

FCC REPORT

Applicant: SHENZHEN XENON INDUSTRIAL LTD

Address of Applicant: 7/F BLOCK C9 FUYUAN INDUSTRIAL PARK ZHOUSHI
ROAD XIXIANG BAOAN DISTRICT SHENZHEN CHINA

Equipment Under Test (EUT)

Product Name: WiFi DoorBell

Model No.: SM-D9X, SM-D8X

Trade Mark: Xenon

FCC ID: 2AJ5F-SM-D9X

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.231:2015

Date of sample receipt: November 05, 2016

Date of Test: November 05-09, 2016

Date of report issued: November 09, 2016

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Lo
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

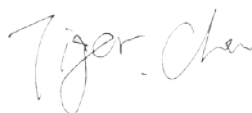
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2 Version

Version No.	Date	Description
00	November 09, 2016	Original

Prepared By:

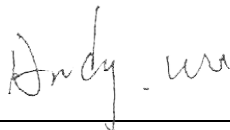


Date:

November 09, 2016

Project Engineer

Check By:



Date:

November 09, 2016

Reviewer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
Field strength of the fundamental signal	15.231 (a)1	Pass
Spurious emissions	15.231 (a)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Dwell time	15.231 (a)1	Pass

Pass: The EUT complies with the essential requirements in the standard.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	$\pm 4.34\text{dB}$	(1)
Radiated Emission	30MHz ~ 1000MHz	$\pm 4.24\text{dB}$	(1)
Radiated Emission	1GHz ~ 26.5GHz	$\pm 4.68\text{dB}$	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	$\pm 3.45\text{dB}$	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 Client Information

Applicant:	SHENZHEN XENON INDUSTRIAL LTD
Address of Applicant:	7/F BLOCK C9 FUYUAN INDUSTRIAL PARK ZHOUSHI ROAD XIXIANG BAOAN DISTRICT SHENZHEN CHINA
Manufacturer:	SHENZHEN XENON INDUSTRIAL LTD
Address of Manufacturer:	7/F BLOCK C9 FUYUAN INDUSTRIAL PARK ZHOUSHI ROAD XIXIANG BAOAN DISTRICT SHENZHEN CHINA

5.2 General Description of EUT

Product Name:	WiFi DoorBell
Model No.:	SM-D9X, SM-D8X
Test Model No. :	SM-D9X
<i>Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The only difference is the model name for commercial purpose.</i>	
Operation Frequency:	433.35MHz
Modulation technology:	OOK
Antenna Type:	Integrity Antenna
Antenna gain:	-8dBi (declare by applicant)
Power supply:	DC 12V

5.3 Test mode

Transmitting mode	Keep the EUT in transmitting mode.
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Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	77.35	88.67	78.01

Final Test Mode:

According to ANSI C63.10 standards, the test results are both the “worst case” and “worst setup”:
Y axis (see the test setup photo)

5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- FCC —Registration No.: 600491

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, June 22, 2016.

- Industry Canada (IC) —Registration No.: 9079A-2

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016.

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone,
Xixiang Road, Baoan District, Shenzhen, Guangdong, China
Tel: 0755-27798480
Fax: 0755-27798960

5.6 Other Information Requested by the Customer

None.

6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 03 2015	July 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June 29 2016	June 28 2017
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 29 2016	June 28 2017
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 29 2016	June 28 2017
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 29 2016	June 28 2017
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 29 2016	June 28 2017
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	June 29 2016	June 28 2017
10	Coaxial Cable	GTS	N/A	GTS211	June 29 2016	June 28 2017
11	Coaxial cable	GTS	N/A	GTS210	June 29 2016	June 28 2017
12	Coaxial Cable	GTS	N/A	GTS212	June 29 2016	June 28 2017
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 29 2016	June 28 2017
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 29 2016	June 28 2017
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 29 2016	June 28 2017
16	Band filter	Amindeon	82346	GTS219	June 29 2016	June 28 2017
17	Power Meter	Anritsu	ML2495A	GTS540	June 29 2016	June 28 2017
18	Power Sensor	Anritsu	MA2411B	GTS541	June 29 2016	June 28 2017

Conducted Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.16 2014	May.15 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 29 2016	June. 28 2017
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 29 2016	June. 28 2017
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 29 2016	June. 28 2017
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 29 2016	June. 28 2017

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (dd-mm-yy)	Cal.Due date (dd-mm-yy)
1	Barometer	ChangChun	DYM3	GTS257	June 29 2016	June 28 2017

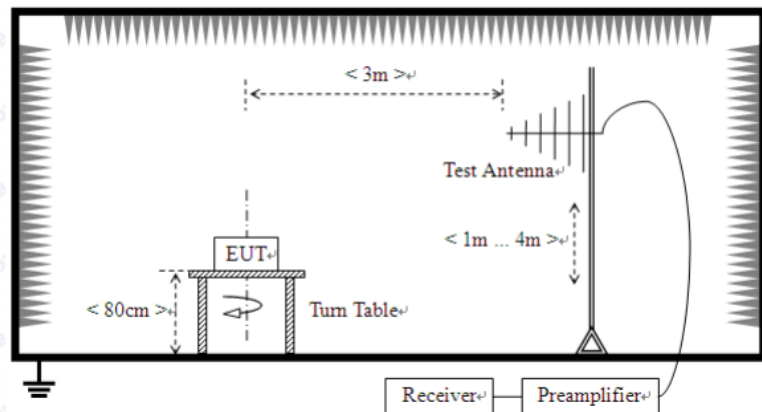
7 Test results and Measurement Data

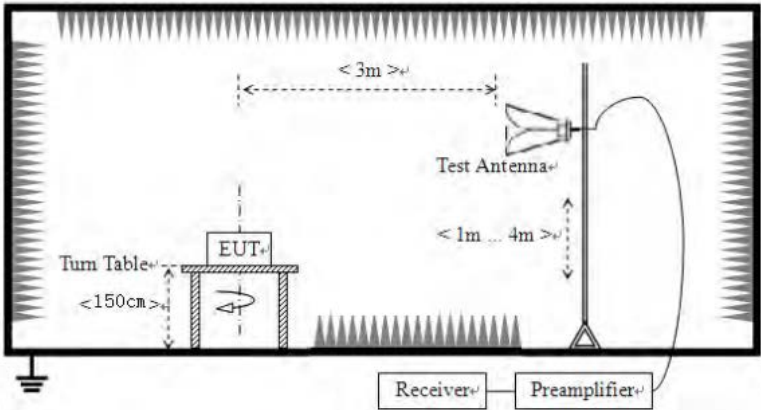
7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
EUT Antenna:	

The antenna is integral antenna, the best case gain of the antenna is -8dBi.

7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	30MHz to 6000MHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
(Field strength of the fundamental signal)	433.35MHz		80.81		Average Value
			100.81		Peak Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
(Spurious Emissions)	30MHz-88MHz		40.00		Quasi-peak Value
	88MHz-216MHz		43.50		Quasi-peak Value
	216MHz-960MHz		46.00		Quasi-peak Value
	960MHz-1GHz		54.00		Quasi-peak Value
	Above 1GHz		54.00		Average Value
			74.00		Peak Value
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits a higher field strength.					
Test setup:	Below 1GHz  Above 1GHz				

	
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8 meters for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

7.2.1 Field Strength of The Fundamental Signal

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
433.35	94.64	17.53	3.01	29.43	85.75	100.81	-15.06	Horizontal
433.35	97.56	17.53	3.01	29.43	88.67	100.81	-12.14	Vertical

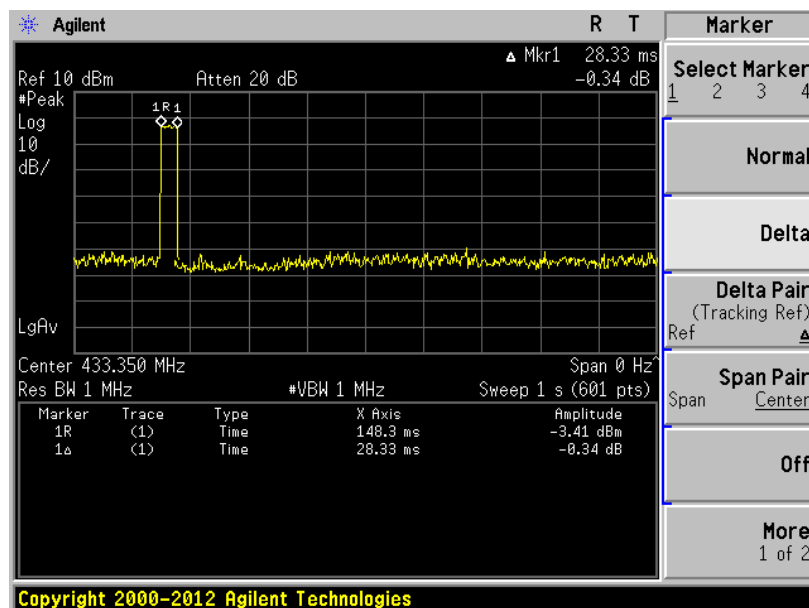
Average value:

Frequency (MHz)	Peak Value (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.35	85.75	-10.96	74.79	80.81	-6.02	Horizontal
433.35	88.67	-10.96	77.71	80.81	-3.10	Vertical

Average value:

Calculate Formula:	Average value=Peak value + Duty Cycle Factor
	Duty cycle factor=20 log(Duty cycle)
	Duty cycle=on time/100 milliseconds or period, whichever is less
Test data:	T on time =28.33(ms)
	T period =100ms
	Duty cycle=0.2833
	duty cycle factor=-10.96

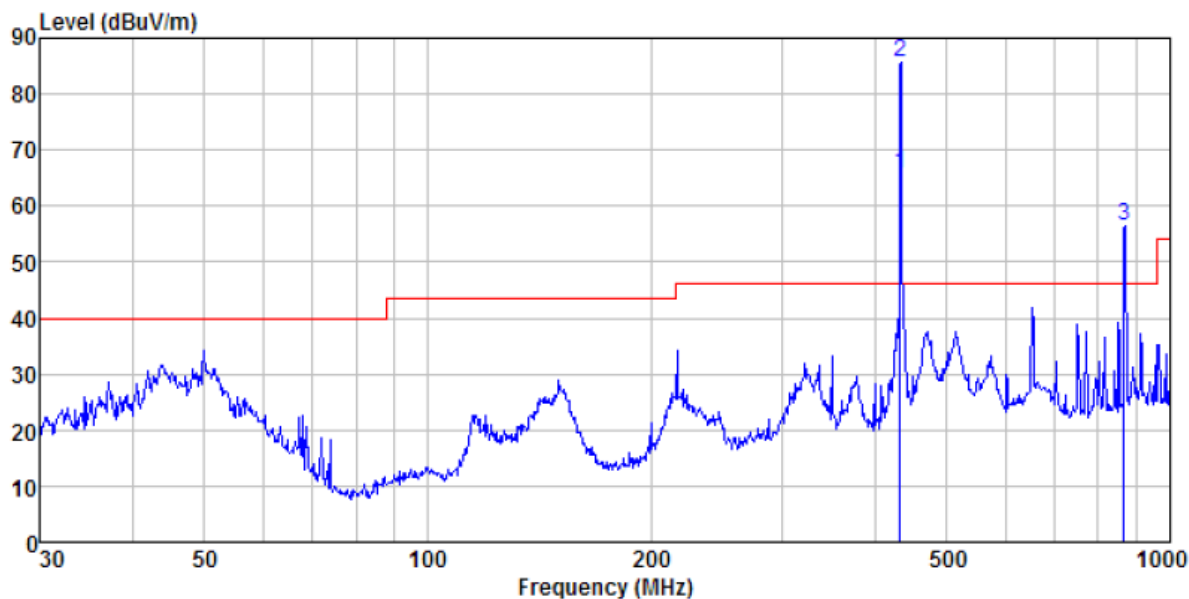
Test plot as follows:



7.2.2 Spurious emissions

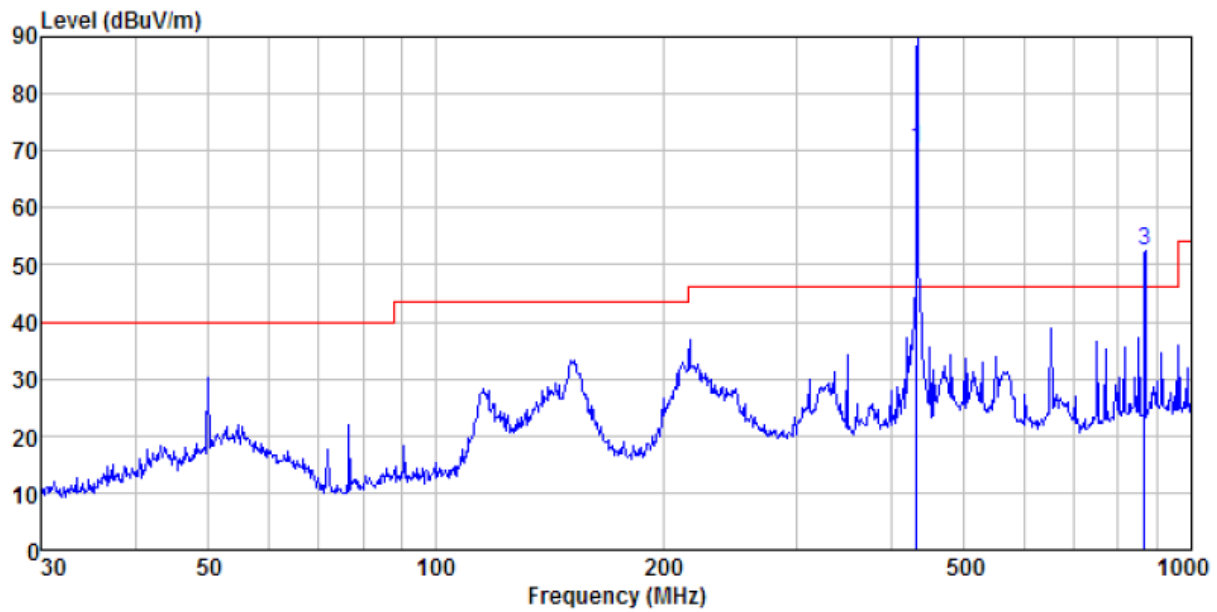
Below 1GHz:

Vertical:



Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	polarization
866.70	57.93	22.78	4.73	29.13	56.31	60.81	-4.52	QP	Vertical

Horizontal:



Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	polarization
866.70	54.07	22.78	4.73	29.13	52.45	60.81	-8.38	QP	Horizontal

Above 1G:

Peak value:

Frequency (MHz)	Read Level (dBUV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBUV/m)	Limit Line (dBUV/m)	Over Limit (dB)	Polarization
1340.00	38.26	25.69	4.57	33.33	35.19	74.00	-38.81	Vertical
2210.00	36.34	27.97	5.19	34.23	35.27	74.00	-38.73	Vertical
3110.00	36.97	28.74	6.17	33.20	38.68	74.00	-35.32	Vertical
3990.00	32.51	29.66	7.85	32.19	37.83	74.00	-36.17	Vertical
4770.00	32.56	31.73	8.58	32.07	40.80	74.00	-23.20	Vertical
5700.00	31.30	32.50	9.79	32.31	41.28	74.00	-32.72	Vertical
1190.00	37.89	25.31	4.46	33.07	34.59	74.00	-39.41	Horizontal
2395.00	37.66	27.59	5.39	34.01	36.63	74.00	-37.37	Horizontal
2670.00	36.70	28.04	5.65	33.70	36.69	74.00	-37.31	Horizontal
4190.00	33.74	30.18	8.05	31.96	40.01	74.00	-33.99	Horizontal
4855.00	31.79	31.83	8.64	32.11	40.15	74.00	-33.85	Horizontal
5885.00	30.04	32.74	10.04	32.20	40.62	74.00	-33.38	Horizontal

Remark:

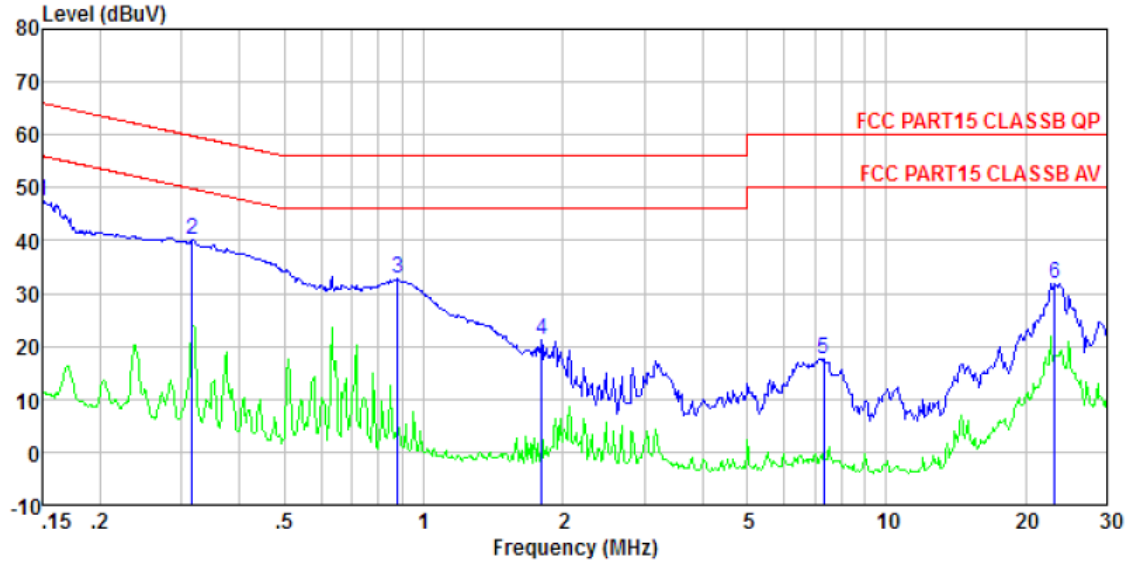
1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *Average value = Peak value + Duty cycle factor*

7.3 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207																
Test Method:	ANSI C63.10:2013																
Test Frequency Range:	150KHz to 30MHz																
Class / Severity:	Class B																
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto																
Limit:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table>	Frequency range (MHz)	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.	
Frequency range (MHz)	Limit (dBuV)																
	Quasi-peak	Average															
0.15-0.5	66 to 56*	56 to 46*															
0.5-5	56	46															
5-30	60	50															
Test setup:	Reference Plane LISN AUX Equipment E.U.T Test table/Insulation plane 40cm 80cm LISN Filter AC power EMI Receiver Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m																
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.																
Test Instruments:	Refer to section 6.0 for details																
Test mode:	Refer to section 5.3 for details																
Test results:	Pass																

Measurement data

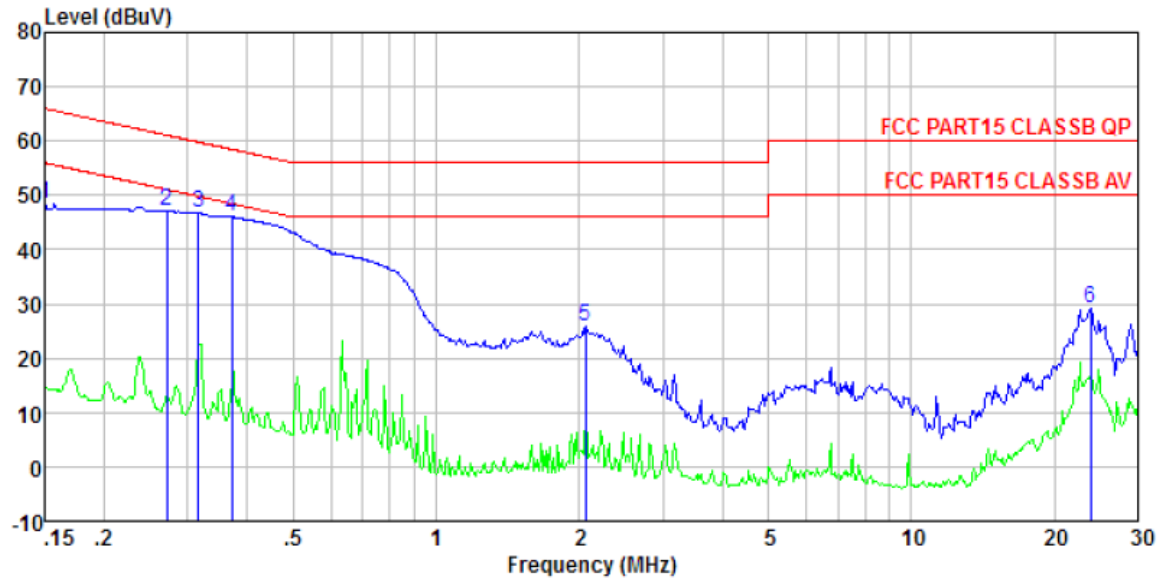
Line:



Site : Shielded room
 Condition : FCC PART15 CLASSB QP LISN-2016 LINE
 Job No. : GTS201610000218
 Test mode : Transmitting mode
 Test Engineer: Boy

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	47.05	0.42	0.12	47.59	66.00	-18.41	Peak
2	0.317	39.52	0.44	0.10	40.06	59.80	-19.74	Peak
3	0.880	32.61	0.26	0.13	33.00	56.00	-23.00	Peak
4	1.800	21.04	0.20	0.14	21.38	56.00	-34.62	Peak
5	7.329	17.30	0.22	0.17	17.69	60.00	-42.31	Peak
6	23.140	31.43	0.35	0.23	32.01	60.00	-27.99	Peak

Neutral:



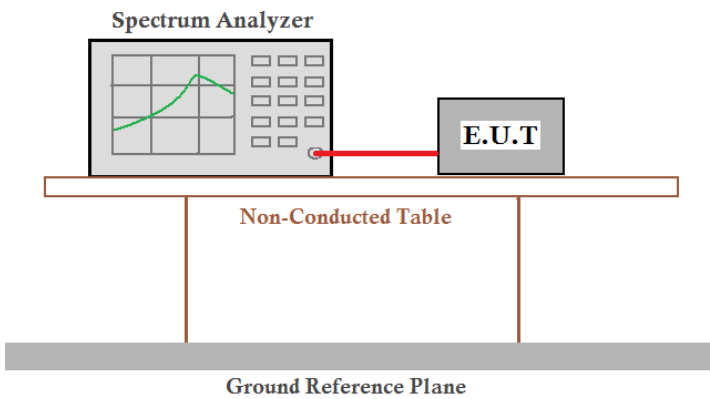
Site : Shielded room
Condition : FCC PART15 CLASSB QP LISN-2016 NEUTRAL
Job No. : GTS201610000218
Test mode : Transmitting mode
Test Engineer: Boy

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	48.04	0.41	0.12	48.57	66.00	-17.43	Peak
2	0.272	46.57	0.42	0.11	47.10	61.07	-13.97	Peak
3	0.317	46.28	0.42	0.10	46.80	59.80	-13.00	Peak
4	0.371	45.52	0.40	0.10	46.02	58.47	-12.45	Peak
5	2.066	25.56	0.20	0.15	25.91	56.00	-30.09	Peak
6	23.888	28.64	0.35	0.23	29.22	60.00	-30.78	Peak

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

7.4 20dB Occupy Bandwidth

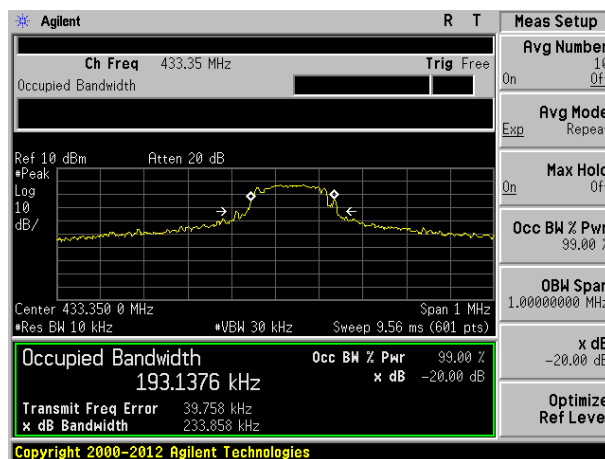
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.10:2013
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

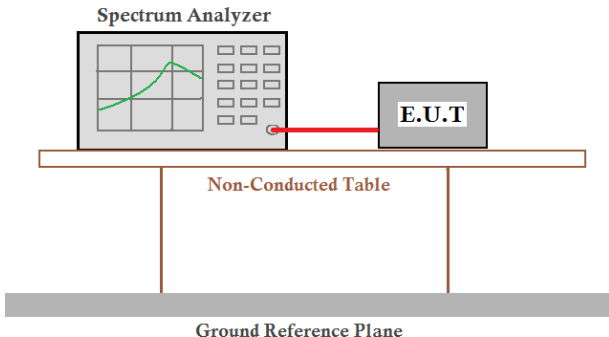
Test Frequency (MHz)	20dB bandwidth (MHz)	Limit (MHz)	Result
433.35	0.234	1.083 MHz	Pass

Note: Limit= Fundamental frequency×0.25%=433.35×0.25%=1.083MHz

Test plot as follows:



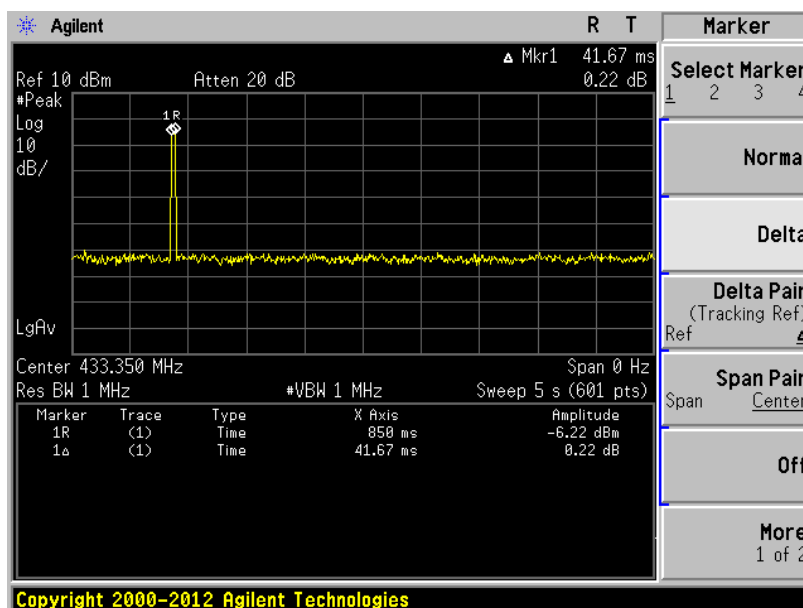
7.5 Dwell time

Test Requirement:	FCC Part15 C Section 15.231 (a1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=3MHz, span=0Hz, detector: Peak
Limit:	Not more than 5seconds
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

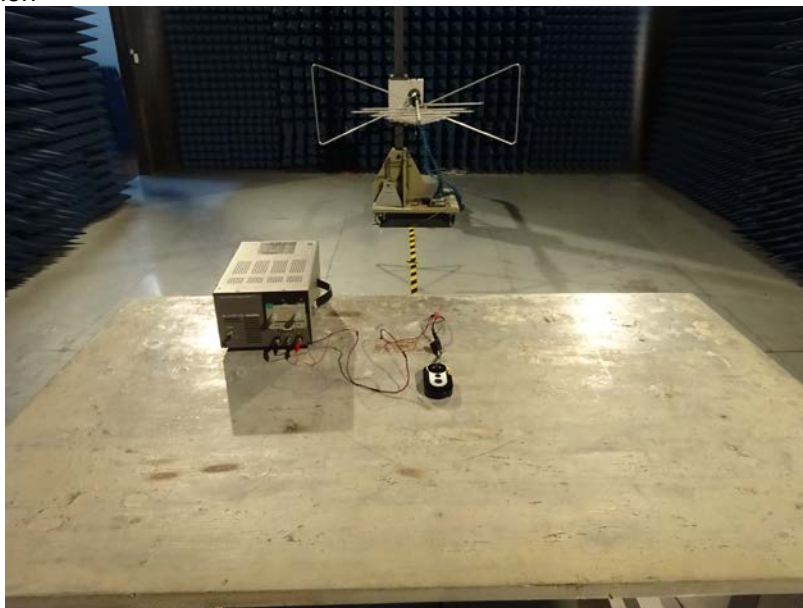
Duration of each TX(second):	Limit (second)	Result
0.04167	<5.0	Pass

The device is manually operation , which is employed for common radio control purposes

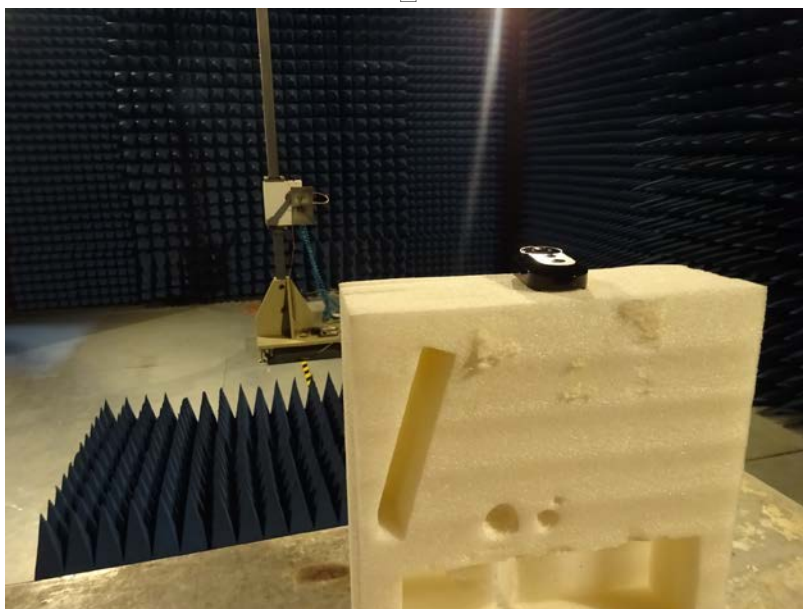


8 Test Setup Photo

Radiated Emission

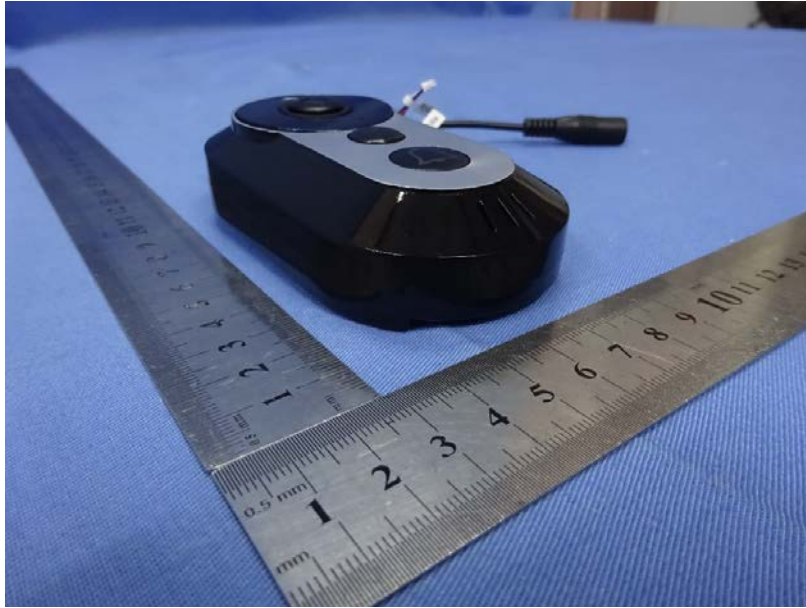


□

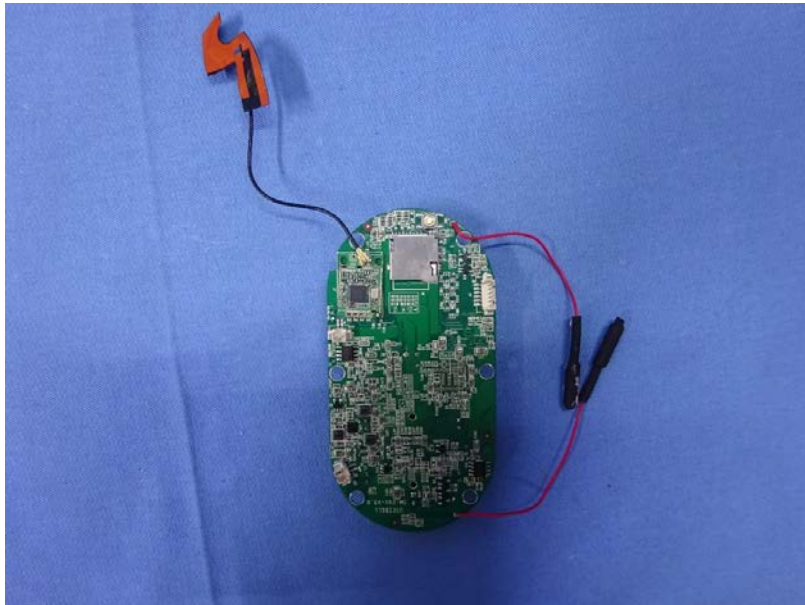


9 EUT Constructional Details









----- End -----