



# FCC PART 15.231 TEST REPORT

Prepared For	Aaron & Andrew Design Inc
Product Name:	RF Transmitter (Wall mounted)
Report No.:	PTS20120103-1F
Trade Name:	N/A
Model Name :	AA-001
FCC ID:	AG2AA-001
Prepared By	DongGuan Precise Testing Service Co.,Ltd.
	F616A Room, 6th Floor, Meixin Business Center, Dongcheng Middle Road, Dongguan, Guangdong, China
Test Date:	Jan.03 ~ Jan.08, 2012
Date of Report :	Jan.08, 2012

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**VERIFICATION OF COMPLIANCE**

Applicant:	Aaron & Andrew Design Inc
Address	2F, # 2, Alley 19, Section 1, Wan-Mei Street, Mu-Ga, Taipei, Taiwan
Manufacturer Name:	NINGBO SHENGYE ELECTRIC APPLIANCE CO.,LTD
Address:	North Guangming Road, Simen Town, Yuyao City, Zhejiang, China
Product Description:	RF Transmitter (Wall mounted)
Brand Name:	N/A
Model Name:	AA-001
Test procedure	ANSI C63.4 : 2003

Prepared by :

Assistant

Reviewer :

Supervisor

Approved &amp; Authorized Signer :

Jacky Ou / Manager

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## 1. GENERAL INFORMATION

### 1.1 PRODUCT DESCRIPTION

The EUT is a short rang, lower power, RF Transmitter (Wall mounted). It is designed by way of utilizing the ASK modulation achieves the system operating.

A major technical description of EUT is described as following:

Power Supply	DC12V by battery
Transmitter Frequency	315 MHz(Only one channel)
Transmit Power	80.40dBuV/m(PK)@3m
Modulation Technique	ASK
20dB Bandwidth	361.8KHz
Duration of each transmission	3.9S
Antenna Type	PCB Printed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	PCB Printed Antenna	N/A	1.1	N/A

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## 1.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: AG2AA-001**, filing to comply with the FCC Part 15 and RSS-GEN requirements.

## 1.3 TEST METHODOLOGY

The radiated emission testing was performed according to the procedures of ANSI C 63.4: 2003 and FCC CFR 47 Rules of 15.207, 15.209, 15.231, 2.1057

## 1.4 TEST FACILITY

All measurement facilities used to collect the measurement data are located at

World Standardization Certification&TestingCO.,LTD

Building A, Baoshi Road, Baoshi Science & Technology Park, Bao'an District, Shenzhen, Guangdong, China.

The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC register No.: 131628

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements

## 1.5 SPECIAL ACCESSORIES

Not available for this EUT intended for grant.

## 1.6 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.



## 2. SYSTEM TEST CONFIGURATION

### 2.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT EXERCISE

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

### 2.3 GENERAL TECHNICAL REQUIREMENTS

- (1). Section 15.207: Conducted Limits (Not applicable)
- (2). Section 15.209: Radiated Emission
- (3). Section 15.231: Spurious Emission Limits
- (4). Section 15.231: The Duration of Each Transmission
- (5). Section 15.231: 20dB bandwidth

### 2.4 CONFIGURATION OF TESTED SYSTEM

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

Item	Equipment	Model No.	Identifier	Note
1	RF Transmitter (Wall mounted)	AA-001	FCC ID:AG2AA-001	EUT
--	--	--	--	--
--	--	--	--	--



### 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207	Conducted Emission	N/A
§15.209	Radiated Emission	Compliant
§15.231	Spurious Emission Limits	Compliant
§15.231	The Duration of Each Transmission	Compliant
§15.231	20dB bandwidth	Compliant
§15.203	Antenna Requirement	Compliant





#### **4. DESCRIPTION OF TEST MODES**

The EUT (RF Transmitter (Wall mounted)) has been tested under normal operating condition.



## 5. CONDUCTED LIMITS (Not applicable)

### 5.1 PROVISIONS APPLICABLE

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequencies within the band 150 KHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50uH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit(dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

\* Decreases with the logarithm of the frequency.

### 5.2 MEASUREMENT PROCEDURE

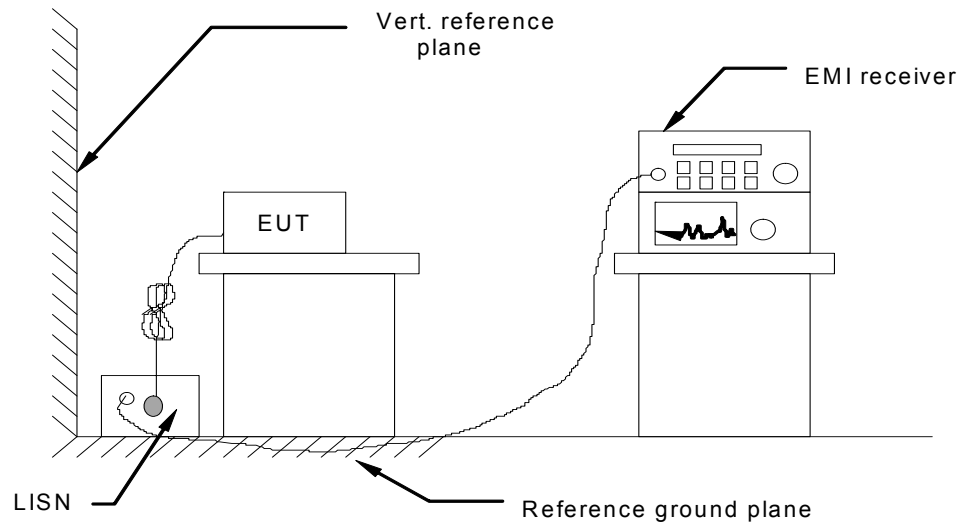
- (1) The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- (2) Support equipment, if needed, was placed as per ANSI C63.4.
- (3) All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- (4) The EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- (5) All support equipments received AC power from a second LISN, if any.
- (6) The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- (7) Analyzer / Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.  
During the above scans, the emissions were maximized by cable manipulation.

### 5.3 TEST SETUP BLOCK DIAGRAM

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#### 5.4 TEST EQUIPMENT USED

Conducted Emission Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Cal. Date
TEST RECEIVER	R&S	FCKL1528	A0304230	2012.06
LISN	SCHWARZBECK	NSLK8127	A0304233	2012.06

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## **5.5 TEST RESULT**

N/A

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## 6. 20dB Bandwidth

### 6.1 PROVISIONS APPLICABLE

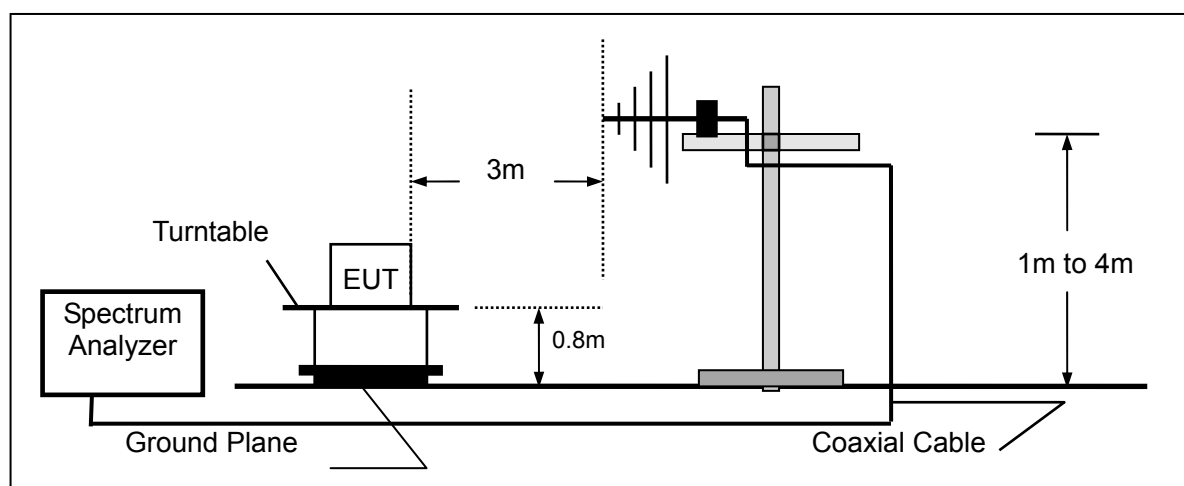
According to Section 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

$$\text{Limit: } 315.1\text{MHz} \times 0.25\% = 0.7877\text{MHz}$$

### 6.2 MEASUREMENT PROCEDURE

- 1). The EUT was placed on a turn table which is 0.8m above ground plane.
- 2). The EUT was operated with signal modulated.
- 3). Set SPA Center Frequency = fundamental frequency, RBW=VBW=51KHz, Span=500kHz
- 4). Set SPA Max hold. Mark peak, -20dB

### 6.3 TEST SETUP BLOCK DIAGRAM



### 6.4 MEASUREMENT EQUIPMENT USED:

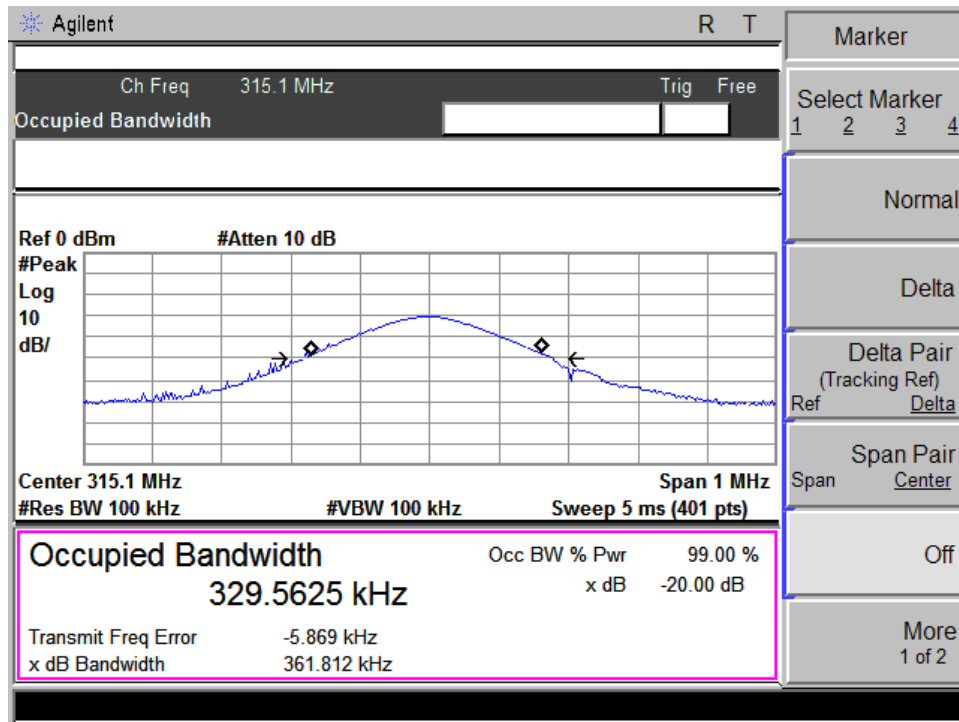
3M ANECHOIC CHAMBER RADIATION TEST SITE					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCS30	100343	04/16/2011	04/15/2012
AMPLIFIER	HP	HP8447E	2945A02715	04/16/2011	04/15/2012
ANTENNA	Sunol Sciences Corp.	JB3	A021907	04/16/2011	04/15/2012
ANTENNA	Sunol Sciences Corp.	JB3	A021907	04/16/2011	04/15/2012
Spectrum Analyzer	Agilent	E4440A	US41421290	04/16/2011	04/15/2012

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## 6.5 MEASUREMENT RESULT



20dB bandwidth	LIMIT	RESULT
0.3618MHz	0.7877MHz	PASS



## 7. RADIATED EMISSION

### 7.1 PROVISIONS APPLICABLE

According to Section 15.231(b), Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz,  $\mu\text{V/m}$  at 3 meters =  $56.81818(F) - 6136.3636$ ; for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $41.6667(F) - 7083.3333$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

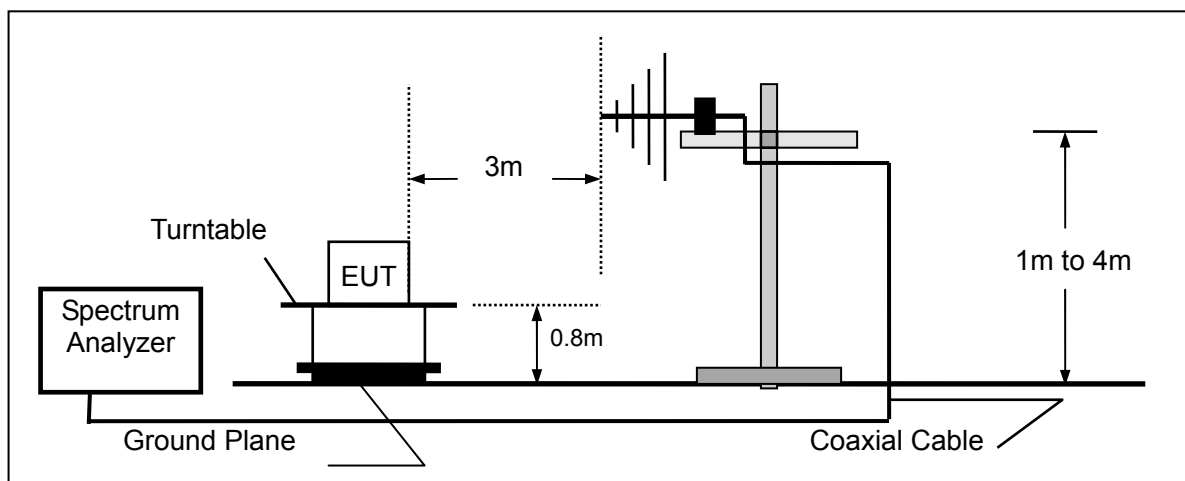
AV Limit:  $41.6667 \times 315.1 - 7083.3333 = 6045.843 \mu\text{V/m} = 75.63 \text{ dBuV/m}$

PK Limit: 95.63 dBuV/m

### 7.2 MEASUREMENT PROCEDURE

- (1) On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
- (2) The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- (3) The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- (4) The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- (5) The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- (6) The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- (7) The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
- (8) The maximum signal level detected by the measuring receiver shall be recorded.
- (9) The measurement shall be repeated with the test antenna set to horizontal polarization
- (10) According to the above steps, three orthogonal planes (x, y, z) are operated.

### 7.3 TEST SETUP BLOCK DIAGRAM



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**7.4 MEASUREMENT EQUIPMENT USED:**

3M ANECHOIC CHAMBER RADIATION TEST SITE					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCS30	100343	04/16/2011	04/15/2012
AMPLIFIER	HP	HP8447E	2945A02715	04/16/2011	04/15/2012
ANTENNA	Sunol Sciences Corp.	JB3	A021907	04/16/2011	04/15/2012
ANTENNA	Sunol Sciences Corp.	JB3	A021907	04/16/2011	04/15/2012
Spectrum Analyzer	Agilent	E4407B	US41421290	04/16/2011	04/15/2012

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**CALCULATION OF DUTY CYCLE:**

The period of the pulse train is determined by observing it on an oscilloscope or a spectrum analyzer with zero (0) frequency span.

The average field strength is determined by multiplying the peak field strength by the percent on time.

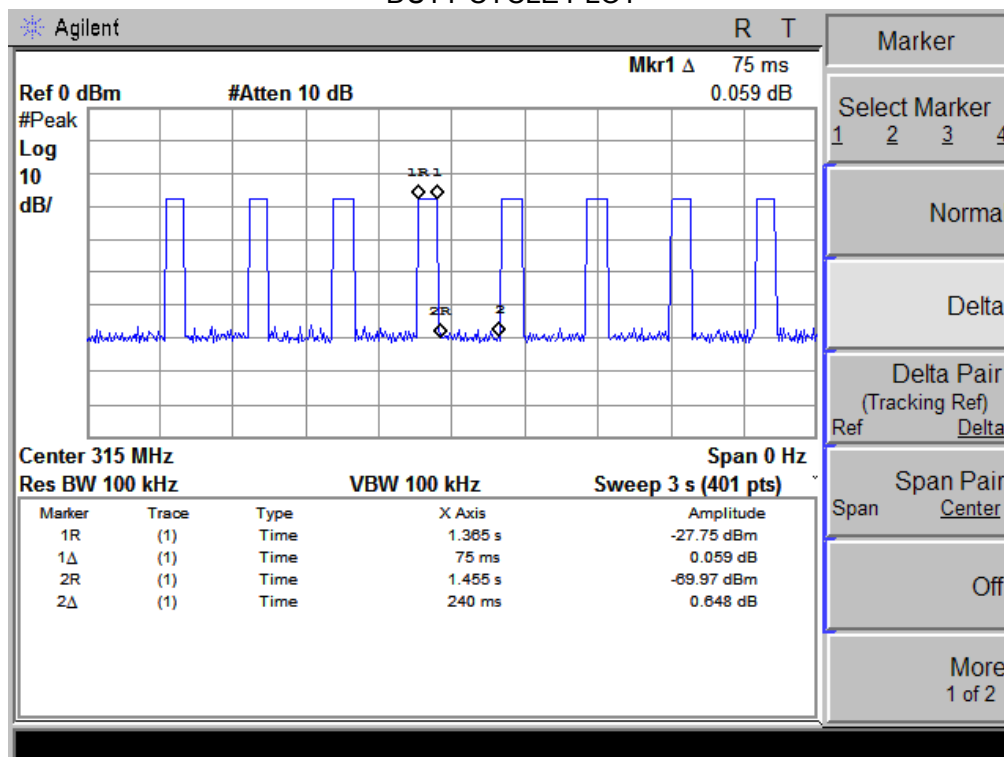
$$\text{dB} = 20 \cdot \log(\text{ON TIME}) / \text{PERIOD}$$

$$\text{dB} = 20 \cdot \log(75 / 75 + 240)$$

$$\text{dB} = 20 \cdot \log(0.238)$$

$$\text{dB} = -12.46$$

Duty cycle factor: -12.46 dB

**DUTY CYCLE PLOT**

The signal bandwidth was measured and less than 100 kHz RBW so PDCF factor is not required.

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**7.5 MEASUREMENT RESULTS****X ORTHOGONAL PLANE IS THE STATE DATA OF THREE ORTHOGONAL PLANES (X, Y, Z)**

<b>RADIATED EMISSION – HORIZONTAL (30MHZ TO 5GHZ)</b>							
<b>Frequency</b>	<b>Antenna Pol.</b>	<b>Field Strength</b>	<b>Field Strength</b>	<b>Limit(PK)</b>	<b>Limit(QP)</b>	<b>Limit(AV)</b>	<b>State</b>
GHz	H/V	dBuV/m (PK)	dBuV/m (AV)	dBuV/m	dBuV/m	dBuV/m	
315.000	H	80.40	67.94	95.63	--	75.63	pass
630.000	H	42.00	--	--	46.00	--	pass
945.000	H	40.00	--	--	46.00	--	pass
1260.000	H	37.01	--	74.00	--	54.00	pass
3150.300	H	--	--	74.00	--	54.00	pass
4339.000	H	--	--	74.00	--	54.00	pass
--	H	--	--	--	--	--	pass

<b>RADIATED EMISSION - VERTICAL(30MHZ TO 5GHZ)</b>							
<b>Frequency</b>	<b>Antenna Pol.</b>	<b>Field Strength</b>	<b>Field Strength</b>	<b>Limit(PK)</b>	<b>Limit(QP)</b>	<b>Limit(AV)</b>	<b>State</b>
GHz	H/V	dBuV/m (PK)	dBuV/m (AV)	dBuV/m	dBuV/m	dBuV/m	
315.000	V	54.60	--	95.62	--	75.62	pass
630.000	V	39.40	--	--	46.00	--	pass
945.000	V	38.80	--	--	46.00	--	pass
1260.000	V	35.34	--	74.00	--	54.00	pass
3150.300	V	--	--	74.00	--	54.00	pass
4339.000	V	--	--	74.00	--	54.00	pass
--	V	--	--	--	--	--	pass

Note:

“-”indicate the test value(general spurious emissions) is much lower to limit. Only show the harmonics.

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## 8. THE DURATION OF EACH TRANSMISSION

### 8.1 PROVISIONS APPLICABLE

8.1.1 According to Section 15.231(b), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### 8.2 TEST SETUP

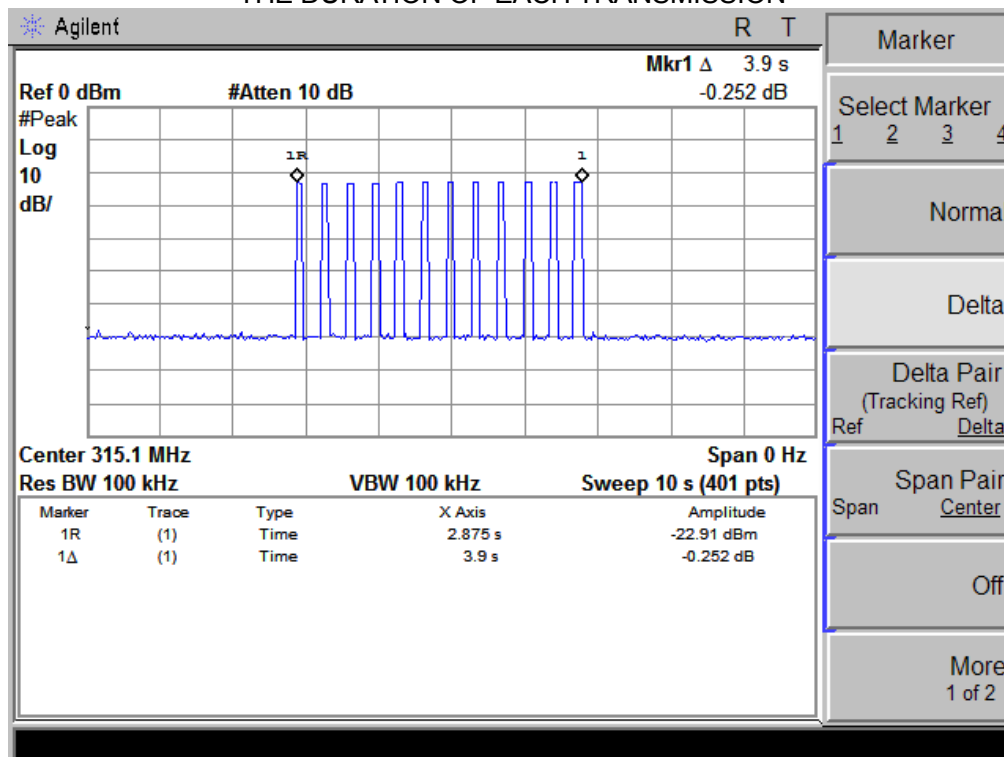
The same as 6.3

### 8.3 MEASUREMENT INSTRUMENTS

The same as 6.4

### 8.4 MEASUREMENT RESULT

#### THE DURATION OF EACH TRANSMISSION



THE DURATION OF EACH TRANSMISSION	LIMIT	RESULT
3.9s	5s	PASS



## 9 ANTENNA REQUIREMENT

### 9.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: 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.

### 9.2 EUT ANTENNA

The EUT antenna is integral Antenna. It comply with the standard requirement.



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**PPENDIX 1**  
**PHOTOGRAPHS OF THE TEST SETUP**



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### PHOTOGRAPHS OF THE TEST SETUP (>1GHZ)



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