



FCC RADIO TEST REPORT

Applicant : SHENZHEN QIAOHUA INDUSTRIES LIMITED

Address : Qiaohua Industrial Zone, Luo Tian Forestry Center,
SongGang Town, Bao An District, Shenzhen,
Guangdong, China 518105

Equipment : Wireless Doorbell Transmitter

Model No. : QH-X, QH-A, QH-B, QH-C, QH-D, QH-E, QH-F,
QH-G, QH-H, QH-I, QH-J, QH-K, QH-L, QH-M, QH-N,
QH-O, QH-P, QH-Q, QH-R, QH-S, QH-T, QH-U, QH-V,
QH-W, QH-Y, QK-P1, QK-P2, QK-P3, QK-P4, QK-P5,
QK-P6, QK-R1, QK-M1, QK-M2, QK-A1

Trade Mark : **Quhwa**

FCC ID : 2AAV8QH-X

- The test result refers exclusively to the test presented test model / sample.,
- Without written approval of **CerpPASS Technology (Suzhou) Co., Ltd.** the test report shall not be reproduced except in full.
- The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Rules and Regulations Part 15. The test report has been issued separately.
- The test report must not be used by the clients to claim product certification approval by **NVLAP** or any agency of the Government.



FCC RADIO TEST REPORT

Issued by:

CerpPASS Technology (Suzhou) Co., Ltd.

No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China

Tel:86-512-6917-5888

Fax:86-512-6917-5666

I HEREBY CERTIFY THAT :

The sample was received on Jul.12, 2016 and the testing was carried out on Jul.22, 2016 at *CerpPASS Technology (Suzhou) Co., Ltd.* The test result refers exclusively to the test presented test model / sample. Without written approval of *CerpPASS Technology (Suzhou) Co., Ltd.*, the test report shall not be reproduced except in full.

Approved by:

Miro Chueh
EMC/ RF B.U. Manager



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1. Summary of Test Procedure and Test Results

1.1 Applicable Standards

ANSI C63.10-2013

FCC Rules and Regulations Part 15 Subpart C §15.231

FCC Rule	Description of Test	Result
15.203	. Antenna Requirement	Pass
15.207	. AC Power Line Conducted Emission	N/A
15.209 15.231	. Spurious Emission(Radiated)	Pass
15.231	. 20dB Occupied Bandwidth Measurement	Pass

Note: (1) "N/A" denotes test is not applicable in this test report.

(2) EUT is used new battery



2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Modulation Type	ASK
Frequency Range	433.92MHz
Channel Number	1
Antenna Type/ gain	PCB Antenna with 0.5dBi
Power Source	3V DC

2.2 Test Mode and Test Software

- a. During testing, the interface cables and equipment positions were varied according to technical standards.
- b. The complete test system included EUT for the test.
- c. XYZ 3 axes of the EUT have been tested, only the worst axis was reported.
- d. New battery was used for all the testing on this report.

2.3 Description of Test System

The EUT was tested alone. No support devices are needed for testing.



2.4 General Information of Test

<input type="checkbox"/>	Test Site	Cerpass Technology Corporation Test Laboratory Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881 Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C. Tel: +886-2-2663-8582
	FCC	TW1079, TW1061,390316, 228391, 641184
	IC	4934B-1, 4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication Test C-4463 for Conducted emission test R-3428, R-4128 for Radiated emission test G-812, G-813 for radiated disturbance above 1GHz
<input checked="" type="checkbox"/>	Test Site	Cerpass Technology (Suzhou) Co., Ltd. Address: No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China Tel: +86-512-6917-5888 Fax: +86-512-6917-5666
	FCC	331395
	IC	7290A-1, 7290A-2
	VCCI	T-1945 for Telecommunication Test C-2919 for Conducted emission test R-2670 for Radiated emission test G-227 for radiated disturbance above 1GHz
Frequency Range Investigated:		Conducted: from 150kHz to 30 MHz Radiation: from 30 MHz to 25000MHz
Test Distance :		The test distance of radiated emission from antenna to EUT is 3 M.



3. Test Equipment and Ancillaries Used for Tests

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date.
EMI Test Receiver	R&S	ESCI	100853	2016-02-22	2017-02-21
Preamplifier	HP	8447F	3113A05915	2016-02-22	2017-02-21
Preamplifier	FIELD	AFS44-00101800 -25-10P-44	1579008	2015-09-30	2016-09-29
Ultra Broadband Antenna	SCHAFFNER	CBL6112D	22241	2016-02-24	2017-02-23
Broad-Band Horn Antenna	Sunol	DRH-118	A072913	2015-09-30	2016-09-29
Spectrum Analyzer	Agilent	E4407B	MY45118947	2016-06-06	2017-06-05
Temperature/ Humidity Meter	mingle	ETH529	N/A	2016-02-19	2017-02-18



4. Antenna Requirements

4.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.247(b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.2 Antenna Construction and Directional Gain

No.	Antenna Type	Antenna Gain
	PCB Antenna	0.5dBi



5. Test of Radiated Emission

5.1 Test Limit

According to 15.231(e) the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Frequency (MHz)	Field Strength of Fundamental	Field Strength of Spurious
	$\mu\text{V}/\text{m}$	$\mu\text{V}/\text{m}$
40.66 ~ 40.70	2250	225
70 ~130	1250	125
130 ~ 174	1250 ~ 3750	125 ~ 375
174 ~ 260	3750	375
260 ~ 470	3750~ 12500	375~ 1250
Above 470	12500	1250

NOTE:

1. Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, $\mu\text{V}/\text{m}$ at 3 meters = $56.81818(F) - 6136.3636$; for the band 260-470 MHz, $\mu\text{V}/\text{m}$ at 3 meters = $41.6667(F) - 7083.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.
2. The above field strength limits are specified at a distance of 3meters. The tighter limits apply at the band edges.

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequency (MHz)	Distance	Limit ($\mu\text{V}/\text{m}$)
0.09 ~ 0.490	300m	$2400/F(\text{kHz})$
0.490 ~ 1.705	30m	$24000/ F(\text{kHz})$
1.705 ~ 30	30m	30
30 ~ 88	3m	100
88 ~ 216	3m	150
216 ~ 960	3m	200
Above 960	3m	500

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



5.2 Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- i. "Cone of radiation" has been considered to be 3dB beamwidth of the measurement antenna.

NOTE:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
- 3. The Average value = Peak value + 20log(Duty cycle)
- 4. Duty Factor = 20log(total duty / period of pulse train)

NATA& PLOT:

Data Transmissions		Number of pulses
Packet time	25.20 msec	
Long pulse Duration	1.05 msec	19
Short pulse Duration	0.33 msec	35
Total Transmissions Duration	1.05*19+0.33*35=31.5 msec	
On Time within 100 msec	31.5 msec	
Dutycycle Correction factor	20log(31.5/100)=-10.03dB	



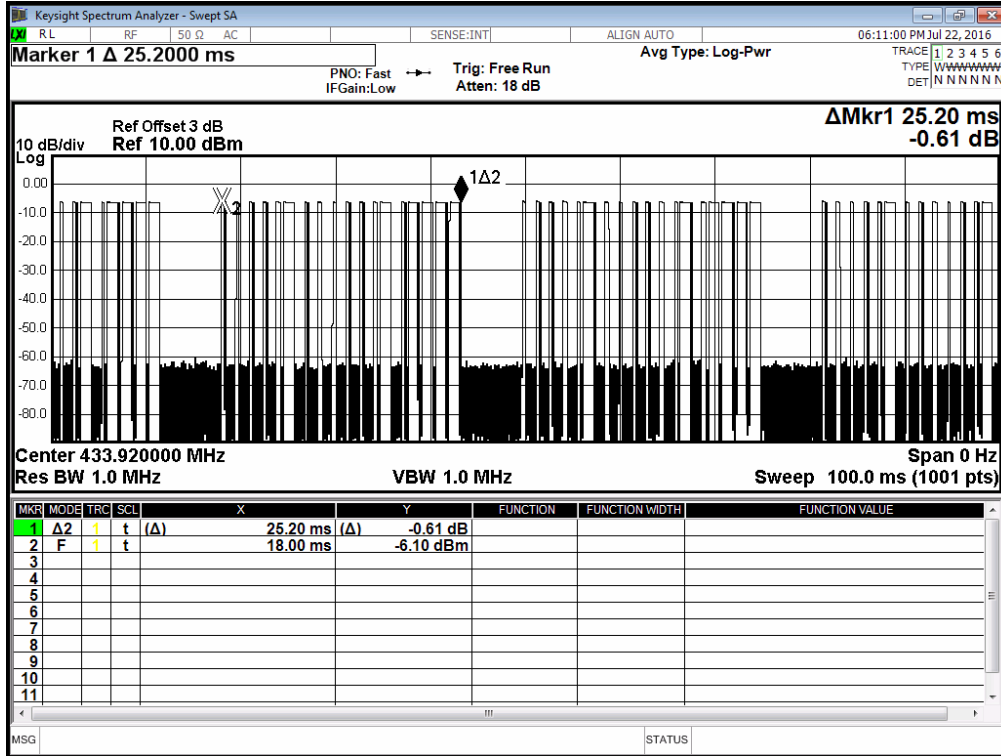
Test Date: Jul. 22, 2016

Temperature: 26°C

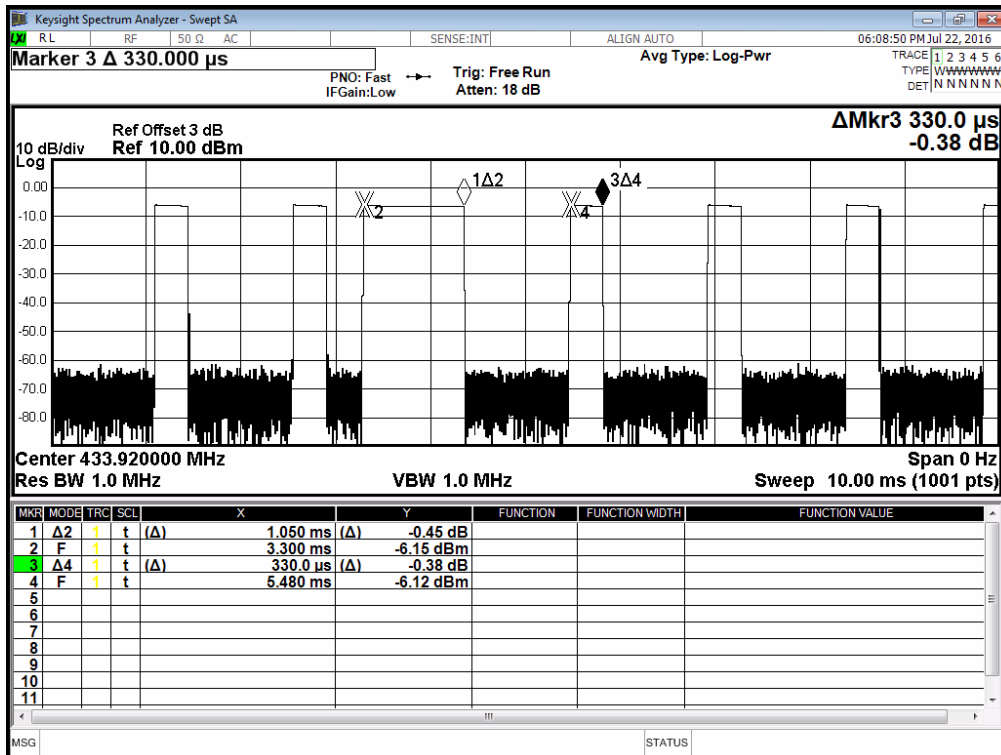
Atmospheric pressure: 1008 hPa

Humidity: 50%

Number of pulses



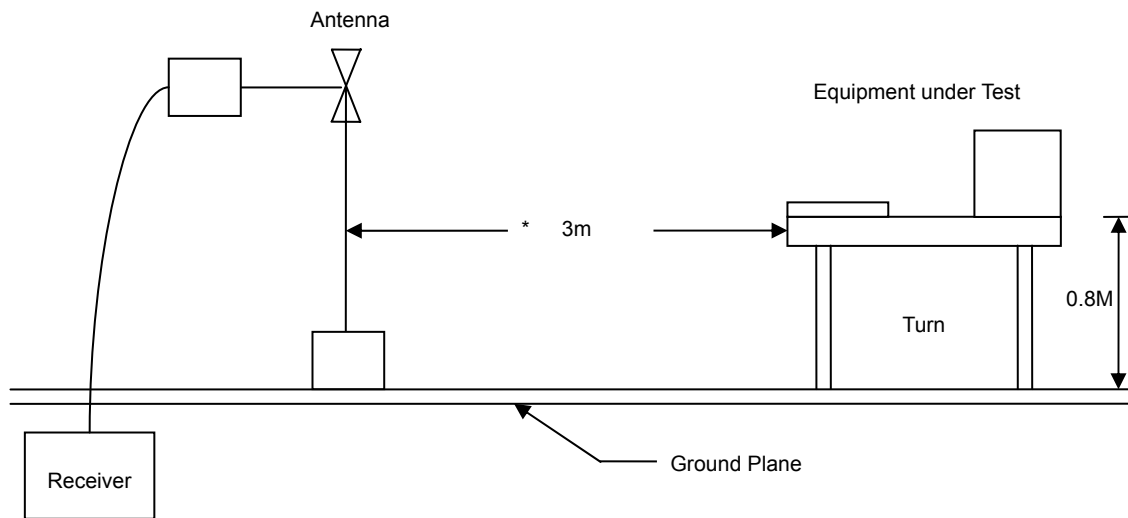
Pulse Duration



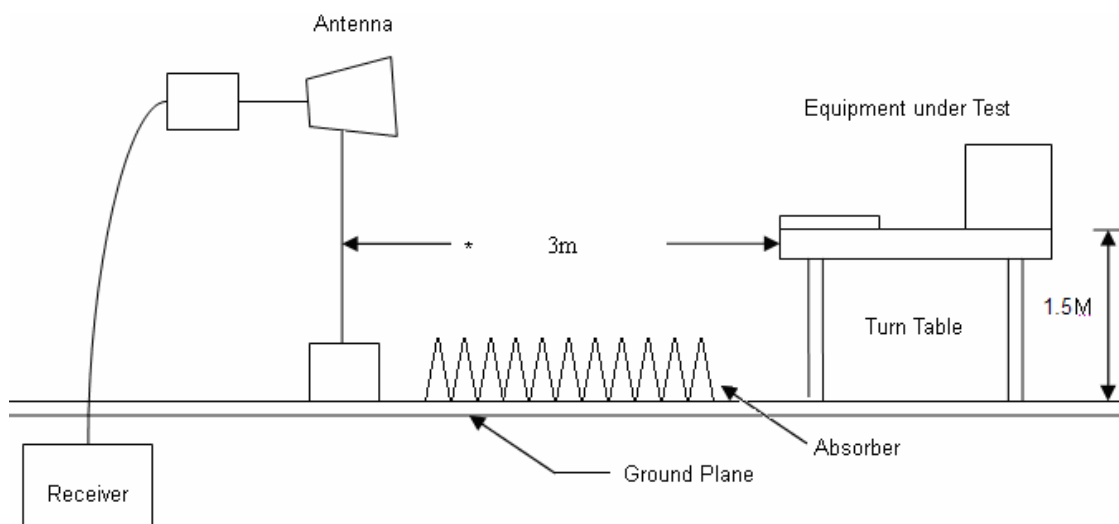


5.3 Typical Test Setup

Below 1GHz test setup



Above 1GHz Test Setup

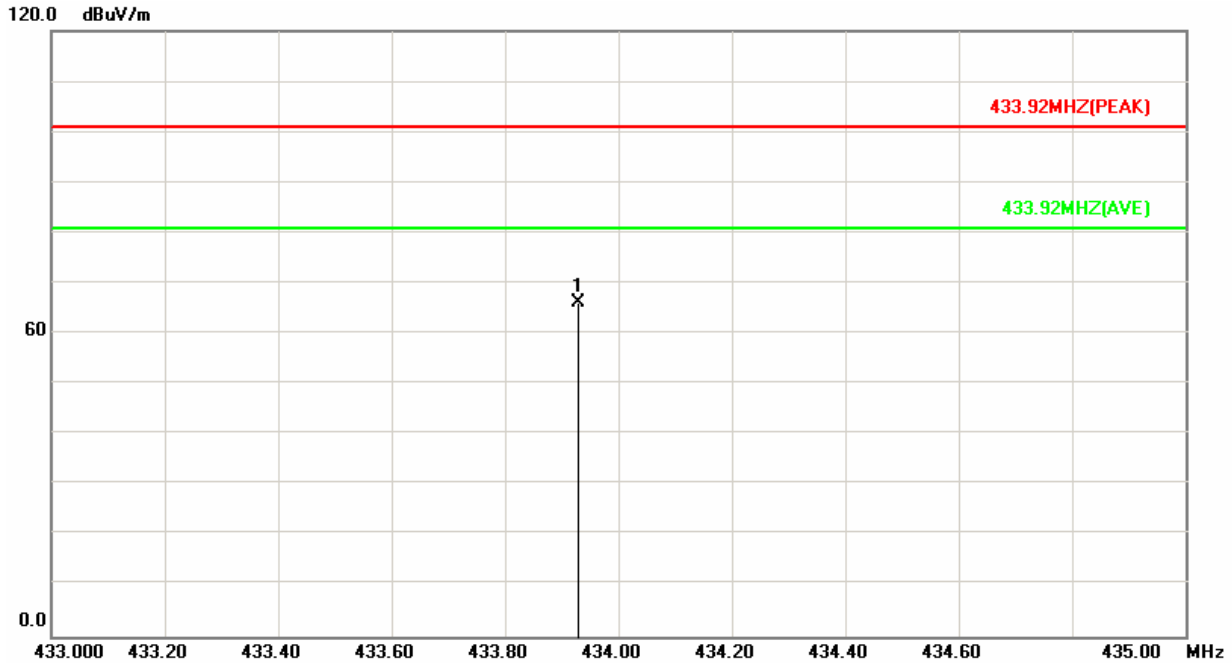




5.4 Test Result and Data

5.4.1 Test Result of Fundamental Emission

Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Jul. 22, 2016	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
433.9300	-4.44	70.56	66.12	100.80	-34.68	peak

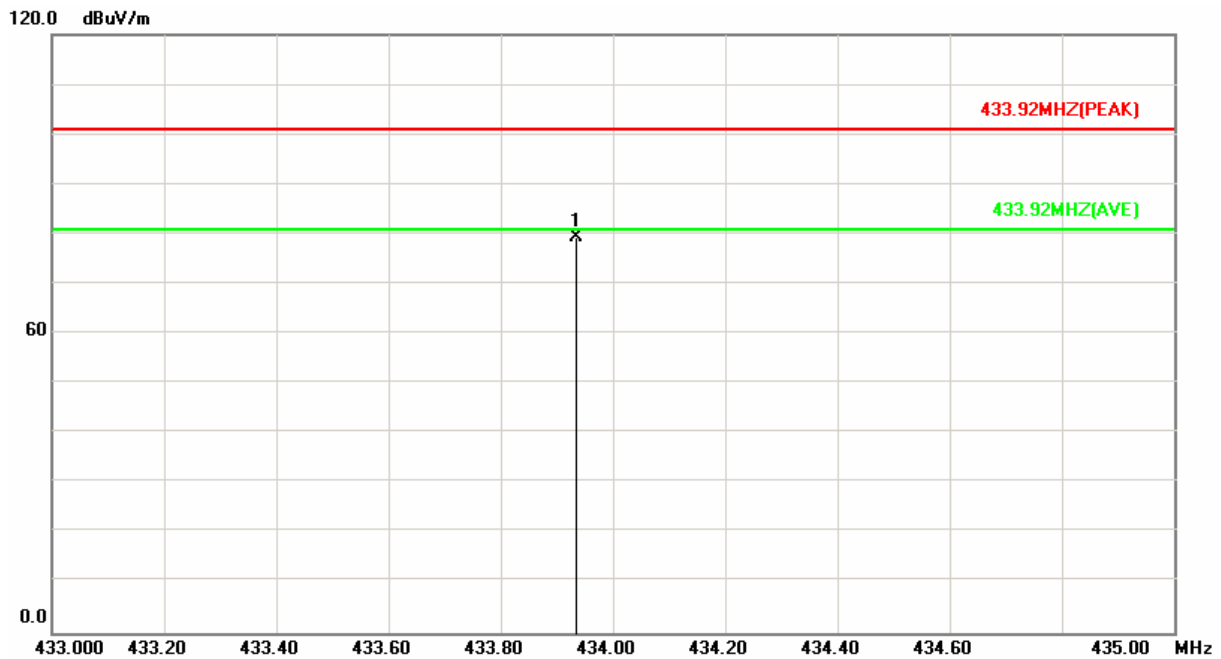
Note: Level = Reading + Factor

Margin = Level – Limit

AV=Peak value+ Duty cycle factor= 66.12+ (-10.03) = 56.09 dBuV/m < Limit 80.80dBuV/m



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Jul. 22, 2016	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
433.9340	-4.44	83.85	79.41	100.80	-21.39	peak

Note: Level = Reading + Factor

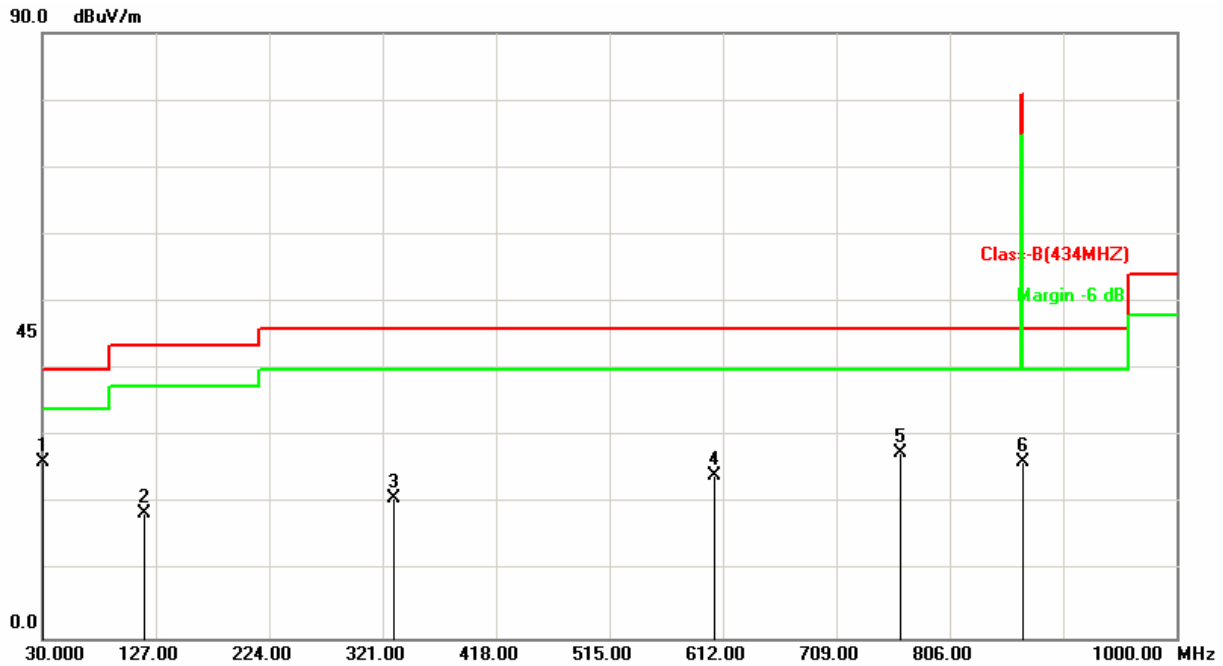
Margin = Level – Limit

AV=Peak value+ Duty cycle factor= 79.41+ (-10.03) = 69.38 dBuV/m < Limit 80.80dBuV/m



5.4.2 Test Result of Unwanted Spurious emission(Below 1GHz)

Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Jul. 22, 2016	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa

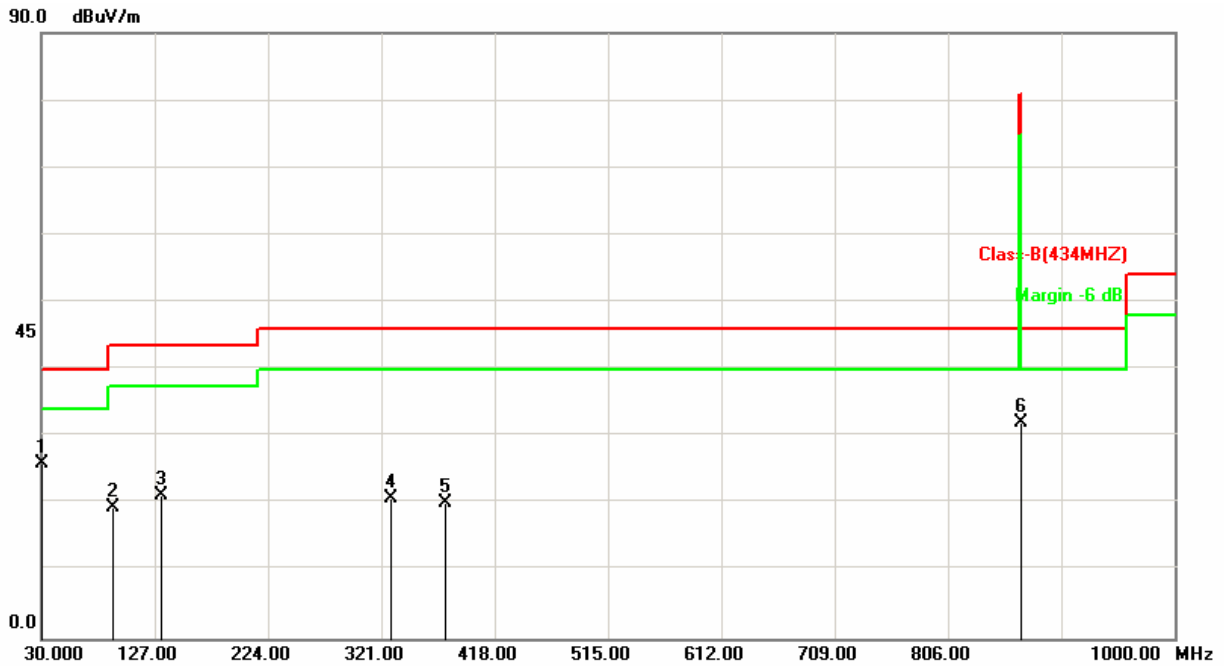


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)
1	30.0000	-3.01	29.29	26.28	40.00	-13.72	QP	100	0
2	117.3000	-8.18	26.69	18.51	43.50	-24.99	QP	100	0
3	330.7000	-4.08	24.90	20.82	46.00	-25.18	QP	100	0
4	604.2400	-1.21	25.30	24.09	46.00	-21.91	QP	100	0
5	763.3200	1.69	25.80	27.49	46.00	-18.51	QP	100	0
6	868.0800	2.27	23.87	26.14	80.80	-54.66	QP	100	0

Note: Level = Reading + Factor
Margin = Level – Limit



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Jul. 22, 2016	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



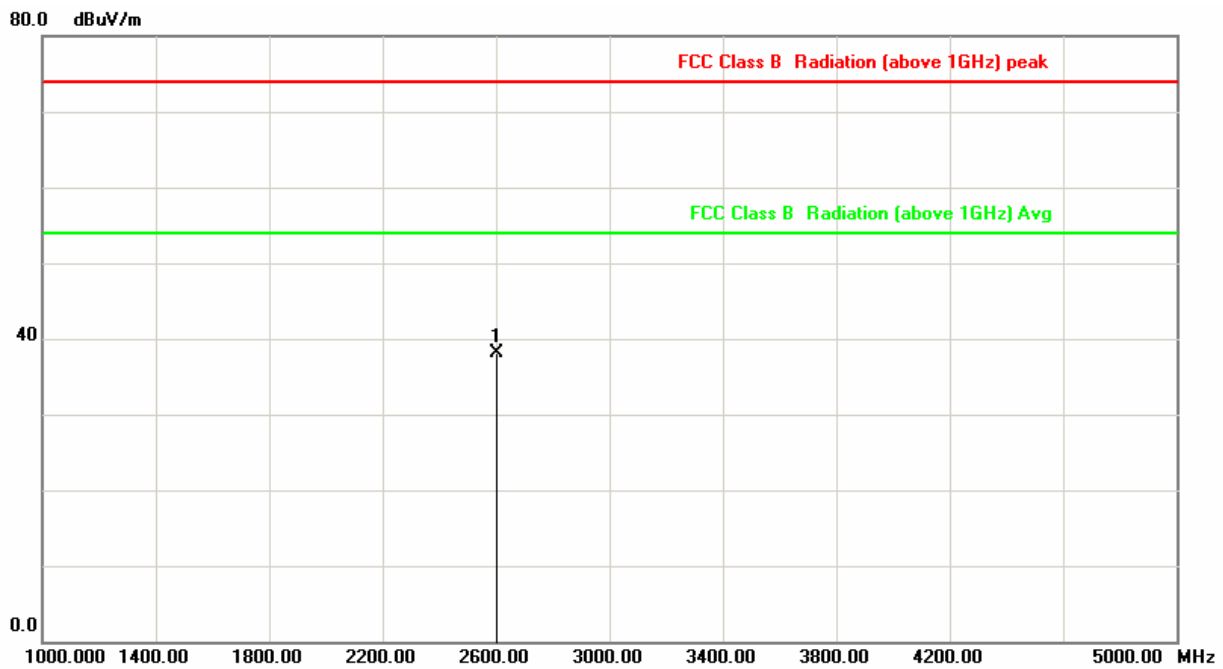
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)
1	30.0000	-3.01	29.01	26.00	40.00	-14.00	QP	100	360
2	91.1100	-11.17	30.52	19.35	43.50	-24.15	QP	100	360
3	132.8200	-9.28	30.50	21.22	43.50	-22.28	QP	100	360
4	329.7300	-4.13	24.94	20.81	46.00	-25.19	QP	100	360
5	375.3200	-4.95	25.20	20.25	46.00	-25.75	QP	100	360
6	868.0800	2.27	29.71	31.98	80.80	-48.82	QP	100	360

Note: Level = Reading + Factor
Margin = Level – Limit



5.4.3 Test Result of Unwanted Spurious emission (Above 1GHz)

Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Jul. 22, 2016	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa

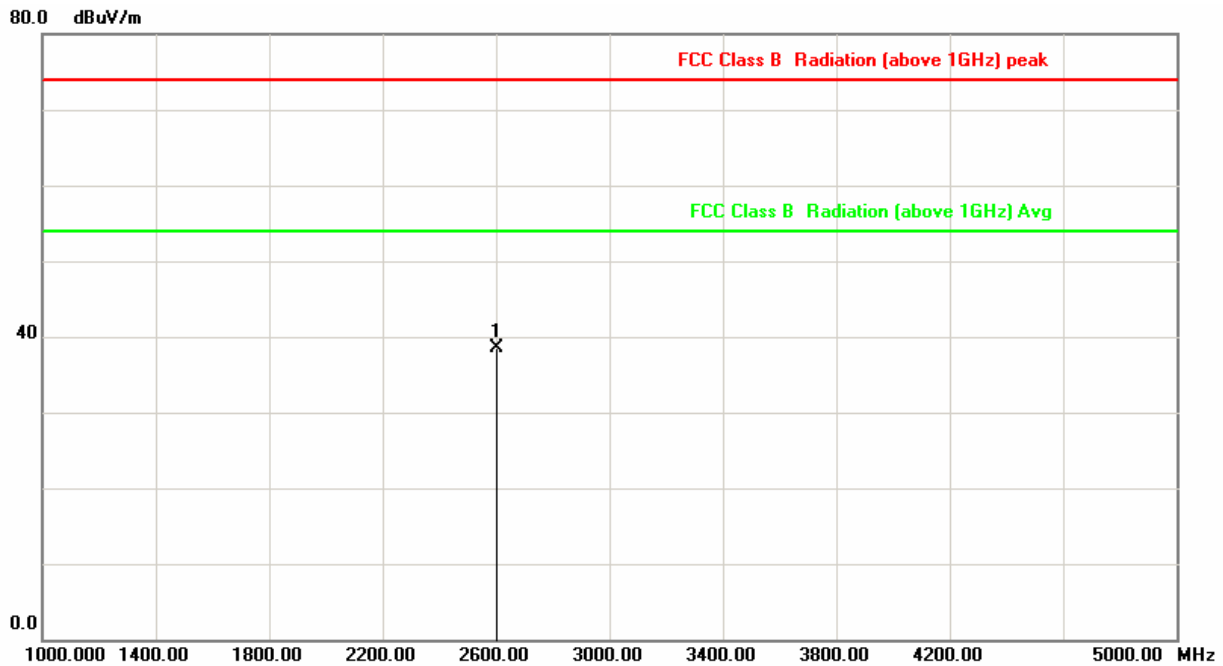


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
1	2603.520	-1.89	40.08	38.19	74.00	-35.81	peak

Note: Level = Reading + Factor
Margin = Level – Limit



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Jul. 22, 2016	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



1	2603.520	-1.89	40.41	38.52	74.00	-35.48	peak
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Note: Level = Reading + Factor
Margin = Level – Limit

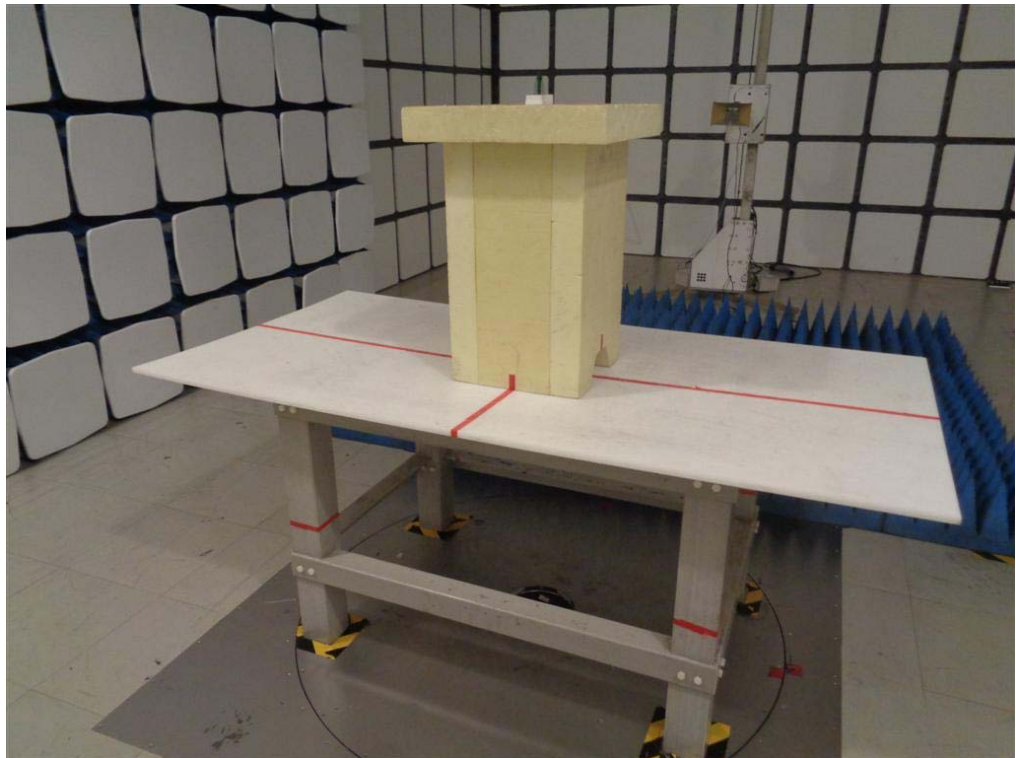


5.5 Test Photographs

Below 1GHz



Above 1GHz



Rear View

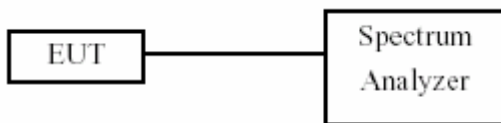


6. 20dB Occupied Bandwidth Measurement

6.1 Test Procedure

- a. The EUT placed on the turning table.
- b. The signal was coupled to the spectrum analyzer through an antenna.
- c. Set the resolution bandwidth to 100kHz and video bandwidth to 100kHz then select Peak function to scan the channel frequency.
- d. The 20dB bandwidth was measured and recorded.

6.2 Test Setup Layout



6.3 Limits of Band Edges Measurement

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for device operating above 70 MHz and above 900 MHz.

Frequency (MHz)	Limit of 20dB Bandwidth (MHz)
433.92	1.08

6.4 Measurement Equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
Spectrum Analyzer	Agilent	N9020A	US46220290	2016/06/06	2017/06/05

6.5 Test Result and Data

Test Date: Jul. 22, 2016

Temperature: 26°C

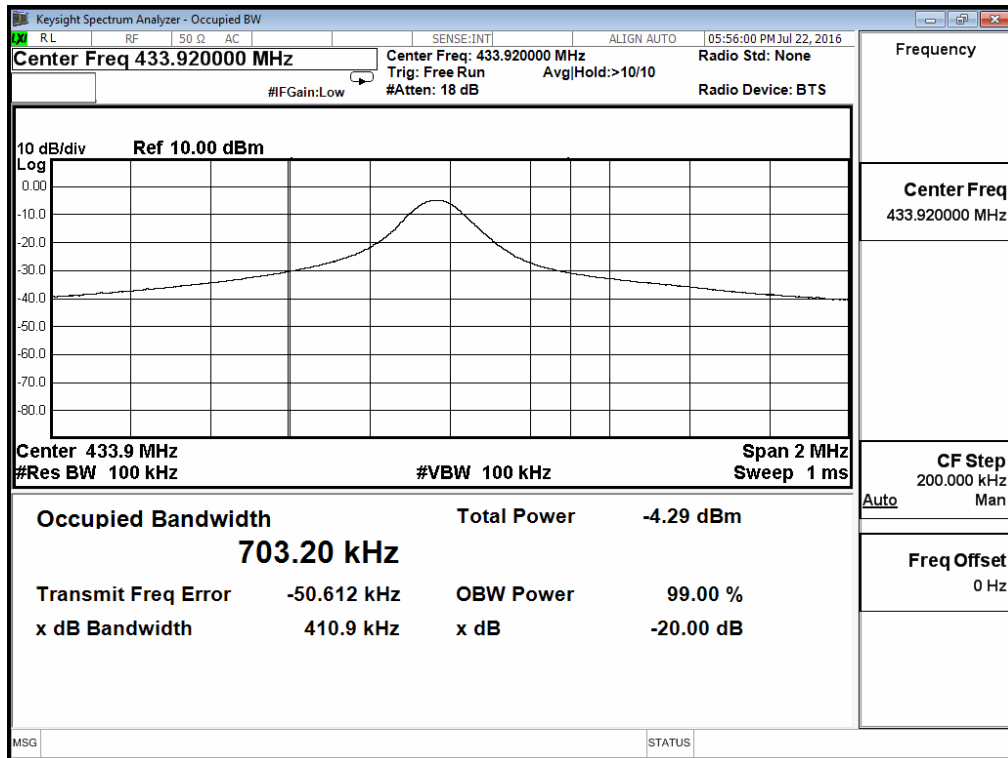
Atmospheric pressure: 1008 hPa

Humidity: 50%

Frequency (MHz)	20 dB bandwidth (MHz)	PASS / FAIL
433.92	0.411	PASS



Frequency: 433.92MHz, CH1



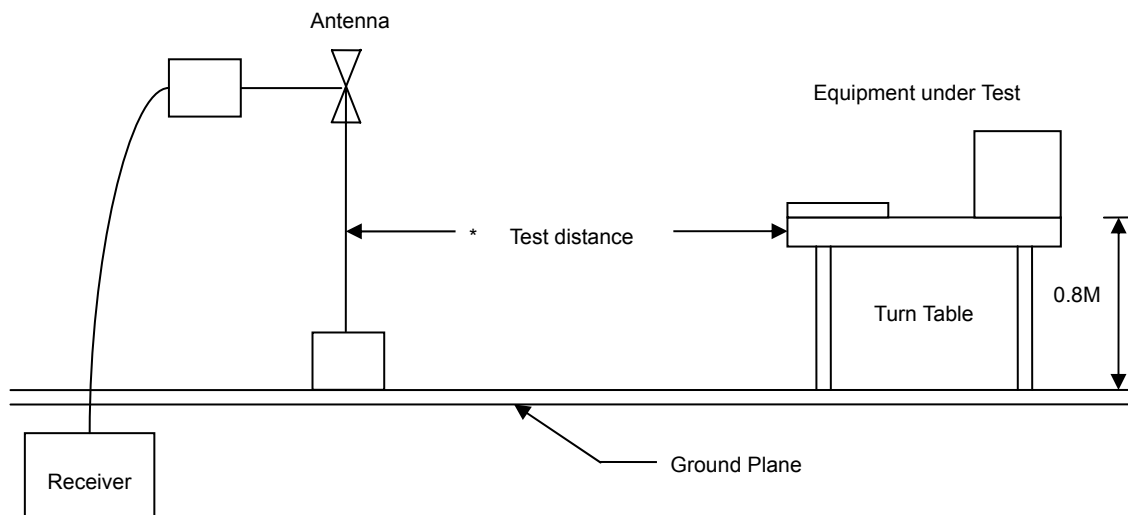


7. Transmission Time Control

7.1 Test Procedure

1. Set up the EUT in the state of Transmitter.
2. Set up the Spectrum, judge whether to accord with the regulation demand or not.

7.2 Test Setup Layout



7.3 Test Limit

Please refer section 15.231

According to §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.

According to §15.231(a)(2), A transmitter activated automatically shall cease transmission within 5 seconds after activation.

According to §15.231(e), In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

7.4 Measurement Equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
Spectrum Analyzer	Agilent	N9020A	US46220290	2016/06/06	2017/06/05



7.5 Test Result and Data

Test Date: Jul. 22, 2016

Temperature: 26°C

Atmospheric pressure: 1008 hPa

Humidity: 50%

Frequency (MHz)	Operation time(Sec.)	Limit	PASS / FAIL
433.92	2.23	<5 sec	PASS

Frequency: 433.92MHz

