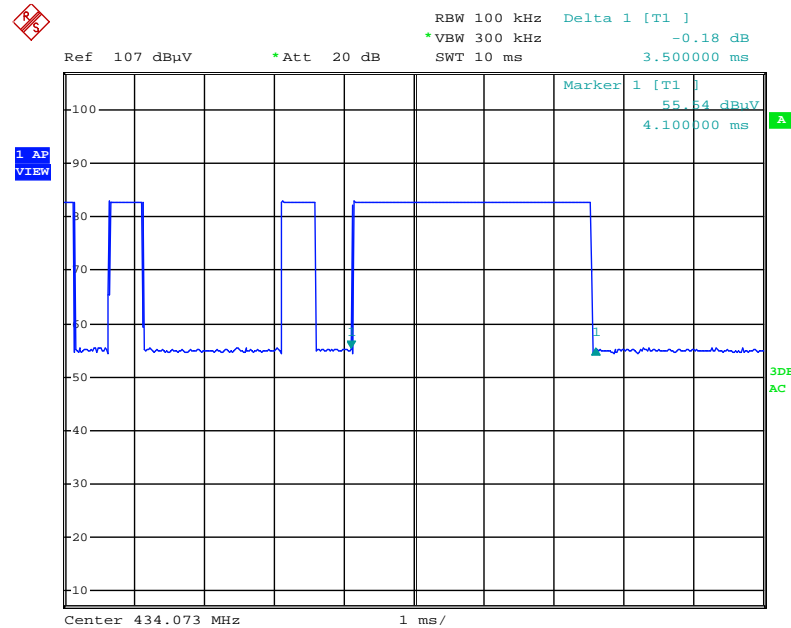
Date: 19.JUL.2011 12:51:51

Duty Cycle 3



Date: 19.JUL.2011 12:53:51

Duty Cycle 4



Date: 19.JUL.2011 12:53:21

***** END OF REPORT *****