Lab Code: 200707-0

FCC PART 15.231

TEST REPORT

For

Xiamen Pinnacle Electrical Co.,Ltd.

4F Guang Xia Building, Torch High-Tech Zone, Xiamen, China

FCC ID: O89RR1X

Report Type:	Product Type:
Original Report	RF Repeater

Test Engineer:	Leon Chen
Report Number:	R1XM120716053-00
Report Date:	2012-08-13
Reviewed By:	Ivan Cao EMC Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Xiamen Pinnacle Electrical Co.,Ltd.'s* product, model number: *RR1X (FCC ID: O89RR1X) (*the "EUT") in this report is a RF Repeater, which was measured approximately: 9.0 cm (L) x 4.5cm (W) x 6.1 cm (H), rated input voltage: DC 9V from adapter.

Adapter information:
Model:P6-090060 US
Input: 100-240V~50/60Hz 0.2A
Output: 9.0V, 0.6A

All measurement and test data in this report was gathered from production sample serial number: 120716053 (Assigned by BACL, Dongguan). The EUT was received on 2012-07-25.

Objective

This document is a 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, 15.209, 15.35(c) and 15.231 rules.

Related Submittal(s)/Grant(s)

No related submittal(s).

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. (Dongguan). 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. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) 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 February 02, 2012. 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.: 273710. 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 in testing mode which was provided by manufacturer.

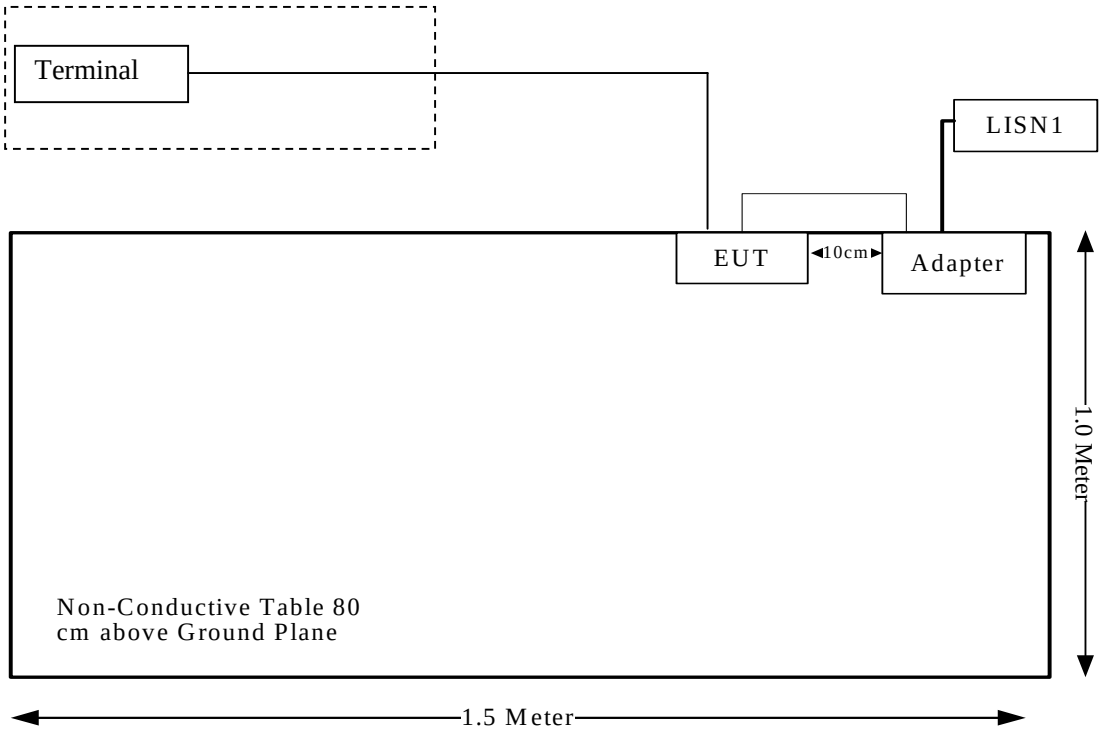
Equipment Modifications

No modifications were made to the unit tested.

External I/O Cable

Cable Description	Length (m)	From Port	To
RJ11 Cable	10	EUT	Teminal

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207 (a)	Conducted Emissions	Compliance
§15.205, §15.209, §15.231 (b)	Radiated Emissions	Compliance
§15.231 (c)	20dB Band Width Testing	Compliance
§15.231 (a)(1)	Deactivation Testing	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 two monopole antennas, one for transmitting, one for receiving; which were soldered on the PCB, which complied with 15.203. Please refer to the EUT Internal photos.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

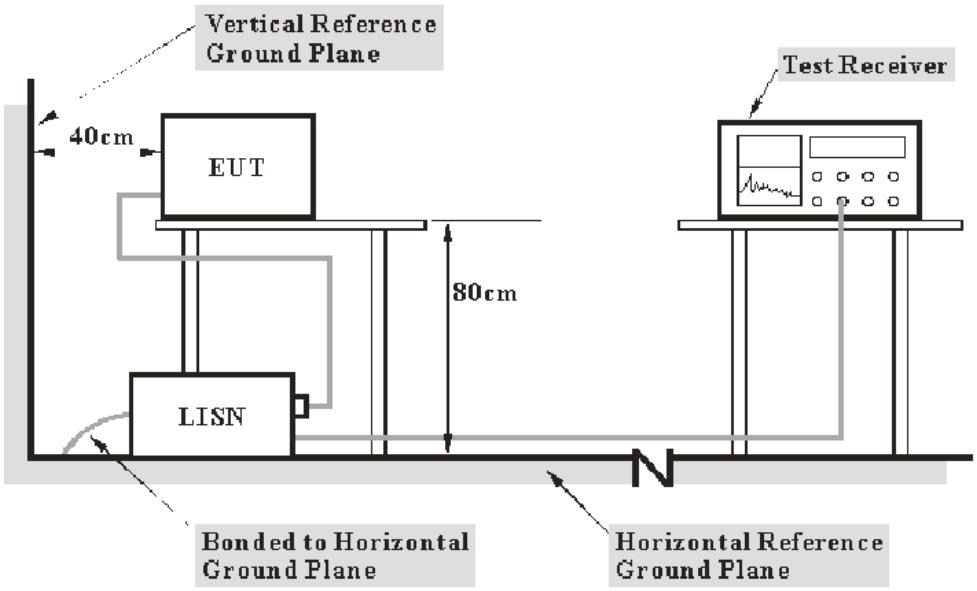
FCC§15.207

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. (Dongguan) 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 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter 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:

Frequency Range	***IF B/W***
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the first 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 Reciever	ESCS 30	830245/006	2011-10-08	2012-10-07
Rohde & Schwarz	LISN	ESH3-Z5	843331/015	2011-10-08	2012-10-07
Rohde & Schwarz	LISN	ESH3-Z5	100113	2011-10-08	2012-10-07

*** Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Dongguan) 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 15.207, with the worst margin reading of:

2.87 dB at **0.490 MHz** in the **Neutral** conducted mode

Test Data

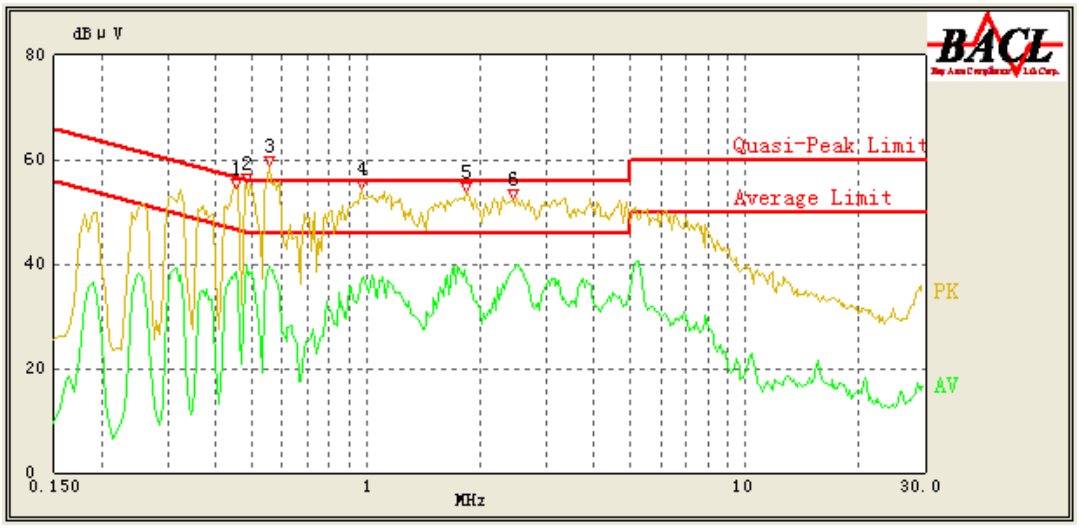
Environmental Conditions

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

The testing was performed by Leon Chen on 2012-07-31.

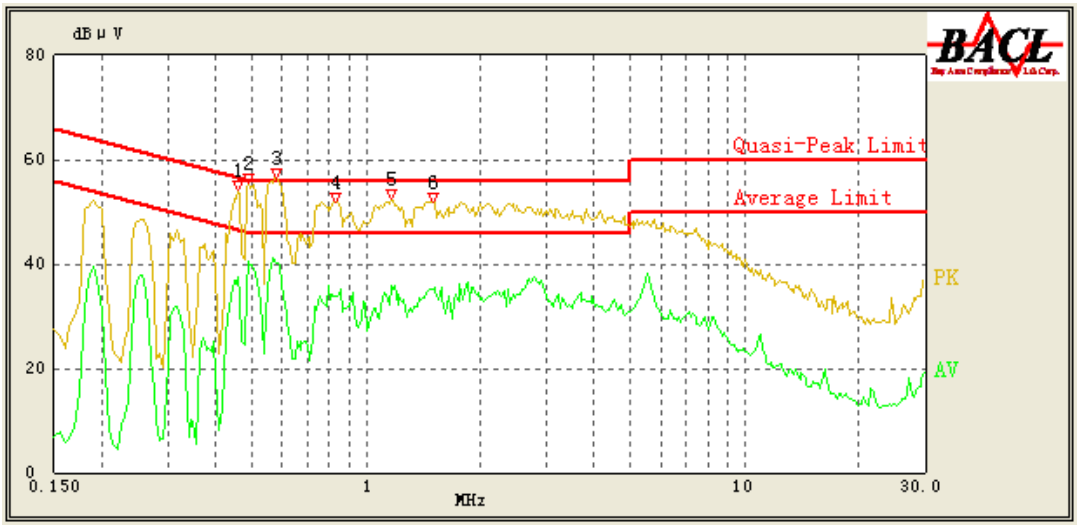
EUT operating mode: Transmitting

AC 120V/60Hz, Line



Frequency (MHz)	Reading (dBµV)	Correction (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.555	52.07	0.43	56.00	3.93	QP
0.455	52.45	0.42	57.29	4.84	QP
0.485	51.19	0.42	56.43	5.24	QP
0.555	39.39	0.43	46.00	6.61	Ave.
0.485	39.78	0.42	46.43	6.65	Ave.
2.435	38.77	0.48	46.00	7.23	Ave.
0.455	38.61	0.42	47.29	8.68	Ave.
0.980	37.09	0.45	46.00	8.91	Ave.
1.835	36.35	0.48	46.00	9.65	Ave.
0.975	46.26	0.45	56.00	9.74	QP
1.835	43.92	0.48	56.00	12.08	QP
2.435	43.21	0.48	56.00	12.79	QP

AC 120V/60Hz, Neutral



Frequency (MHz)	Reading (dBµV)	Correction (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.490	53.42	0.42	56.29	2.87	QP
0.580	52.56	0.43	56.00	3.44	QP
0.490	40.66	0.42	46.29	5.63	Ave.
0.580	40.26	0.43	46.00	5.74	Ave.
0.460	37.54	0.42	47.14	9.60	Ave.
1.160	46.05	0.45	56.00	9.95	QP
1.500	46.01	0.46	56.00	9.99	QP
1.160	35.95	0.45	46.00	10.05	Ave.
1.500	35.13	0.46	46.00	10.87	Ave.
0.830	44.72	0.44	56.00	11.28	QP
0.835	33.93	0.44	46.00	12.07	Ave.
0.460	43.19	0.42	57.14	13.95	QP

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

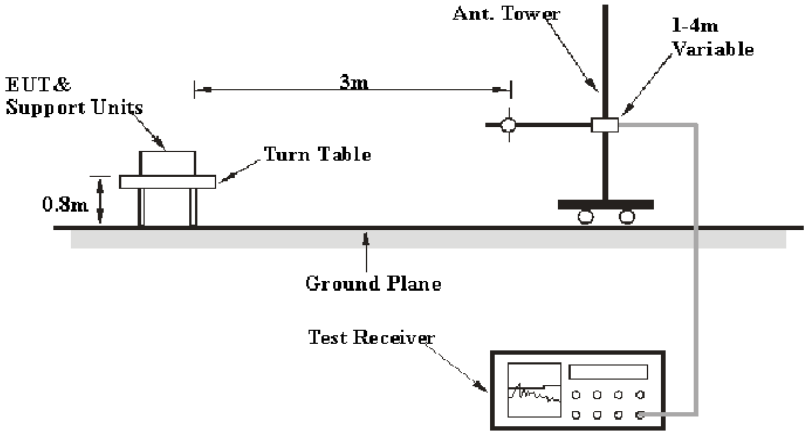
Measurement Uncertainty

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.

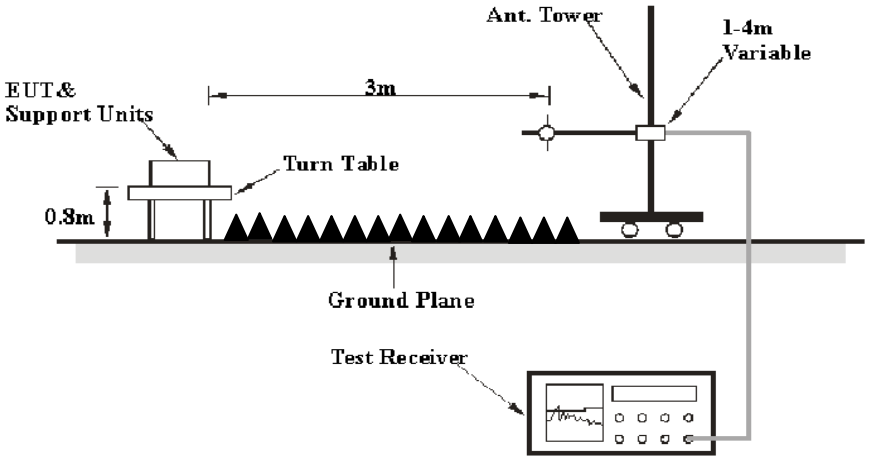
Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements and the best estimate of the uncertainty of a radiation emission measurement at Bay Area Compliance Laboratories Corp. (Dongguan) is 4.0 dB. (k=2, 95% level of confidence)

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters 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:

Frequency Range	***RBW***	***Video B/W***	***Detector***
30MHz – 1000 MHz	100 kHz	300 kHz	PK
1000 MHz – 5000 MHz	1 MHz	3 MHz	PK

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Reciever	ESCI	100224	2012-5-13	2013-5-12
Sunol Sciences	Hybrid Antennas	JB3	A060611-1	2011-9-6	2012-9-5
HP	Pre-amplifier	8447E	2434A02181	2011-10-8	2012-10-7
Rohde & Schwarz	Spectrum Analyzer	FSEM	1079 8500	2011-10-9	2012-10-8
Dayang	Horn Antenna	OMCDH10180	10279001B	2011-7-30	2013-7-29
mini-circuits	Wideband Amplifier	ZVA-183-S+	96901149	2012-4-24	2013-4-23

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

Test Procedure

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

According to §15.231, Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector

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 Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Loss + Cable Loss - 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:

Margin = Limit –Corrected Amplitude

Test Results Summary

According to the data in the following table, the EUT complied with the CFR47 §15.205, §15.209, §15.231 (b), with the worst margin reading of:

4.61 dB at **1301.76 MHz** in the **Horizontal** polarization

Test Data

Environmental Conditions

Temperature:	26 ° C
Relative Humidity:	50 %
ATM Pressure:	100.0 kPa

The testing was performed by Leon Chen on 2012-08-10.

Test mode: Transmitting

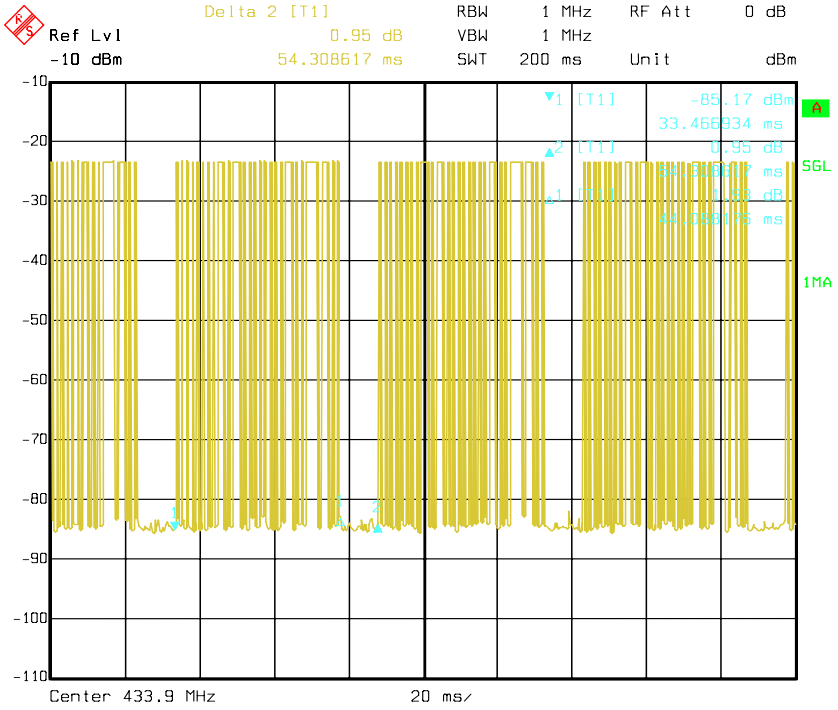
Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/QP/Ave.)	Polar (H/V)	Corrected Factor (dB)	Correction Data (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
1301.76	48.8	Ave.	H	0.59	49.39	54.00	4.61	Harmonic
433.92	76.79	Ave.	H	-2.52	74.27	80.8	6.53	Fundamental
1301.76	43.38	Ave.	V	0.59	43.97	54.00	10.03	Harmonic
433.92	72.88	Ave.	V	-2.52	70.36	80.8	10.44	Fundamental
1301.76	58.79	PK	H	0.59	59.38	74.00	14.62	Harmonic
216.94	54.15	Ave.	V	-8.24	45.91	60.8	14.89	Spurious
433.92	86.78	PK	H	-2.52	84.26	100.8	16.54	Fundamental
216.94	52.34	Ave.	H	-8.24	44.1	60.8	16.7	Spurious
1735.75	38.81	Ave.	H	2.96	41.77	60.8	19.03	Harmonic
1301.76	53.37	PK	V	0.59	53.96	74.00	20.04	Harmonic
433.92	82.87	PK	V	-2.52	80.35	100.8	20.45	Fundamental
868.08	35.81	Ave.	V	3.86	39.67	60.8	21.13	Harmonic
868.08	35.54	Ave.	H	3.87	39.41	60.8	21.39	Harmonic
1735.75	33.25	Ave.	V	2.96	36.21	60.8	24.59	Harmonic
216.94	64.14	PK	V	-8.24	55.9	80.8	24.9	Spurious
2169.87	28.79	Ave.	H	5.42	34.21	60.8	26.59	Harmonic
216.94	62.33	PK	H	-8.24	54.09	80.8	26.71	Spurious
2603.41	30.16	Ave.	H	2.96	33.12	60.8	27.68	Harmonic
2603.41	28.23	Ave.	V	2.96	31.19	60.8	29.61	Harmonic
868.08	45.8	PK	V	3.86	49.66	80.8	31.14	Harmonic
868.08	45.53	PK	H	3.87	49.4	80.8	31.4	Harmonic
1735.75	43.24	PK	V	2.96	46.2	80.8	34.6	Harmonic
2169.87	38.78	PK	H	5.42	44.2	80.8	36.6	Harmonic
2603.41	40.15	PK	H	2.96	43.11	80.8	37.69	Harmonic
1735.75	39.26	PK	H	2.96	42.22	80.8	38.58	Harmonic
2603.41	38.22	PK	V	2.96	41.18	80.8	39.62	Harmonic

*Within measurement uncertainty!

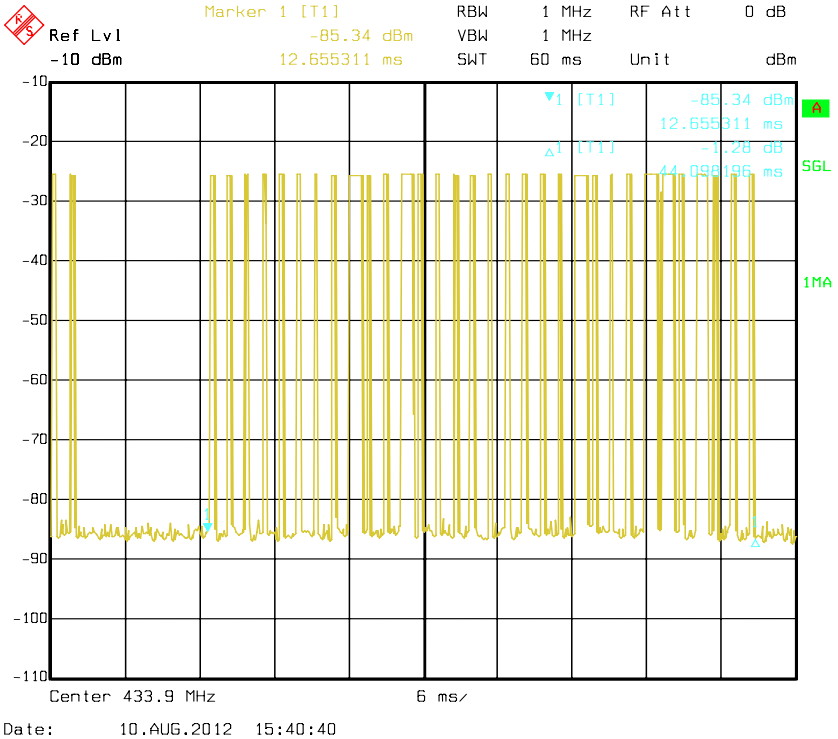
Note: Duty cycle correction factor = 20*log (T_{ON}/T_{ON+OFF}) = 20*log {(26 * 0.41 ms + 6 * 1.09 ms)/54.31 ms} = -9.99 dB

Please refer to following plot.

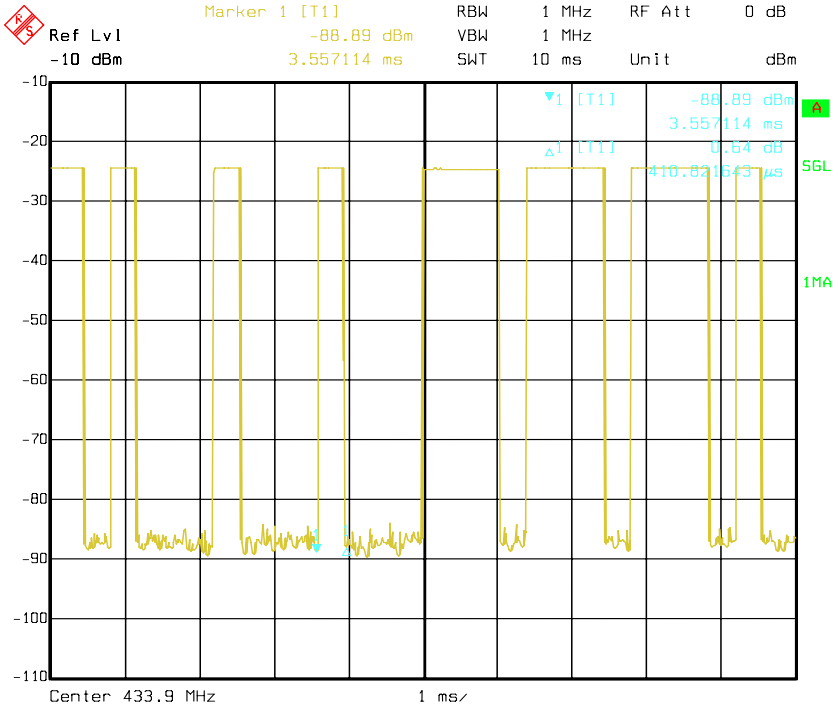
$T_{on}+T_{off}$=54.31ms



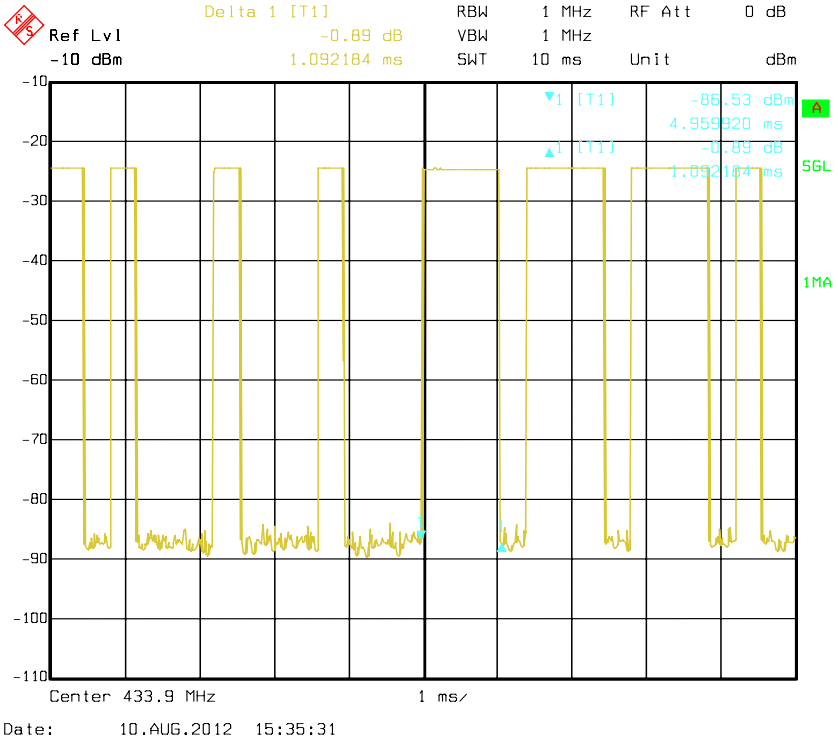
6*longer pulse and 26*shorter pulse



Shorter pulse=0.41ms



Longer pulse=1.09ms



FCC §15.231(c) – 20 dB BANDWIDTH TESTING

Requirement

Per 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	101122	2011-11-17	2012-11-16
HP	Amplifier	HP8447E	1937A01046	2011-11-24	2012-11-23
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2011-11-28	2012-11-27

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) 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 Leon Chen on 2012-08-10.

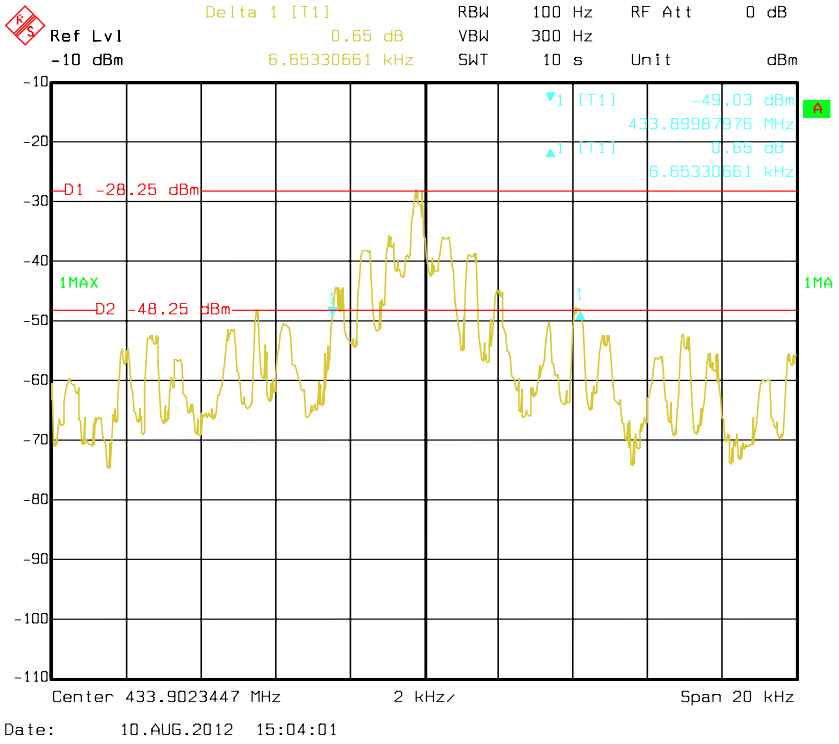
Test Mode: Transmitting

Please refer to following table and plot.

Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Result
433.92	6.65	1084.8	Pass

Note: Limit = 0.25% * Center Frequency = 0.25% * 433.9023447 MHz = 1.084755MHz

20 dB Bandwidth

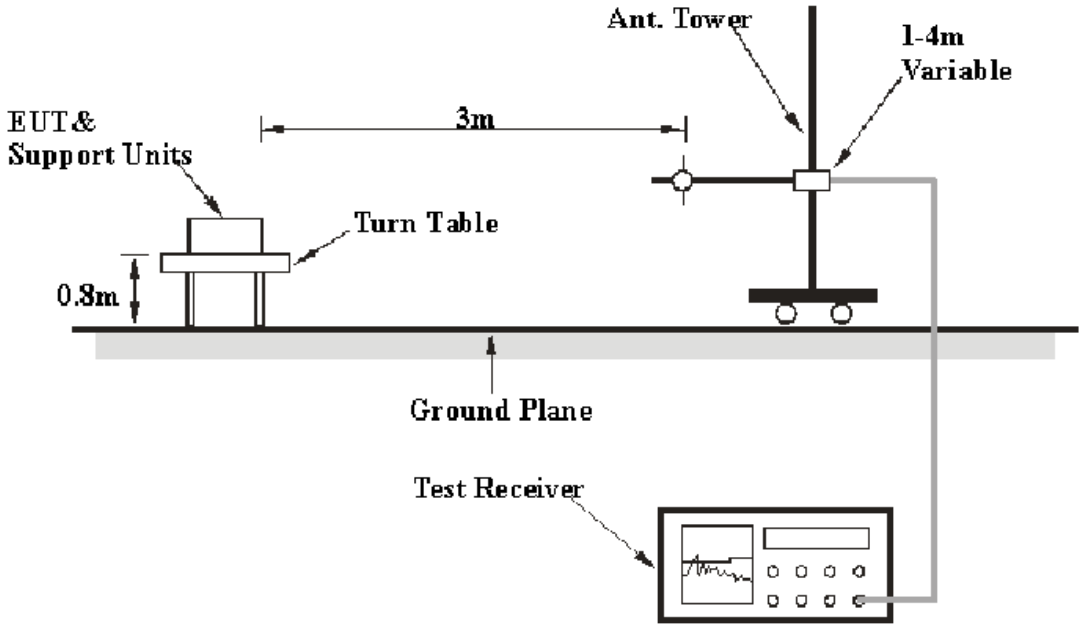


FCC §15.231(a) - DEACTIVATION TESTING

Applicable Standard

Per 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 - 2009. 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	101122	2011-11-17	2012-11-16
HP	Amplifier	8447E	1937A01046	2011-11-24	2012-11-23
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2011-11-28	2012-11-27

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

Test Data

Environmental Conditions

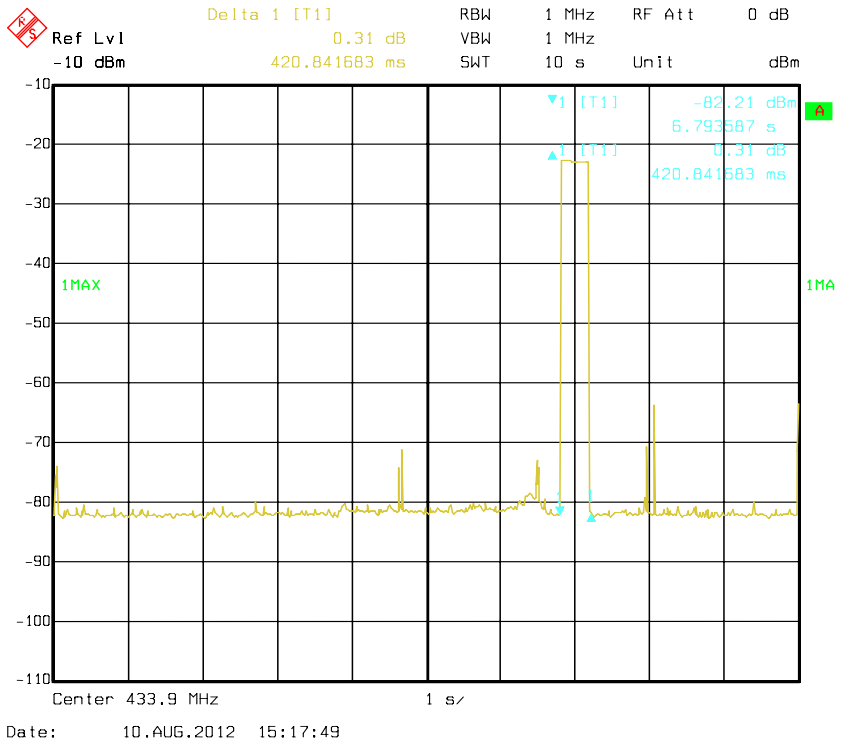
Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	101 kPa

The testing was performed by Leon Chen on 2012-08-10.

Test Mode: Transmitting

Test Result: Compliance. Please refer to following plot.

Deactivate Time (s)	Limit	Result
0.421	<5s	Pass



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