

FCC PART 15.231

TEST REPORT

For

FUJIAN HUANYUTONG TECHNOLOGY CO.,LTD

Fujian Hai-Xi High-Tech industrial zone, Fengze District, Quanzhou, Fujian, China

FCC ID: ADZT0112

Report Type: Original Report	Product Type: wireless calling system
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Report Date: 2018-03-15	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		wireless calling system
EUT Model:		T0112
FCC ID:		ADZT0112
Rated Input Voltage:		DC 12V from adapter
Adapter Information	Model:	HW-120200U6W
	Input:	AC 100-240V~50/60Hz, 0.8A
	Output:	DC 12V, 2.0A
External Dimension:		220mm(L)*135mm(W)*48mm(H)
Serial Number:		171107052
EUT Received Date:		2017.11.07

Objective

This report is prepared on behalf of **FUJIAN HUANYUTONG TECHNOLOGY CO.,LTD** in accordance with Part 2, Subpart J, Part 15, Subparts A, and C of the Federal Communications Commission's rules

The tests were performed in order to determine compliance with FCC Rules Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209, 15.35(c) and 15.231 rules.

Related Submittal(s)/Grant(s)

FCC submissions with Part 15.231 DSC, FCC ID: ADZT0818

FCC submissions with Part 15B CYY, FCC ID: ADZT0918

Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
Unwanted Emissions, radiated	30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

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 Industry Area, Tangxia, Dongguan, Guangdong, China

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218,the FCC Designation No. : CN1220.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062D.

SYSTEM TEST CONFIGURATION

Justification

The system was configured in testing mode which was provided by manufacturer.

The device operation frequency is 433.92 MHz.

Equipment Modifications

No modifications were made to the unit tested.

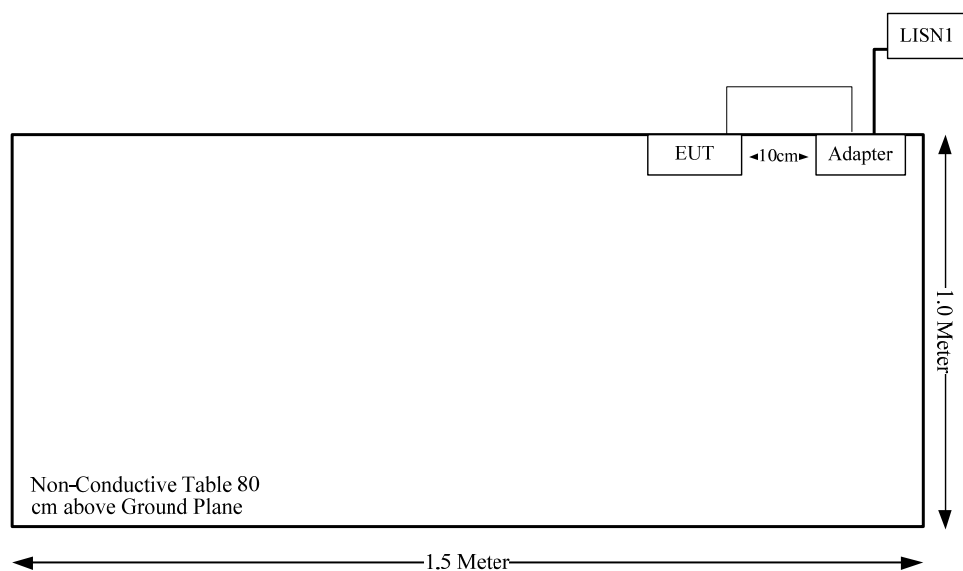
EUT Exercise Software

No software was used in test.

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From	To
DC Cable	NO	NO	1.5	Adapter	EUT

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 Bandwidth	Compliance
§15.231 (a)	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.

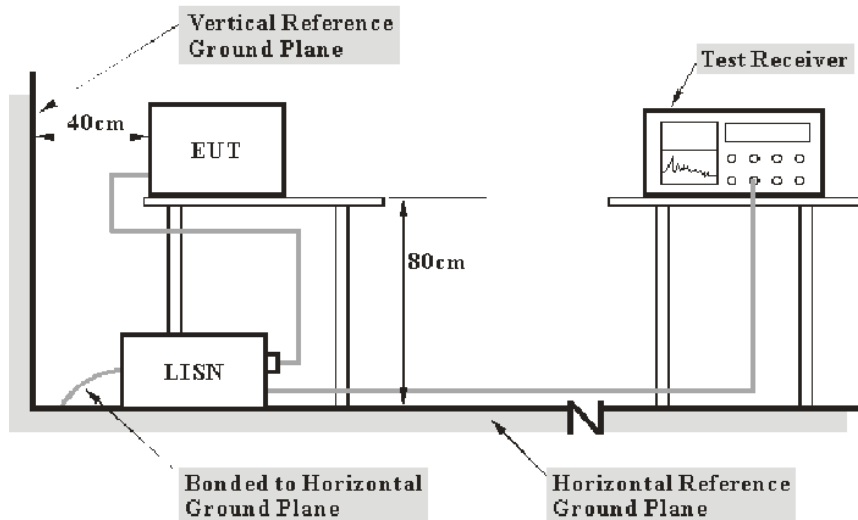
The EUT has two external antenna arrangement, one for transmitting, one for receiving, which was permanently attached and the antenna gain is 0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a)

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 C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207.

The spacing between the peripherals was 10 cm.

The EUT was connected to the main LISN with a 120/60 Hz AC 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 EUT 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.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

$$C_f = A_C + VDF$$

Herein,

V_C (cord. Reading): corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN

C_f : Correction Factor

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB 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
R&S	EMI Test Receiver	ESCS 30	830245/006	2017-12-11	2018-12-11
R&S	Two-line V-network	ENV 216	101614	2017-12-08	2018-12-08
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
N/A	Coaxial Cable	C-NJNJ-50	C-0200-01	2017-09-05	2018-09-05

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

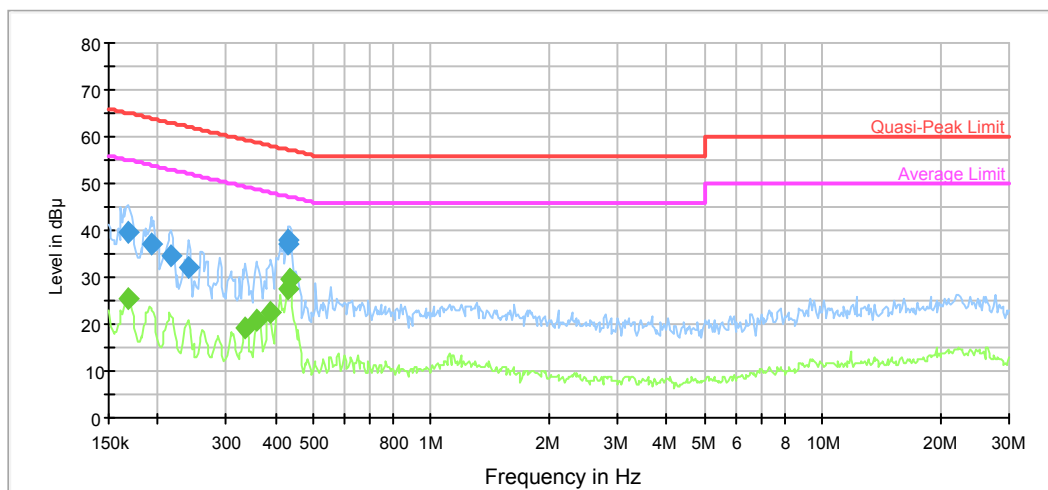
Test Data**Environmental Conditions**

Temperature:	25.4 °C
Relative Humidity:	50 %
ATM Pressure:	100.9 kPa

The testing was performed by Ade Xiao on 2018-03-06.

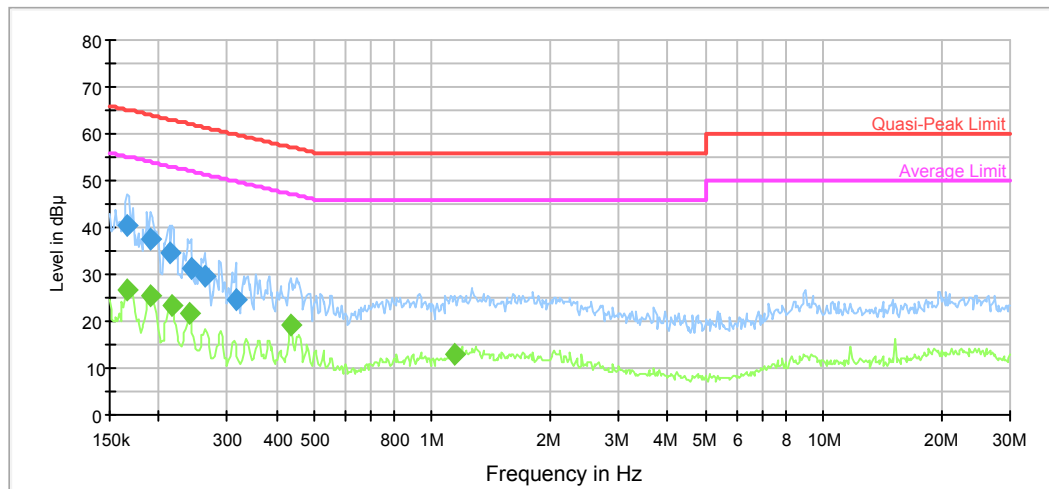
Test Mode: Transmitting

AC120V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.169044	39.7	9.000	L1	10.9	25.3	65.0	Compliance
0.192030	36.8	9.000	L1	10.7	27.1	63.9	Compliance
0.216409	34.4	9.000	L1	10.5	28.6	63.0	Compliance
0.240029	32.0	9.000	L1	10.4	30.1	62.1	Compliance
0.429420	37.2	9.000	L1	9.9	20.1	57.3	Compliance
0.432855	37.9	9.000	L1	9.9	19.3	57.2	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.167702	25.4	9.000	L1	10.9	29.7	55.1	Compliance
0.335433	19.3	9.000	L1	10.1	30.0	49.3	Compliance
0.360371	21.0	9.000	L1	10.0	27.7	48.7	Compliance
0.387164	22.5	9.000	L1	10.0	25.6	48.1	Compliance
0.429420	27.7	9.000	L1	9.9	19.6	47.3	Compliance
0.436318	29.5	9.000	L1	9.9	17.6	47.1	Compliance

AC120V, 60 Hz, Neutral:

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.166371	40.6	9.000	N	10.9	24.5	65.1	Compliance
0.190505	37.5	9.000	N	10.7	26.5	64.0	Compliance
0.212988	34.5	9.000	N	10.5	28.6	63.1	Compliance
0.241949	31.2	9.000	N	10.4	30.8	62.0	Compliance
0.262017	29.7	9.000	N	10.3	31.7	61.4	Compliance
0.314718	24.6	9.000	N	10.1	35.2	59.8	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.166371	26.7	9.000	N	10.9	28.4	55.1	Compliance
0.190505	25.4	9.000	N	10.7	28.6	54.0	Compliance
0.216409	23.4	9.000	N	10.5	29.6	53.0	Compliance
0.240029	21.6	9.000	N	10.4	30.5	52.1	Compliance
0.436318	19.1	9.000	N	9.9	28.0	47.1	Compliance
1.144267	13.0	9.000	N	9.8	33.0	46.0	Compliance

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

FCC §15.205, §15.209, §15.231 (b)

(b) In addition to the provisions of §15.205, 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 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

¹Linear interpolations.

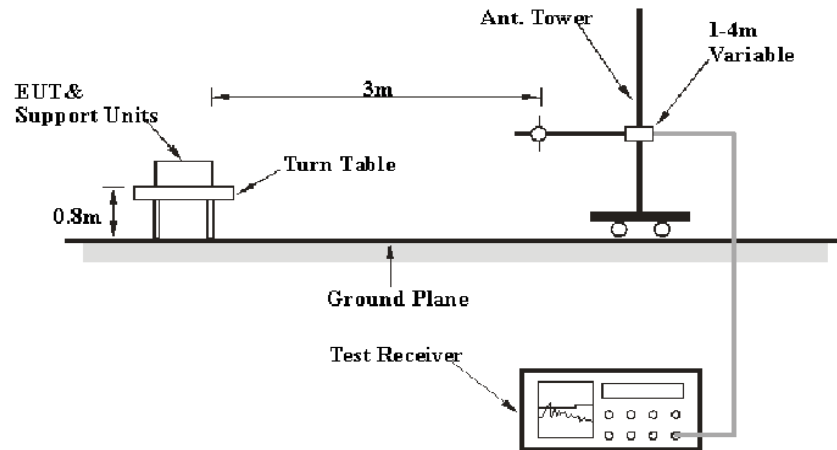
(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, 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. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

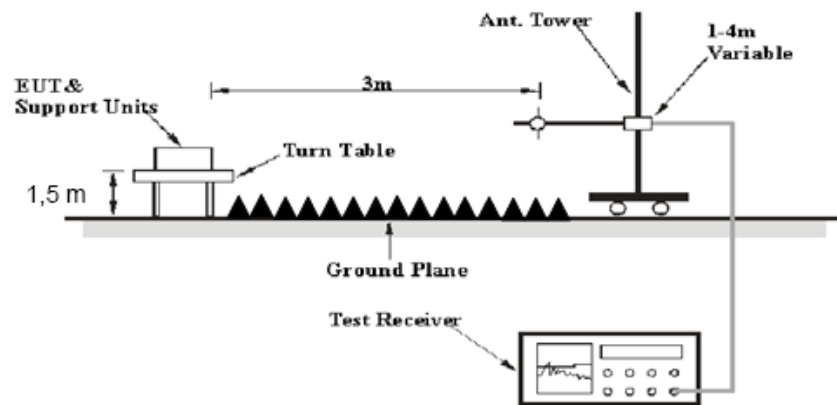
(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

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 C63.10-2013. The specification used was the FCC 15 § 15.209, 15.205 and 15.231.

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	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	100 kHz	PK
1 GHz – 5 GHz	1 MHz	3 MHz	/	PK

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
Agilent	Spectrum Analyzer	E4440A	SG43360054	2017-12-08	2018-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
MITEQ	Amplifier	AFS42-00101800-25-S-42	2001271	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-1000-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-SJSJ-50	C-0800-01	2017-09-05	2018-09-05
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

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

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 7dB means the emission is 7dB 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 CFR47 §15.205, §15.209, §15.231 (b).

Test Data**Environmental Conditions**

Temperature:	25~26.5 °C
Relative Humidity:	54~57 %
ATM Pressure:	100.6~101.3 kPa

The testing was performed by Eric Xiao and Sunny Cen on 2018-03-02 & 2018-03-05.

Test mode: Transmitting

Field Strength (Peak)

Frequency	Receiver	Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	15.231(b)	
(MHz)	Reading (dBμV)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)
Operating Frequency: 433.92 MHz								
433.92	51.10	H	16.48	2.65	0.00	70.23	100.83	30.60
433.92	50.31	V	16.48	2.65	0.00	69.44	100.83	31.39
867.84	40.70	H	21.76	4.09	0.00	66.55	80.83	14.28
867.84	37.95	V	21.76	4.09	0.00	63.80	80.83	17.03
1301.76	74.70	H	24.53	1.57	35.95	64.85	74.00	9.15
1301.76	75.22	V	24.53	1.57	35.95	65.37	74.00	8.63
1735.68	67.77	H	26.19	1.65	36.06	59.55	80.83	21.28
1735.68	69.74	V	26.19	1.65	36.06	61.52	80.83	19.31
2169.60	73.70	H	27.64	1.74	36.18	66.90	80.83	13.93
2169.60	72.92	V	27.64	1.74	36.18	66.12	80.83	14.71
2603.52	53.61	H	28.67	1.88	36.38	47.78	80.83	33.05
2603.52	57.72	V	28.67	1.88	36.38	51.89	80.83	28.94

Field Strength (Average)

Frequency (MHz)	Peak Measurement @ 3m (dBμV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Average Amp. (dBμV/m)	15.231(b)	
					Limit (dBμV/m)	Margin (dB)
Operating Frequency: 433.92 MHz						
433.92	70.23	H	-13.88	56.35	80.83	24.48
433.92	69.44	V	-13.88	55.56	80.83	25.27
867.84	66.55	H	-13.88	52.67	60.83	8.16
867.84	63.80	V	-13.88	49.92	60.83	10.91
1301.76	64.85	H	-13.88	50.97	54.00	3.03
1301.76	65.37	V	-13.88	51.49	54.00	2.51
1735.68	59.55	H	-13.88	45.67	60.83	15.16
1735.68	61.52	V	-13.88	47.64	60.83	13.19
2169.60	66.90	H	-13.88	53.02	60.83	7.81
2169.60	66.12	V	-13.88	52.24	60.83	8.59
2603.52	47.78	H	-13.88	33.90	60.83	26.93
2603.52	51.89	V	-13.88	38.01	60.83	22.82

Duty Cycle Correction Factor Calculation as below:

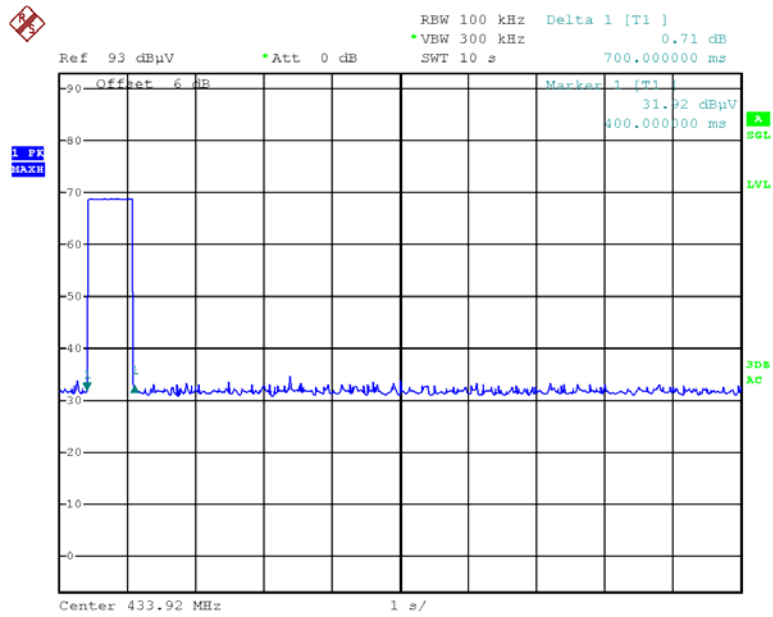
$$T_{on}=0.55*25=13.75 \text{ ms}$$

$$T_{on+off}=68 \text{ ms}$$

$$\text{Duty cycle} = 13.75/68*100\%=20.22\%$$

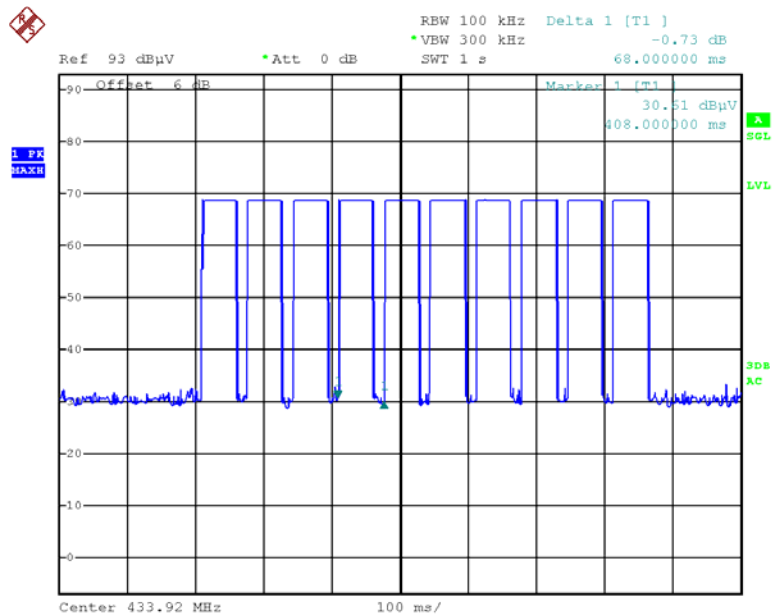
$$\text{Duty Cycle Correction Factor} = 20*\log(\text{Duty cycle}) = -13.88 \text{ dB}$$

Transmission duration:700ms

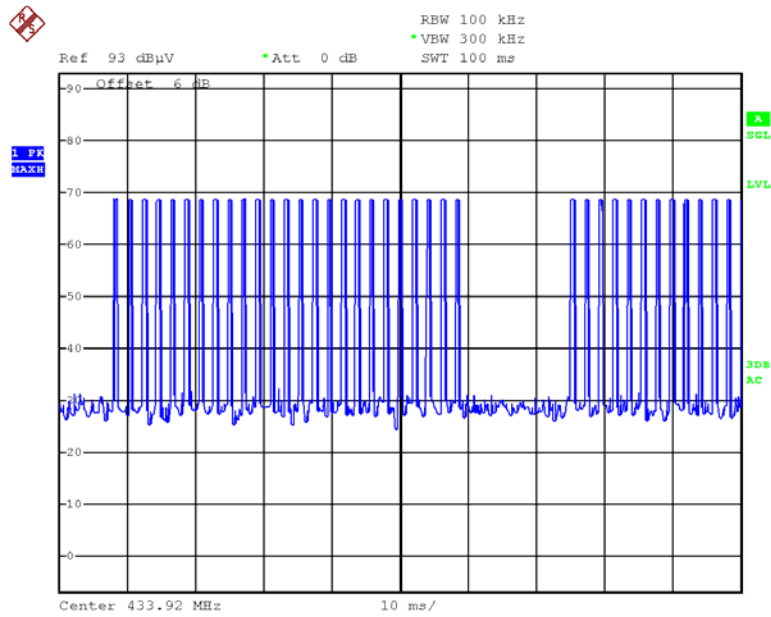


Date: 2.MAR.2018 19:36:06

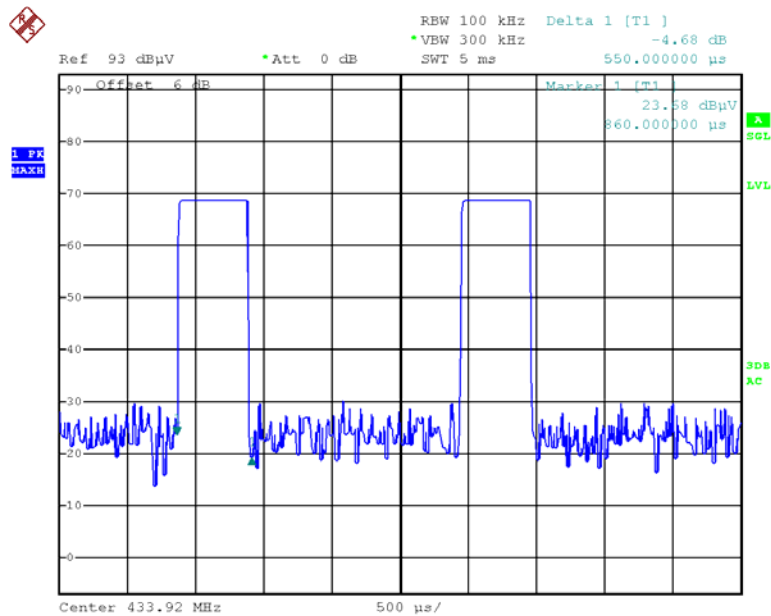
Period:68ms



Date: 2.MAR.2018 19:37:24

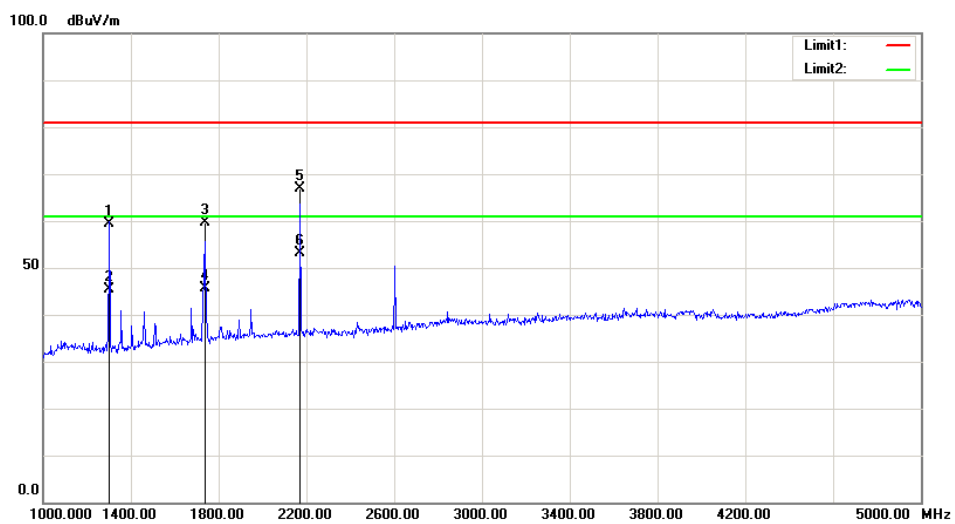
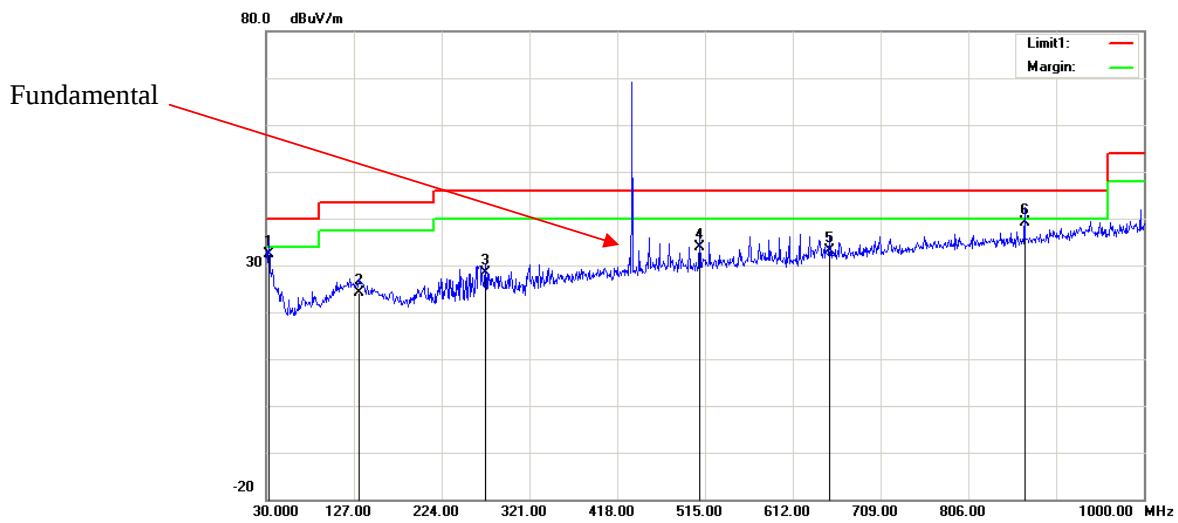
25 pulse in one Period

Date: 2.MAR.2018 19:55:46

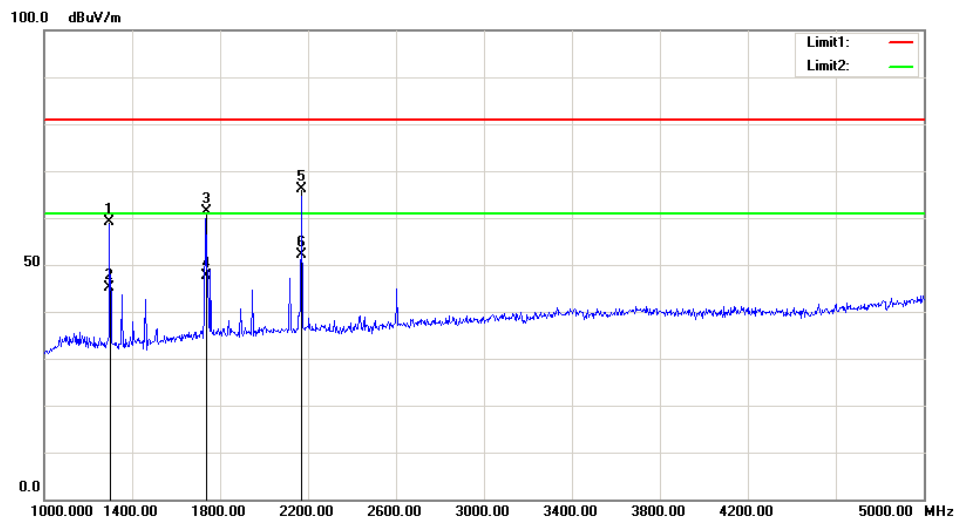
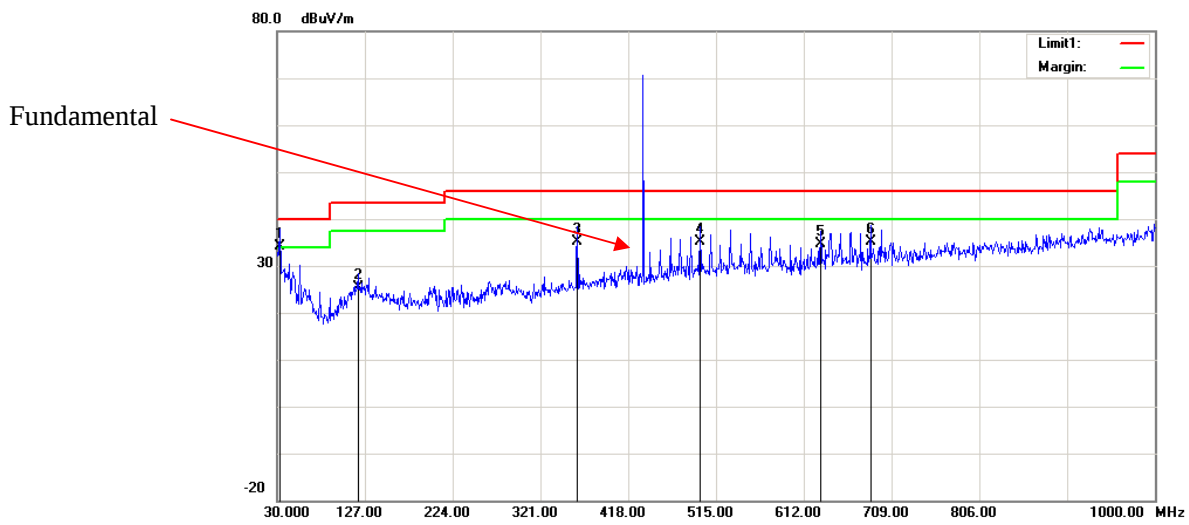
One pulse: 0.55ms

Date: 2.MAR.2018 20:01:28

Horizontal:



Vertical:



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
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Procedure

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:	57 %
ATM Pressure:	101.3 kPa

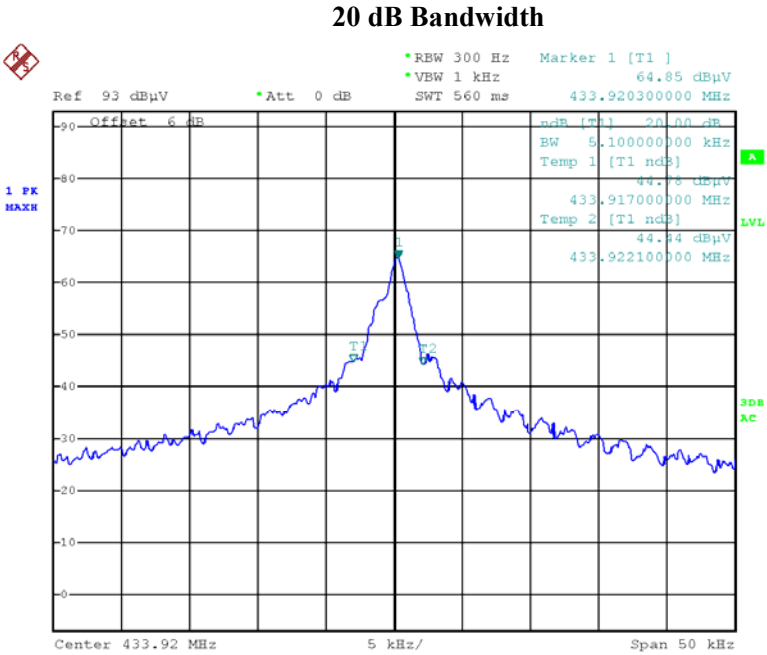
The testing was performed by David Huang on 2018-03-02

Test Mode: Transmitting

Please refer to following table and plot.

Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Result
433.92	5.1	1084.8	Pass

Note: Limit = 0.25% * Center Frequency = 0.25%*433.92MHz = 1084.8kHz



Date: 2.MAR.2018 20:23:29

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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2017-12-11	2018-12-11
Sunol Sciences	Antenna	JB3	A060611-1	2017-11-10	2020-11-10
HP	Amplifier	8447D	2727A05902	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0400-01	2017-09-05	2018-09-05
N/A	Coaxial Cable	C-NJNJ-50	C-0075-01	2017-09-05	2018-09-05

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	57 %
ATM Pressure:	101.3 kPa

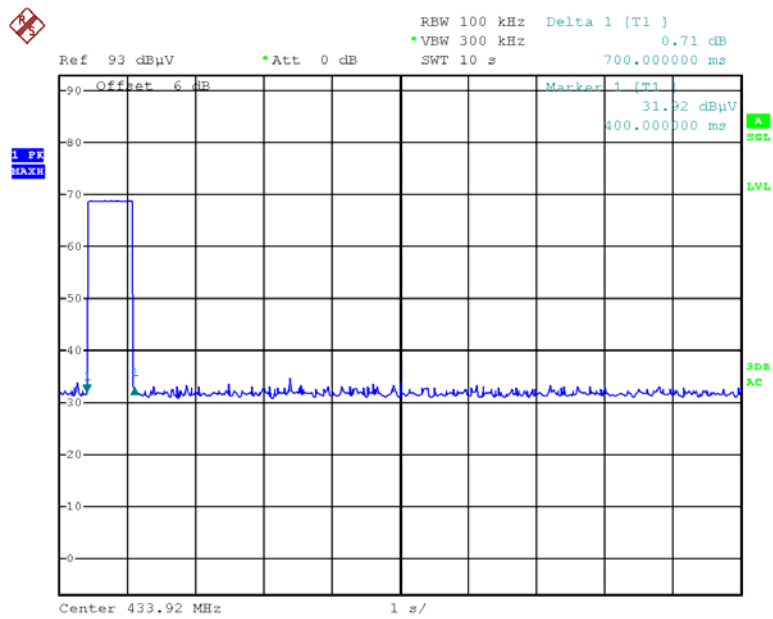
The testing was performed by David Huang on 2018-03-02

Test Mode: Transmitting

Test Result: Compliance. Please refer to following plot.

Deactivate Time (s)	Limit	Result
0.7	<5s	Pass

Transmission duration



Date: 2.MAR.2018 19:36:06

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