RADIO TEST REPORT

For

shenzhen renheng smart lndustial Co.,Ltd

Product Name:	Remote Control
Model :	HR-X3
Series Model:	RH-X3-1
FCC ID:	2AMXR-HRX3
Prepared By :	Shenzhen BST Technology Co., Ltd. Building No.23-24, Zhiheng Industrial Park, Guankouer Road, Nantou,Nanshan District,Shenzhen,Guangdong,China
Test Date:	June 10-30, 2017
Date of Report :	June 30, 2017
Test Result	pass
Report No.:	BST1707781090001Y-ER-1

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:.	shenzhen renheng smart Industial Co.,Ltd
Address of applicant:	Baolong Industrial Zone A2, Huawang Road 301, Longhua New District,Shenzhen City
Manufacturer:	shenzhen renheng smart Industial Co.,Ltd
Address of manufacturer:	Baolong Industrial Zone A2, Huawang Road 301, Longhua New District,Shenzhen City

General Description of EUT	
Product Name:	Remote control
Trade Name:	N/A
Model No.:	HR-X3
Adding Model(s):	RH-X3-1
Rated Voltage:	DC 12V
Power Adapter Model:	N/A
Note: The test data is gathered from a production sample provided by the manufacturer. The appearance of others models listed in the report is different from main-test model HR-X3, but the circuit and the electronic construction do not change, declared by the manufacturer.	

Technical Characteristics of EUT	
Frequency Range:	433.92 MHz
Max. Field Strength:	76.2 dBuV/m(AV)
Data Rate:	N/A
Modulation:	OOK
Antenna Type:	PCB antenna
Antenna Gain:	1DBI

1.2 Test Standards

The following report is prepared on behalf of the shenzhen renheng smart lndustial Co.,Ltd in accordance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.231, 15.203, 15.205 and 15.209 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission/immunity, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

Shenzhen Asia Test Technology Co.,Ltd.
7 / F, Xinwei Building, Gushu Village, Xixiang Town, Baoan District, Shenzhen, China
FCC Registration No.: 348715; IC Registration No.: 12198A

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

1.5 EUT Setup and Test Mode

The EUT was operated at continuous transmitting mode that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Transmitting	With modulation
TM2		
TM3		

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Occupied Bandwidth	Conducted	±1.5%
Conducted Spurious Emission	Conducted	±2.17dB
Transmission Time	Conducted	±5%
Conducted Emissions	Conducted	±2.88dB
Transmitter Spurious Emissions	Radiated	±5.1dB

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2017-06-04	2018-06-03
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2017-06-04	2018-06-03
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-04	2018-06-03
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-04	2018-06-03
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-04	2018-06-03
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-04	2018-06-03
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-04	2018-06-03
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-04	2018-06-03
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-04	2018-06-03
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2017-06-04	2018-06-03
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2017-06-04	2018-06-03
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2017-06-04	2018-06-03

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	N/A
§ 15.209	Radiated Spurious Emissions	Compliant
§15.231(a)	Deactivation Testing	Compliant
§15.231(b)	Radiated Emissions	Compliant
§15.231(c)	20dB Bandwidth Testing	Compliant

Note: 1. Compliant is applicable, N/A is not applicable.

2. The EUT is powered by the battery, so the conducted emission is not applicable.

3. Antenna Requirement

3.1 Standard Applicable

According to FCC Part 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. 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.

3.2 Test Result

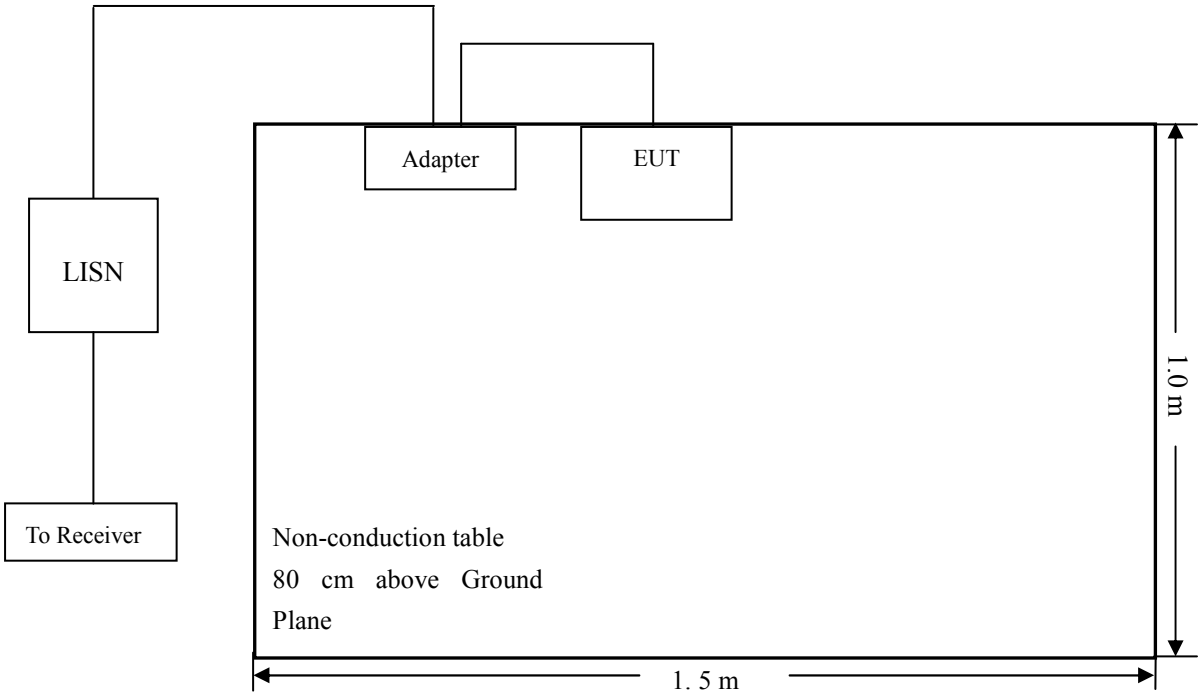
This product has a permanent antenna, fulfill the requirement of this section.

4. Conducted Emissions

4.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
The spacing between the peripherals was 10 cm.

4.2 Basic Test Setup Block Diagram



4.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

4.4 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency ..... 150 kHz
Stop Frequency..... 30 MHz

Sweep Speed ..... Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth ..... 9 kHz
Quasi-Peak Adapter Mode ..... Normal

4.5 Summary of Test Results/Plots

According to the data in section 4.7, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device

Note: The EUT is powered by the battery, so the conducted emission is not applicable.

5. Radiated Emissions

5.1 Standard Applicable

According to §15.231(b), 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	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

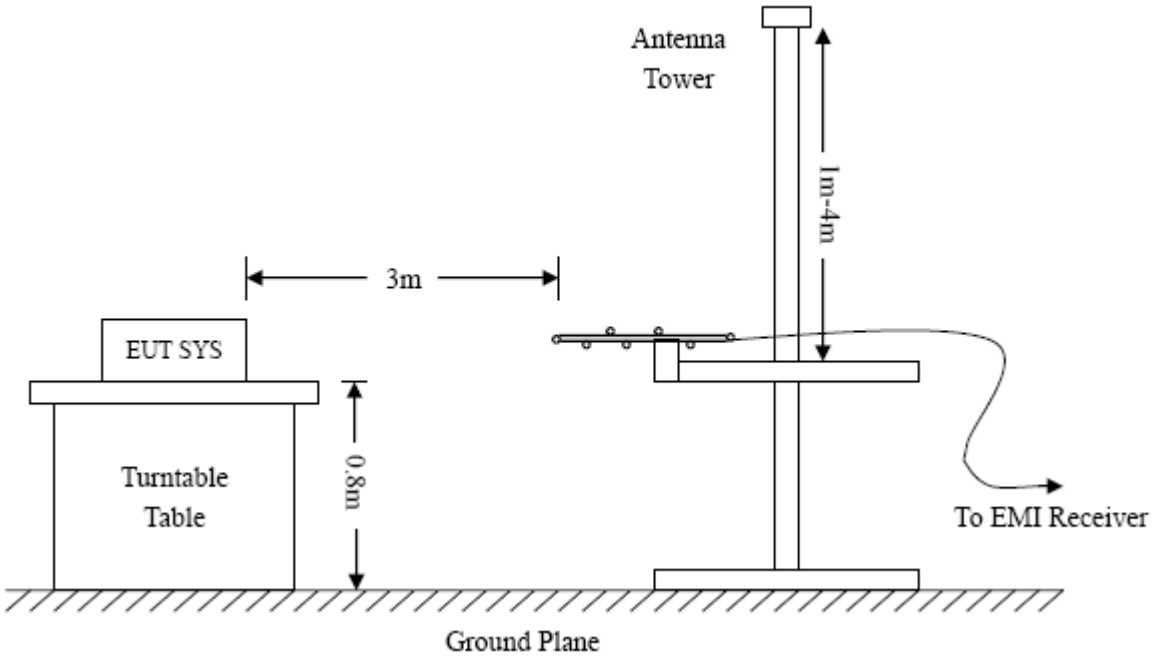
The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209,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

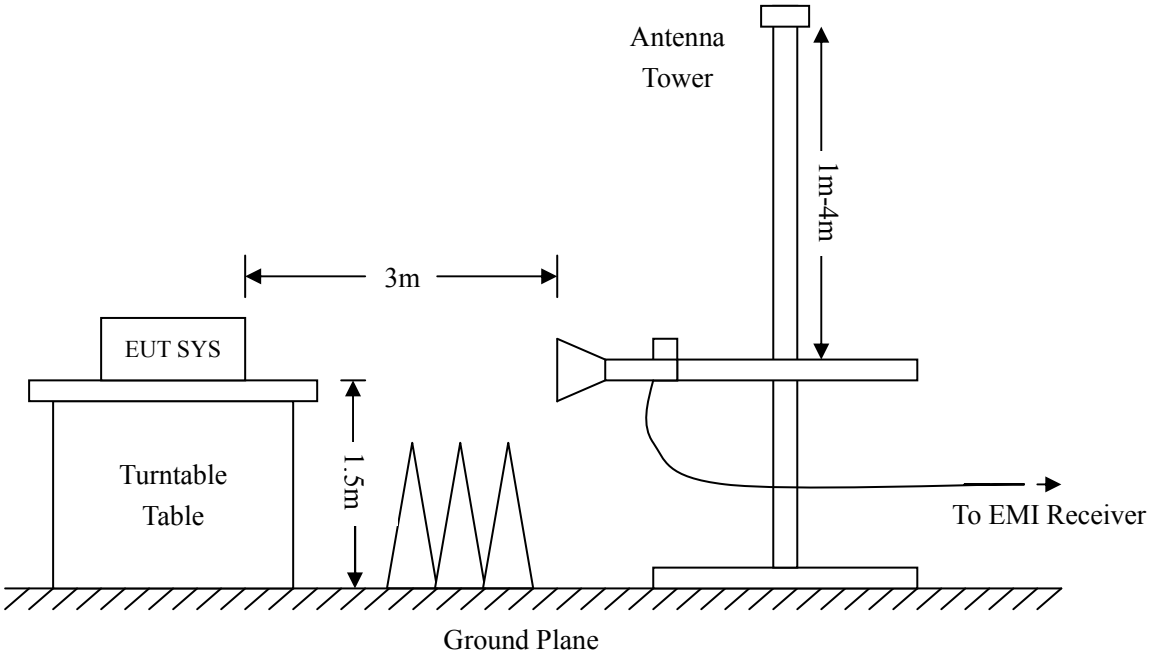
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

5.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.231(b) and FCC Part 15.209 Limit.





5.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading +Ant.Loss +Cab. Loss – Ampl.Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15C Limit

5.4 Environmental Conditions

Temperature:	21° C
Relative Humidity:	50%
ATM Pressure:	1011 mbar

5.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.231 standards, and had the worst margin of:

-4.63 dB at **433.92 MHz** in the Horizontal polarization, **AV Detector**, **9 kHz to 5 GHz**, **1 Meters**

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Horizontal

Below 1GHz									
Frequency	**Reading**	**Corr.**	**Duty cycle**	**Result**	**Limit**	**Margin**	**Deg.**	**Height**	**Remark**
MHz	**dBuV/m**	**Factor(dB)**	**Factor (dB)**	**dBuV/m**	**dBuV/m**	**(dB)**	**(°)**	**(cm)**	
433.92	78.39	-2.19	N/A	76.2	80.83	-4.63	165	100	Ave
433.92	/	/	-9.13	85.33	100.83	-15.5	201	100	peak
867.84	54.27	4.63	N/A	49.64	60.83	-11.19	98	100	Ave
867.84	/	/	-9.13	58.77	80.83	-22.06	215	100	peak
Above 1GHz									
1301.76	48.37	-12.91	N/A	35.46	54	-18.54	125	150	Ave
1301.76			-9.13	44.59	74	-29.41	65	150	peak
1735.68	46.89	-9.2	N/A	37.69	54	-16.31	18	150	Ave
1735.68	/	/	-9.13	46.82	74	-27.18	216	150	peak

Vertical

Below 1GHz									
Frequency	**Reading**	**Corr.**	**Dutycycle**	**Result**	**Limit**	**Margin**	**Deg.**	**Height**	**Remark**
MHz	**dBuV/m**	**Factor(dB)**	**Factor (dB)**	**dBuV/m**	**dBuV/m**	**(dB)**	**(°)**	**(cm)**	
433.92	76.45	-2.19	N/A	74.26	80.83	-6.57	165	100	Ave
433.92	/	/	-9.13	83.39	100.83	-17.44	201	100	peak
867.84	52.11	4.63	N/A	47.48	60.83	-13.35	98	100	Ave
867.84	/	/	-9.13	56.61	80.83	-24.22	215	100	peak
Above 1GHz									
1301.76	44.82	-12.91	N/A	31.91	54	-22.09	125	150	Ave
1301.76			-9.13	41.04	74	-32.96	65	150	peak
1735.68	41.11	-9.2		31.91	54	-22.09	18	150	Ave
1735.68	/	/	-9.13	41.04	74	-32.96	216	150	peak

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
The measurements greater than 20dB below the limit from 9kHz to 30MHz..

The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the the operating frequency 433.92MHz.

6. 20dB Bandwidth

6.1 Standard Applicable

According to FCC Part 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.

6.1 Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band.

6.2 Environmental Conditions

Temperature:	21° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

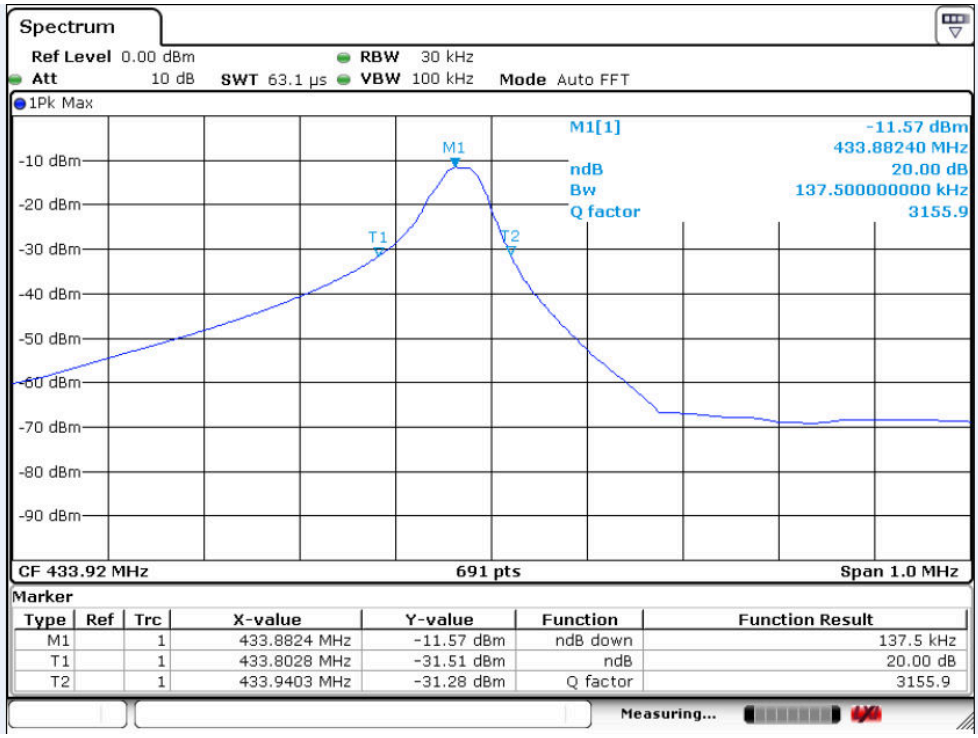
6.3 Summary of Test Results/Plots

Test Frequency MHz	20dB Bandwidth kHz	Limit kHz	Result
433.92	137.5	1084	Pass

Limit = Fudamental Frequency X 0.25% = 433.92 MHz X 0.25% = 1084 kHz

Please refer to the attached plots.

20dB Bandwidth Test Plot



7. Transmission Time

7.1 Standard Applicable

According to FCC Part 15.231 (a), the transmitter shall be complied the following requirements:

1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

7.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

7.3 Environmental Conditions

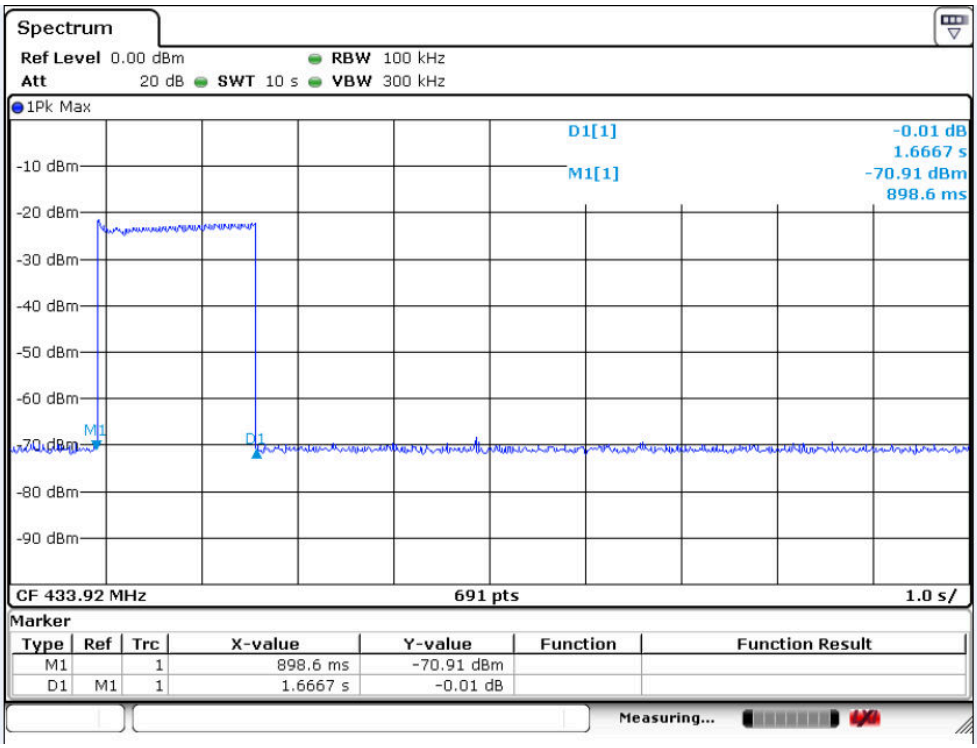
Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

7.4 Summary of Test Results/Plots

Transmission Type	Test Frequency MHz	Transmission Time seconds	Limit s	Result
Manually	433.92	1.6667	5	Pass

Please refer to the attached plots.

Transmission Time



8. Duty Cycle

8.1 Standard Applicable

According to FCC Part 15.231 (b)(2) and 15.35 (c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

8.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

8.3 Environmental Conditions

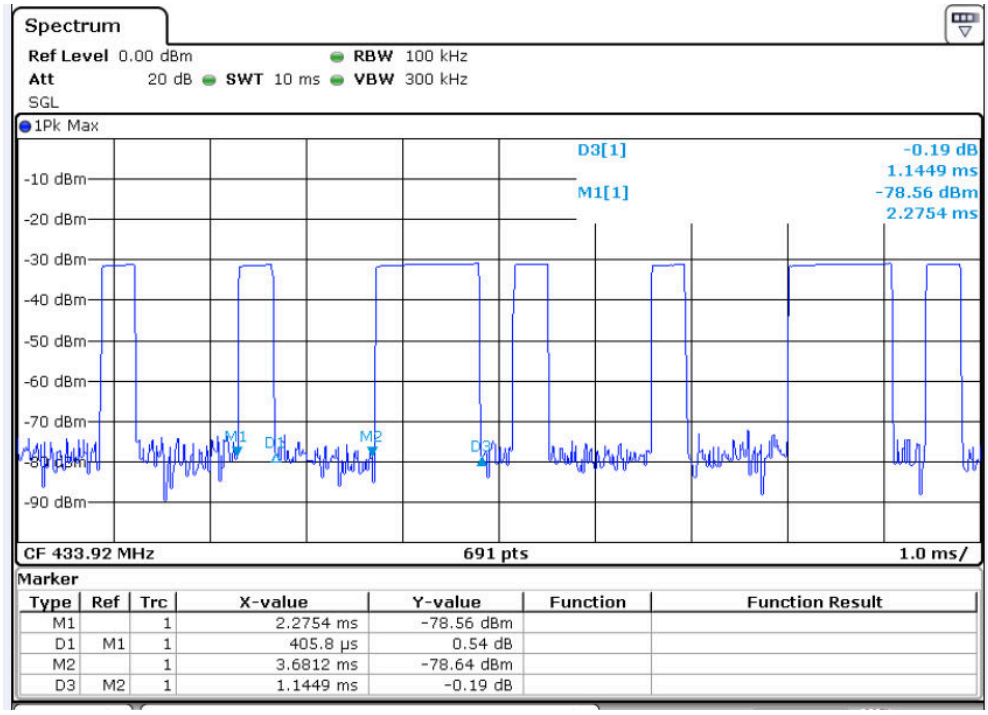
Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

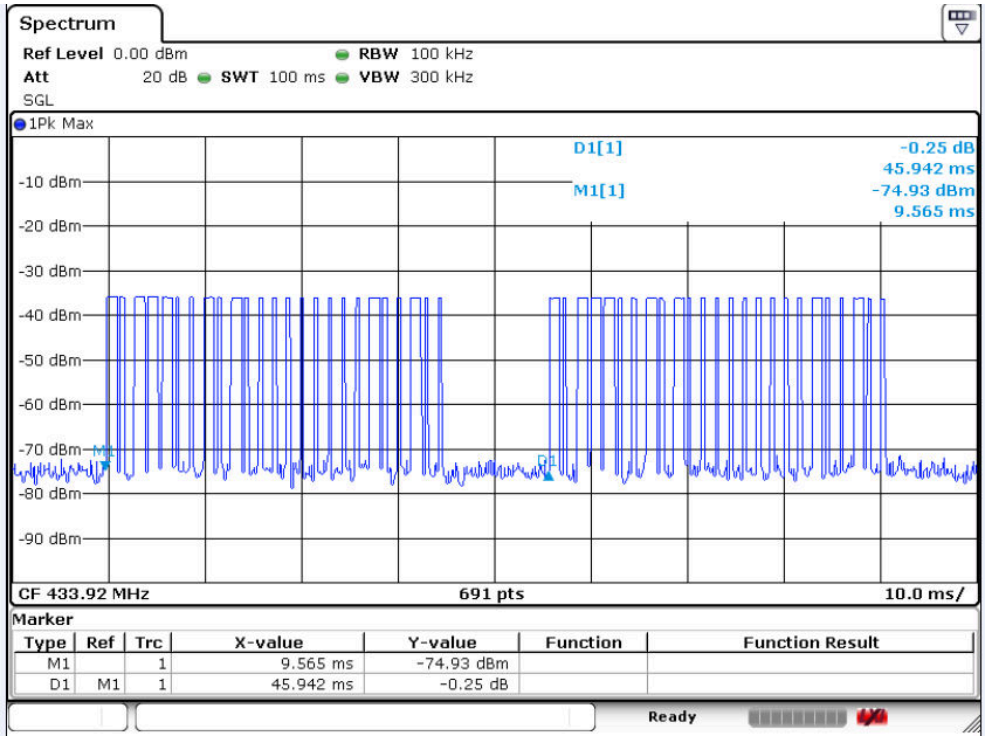
8.4 Summary of Test Results

Type of Pulse	Width of Pulse ms	Quantity of Pulse	Transmission Time ms	Total Time (T_{on}) ms
Pulse 1 (Wide)	1.1449	8	9.1592	16.0578
Pulse 2 (Narrow)	0.4058	17	6.8986	

Test Period (T_p) ms	Total Time (T_{on}) ms	Duty Cycle %	Duty Cycle Factor dB
100	45.942	34.95	-9.13

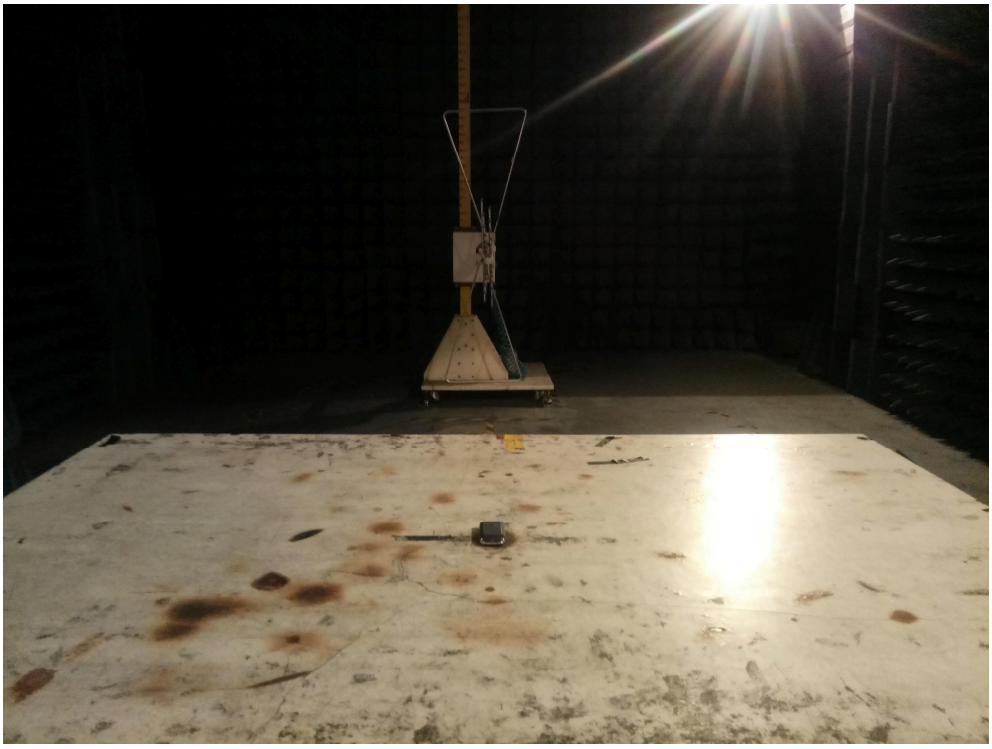
Please refer to the attached test plots

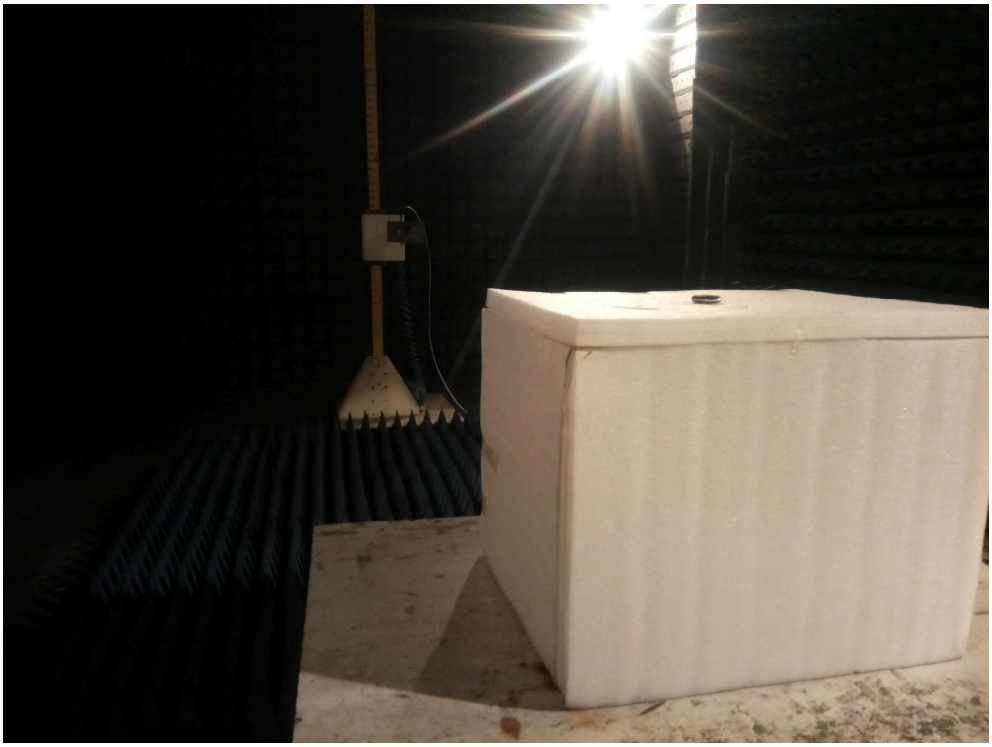

Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
Att 20 dB SWT 10 ms VBW 300 kHz
SGL
1Pk Max
D3[1] -0.19 dB
1.1449 ms
M1[1] -78.56 dBm
2.2754 ms
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 433.92 MHz
691 pts
1.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.2754 ms -78.56 dBm
D1 M1 1 405.8 µs 0.54 dB
M2 1 3.6812 ms -78.64 dBm
D3 M2 1 1.1449 ms -0.19 dB


Spectrum
Ref Level 0.00 dBm
RBW 100 kHz
Att 20 dB SWT 100 ms VBW 300 kHz
SGL
1Pk Max
D1[1] -0.25 dB
45.942 ms
M1[1] -74.93 dBm
9.565 ms
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
CF 433.92 MHz
691 pts
10.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 9.565 ms -74.93 dBm
D1 M1 1 45.942 ms -0.25 dB
Ready

9 Test Photo

RE





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