TEST REPORT

Reference No......	:	WTS20S11089142W V1
FCC ID.....	:	2AD9XPIRD
Applicant.....	:	Versa Wireless Inc.
Address.....	:	103 - 19292 60th Ave. Surrey, BC, V3S 3M2 Canada
Manufacturer.....	:	A&R Technologies Ltd
Address.....	:	Block 34B, Phase 4, Huaide Cuigang Ind, Park, Fuyong , Baoan, Shenzhen, China.
Product.....	:	Motion Sensor
Model(s).....	:	PIR-DUAL
Standards.....	:	FCC CFR47 Part 15 Section 15.231:2019
Date of Receipt sample....	:	2020-11-26
Date of Test.....	:	2020-11-27 to 2020-12-08
Date of Issue.....	:	2021-01-06
Test Result.....	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
Waltek Testing Group Co., Ltd.
Address: No. 77, Houjie Section, Guantai Road, Houjie Town, Dongguan City, Guangdong, China
Tel: +86-769-2267 6998
Fax: +86-769-2267 6828

Compiled by:

Levi Xiao

Levi Xiao / Project Engineer

Approved by:

WALTEK TESTING GROUP CO.,LTD WALTEK TEST REPORT

Daniel Liu / Manager

2 Contents

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS20S11089142W	2020-11-26	2020-11-27 to 2020-12-08	2020-12-09	Original	-	Replaced
WTS20S11089142W V1	2020-11-26	2020-11-27 to 2020-12-08	2021-01-06	Version 1	Updated	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	Motion Sensor
Model(s):	PIR-DUAL
Type of Modulation:	OOK
Frequency Range:	319.5MHz,345 MHz
Antenna installation:	Loop antenna
Antenna Gain:	-15dBi

4.2 Details of E.U.T.

Ratings:	3.0VDC From Battery

4.3 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Test channel
Transmitting	319.5MHz
Transmitting	345 MHz

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	100947	2020-09-17	2021-09-16
2.	LISN	R&S	ENV216	101215	2020-09-17	2021-09-16
3.	Cable	Top	TYPE16(3.5M)	-	2020-09-17	2021-09-16
3m Semi-anechoic Chamber for Radiation Emissions						
1	Test Receiver	R&S	ESCI	101296	2020.04.20	2021.04.19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2020.04.25	2021.04.24
3	Amplifier	ANRITSU	MH648A	M43381	2020.04.20	2021.04.19
4	Cable	HUBER+SUHNER	CBL2	525178	2020.04.20	2021.04.19
5	Spectrum Analyzer	R&S	FSP30	100091	2020-04-20	2021.04.19
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2020-04-25	2021.04.24
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2020-08-26	2021-08-25
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	Spectrum Analyzer	Agilent	N9020A	MY49100060	2020-07-30	2021-07-29
2	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2020-07-30	2021-07-29
3	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	2020-07-30	2021-07-29
4	EXA Signal Analyzer	Keysight	N9010A	MY50520207526B25MPBW7X	2020-04-20	2021-04-19
"*": The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.						

5.2 Measurement Uncertainty

Parameter	**Uncertainty**
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (30M~1000MHz)
	± 5.47 dB (1000M~25000MHz)
Confidence interval：95%. Confidence factor:k=2	

5.3 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test Lab: N/A

Lab address: N/A

Test items: N/A

6 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	N/A
Radiated Spurious Emissions	15.205(a) 15.209 15.231(a)	Pass
Periodic Operation	15.231(a)	Pass
Emission Bandwidth	15.231(c)	Pass
Antenna Requirement	15.203	Pass
Note: Pass=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable.		

7 Radiated Spurious Emissions

Test Requirement: FCC Part15 Paragraph 15.231(a), 15.209, 15.205

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

Fundamental Frequency (MHz)	Field Strength of Fundamental (uV/m)	Field Strength of Fundamental (dBuV/m)	Field Strength of Spurious Emission (uV/m)	Field Strength of Spurious Emission (dBuV/m)
44.66-40.70	2250	67	225	47
70-130	1250	62	125	42
130-174	1250 to 3750*	62 to 71.48*	125 to 375*	42 to 51.48*
174-260	3750	71.48	375	51.48
260-470	3750 to 12500*	71.48 to 81.94*	375 to 1250*	51.48 to 61.94*
Above 470	12500	81.94	1250	61.94
* linear interpolations				

7.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 54.6% RH

Atmospheric Pressure: 101.7kPa

Test Voltage: DC 3.0V by Battery*

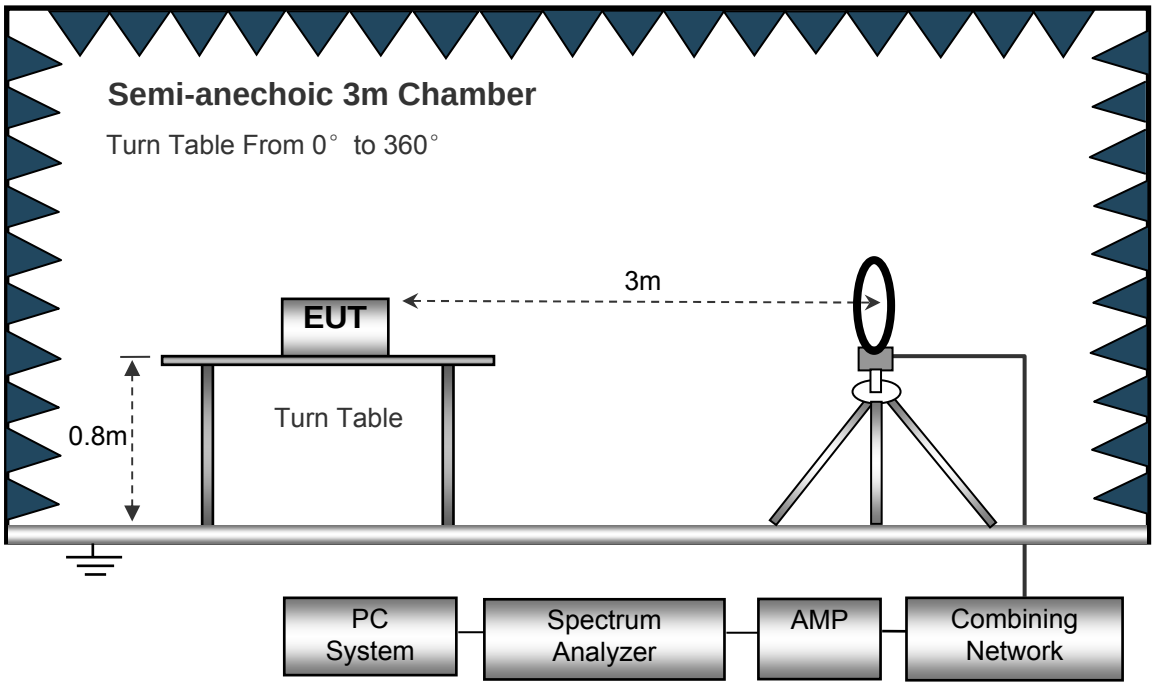
EUT Operation **:**

*The test was performed in Transmitting mode, the test data were shown in the report.

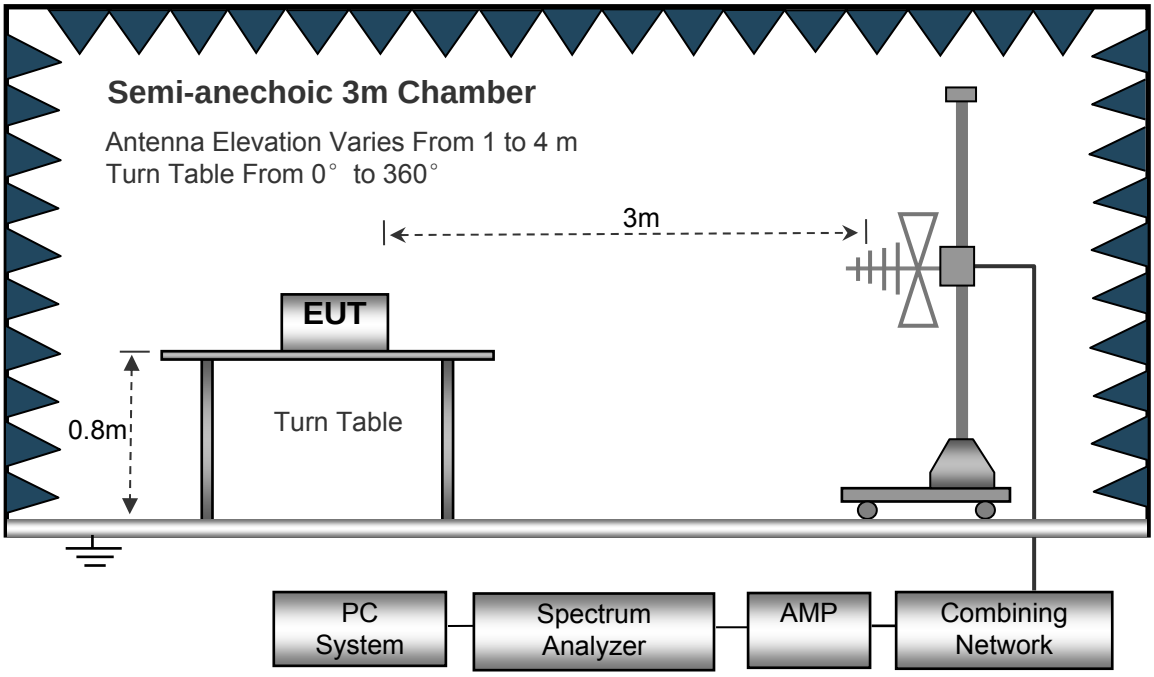
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10:2013.

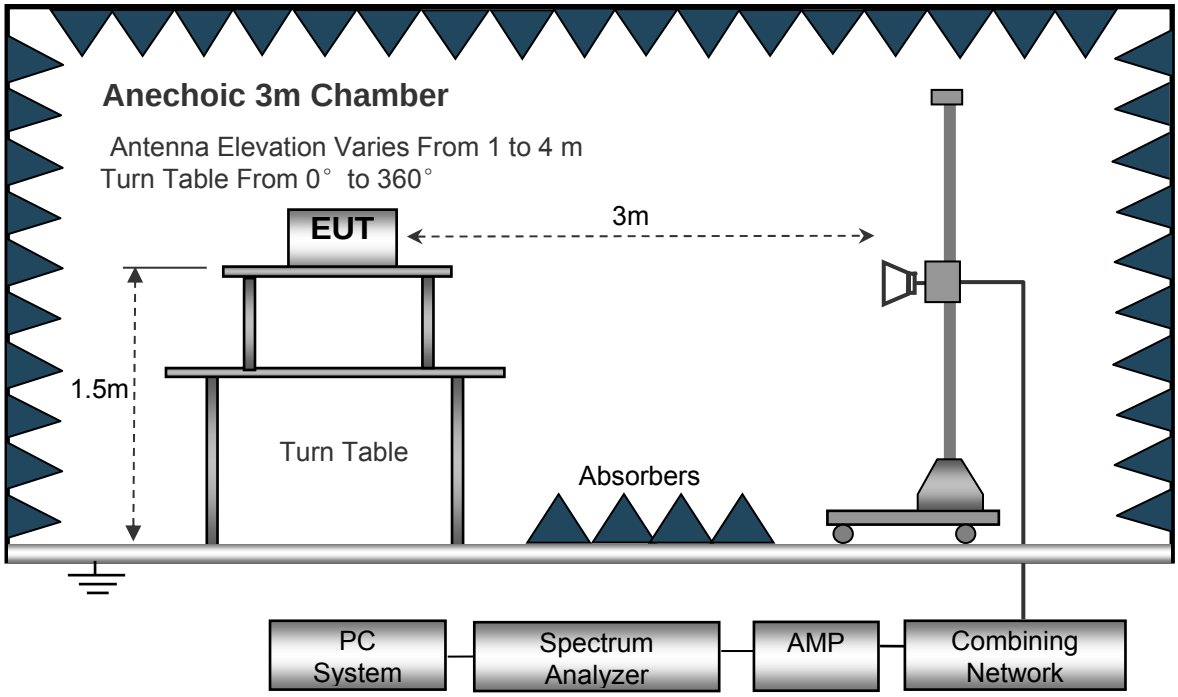
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed .....Auto
IF Bandwidth.....10kHz
Video Bandwidth.....10kHz

Resolution Bandwidth.....10kHz

30MHz ~ 1GHz

Sweep Speed .....Auto
Detector .....PK
Resolution Bandwidth.....100kHz
Video Bandwidth.....300kHz

Above 1GHz

Sweep Speed .....Auto
Detector .....PK
Resolution Bandwidth.....1MHz
Video Bandwidth.....3MHz

7.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane; For above1GHz, the EUT is 1.5m above ground plane.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

6. Repeat above procedures until the measurements for all frequencies are complete.

7. The radiation measurements are tested under 3-axes(X, Y, Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Summary of Test Results

Test Frequency: 9 kHz~30 MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30 MHz ~ 5 GHz

Test Channel: 319.5MHz

Frequency	Receiver Reading (PK)	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude (PK)	FCC Part 15.231/15.209/205	
			Height	Polar			Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
319.5	100.47	124	1.2	H	-10.44	90.03	95.89	-5.86
319.5	100.33	146	1.8	V	-10.44	89.89	95.89	-6.00
630.00	40.74	304	1.1	H	0.04	40.78	75.89	-34.84
630.00	31.32	339	1.4	V	0.04	31.36	75.89	-44.26
945.00	54.77	233	1.1	H	-16.38	38.39	75.89	-37.23
945.00	54.08	113	1.3	V	-16.38	37.70	75.89	-37.92
2725.20	54.49	272	1.4	H	-14.87	39.62	74.00	-34.38
2725.20	57.16	157	1.4	V	-14.87	42.29	74.00	-31.71

Test Channel:345Mhz

Frequency	Receiver Reading (PK)	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude (PK)	FCC Part 15.231/15.209/205	
			Height	Polar			Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
345	101.41	115	1.2	H	-10.44	90.97	97.25	-6.28
345	99.52	143	1.7	V	-10.44	89.08	97.25	-8.17
630.00	40.30	307	1.2	H	0.04	40.34	77.25	-42.41
630.00	31.27	339	1.4	V	0.04	31.31	77.25	-45.94
945.00	54.67	231	1.1	H	-16.38	38.29	77.25	-38.96
945.00	54.18	111	1.3	V	-16.38	37.80	77.25	-39.45
2725.20	54.59	272	1.4	H	-14.87	39.72	74.00	-34.28
2725.20	57.15	157	1.4	V	-14.87	42.28	74.00	-31.72

Test Channel: 319.5MHz ,AV = Peak +20Log$_{10}$ (duty cycle) =PK+ (-19.25)

[refer to section 8 for more detail]

Frequency	PK	RX Antenna Polar	Duty cycle Factor	Calculated AV	FCC Part 15.231/209/205	
					Limit	Margin
(MHz)	(dBμV/m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
319.5	90.03	H	-19.25	70.78	75.89	-5.11
319.5	89.89	V	-19.25	70.64	75.89	-5.25
630.00	40.78	H	-19.25	21.53	55.89	-34.36
630.00	31.36	V	-19.25	12.11	55.89	-43.78
945.00	38.39	H	-19.25	19.14	55.89	-36.75
945.00	37.70	V	-19.25	18.45	55.89	-37.44
2725.20	39.62	H	-19.25	20.37	54.00	-33.63
2725.20	42.29	V	-19.25	23.04	54.00	-30.96

Test Channel: 345MHz ,AV = Peak +20Log$_{10}$ (duty cycle) =PK+ (-16.99)

[refer to section 8 for more detail]

Frequency	PK	RX Antenna Polar	Duty cycle Factor	Calculated AV	FCC Part 15.231/209/205	
					Limit	Margin
(MHz)	(dBμV/m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
345	90.97	H	-16.99	73.98	77.25	-3.27
345	89.08	V	-16.99	72.09	77.25	-5.16
630.00	40.34	H	-16.99	23.35	57.25	-33.9
630.00	31.31	V	-16.99	14.32	57.25	-42.93
945.00	38.29	H	-16.99	21.3	57.25	-35.95
945.00	37.80	V	-16.99	20.08	57.25	-37.17
2725.20	39.72	H	-16.99	22.73	54.00	-31.27
2725.20	42.28	V	-16.99	25.29	54.00	-28.71

8 Periodic Operation

The duty cycle was determined by the following equation:

To calculate the actual field intensity, The duty cycle correction factor in decibel is needed for later use and can be obtained from following conversion

Duty Cycle(%)=Total On interval in a complete pulse train/ Length of a complete pulse train * %

Duty Cycle Correction Factor(dB)=20 * Log_{10}(Duty Cycle(%))

319.5Mhz

Total transmission time(ms)	18.0
Length of a complete transmission period(ms)	165.2ms
Duty Cycle(%)	10.89%
Duty Cycle Correction Factor(dB)	-19.25

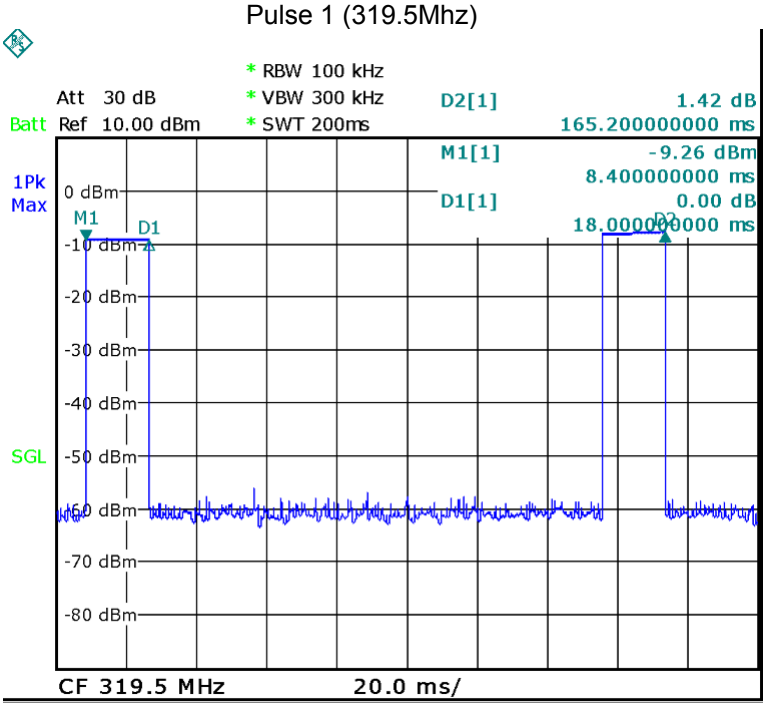
345Mhz

Total transmission time(ms)	16.8
Length of a complete transmission period(ms)	118.8ms
Duty Cycle(%)	14.14%
Duty Cycle Correction Factor(dB)	-16.99

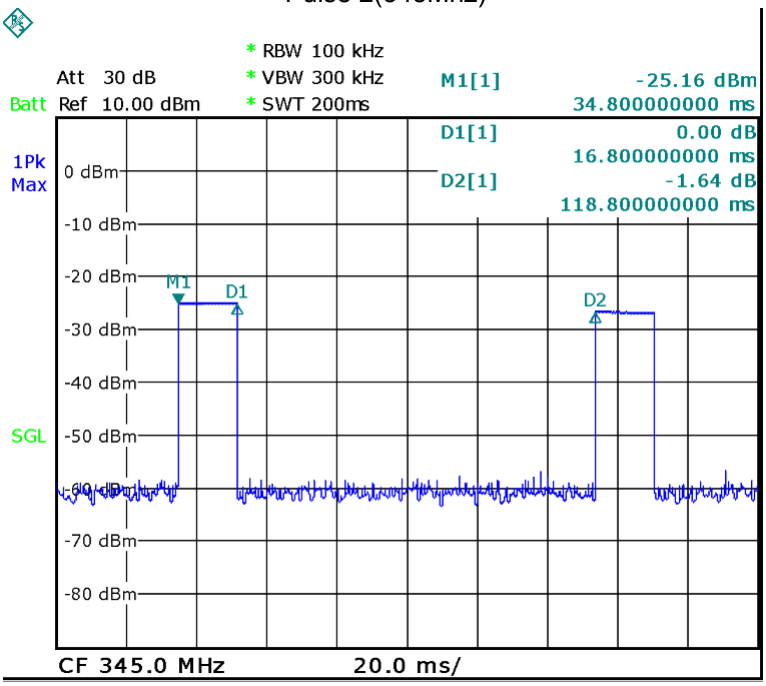
(* Note: the transmitter operates for longer than 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. So the Length of a complete transmission period=100ms)

Refer to the duty cycle plot (as below)

Pulse 1 (319.5Mhz)



Pulse 2(345Mhz)



FCC Part15.231 (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.

(2)A transmitter activated automatically shall cease transmission within 5 seconds after activation.

Note: Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

9 Emission Bandwidth

Test Requirement: FCC Part15.231(c)

Test Method: FCC Part15.231(c)

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 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.

9.1 Test Procedure

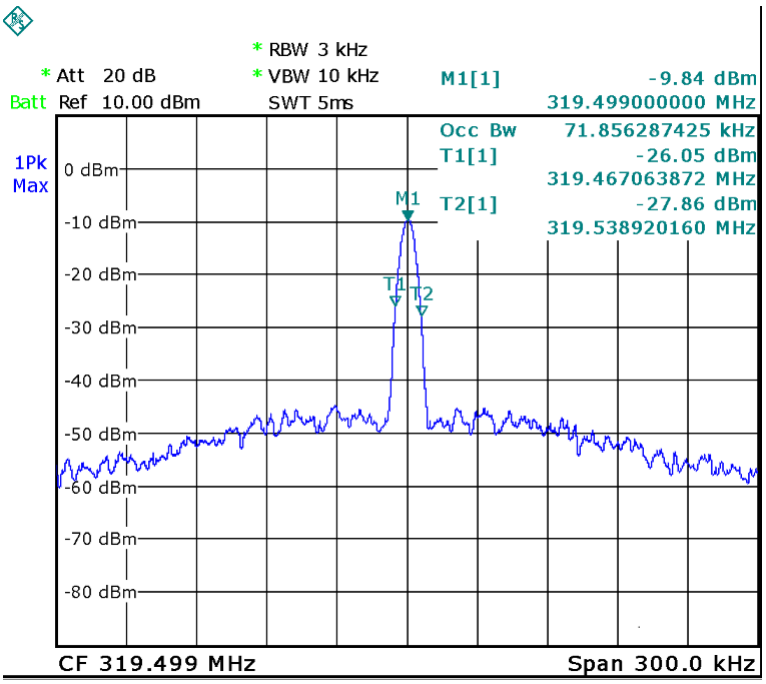
1. The transmitter output (antenna port) was connected to the spectrum analyzer.EUT and its simulators are placed on a table, let EUT working in test mode, then test it.
2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 3 kHz RBW and 10 kHz VBW. The 20 dB bandwidth was recorded.

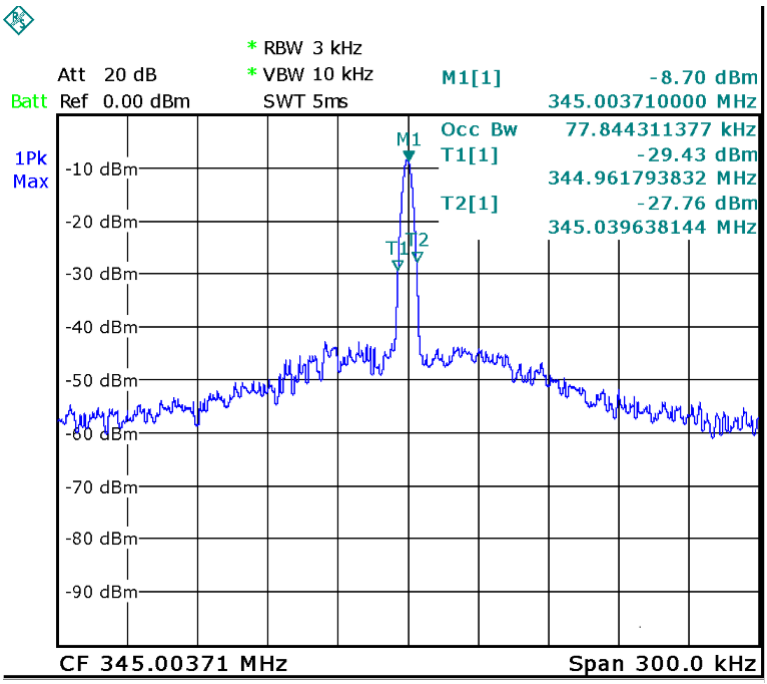
9.2 Test Result

Frequency (MHz)	20dB Bandwidth Emission(kHz)	Limit (kHz)	Result
319.5	71.856	798.75	Compliance
345	77.844	862.5	Compliance

Limit=Center Frequency*0.25%

Test Plot




* RBW 3 kHz
Att 20 dB
* VBW 10 kHz
M1[1] -8.70 dBm
Batt Ref 0.00 dBm
SWT 5ms
345.003710000 MHz
Occ Bw 77.844311377 kHz
1Pk
Max
M1
T1[1] -29.43 dBm
344.961793832 MHz
T2[1] -27.76 dBm
345.039638144 MHz
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
-80 dBm
-90 dBm
T1
T2
CF 345.00371 MHz
Span 300.0 kHz

10 Antenna 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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

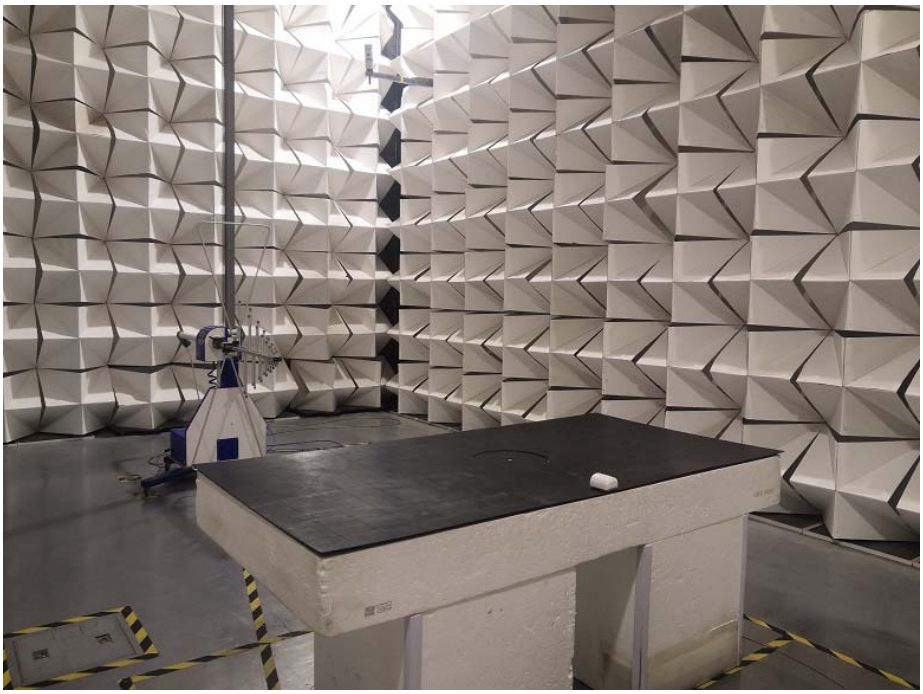
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Result:

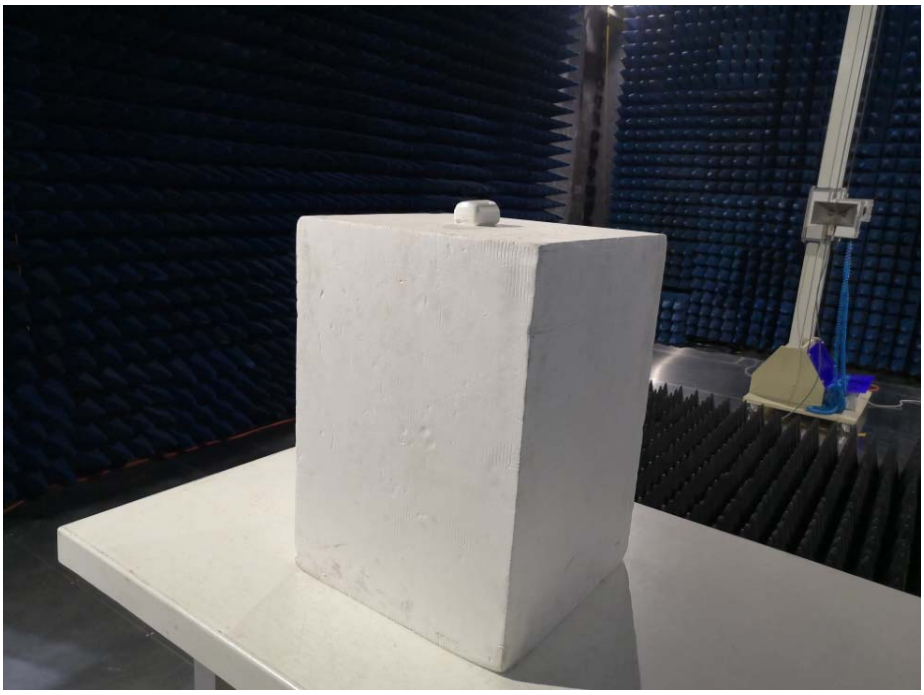
The EUT has one Loop antenna, the gain is -15dBi. meets the requirements of FCC 15.203.

11 Photographs –Test Setup Photos

Radiated Emission 30MHz to 1GHz



Radiated Emission Above 1GHz



12 Photographs - Constructional Details

Note: Please refer to appendix: Appendix- PIR-DUAL-Photos.

======End of Report======