

FCC PART 15.231

TEST REPORT

For

Dakota Alert

32556 E. Main St. PO Box 130, Elk Point, SD 57025 United States

FCC ID: QK8UT-2500

Report Type: Original Report	Product Type: Universal Transmitter
Test Engineer: Jimmy Xiao	<i>Jimmy Xiao</i>
Report Number: RSZ121029004-00	
Report Date: 2012-11-08	
Reviewed By: Suny Sun EMC Engineer	<i>Suny Sun</i>
Test Laboratory:	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

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 may contain data that are not covered by the NVLAP accreditation and shall be marked with an asterisk "★"

TABLE OF CONTENTS

GENERAL INFORMATION.....3

 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)3

 OBJECTIVE3

 RELATED SUBMITTAL(S)/GRANT(S).....3

 TEST METHODOLOGY3

 TEST FACILITY3

SYSTEM TEST CONFIGURATION.....5

 JUSTIFICATION5

 SPECIAL ACCESSORIES5

 EQUIPMENT MODIFICATIONS5

 BLOCK DIAGRAM OF TEST SETUP5

SUMMARY OF TEST RESULTS6

FCC §15.203 - ANTENNA REQUIREMENT.....7

 APPLICABLE STANDARD7

 ANTENNA CONNECTOR CONSTRUCTION7

FCC §15.205, §15.209, §15.231 (B) - RADIATED EMISSIONS8

 APPLICABLE STANDARD8

 MEASUREMENT UNCERTAINTY8

 EUT SETUP9

 EMI TEST RECEIVER SETUP.....9

 TEST PROCEDURE10

 TEST EQUIPMENT LIST AND DETAILS.....10

 CORRECTED AMPLITUDE & MARGIN CALCULATION10

 TEST RESULTS SUMMARY.....10

 TEST DATA10

FCC §15.231(C) – 20 DB BANDWIDTH TESTING13

 APPLICABLE STANDARD13

 TEST EQUIPMENT LIST AND DETAILS.....13

 TEST PROCEDURE13

 TEST DATA13

FCC §15.231- DUTY CYCLE15

 APPLICABLE STANDARD15

 TEST PROCEDURE15

 TEST EQUIPMENT LIST AND DETAILS.....15

 TEST DATA15

FCC §15.231(A)(2) - DEACTIVATION TESTING.....17

 APPLICABLE STANDARD17

 EUT SETUP17

 TEST PROCEDURE17

 TEST EQUIPMENT LIST AND DETAILS.....18

 TEST DATA18

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Dakota Alert's* product, model number: *UT-2500 (FCC ID: QK8UT-2500)* (the "EUT") in this report was a *Universal Transmitter*, which was measured approximately: 8.5 cm (L) x 4.8 cm (W) x 2.1 cm (H), rated input voltage: DC 3V lithium battery.

**All measurement and test data in this report was gathered from production sample serial number: 1210131 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2012-10-29.*

Objective

This 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, section 15.203, 15.205, 15.209, 15.35(c) and 15.231 rules.

Related Submittal(s)/Grant(s)

No related submittal.

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).

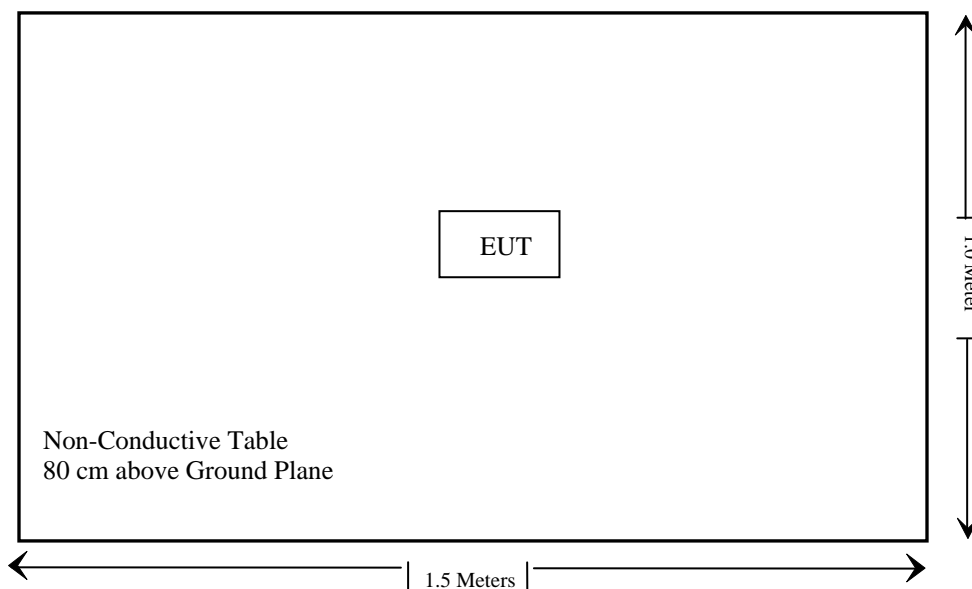
Special Accessories

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

Equipment Modifications

No modification was made to the EUT tested.

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	Not Applicable
§15.205, §15.209, §15.231 (b)	Radiated Emissions	Compliance
§15.231 (c)	20dB Bandwidth	Compliance
§15.231	Duty Cycle	Compliance
§15.231 (a)2	Active time, Silent period	Compliance

Not Applicable: The EUT is powered by battery only.

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.

Antenna Connector Construction

The EUT has one integrated antenna arrangement, which was permanently attached and the gain was 0 dBi, fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliant.

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

Applicable Standard

FCC §15.205, §15.209, §15.231 (b)

According to FCC §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	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

*Linear interpolations.

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

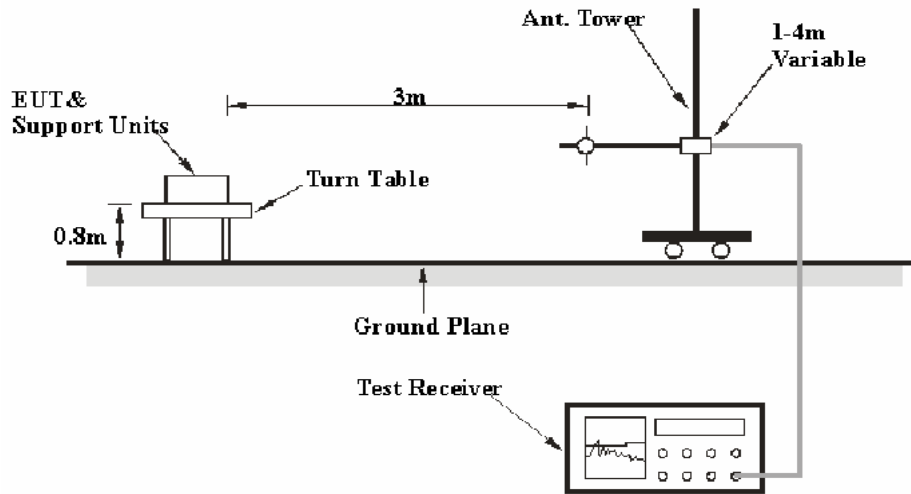
Measurement Uncertainty

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.

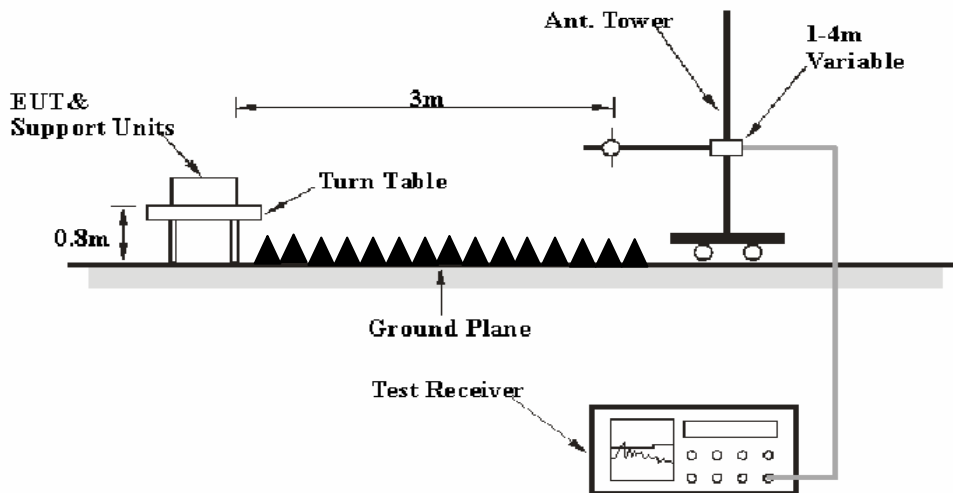
Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements and the best estimate of the uncertainty of a radiation emission measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB, and the uncertainty will not be taken into consideration for all the test data recorded in the report.

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:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>	<i>Dectector</i>
30MHz – 1000 MHz	100 kHz	300 kHz	QP
Above 1 GHz	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 30MHz to 1GHz, Peak and average detection mode above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2012-08-08	2013-08-07
HP	Amplifier	8447E	1937A01046	2011-11-24	2012-11-23
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2012-11-27
Mini-Circuits	Amplifier	ZVA-213+	N/A	2011-11-24	2012-11-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2011-12-01	2012-11-30
R&S	Auto test Software	EMC32	V6.30	-	-

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

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:

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

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 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:

0.43 dB at 1012.4 MHz in the Vertical polarization

Test Data

Environmental Conditions

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

The testing was performed by Jimmy Xiao on 2012-10-29.

Test mode: Transmitting

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dB μ V/m)	FCC 15.231/15.209	
	Reading (dB μ V/m)	Detector (PK/QP/Ave.)		Height (m)	Polar (H/V)			Limit (dB μ V/m)	Margin (dB)
1012.4	68.92	PK	35	1.1	V	-1.20	67.72	74	6.28
1639.1	72.11	PK	242	1.1	V	1.77	73.88	80.83	6.95
1590.8	64.41	PK	113	1.2	V	1.70	66.11	74	7.89
1687.5	63.41	PK	334	1.0	V	2.24	65.65	74	8.35
433.9	99.86	PK	23	1.1	H	-11.4	88.46	100.83	12.37
1928.5	65.17	PK	87	1.2	V	3.07	68.24	80.83	12.59
964.4	55.11	PK	302	1.0	H	-2.9	52.21	74	21.79
867.8	59.55	PK	178	1.0	V	-4.5	55.05	80.83	25.78

Field Strength (Average)

Frequency (MHz)	Peak Measurement @ 3m (dB μ V/m)	Antenna Polar (H/V)	Duty Cycle Correction Factor (dB)	Average Amp. (dB μ V/m)	FCC 15.231/15.209		Comment
					Limit (dB μ V/m)	Margin (dB)	
1012.4	67.72	V	-14.15	53.57	54.00	0.43	Spurious
1639.15	73.88	V	-14.15	59.73	60.83	1.10	Spurious
1590.8	66.11	V	-14.15	51.96	54.00	2.04	Spurious
1687.5	65.65	V	-14.15	51.5	54.00	2.50	Spurious
433.9	88.46	H	-14.15	74.31	80.83	6.52	Fundamental
1928.5	68.24	V	-14.15	54.09	60.83	6.74	Spurious
964.4	52.21	H	-14.15	38.06	54.00	15.94	Spurious
867.8	55.05	V	-14.15	40.9	60.83	19.93	Harmonic

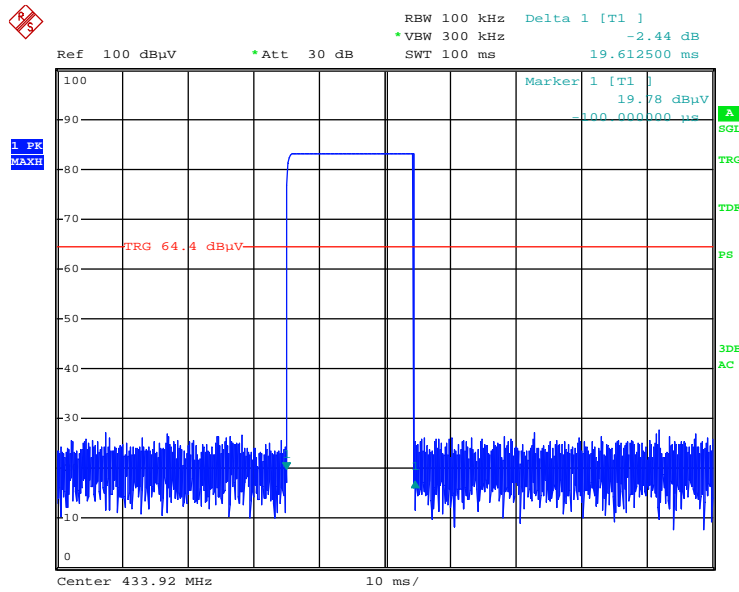
Note:

*Calculate Average value based on Duty Cycle correction factor:

Duty cycle = $T_{on}/(T_{on}+T_{off}) = 19.61/100 = 19.61\%$ Duty Cycle Factor = $20\lg(\text{Duty Cycle}) = 20\lg(19.61\%) = -14.15$

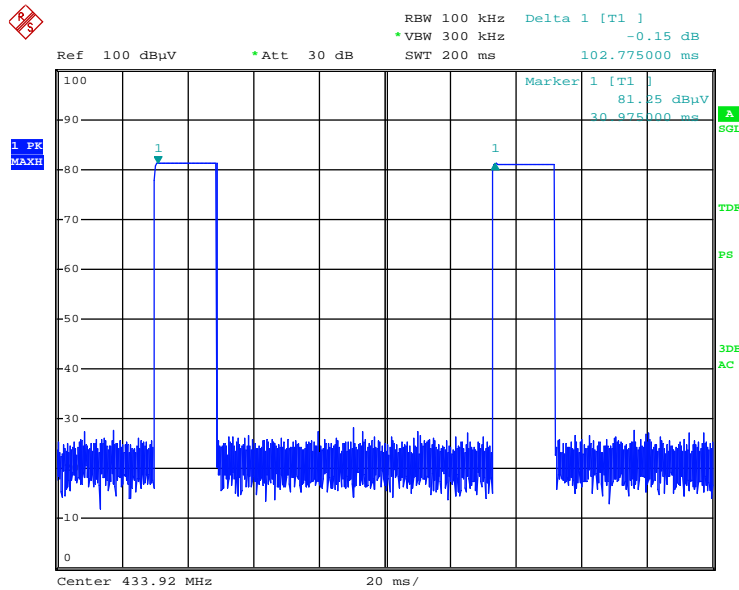
Average = Peak + Duty Cycle Factor

T_{on}



EUT
Date: 29.OCT.2012 12:36:55

T_p



EUT
Date: 29.OCT.2012 12:33:39

FCC §15.231(c) – 20 dB BANDWIDTH TESTING

Applicable Standard

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	2012-08-08	2013-08-07
HP	Amplifier	8447E	1937A01046	2011-11-24	2012-11-23
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2012-03-17	2013-03-16

* **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:	100.0 kPa

The testing was performed by Jimmy Xiao on 2012-10-29.

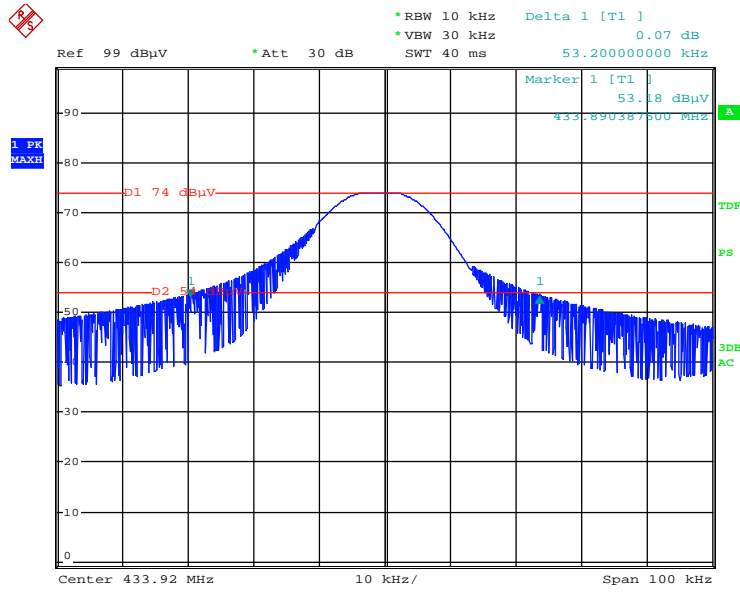
Test Mode: Transmitting

Please refer to following table and plot.

Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (MHz)	Result
433.92	53.2	1.0848	Pass

Note: Limit = 0.25% * center frequency = 0.25% * 433.92 MHz = 1.0848 MHz = 1084.8 kHz
20 dB Bandwidth = 53.2 kHz < 1084.8 kHz

20 dB Bandwidth



EUT
Date: 29.OCT.2012 12:54:57

FCC §15.231- DUTY CYCLE

Applicable Standard

According to FCC §15.231

Limit:

Nil (No dedicated limit specified in the Rules).

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=100 kHz, VBW=300 kHz, Span=0 Hz.
5. Repeat above procedures until all frequency measured was complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2012-08-08	2013-08-07

* **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:	100.0 kPa

The testing was performed by Jimmy Xiao on 2012-10-29.

Test Mode: Transmitting

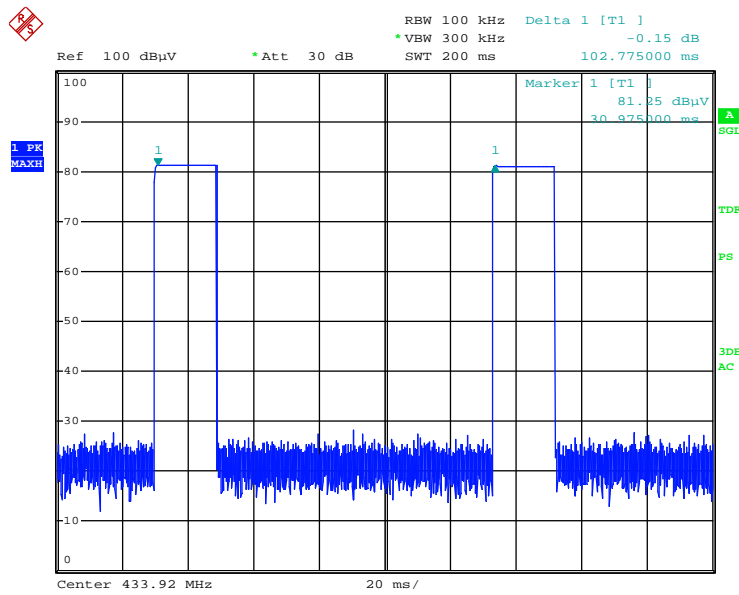
Test Result: Compliance, please refer to following plots.

Duty cycle= T_{on}/T_p

$T_{on}=T_{on1}N_1+T_{on2}N_2+\dots+T_{onn}N_n=19.61\text{ ms}$, $T_p=100\text{ms}$

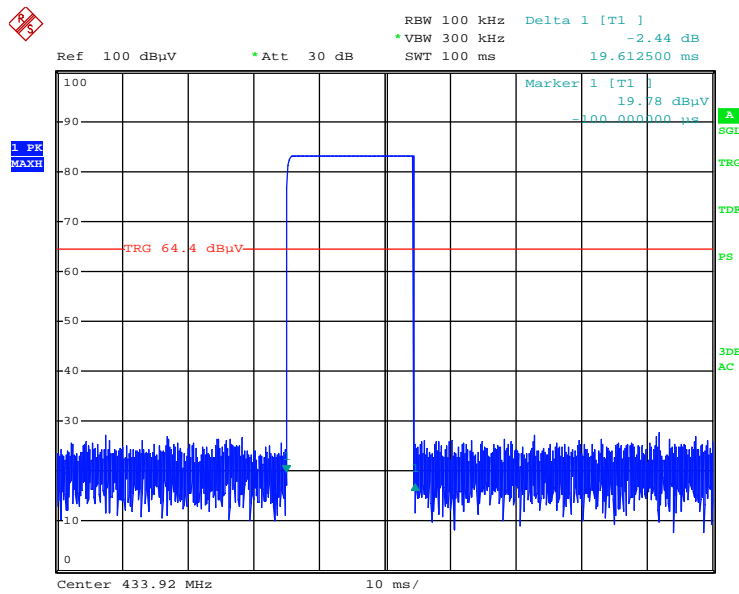
Duty Cycle correction factor= $20\text{Log}(T_{on}/T_p)=20*\text{log}(19.61/100)=-14.15$

Duty Cycle 1



EUT
Date: 29.OCT.2012 12:33:39

Duty Cycle 2



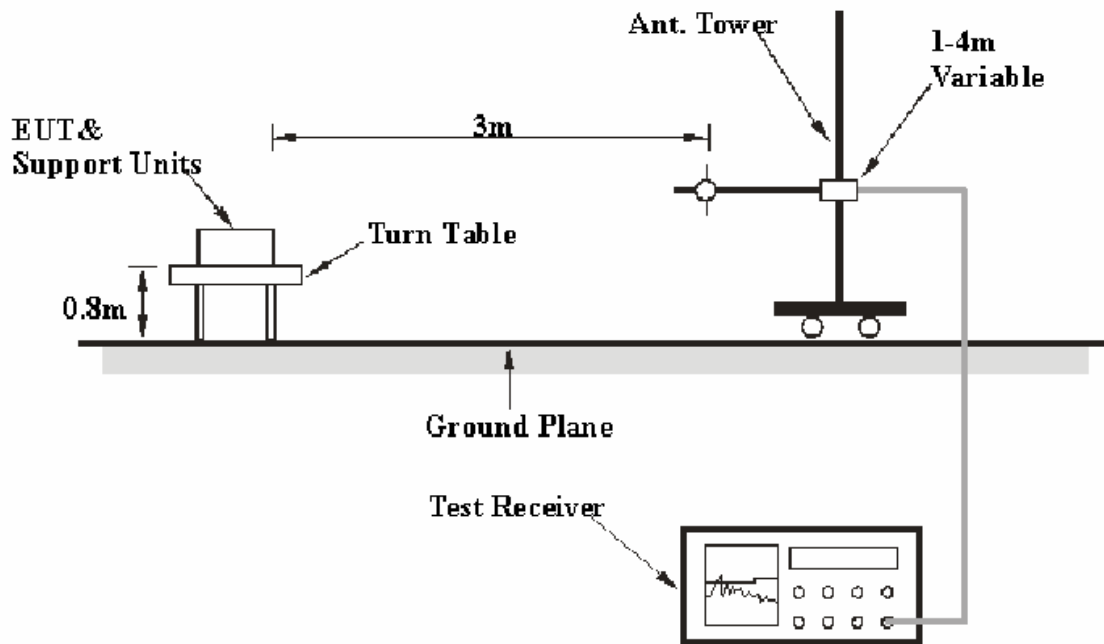
EUT
Date: 29.OCT.2012 12:36:55

FCC §15.231(a)(2) - DEACTIVATION TESTING

Applicable Standard

Per FCC §15.231(a) (2), a transmitter activated automatically shall cease transmission within 5 seconds after activation.

EUT Setup



The deactivation test was performed in the 3 meters chamber B 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 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=100 kHz, VBW=300 kHz, Span=0Hz.
5. Repeat above procedures until all frequency measured was complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	101122	2012-08-08	2013-08-07
HP	Amplifier	8447E	1937A01046	2011-11-24	2012-11-23
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2012-11-27

* **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

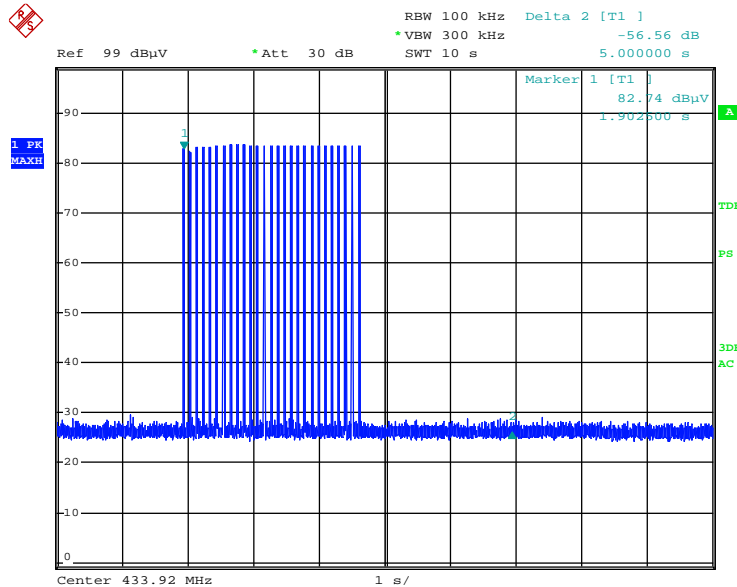
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Jimmy Xiao on 2012-10-29.

Test Mode: Transmitting

Test Result: Compliant, please refer to following plot



EUT
 Date: 29.OCT.2012 12:57:40

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