



FCC PART 15.231

TEST REPORT

For

GTO Access Systems, LLC

3121 Hartsfield Road, Tallahassee, Florida 32303, USA

FCC ID: I6H-MM136KP

<b>Report Type:</b> Original Report	<b>Product Type:</b> MIGHTY MULE RETAIL KEYPAD
<b>Report Number:</b>	RDG170905006-00A
<b>Report Date:</b>	2017-12-21
<b>Reviewed By:</b>	Jerry Zhang EMC Manager <i>Jerry Zhang</i>
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**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

<b>EUT Name:</b>	MIGHTY MULE RETAIL KEYPAD
<b>EUT Model:</b>	MM136K
<b>FCC ID:</b>	I6H-MM136KP
<b>Rated Input Voltage:</b>	DC6.0V from battery or AC/DC 8~24V from AC/DC port
<b>External Dimension:</b>	22.1cm(L)*8.4cm(W)*6.8cm(H)
<b>Serial Number:</b>	170905006
<b>EUT Received Date:</b>	2017-09-05

### Objective

This report is prepared on behalf of *GTO Access Systems, LLC* 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 Part 15C DSS submissions with FCC ID: I6H-MM136KP.  
Part of system submissions with FCC ID: I6H-MM136G3BASE.

### 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	$\pm 5\%$
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	$\pm 1^\circ\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 0.4\%$
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, Puxihu Industry Area, Tangxia, Dongguan, Guangdong, China

Bay Area Compliance Laboratories Corp. (Dongguan) has been accredited to ISO/IEC 17025 by CNAS(Lab code: L5662). And accredited to ISO/IEC 17025 by NVLAP(Test Laboratory Accreditation Certificate Number 500069-0), the FCC Designation No. CN5002 under the KDB 974614 D01.

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.

Bay Area Compliance Laboratories Corp. (Dongguan) was 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.

When the GRANT ACCESS Button of the base unit was pressed, the 915MHz, module will receive it, and if the person at the keypad side press the keypad any key, the 318 MHz module will send out the same ASK signal to the gate opener and open the gate.

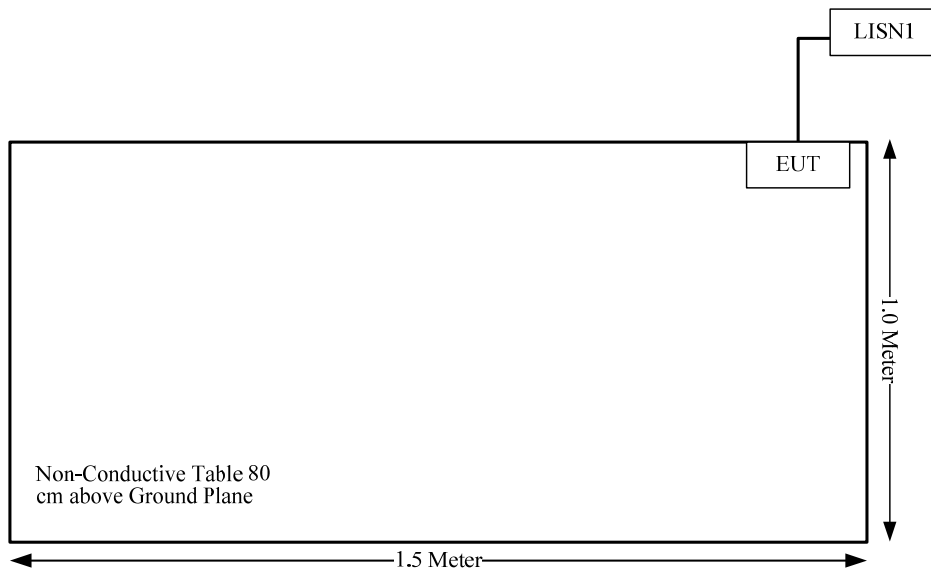
### EUT Exercise Software

No software was used in test.

### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
GTO Access Systems, LLC	INTERCOM BASE UNIT	MM136B	/

### Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

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<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§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

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## **FCC §15.203 - ANTENNA REQUIREMENT**

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### **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.

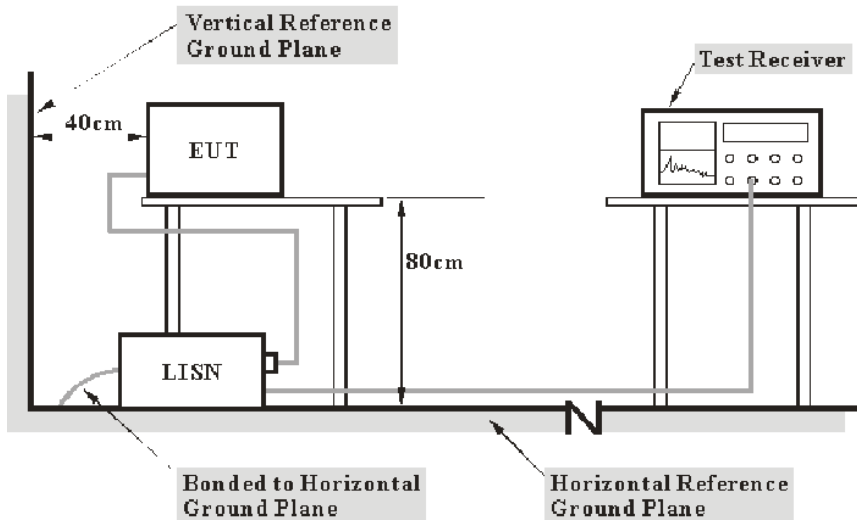
The EUT has one internal antenna arrangement, which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**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 8 or 24 V/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 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.

## 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	2016-12-08	2017-12-08
R&S	L.I.S.N	ESH2-Z5	892107/021	2016-09-25	2017-09-25
R&S	Two-line V-network	ENV 216	3560.6550.12	2016-12-08	2017-12-08
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**

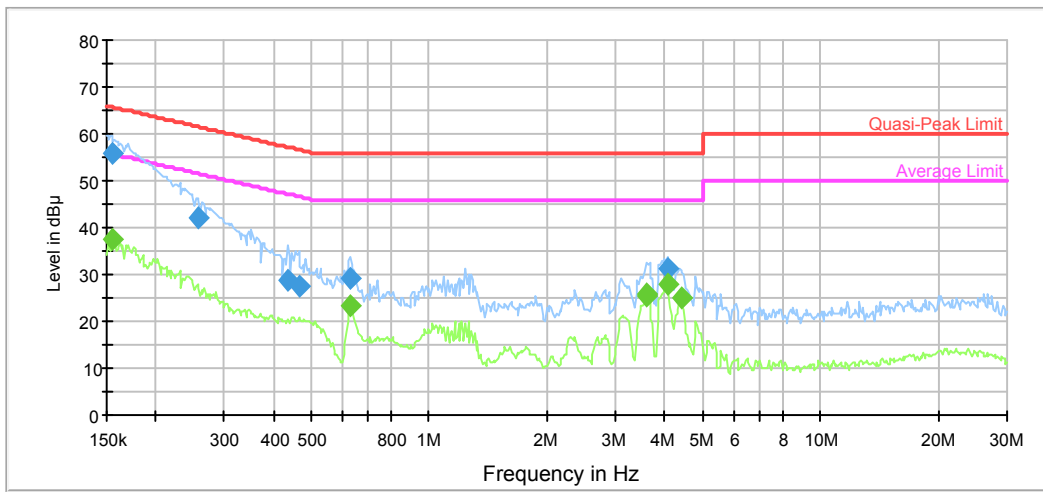
**Environmental Conditions**

<b>Temperature:</b>	27.1 °C
<b>Relative Humidity:</b>	40 %
<b>ATM Pressure:</b>	100.2 kPa

The testing was performed by Alex You on 2017-09-07.

**Test Mode:** Transmitting(AC 24V was the worst)

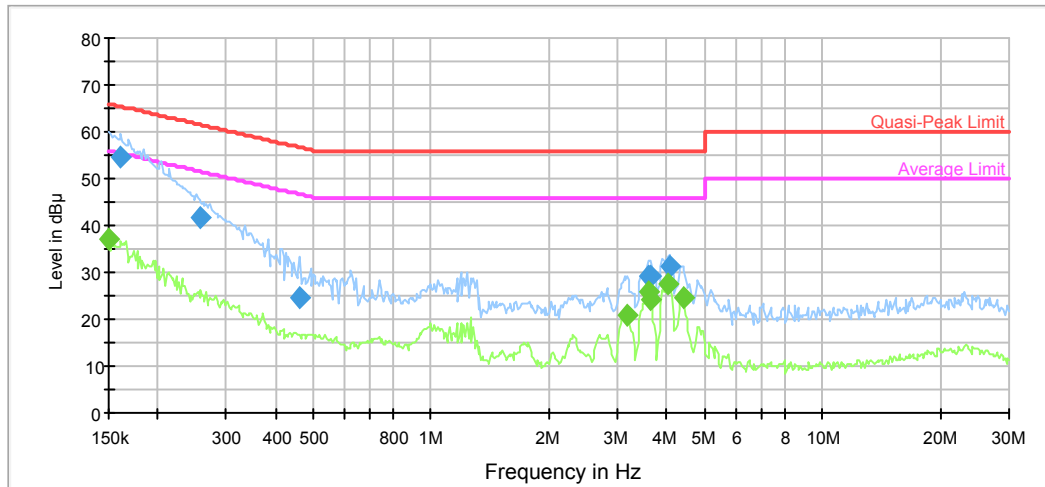
**AC24V, 60 Hz, Line:**



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.154858	55.7	9.000	L1	11.1	10.0	65.7	Compliance
0.255827	42.2	9.000	L1	10.3	19.4	61.6	Compliance
0.436318	28.6	9.000	L1	9.9	28.5	57.1	Compliance
0.465037	27.6	9.000	L1	9.9	29.0	56.6	Compliance
0.629488	29.3	9.000	L1	9.8	26.7	56.0	Compliance
4.062112	31.2	9.000	L1	9.8	24.8	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.154858	37.3	9.000	L1	11.1	18.4	55.7	Compliance
0.629488	23.4	9.000	L1	9.8	22.6	46.0	Compliance
3.575883	25.3	9.000	L1	9.8	20.7	46.0	Compliance
3.604490	25.9	9.000	L1	9.8	20.1	46.0	Compliance
4.062112	27.7	9.000	L1	9.8	18.3	46.0	Compliance
4.399032	24.8	9.000	L1	9.8	21.2	46.0	Compliance

**AC24V, 60 Hz, Neutral:**



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.161152	54.7	9.000	L1	11.0	10.7	65.4	Compliance
0.255827	41.9	9.000	L1	10.3	19.7	61.6	Compliance
0.461346	24.6	9.000	L1	9.9	32.1	56.7	Compliance
3.575883	29.3	9.000	L1	9.8	26.7	56.0	Compliance
3.633326	29.3	9.000	L1	9.8	26.7	56.0	Compliance
4.062112	31.1	9.000	L1	9.8	24.9	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	37.0	9.000	L1	11.2	19.0	56.0	Compliance
3.173039	20.7	9.000	L1	9.8	25.3	46.0	Compliance
3.575883	25.7	9.000	L1	9.8	20.3	46.0	Compliance
3.633326	24.3	9.000	L1	9.8	21.7	46.0	Compliance
4.029873	27.7	9.000	L1	9.8	18.3	46.0	Compliance
4.399032	24.4	9.000	L1	9.8	21.6	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:

<b>Fundamental frequency (MHz)</b>	<b>Field strength of fundamental (microvolts/meter)</b>	<b>Field strength of spurious emissions (microvolts/meter)</b>
40.66-40.70	2,250	225
70-130	1,250	125
130-174	<sup>1</sup> 1,250 to 3,750	<sup>1</sup> 125 to 375
174-260	3,750	375
260-470	<sup>1</sup> 3,750 to 12,500	<sup>1</sup> 375 to 1,250
Above 470	12,500	1,250

<sup>1</sup>Linear interpolations.

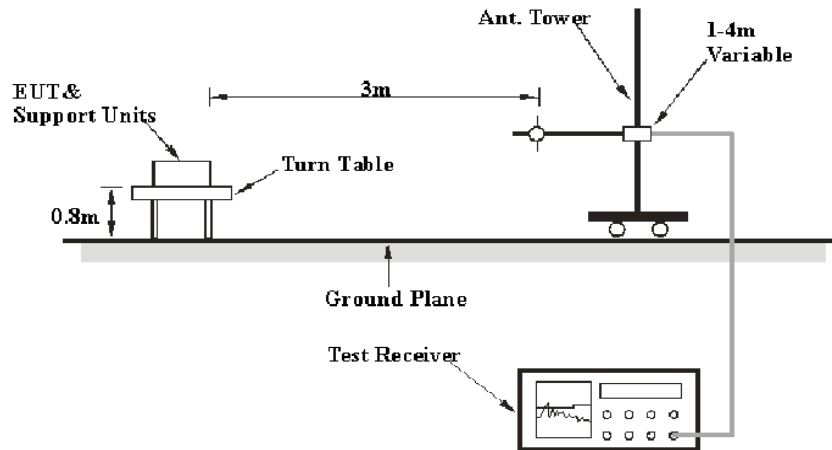
(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(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.

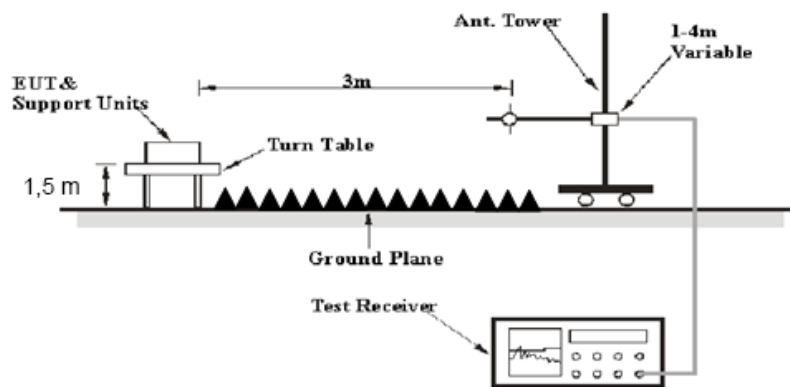
(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §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	Detector
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	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-2	2017-08-25	2020-08-25
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	2019-01-05
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**

<b>Temperature:</b>	26.3 °C~26.3 °C
<b>Relative Humidity:</b>	34 %~34 %
<b>ATM Pressure:</b>	100.2 kPa~100.2 kPa

The testing was performed by Calvin Chen on 2017-12-20 and 2017-12-21.

Test mode: Transmitting(AC 24V was the worst)

**Field Strength (Peak)**

Frequency (MHz)	Receiver Reading (dBµV)	Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	15.231(b)	
		Polar (H/V)	Factor (dB)				Limit (dBµV/m)	Margin (dB)
Operating Frequency:318.055 MHz								
318.055	82.75	H	14.50	2.18	21.57	77.86	95.80	17.94
318.055	77.9	V	14.50	2.18	21.57	73.01	95.80	22.79
636.11	41.67	H	20.10	3.08	22.28	42.57	75.80	33.23
636.11	40.37	V	20.10	3.08	22.28	41.27	75.80	34.53
954.165	50.17	H	23.33	3.76	22.08	55.18	75.80	20.62
954.165	48.43	V	23.33	3.76	22.08	53.44	75.80	22.36
1272.22	58.25	H	25.27	2.15	35.28	50.40	74.00	23.6
1272.22	57.91	V	25.27	2.15	35.28	50.06	74.00	23.94
1590.275	64.41	H	26.10	2.46	35.32	57.65	74.00	16.35
1590.275	63.59	V	26.10	2.46	35.32	56.83	74.00	17.17
1908.33	50.38	H	28.19	2.67	35.58	45.67	74.00	28.33
1908.33	49.84	V	28.19	2.67	35.58	45.13	74.00	28.87
2226.385	62.86	H	30.07	2.97	35.57	60.33	74.00	13.67
2226.385	60.78	V	30.07	2.97	35.57	58.25	74.00	15.75
2544.44	59.91	H	31.54	3.10	35.45	59.10	74.00	14.9
2544.44	59.67	V	31.54	3.10	35.45	58.86	74.00	15.14
2862.495	56.54	H	31.09	3.34	35.35	55.62	74.00	18.38
2862.495	55.92	V	31.09	3.34	35.35	55.00	74.00	19

**Field Strength (Average)**

Frequency (MHz)	Peak Measurement@3m (dBμV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Average Amp. (dBμV/m)	15.231	
					Limit (dBμV/m)	Margin (dB)
318.055	77.86	H	-8.15	69.71	75.8	6.09
318.055	73.01	V	-8.15	64.86	75.8	10.94
636.11	42.57	H	-8.15	34.42	55.8	21.38
636.11	41.27	V	-8.15	33.12	55.8	22.68
954.165	55.18	H	-8.15	47.03	55.8	8.77
954.165	53.44	V	-8.15	45.29	55.8	10.51
1272.22	50.4	H	-8.15	42.25	54	11.75
1272.22	50.06	V	-8.15	41.91	54	12.09
1590.275	57.65	H	-8.15	49.5	54	4.5
1590.275	56.83	V	-8.15	48.68	54	5.32
1908.33	45.67	H	-8.15	37.52	54	16.48
1908.33	45.13	V	-8.15	36.98	54	17.02
2226.385	60.33	H	-8.15	52.18	54	1.82
2226.385	58.25	V	-8.15	50.1	54	3.9
2544.44	59.1	H	-8.15	50.95	54	3.05
2544.44	58.86	V	-8.15	50.71	54	3.29
2862.495	55.62	H	-8.15	47.47	54	6.53
2862.495	55	V	-8.15	46.85	54	7.15

Duty Cycle Correction Factor Calculation as below:

$$T_{on}=8*4.14+10*0.6 =39.12\text{ms}$$

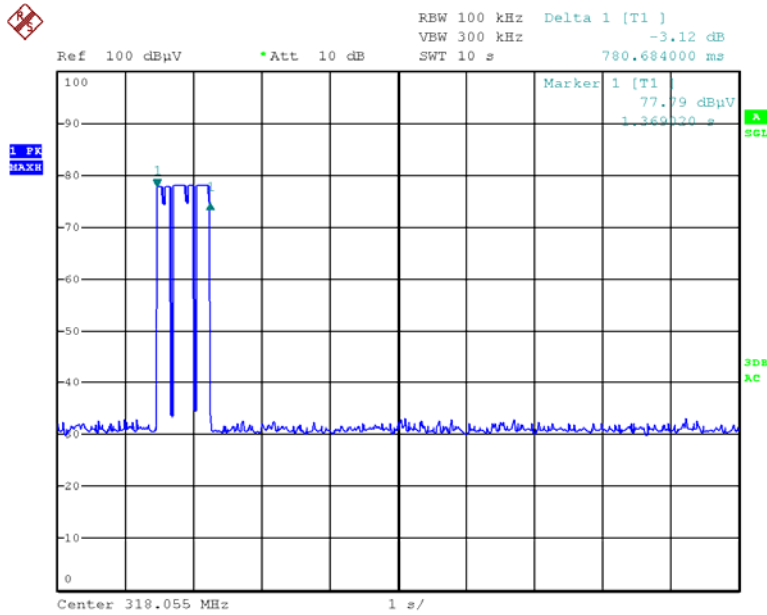
$$T_{on+off}=100 \text{ ms}$$

$$\text{Duty cycle} = 39.12/100*100\%=39.12\%$$

$$\text{Duty Cycle Correction Factor}= 20*\log(\text{Duty cycle})= -8.15 \text{ dB}$$

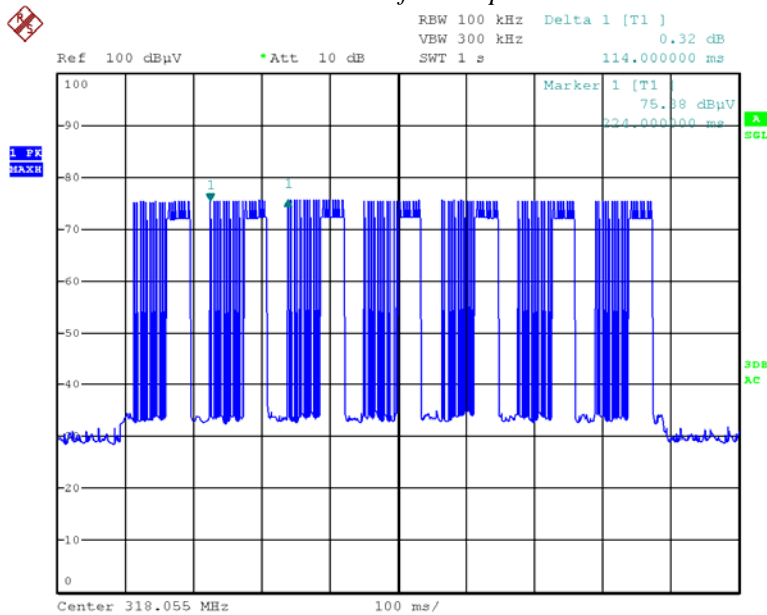


*Transmission duration(780ms)*



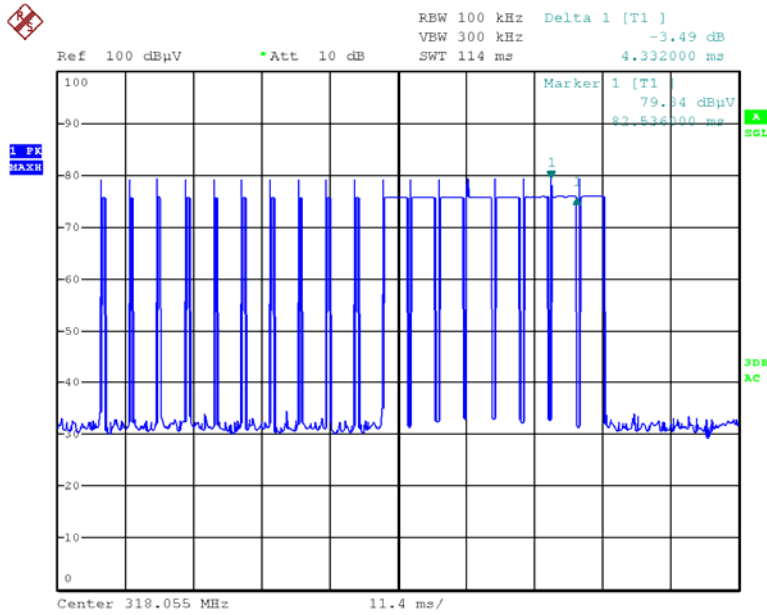
Date: 20.DEC.2017 21:02:22

*7 period in Transmission duration  
114ms for one period*



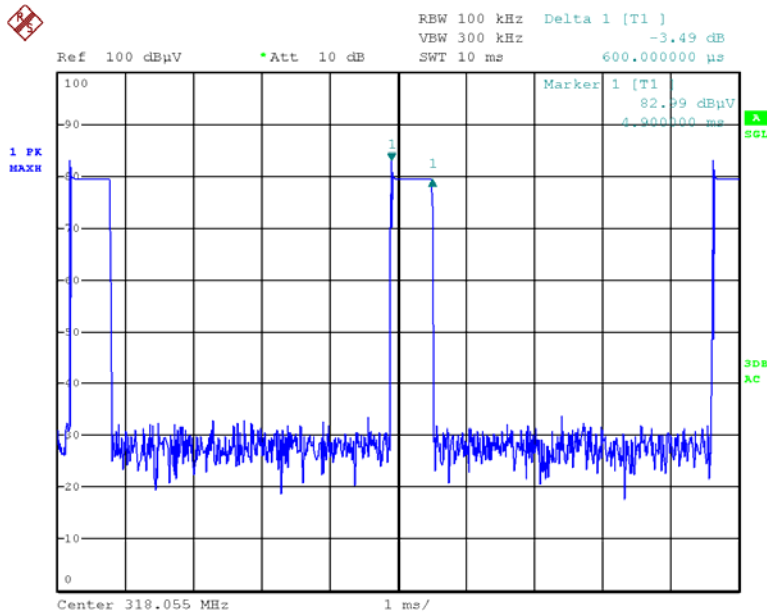
Date: 20.DEC.2017 21:03:46

All Pulse



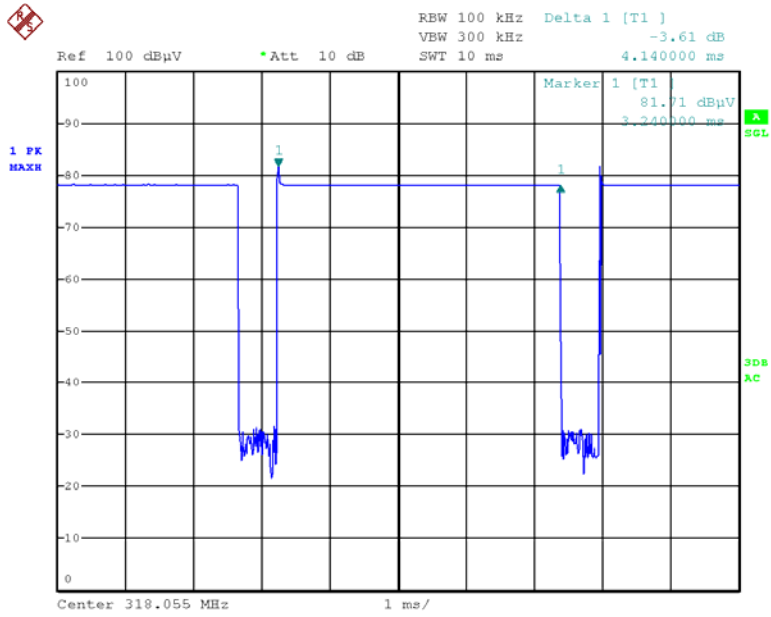
Date: 20.DEC.2017 21:04:32

Pulse 1



Date: 21.DEC.2017 17:12:59

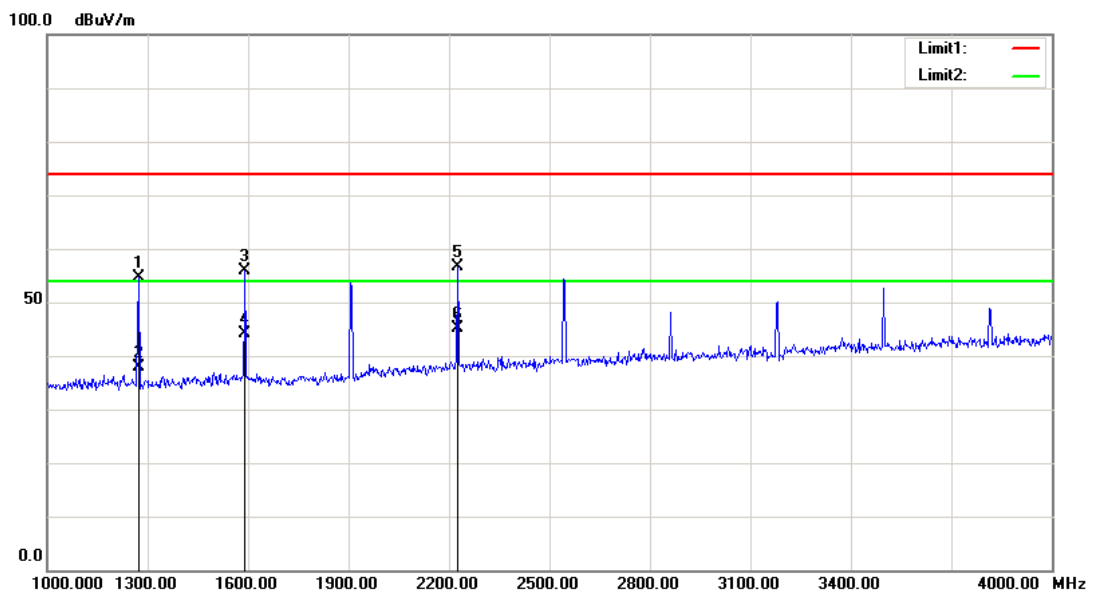
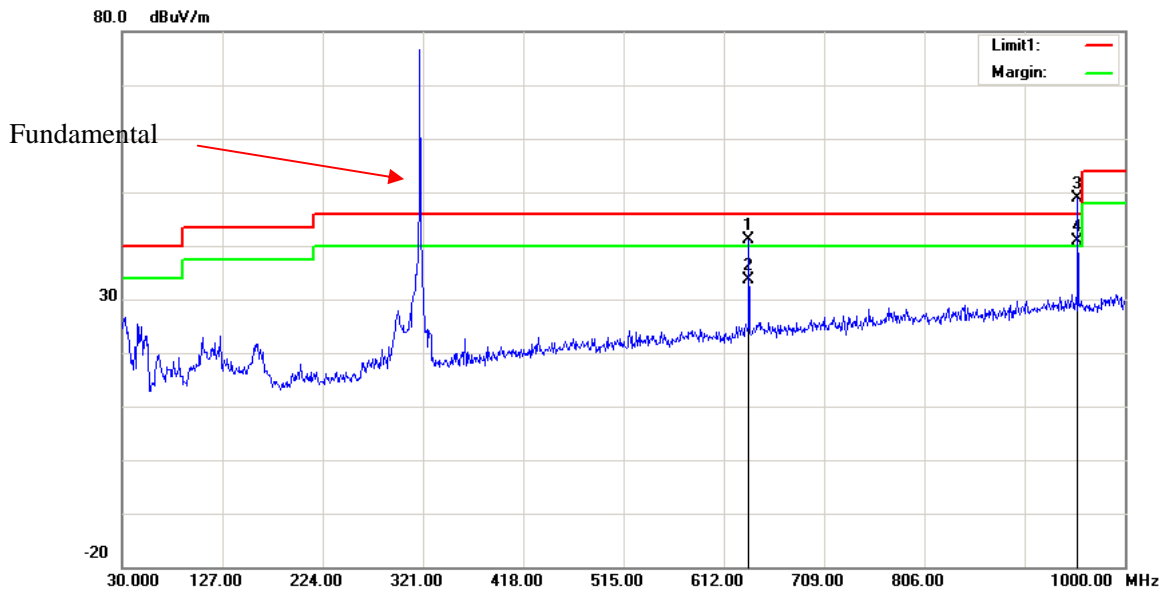
Pulse 2



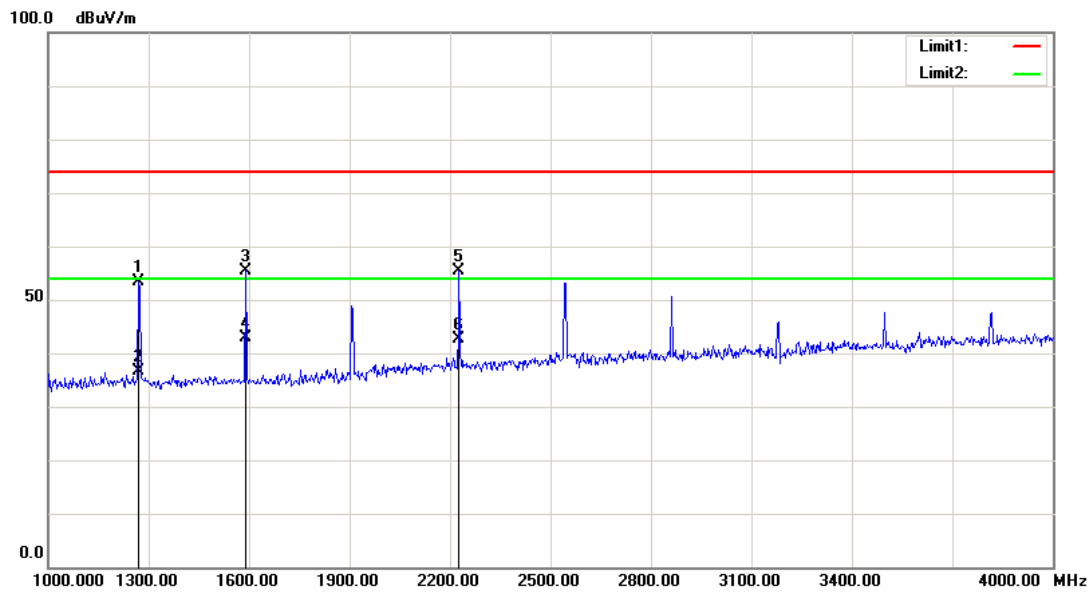
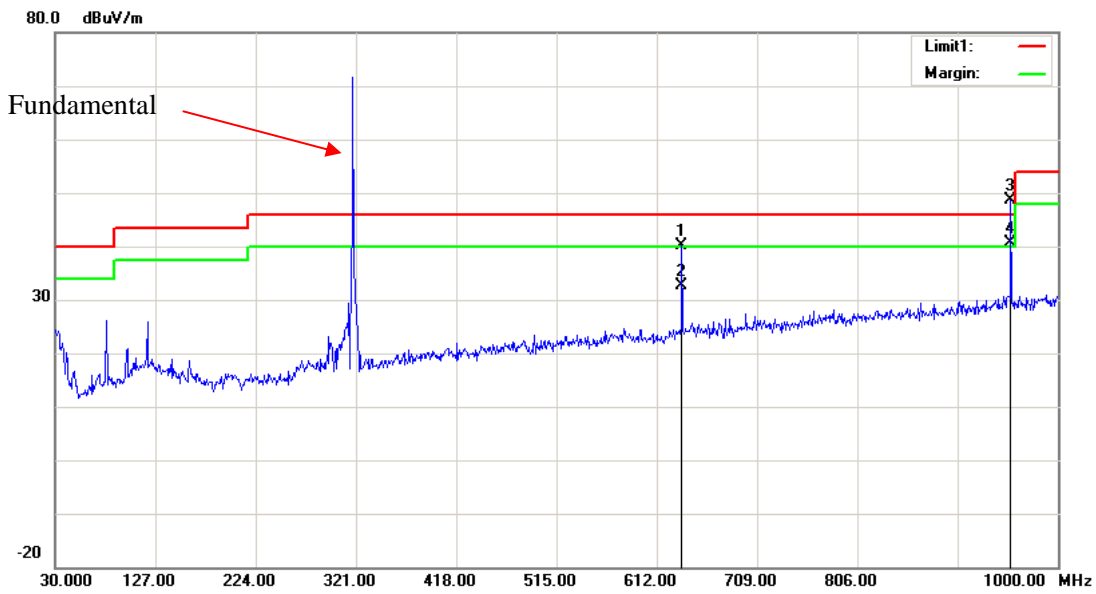
Date: 21.DEC.2017 17:13:55

Peak Test plots

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	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-2	2017-08-25	2020-08-25
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

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:	27.9 °C
Relative Humidity:	49 %
ATM Pressure:	100.4 kPa

The testing was performed by Calvin Chen on 2017-09-08.

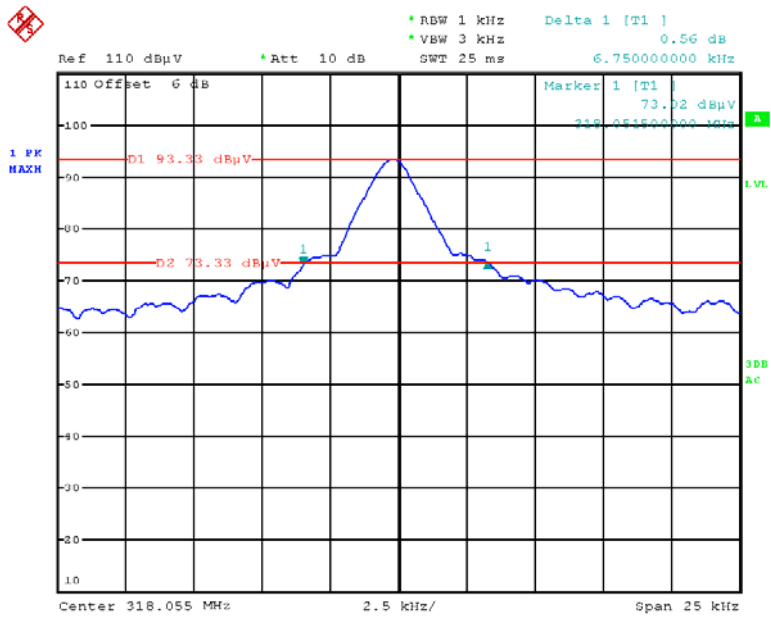
Test Mode: Transmitting

Please refer to following table and plot.

Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (kHz)	Result
318.055	6.75	795.14	Pass

**Note:** Limit = 0.25% \* Center Frequency = 0.25% \* 318.055 MHz = 795.14 kHz

### 20 dB Bandwidth



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**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	2017-09-01	2018-09-01
Sunol Sciences	Antenna	JB3	A060611-2	2017-08-25	2020-08-25
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**

<b>Temperature:</b>	27.9 °C
<b>Relative Humidity:</b>	49 %
<b>ATM Pressure:</b>	100.4 kPa

The testing was performed by Calvin Chen on 2017-12-20.

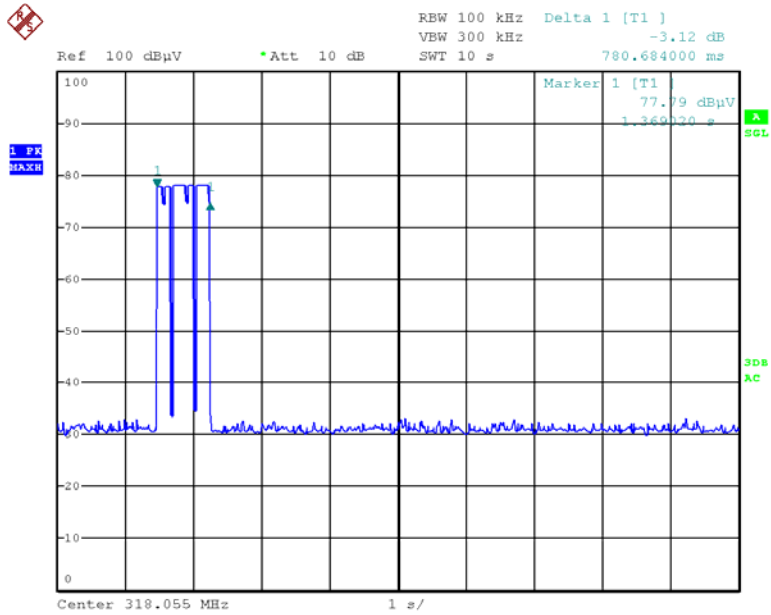
Test Mode: Transmitting

Test Result: Compliance. Please refer to following plot.

Deactivate Time (s)	Limit (s)	Result
0.78	<5	Pass



Transmission duration



Date: 20.DEC.2017 21:02:22

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