

# TEST REPORT

**Product Name** : Microwave Motion Sensor  
**Model Number** : HD016VCR-1A, HD016VCR-1B, HD016VCR-2A,  
HD016VCR-2B, HB001VCR-1A, HB001VCR-1B,  
HB001VCR-2A, HB001VCR-2B  
**FCC ID** : 2AN7F-HDM031

**Prepared for** : Shenzhen Haisen Technology Co., Ltd  
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**Report Number** : EDG2303310062E00101R  
**Date(s) of Tests** : March 31, 2023 to April 28, 2023  
**Date of issue** : April 28, 2023

## Table of Contents

<b>TEST REPORT .....</b>	<b>1</b>
<b>1 TEST RESULT CERTIFICATION .....</b>	<b>3</b>
<b>2 EUT TECHNICAL DESCRIPTION .....</b>	<b>5</b>
<b>3 SUMMARY OF TEST RESULT .....</b>	<b>6</b>
<b>4 TEST METHODOLOGY .....</b>	<b>7</b>
4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS .....	7
4.2 MEASUREMENT EQUIPMENT USED .....	7
4.3 DESCRIPTION OF TEST MODES .....	8
4.4 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING .....	9
<b>5 FACILITIES AND ACCREDITATIONS .....</b>	<b>10</b>
5.1 FACILITIES .....	10
5.2 LABORATORY ACCREDITATIONS AND LISTINGS .....	10
<b>6 TEST SYSTEM UNCERTAINTY .....</b>	<b>11</b>
<b>7 SETUP OF EQUIPMENT UNDER TEST .....</b>	<b>12</b>
7.1 RADIO FREQUENCY TEST SETUP 1 .....	12
7.2 RADIO FREQUENCY TEST SETUP 2 .....	12
7.3 CONDUCTED EMISSION TEST SETUP .....	13
7.4 SUPPORT EQUIPMENT .....	14
<b>8 TEST REQUIREMENTS .....</b>	<b>15</b>
8.1 BANDWIDTH TEST .....	15
8.2 99% BANDWIDTH .....	18
8.3 RADIATED SPURIOUS EMISSION .....	21
8.4 CONDUCTED EMISSIONS TEST .....	30
8.5 ANTENNA APPLICATION .....	31

## 1 TEST RESULT CERTIFICATION

Applicant : Shenzhen Haisen Technology Co., Ltd

Address : 1201, Building 2, No.155, Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen

Manufacturer : Dongguan Haiyue Intelligent Technology Co., LTD

Address : Room 1305, Building 1, Songhu Zhigu Industrial Building, No.9 Liaobu South Yanhe Road, Liaobu Town, Dongguan City, Guangdong Province

EUT : Microwave Motion Sensor

Model Name : HD016VCR-1A, HD016VCR-1B, HD016VCR-2A, HD016VCR-2B, HB001VCR-1A, HB001VCR-1B, HB001VCR-2A, HB001VCR-2B

Trademark : HAISEN

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart C	PASS
IC RSS-GEN, Issue 5, March 2021 IC RSS-210, Issue 10, April 2020	PASS

The above equipment was tested by EMTEK(DONGGUAN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2, Part 15.249, IC RSS-GEN Issue 5 and IC RSS-210 Issue 10. The test results of this report relate only to the tested sample identified in this report.

Date of Test : March 31, 2023 to April 28, 2023

Prepared by : Xia Yang

Xia Yang /Editor

Reviewer : Tim Dong

Tim Dong/ Supervisor

Approved & Authorized Signer : Sam Lv

Sam Lv / Manager

## Modified History

Version	Report No.	Revision Date	Summary
	EDG2303310062E00101R	/	Original Report



## 2 EUT TECHNICAL DESCRIPTION

<b>Product:</b>	Microwave Motion Sensor
<b>Model Number:</b>	HD016VCR-1A, HD016VCR-1B, HD016VCR-2A, HD016VCR-2B, HB001VCR-1A, HB001VCR-1B, HB001VCR-2A, HB001VCR-2B All models have the same RF module and antenna, PCB layout, schematics and components. Only the model and exterior color are different. Here we selected HD016VCR-1A for all the test
<b>Sample number:</b>	1#
<b>Modulation:</b>	FMCW
<b>Frequency Range:</b>	5731MHz-5850MHz
<b>Number of Channels:</b>	120 Channels
<b>Max Transmit Power:</b>	92.94 dBuV@3m
<b>Antenna Gain:</b>	-0.37 dBi
<b>Antenna:</b>	Integrated Antenna
<b>Power supply:</b>	DC 14V
<b>Product SW/HW version:</b>	HW: A0 SW: V0
<b>Radio SW/HW version:</b>	HW: A0 SW: V0
<b>Temperature Range:</b>	-35°C ~ +75°C

*Note: for more details, please refer to the User's manual of the EUT.*

### 3 SUMMARY OF TEST RESULT

FCC Part Clause	IC Part Clause	Test Parameter	Verdict	Remark
15.207	RSS-GEN Clause 8.8	Conducted Emission	N/A	
15.209	RSS-Gen.8.9 RSS-210 Annex B.10(a)	Radiated Emission	PASS	
15.249	RSS-210 Annex B.10(a)	Radiated Spurious Emission	PASS	
15.249	RSS-210 Annex B.10(a)	Band edge test	PASS	
15.249	RSS-GEN Clause 6.7 RSS-210 Annex B.10 (b)	Emission Bandwidth	PASS	
15.203	RSS-GEN Clause 6.8	Antenna Requirement	PASS	
NOTE1: N/A (Not Applicable)				
NOTE2: The report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.				

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

This submittal(s) (test report) is intended for **FCC ID: 2AN7F-HDM031** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

## 4 TEST METHODOLOGY

### 4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

FCC 47 CFR Part 2, Subpart J

FCC 47 CFR Part 15, Subpart C

IC RSS-GEN, Issue 5, March 2021

IC RSS-210, Issue 10, April 2020

### 4.2 MEASUREMENT EQUIPMENT USED

#### For Conducted Emission Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Test Receiver	Rohde& Schwarz	ESCI	100137	2022/05/19	1Year
L.I.S.N.	Rohde& Schwarz	ENV216	101209	2022/05/19	1Year
RF Switching Unit	CDS	RSU-M2	38401	2022/05/19	1Year

#### For Spurious Emissions Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
EMI Test Receiver	Rohde & Schwarz	ESCI	101415	2022/05/19	1Year
Power Amplifier	HP	8447F	OPH64	2022/05/19	1Year
Bilog Antenna	Schwarzbeck	VULB9163	141	2022/05/22	1Year
Horn antenna	Schwarzbeck	BBHA9120D	1272	2022/05/22	1Year
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	2022/05/19	1Year
Loop Antenna	Schwarzbeck	FMZB1513	1513-60	2022/05/22	2 Year
Signal Analyzer	R&S	FSV30	103039	2022/05/19	1Year
Bilog Antenna	Schwarzbeck	VULB9163	141	2022/05/22	1Year
Band reject Filter(50dB)	WI/DE	WRCGV-2400(2400-2485MHz)	2	2022/05/20	1 Year

#### For other test items:

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
Wireless Connectivity Tester	R&S	CMW270	102543	2022/06/21	1Year
Automatic Control Unit	Tonscend	JS0806-2	21I8060480	2022/06/21	1Year
Signal Analyzer	KEYSIGHT	N9010B	MY60242456	2022/06/21	1Year
Analog Signal Generator	KEYSIGHT	N5173B	MY61252625	2022/06/21	1Year
UP/DOWN-Converter	R&S	CMW-Z800A	100274	2022/06/21	1Year
Vector Signal Generator	KEYSIGHT	N5182B	MY61252674	2022/06/21	1Year
Temperature&Humidity test chamber	ESPEC	EL-02KA	12107166	2022/06/21	1 Year
Signal Analyzer	R&S	FSV30	103039	2022/05/20	1 Year

**Remark:** Each piece of equipment is scheduled for calibration once a year.

### 4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.

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

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

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

The EUT has been tested under its typical operating condition so those modulation and channel were used for all test.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5731	41	5771	81	5811
2	5732	42	5772	82	5812
3	5733	43	5773	83	5813
4	5734	44	5774	84	5814
5	5735	45	5775	85	5815
6	5736	46	5776	86	5816
7	5737	47	5777	87	5817
8	5738	48	5778	88	5818
9	5739	49	5779	89	5819
10	5740	50	5780	90	5820
11	5741	51	5781	91	5821
12	5742	52	5782	92	5822
13	5743	53	5783	93	5823
14	5744	54	5784	94	5824
15	5745	55	5785	95	5825
16	5746	56	5786	96	5826
17	5747	57	5787	97	5827
18	5748	58	5788	98	5828
19	5749	59	5789	99	5829
20	5750	60	5790	100	5830
21	5751	61	5791	101	5831
22	5752	62	5792	102	5832
23	5753	63	5793	103	5833
24	5754	64	5794	104	5834
25	5755	65	5795	105	5835
26	5756	66	5796	106	5836
27	5757	67	5797	107	5837
28	5758	68	5798	108	5838
29	5759	69	5799	109	5839
30	5760	70	5800	110	5840
31	5761	71	5801	111	5841
32	5762	72	5802	112	5842



33	5763	73	5803	113	5843
34	5764	74	5804	114	5844
35	5765	75	5805	115	5845
36	5766	76	5806	116	5846
37	5767	77	5807	117	5847
38	5768	78	5808	118	5848
39	5769	79	5809	119	5849
40	5770	80	5810	<b>120</b>	<b>5850</b>

Test Frequency and Channel list:

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5731	70	5800	120	5850

#### 4.4 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of product

Test software version:	The applicant provides samples of the corresponding frequency		
Frequency (MHz)	1	70	120
FMCW	default	default	default

## 5 FACILITIES AND ACCREDITATIONS

### 5.1 FACILITIES

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

EMTEK(DONGGUAN) CO., LTD.

-1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology Research and Development Base, N.9, Xincheng Avenue, Songshanhu High-technology Industrial Development Zone, Dongguan, Guangdong, China.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

### 5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab.

: Accredited by CNAS, 2020.08.27  
The certificate is valid until 2024.07.05  
The Laboratory has been assessed and proved to be in compliance with  
CNAS/CL01:2018  
The Certificate Registration Number is L3150

Accredited by FCC  
Designation Number: CN1300  
Test Firm Registration Number: 945551

Accredited by A2LA, April 05, 2021  
The Certificate Registration Number is 4321.02

Accredited by Industry Canada  
The Certificate Registration Number is CN0113

Name of Firm

Site Location

: EMTEK(DONGGUAN) CO., LTD.  
: -1&2/F., Building 2, Zone A, Zhongda Marine Biotechnology Research and Development Base, N.9, Xincheng Avenue, Songshanhu High-technology Industrial Development Zone, Dongguan, Guangdong, China

## 6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Band Edge Test	$\pm 3\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 3\%$

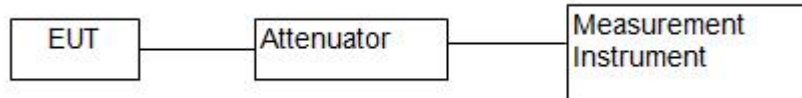
Measurement Uncertainty for a level of Confidence of 95%



## 7 SETUP OF EQUIPMENT UNDER TEST

### 7.1 RADIO FREQUENCY TEST SETUP 1

The EUT wireless component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



### 7.2 RADIO FREQUENCY TEST SETUP 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

Below 30MHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

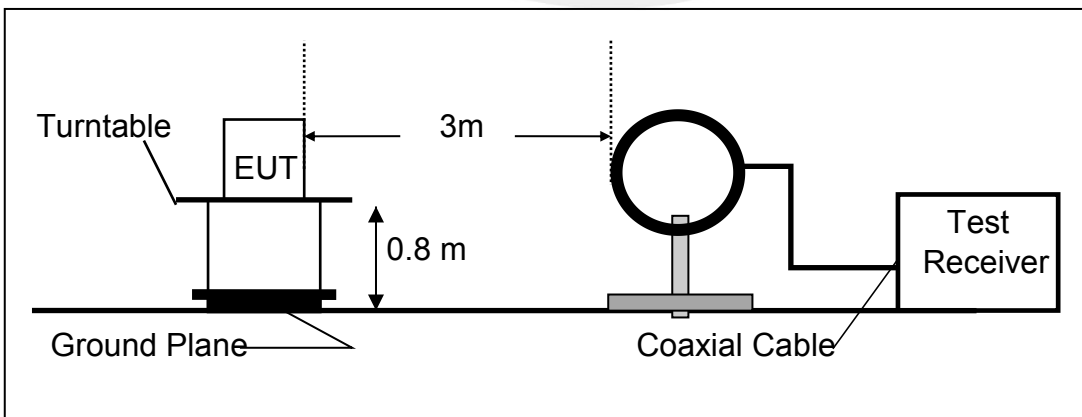
30MHz-1GHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

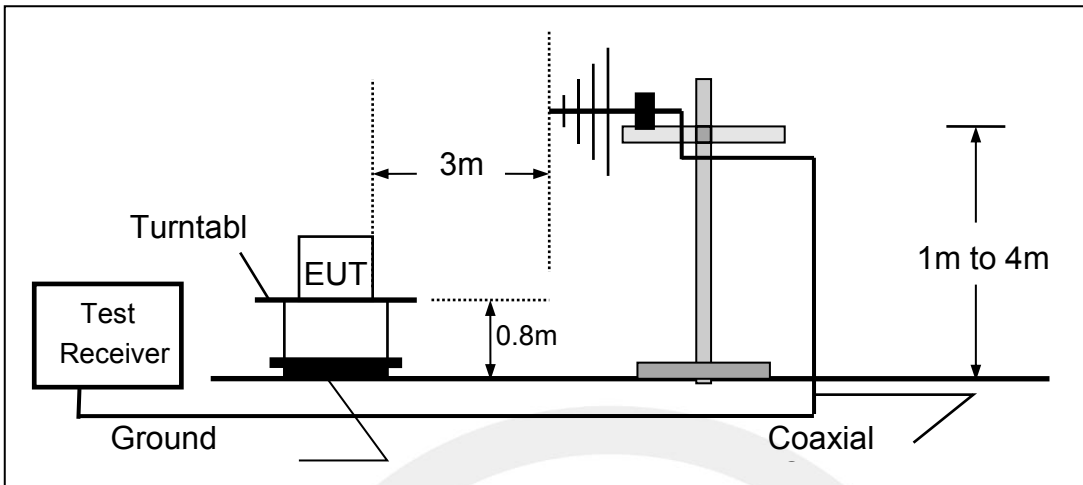
Above 1GHz:

The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

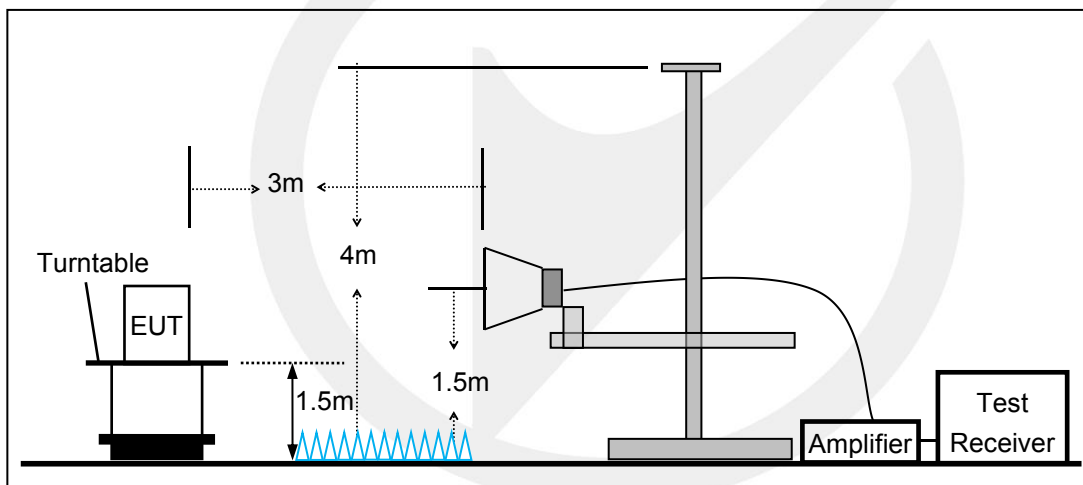
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

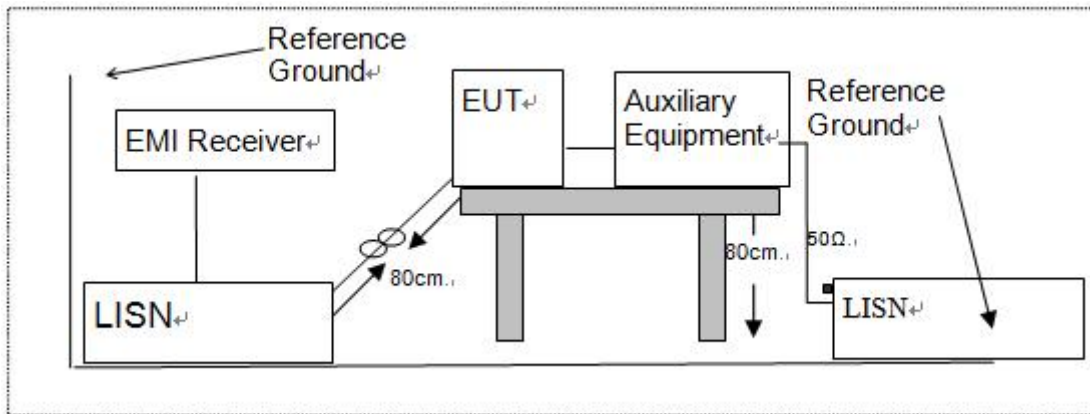


### 7.3 CONDUCTED EMISSION TEST SETUP

The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



#### 7.4 SUPPORT EQUIPMENT

EUT Cable List and Details

Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Cable List and Details

Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
DC power supply	/	/	/
/	/	/	/

#### Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 8 TEST REQUIREMENTS

### 8.1 BANDWIDTH TEST

#### 8.1.1 Applicable Standard

According to FCC Part 15.249  
According to RSS-GEN Clause 6.7

#### 8.1.2 Conformance Limit

N/A

#### 8.1.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

#### 8.1.4 Test Procedure

The EUT was operating in controlled its channel. Printed out the test result from the spectrum by hard copy function. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW  $\geq 1\%$  of the 20 dB bandwidth(3Hz)

Set the video bandwidth (VBW)  $\geq$  RBW(10Hz).

Set Span= approximately 2 to 3 times the 20 dB bandwidth

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

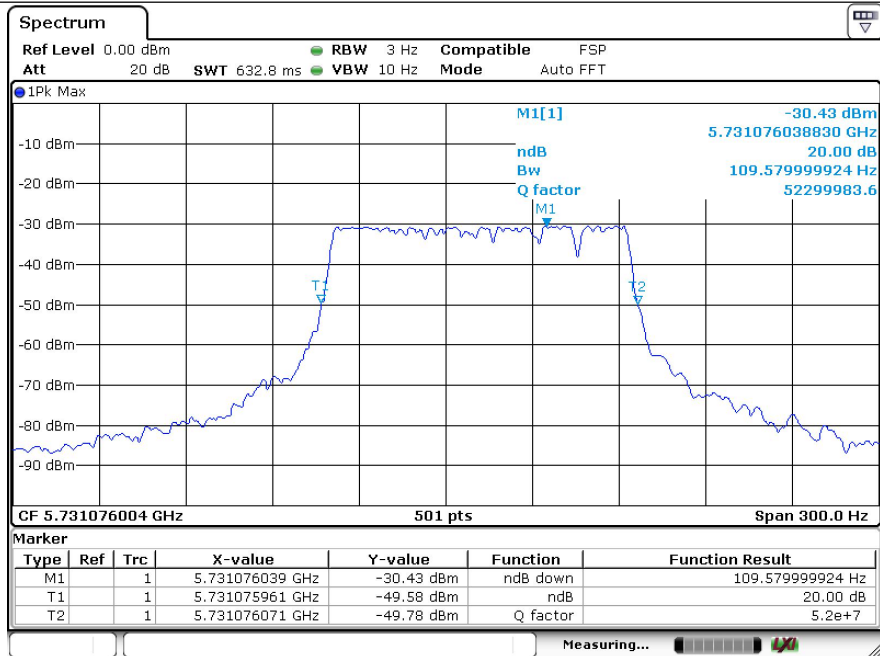
Measure and record the results in the test report.

#### Test Results

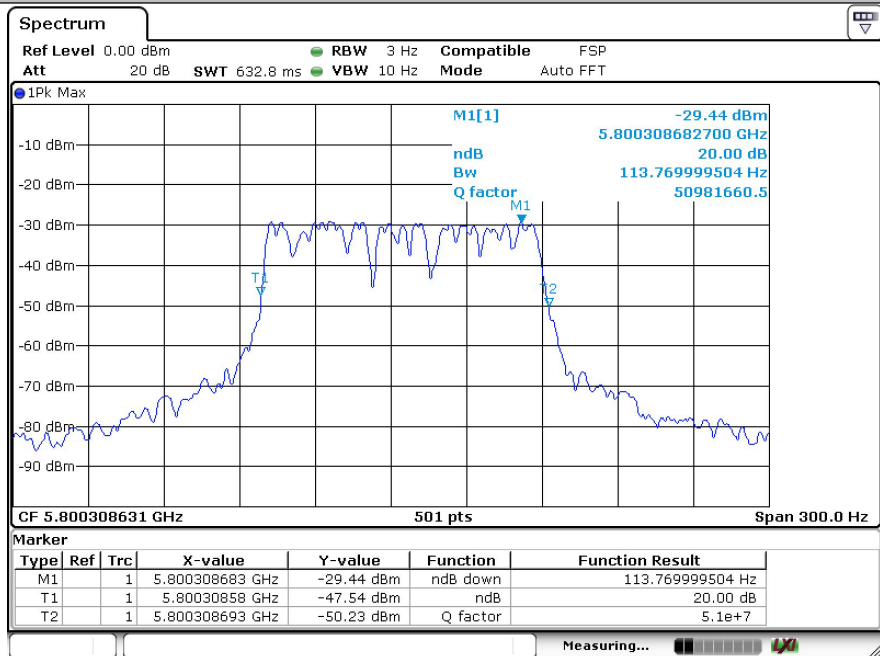
Temperature:	25°C
Relative Humidity:	45%
ATM Pressure:	1011 mbar

Note: N/A

TestMode	Antenna	Frequency[MHz]	20db EBW[Hz]	Limit[MHz]	Verdict
FMCW	Ant1	5731	109.6	---	---
FMCW	Ant1	5800	113.8	---	---
FMCW	Ant1	5850	120.4	---	---

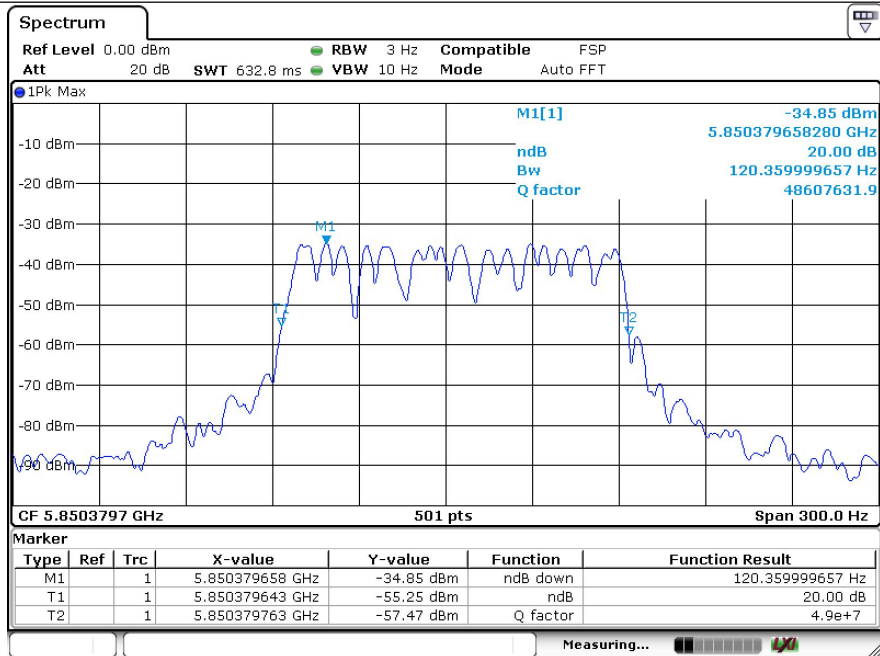


FMCW-Ant1-5731



FMCW-Ant1-5800





FMCW-Ant1-5850

## 8.2 99% BANDWIDTH

### 8.2.1 Applicable Standard

According to RSS-GEN Clause 6.7

### 8.2.2 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

### 8.2.3 Test Procedure

The EUT was operating in Bluetooth mode and controlled its channel. Printed out the test result from the spectrum by hard copy function.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW = 1%-5% OBW(3 Hz).

Set the video bandwidth (VBW) =10 Hz.

Set Span=3 MHz

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Allow the trace to stabilize.

Use the 99 % power bandwidth function of the instrument

Measure the maximum width of the emission.

Measure and record the results in the test report.

### 8.2.4 Test Results

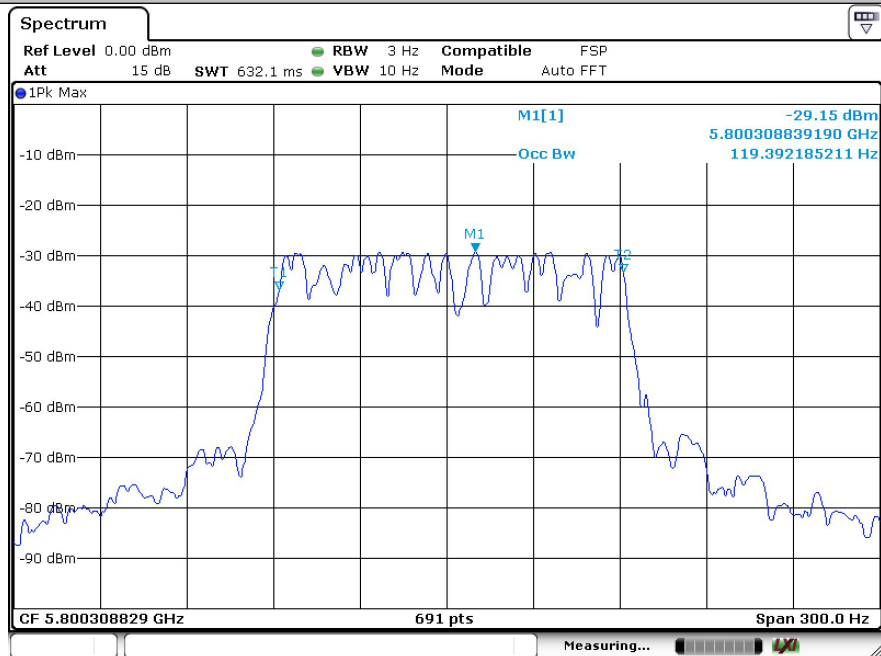
Temperature:	25°C
Relative Humidity:	45%
ATM Pressure:	1011 mbar

Note: N/A

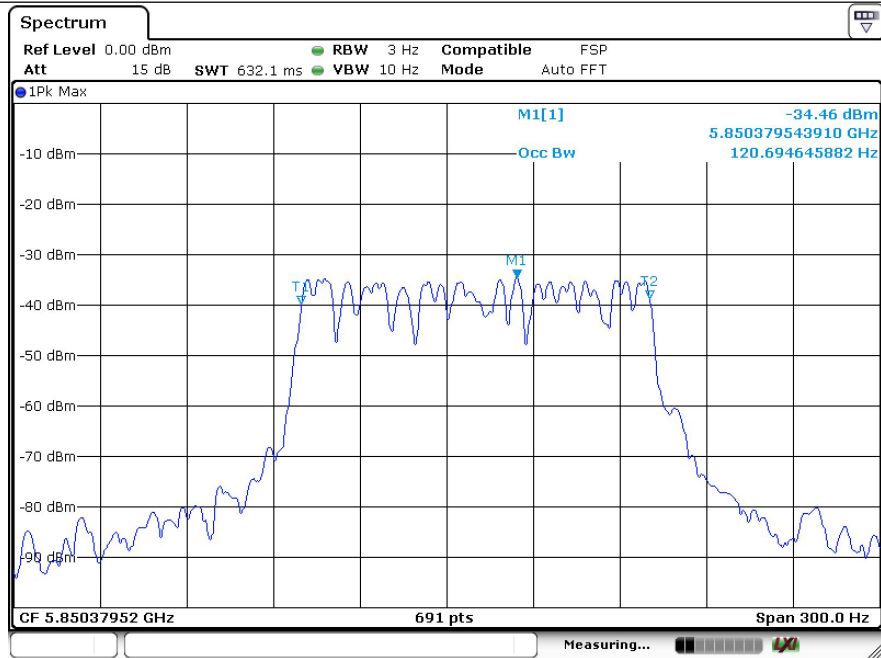
TestMode	Antenna	Frequency[MHz]	OCB [Hz]	Limit[MHz]	Verdict
FMCW	Ant1	5730	103.3	---	---
FMCW	Ant1	5800	119.4	---	---
FMCW	Ant1	5850	120.7	---	---



FMCW-Ant1-5731



FMCW-Ant1-5800



FMCW-Ant1-5850

### 8.3 RADIATED SPURIOUS EMISSION

#### 8.3.1 Applicable Standard

According to FCC Part 15.249 and 15.209

According to RSS-Gen.8.9, RSS-Gen 8.10 and RSS-210 Annex B.10

#### 8.3.2 Conformance Limit

According to FCC Part 15.249 and RSS-210 Annex B.10(a): radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to FCC Part 15.205 and RSS-Gen.8.10, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

According to FCC Part 15.205 and RSS-Gen.8.9, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	24000/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Remark : 1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

3. Distance extrapolation factor =40log(Specific distance/ test distance)( dB);

Limit line=Specific limits(dBuV) + distance extrapolation factor.

for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where RBWCF [dB] =10\*lg(100 [kHz]/narrower RBW [kHz]). , the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

Field strength of fundamental and Field strength of harmonics Limit:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50(94 dBV/m)	500(54 dBV/m)
2400-2483.5 MHz	50(94 dBV/m)	500(54 dBV/m)
5725-5875 MHz	50(94 dBV/m)	500(54 dBV/m)
24.0-24.25 GHz	250(108 dBV/m)	2500(68 dBV/m)

As shown in §15.35(b) and RSS-210 Annex B.10, for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation

For this report

Fundamental Frequency	Field Strength Of Fundamental	Field Strength of Spurious Emissions
5725-5875 MHz	AV:94 dBuV/m at 3m distance	AV:54 dBuV/m at 3m distance
	PK:114 dBuV/m at 3m distance	PK:74 dBuV/m at 3m distance

### 8.3.3 Test Configuration

Test according to clause 7.2 radio frequency test setup 2

### 8.3.4 Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

The EUT was placed on a turn table which is 0.8m above ground plane.

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

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for  $f \geq 1$  GHz(1GHz to 25GHz), 100 kHz for  $f < 1$  GHz(30MHz to 1GHz)

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from  $20\log(\text{dwell time}/100 \text{ ms})$ , in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Repeat above procedures until all frequency measured was complete.

### 8.3.5 Test Results

Temperature:	24° C
Relative Humidity:	53%
ATM Pressure:	1011 mbar

#### ■ Spurious Emission below 30MHz (9KHz to 30MHz)

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =  $40 \log(\text{Specific distance} / \text{test distance})$  (dB);

Limit line = Specific limits(dBuV) + distance extrapolation factor

#### ■ Field Strength of the fundamental signal

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
5731	V	92.94	92.88	114	94	-21.06	-1.12
5731	H	84.13	83.29	114	94	-29.87	-10.71
5800	V	91.32	91.19	114	94	-22.68	-2.81
5800	H	83.40	83.22	114	94	-30.60	-10.78
5850	V	89.65	89.52	114	94	-24.35	-4.48
5850	H	82.41	82.22	114	94	-31.59	-11.78

Note: (1) Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain

(2) Emission Level = Reading Level + Probe Factor + Cable Loss

# Out of Band Emissions

Test mode: FMCW

Frequency:

Channel 1: 5731MHz

Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)
5712.30	H	52.63	74	38.29	54
5723.40	V	53.04	74	38.76	54

Test mode: FMCW

Frequency:

Channel 120: 5850MHz

Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)
5873.000	H	53.70	74	39.11	54
5854.600	V	53.74	74	39.18	54

**Note:** (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).

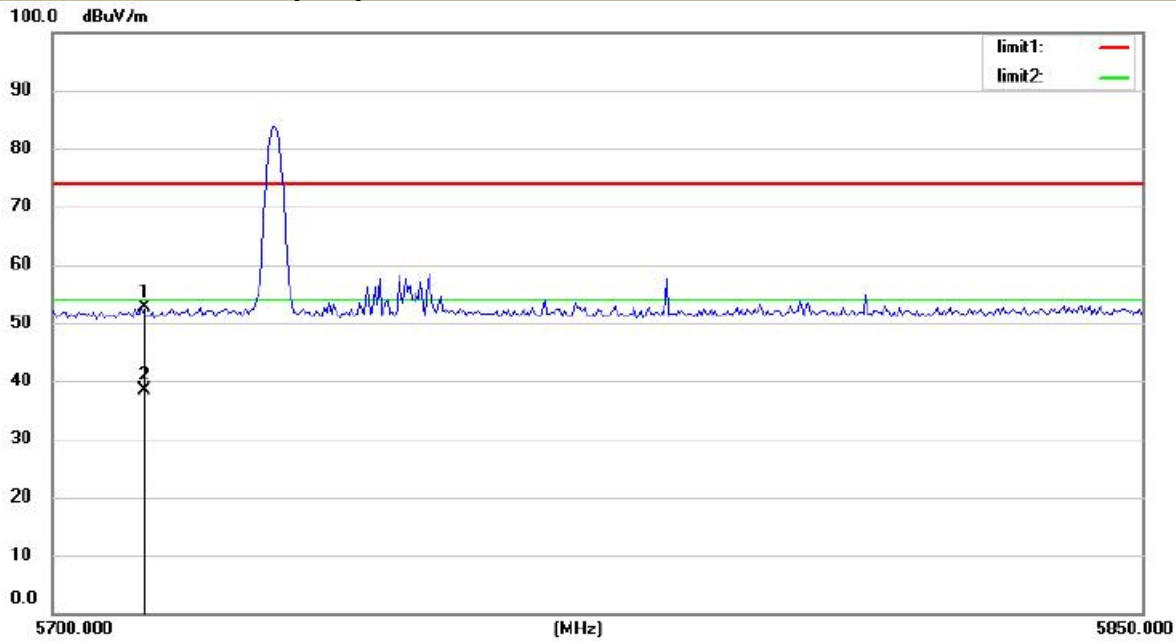
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.

(3) Correct Factor= Ant\_F + Cab\_L - Preamp

(4)Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.



Test Model	Band Emissions		
	Low		
	Test By: Ccyf	FMCW	H

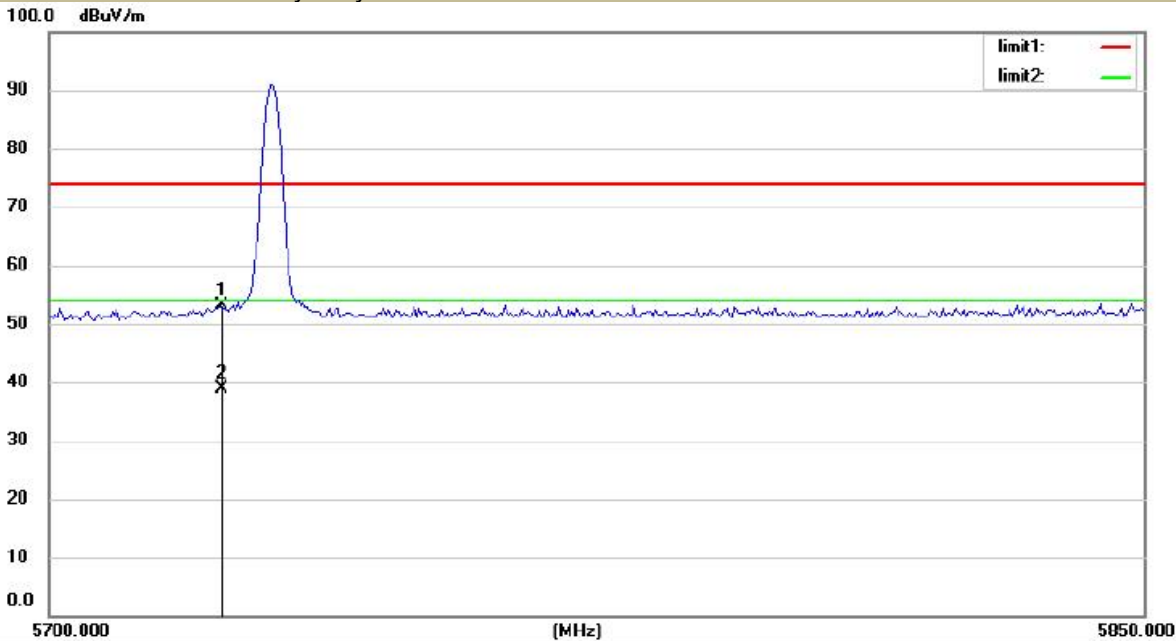


Site Chamber #1

Polarization: *Horizontal*

Temperature: 24.4

Test Model	Band Emissions		
	Low		
	Test By: Ccyf	FMCW	V

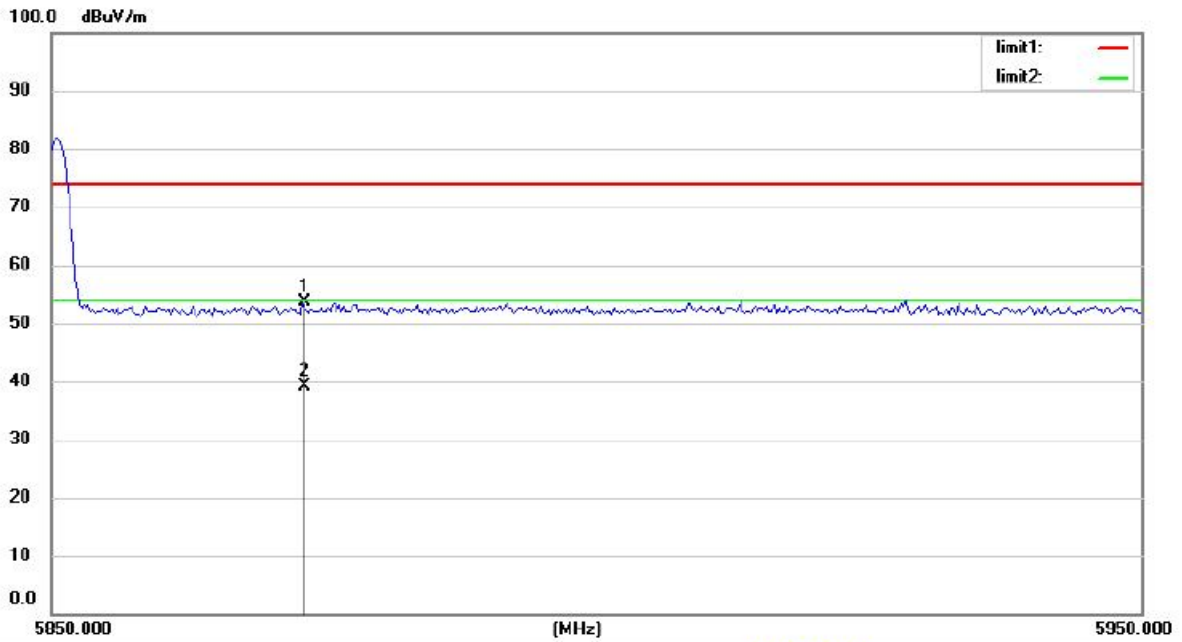


Site Chamber #1

Polarization: *Vertical*

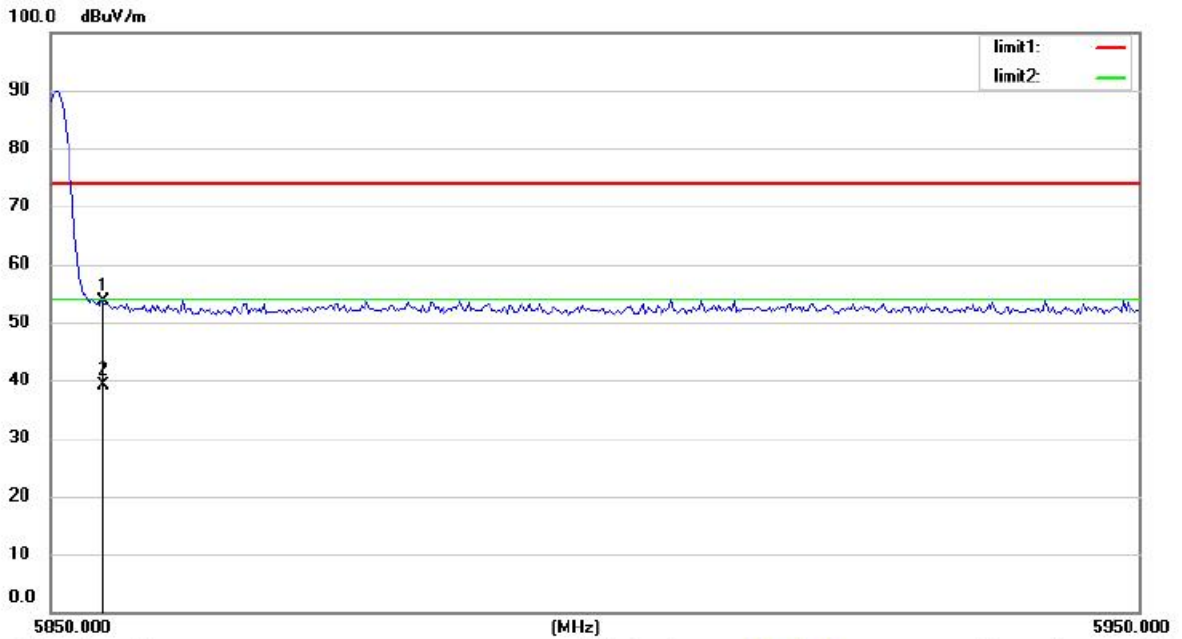
Temperature: 24.4

Test Model	Band Emissions	FMCW	H
	High		
	Test By: Ccyf		



Site Chamber #1 Polarization: **Horizontal** Temperature: 24.4

Test Model	Band Emissions	FMCW	V
	High		
	Test By: Ccyf		



Site Chamber #1 Polarization: **Vertical** Temperature: 24.4

■ Spurious Emission Above 1GHz (1GHz to 40GHz)

Test mode: FMCW Frequency: Channel 1: 5731MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
7766	V	59.62	44.99	74.00	54.00	-14.38	-9.01
11506	V	59.90	45.22	74.00	54.00	-14.10	-8.78
12798	V	60.25	45.69	74.00	54.00	-13.75	-8.31
7766	H	59.46	45.00	74.00	54.00	-14.54	-9.00
11030	H	59.56	45.16	74.00	54.00	-14.44	-8.84
12322	H	59.66	45.13	74.00	54.00	-14.34	-8.87

Test mode: FMCW Frequency: Channel 70:5800MHz

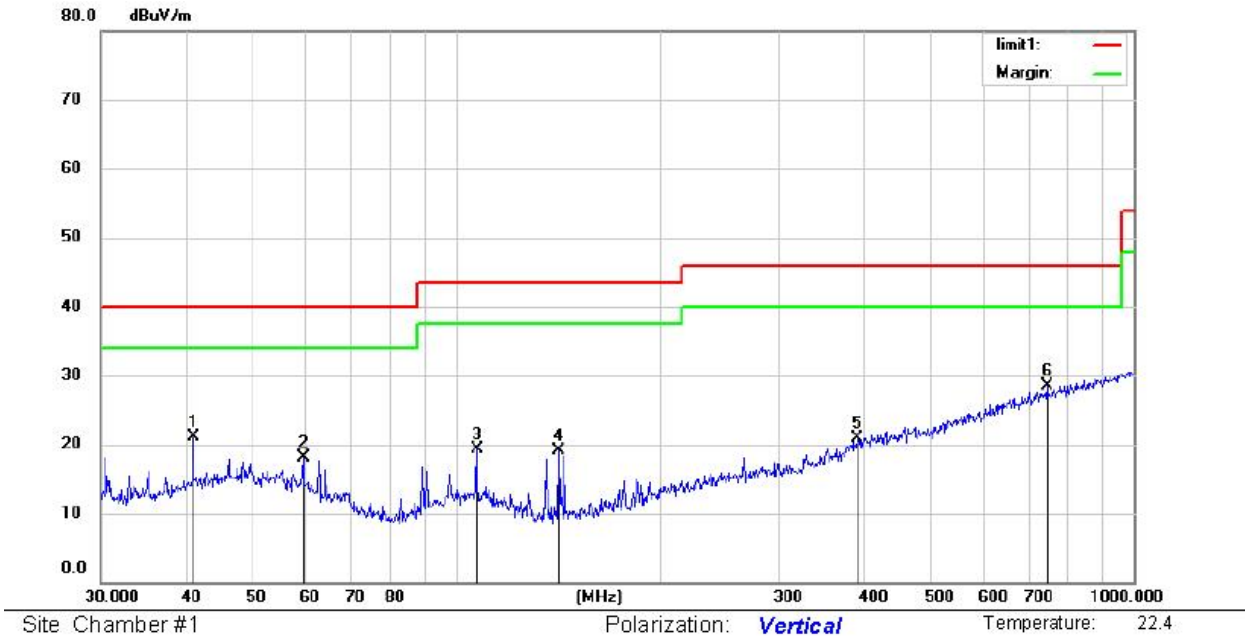
Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
7800	V	59.28	44.59	74.00	54.00	-14.72	-9.41
10996	V	59.30	44.77	74.00	54.00	-14.70	-9.23
12356	V	59.74	45.13	74.00	54.00	-14.26	-8.87
7596	H	59.08	44.54	74.00	54.00	-14.92	-9.46
11064	H	59.55	45.05	74.00	54.00	-14.45	-8.95
12832	H	59.33	44.81	74.00	54.00	-14.67	-9.19

Test mode: FMCW Frequency: Channel 120: 5850MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
7800	V	58.22	43.79	74.00	54.00	-15.78	-10.21
10962	V	59.11	44.52	74.00	54.00	-14.89	-9.48
12832	V	59.36	44.85	74.00	54.00	-14.64	-9.15
7766	H	59.15	44.50	74.00	54.00	-14.85	-9.50
10996	H	59.84	45.36	74.00	54.00	-14.16	-8.64
12764	H	59.46	44.79	74.00	54.00	-14.54	-9.21

**Note:** (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).  
 (2) Emission Level= Reading Level+Correct Factor +Cable Loss.  
 (3) Correct Factor= Ant\_F + Cab\_L - Preamp  
 (4)Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Spurious Emission below 1GHz (30MHz to 1GHz)  
All modes have been tested, and the worst result recorded was report as below:



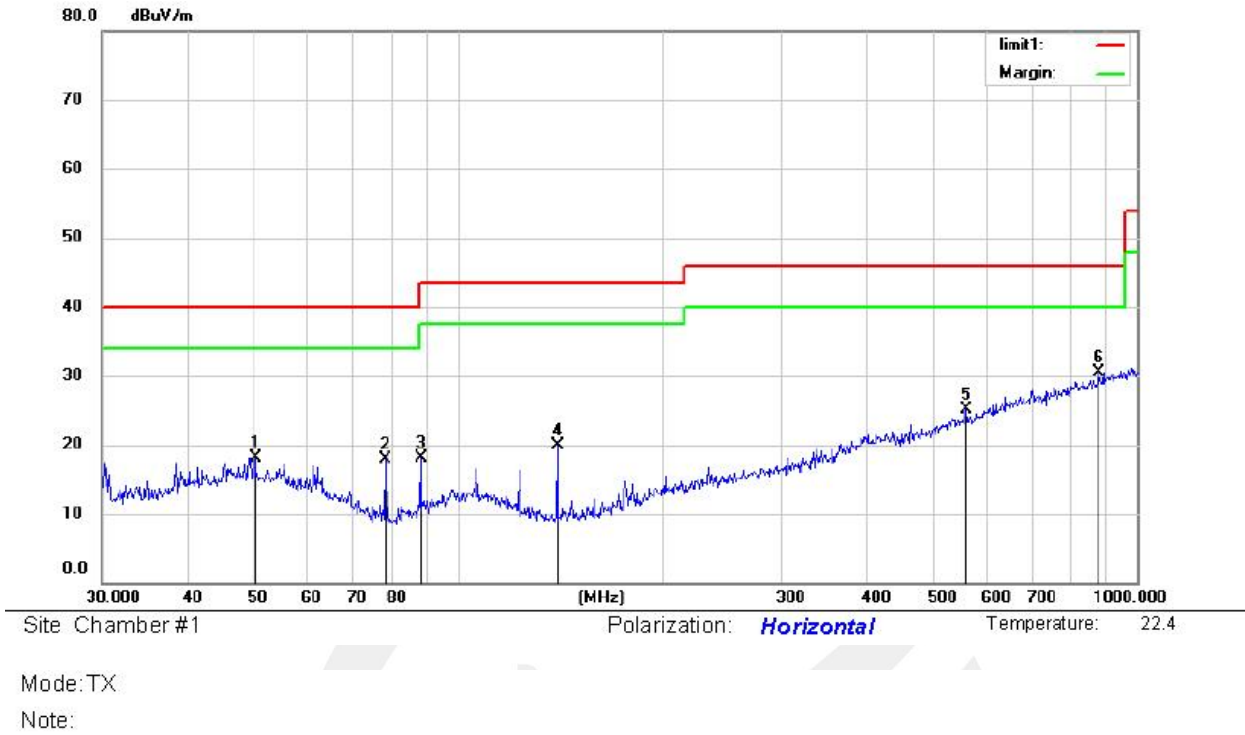
Mode:TX

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		40.9881	37.88	-16.80	21.08	40.00	-18.92	QP		
2		59.6493	35.26	-17.10	18.16	40.00	-21.84	QP		
3		107.5101	37.62	-18.22	19.40	43.50	-24.10	QP		
4		141.8262	40.19	-21.08	19.11	43.50	-24.39	QP		
5		390.7226	31.22	-10.31	20.91	46.00	-25.09	QP		
6	*	744.8661	34.04	-5.61	28.43	46.00	-17.57	QP		

\*:Maximum data x:Over limit l:over margin

Operator: Ccyf



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		50.4090	33.87	-15.73	18.14	40.00	-21.86	QP		
2		78.4133	39.25	-21.43	17.82	40.00	-22.18	QP		
3		88.3421	38.28	-20.18	18.10	43.50	-25.40	QP		
4		140.3421	41.11	-21.19	19.92	43.50	-23.58	QP		
5		560.6928	32.75	-7.65	25.10	46.00	-20.90	QP		
6	*	878.3214	33.77	-3.32	30.45	46.00	-15.55	QP		

\*:Maximum data    x:Over limit    !:over margin

Operator: Ccyf

**Remark:**

1. Measurement (dBμV/m) = Antenna Factor(dB) -Amp Factor(dB) +Cable Loss(dB) + Reading(dBμV/m)
2. Over (dB) = Measurement (dBμV/m) - Limit (dBμV/m)

## 8.4 CONDUCTED EMISSIONS TEST

### 8.4.1 Applicable Standard

According to FCC Part 15.207(a)

### 8.4.2 Conformance Limit

Frequency(MHz)	Conducted Emission Limit	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 8.4.3 Test Configuration

Test according to clause 7.3 conducted emission test setup

### 8.4.4 Test Procedure

The EUT was placed on a table which is 0.8m above ground plane.  
Maximum procedure was performed on the highest emissions to ensure EUT compliance.  
Repeat above procedures until all frequency measured were complete.

### 8.4.5 Test Results

N/A

The device is powered only by DC 14V.

## 8.5 ANTENNA APPLICATION

### 8.5.1 Antenna Requirement

Standard	Requirement
FCC CRF Part 15.203	<p>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.</p>
RSS-GEN Clause 6.8	<p>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 RSS-GEN Clause 6.8. 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 RSS-GEN Clause 6.8, 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.</p>

### 8.5.2 Result

PASS.

- The EUT has 1 antennas: an Integrated Antenna for 2.4G, antenna has a gain of -0.37 dBi ;
- Note:
- ☒ Antenna use a permanently attached antenna which is not replaceable.
  - ☐ Not using a standard antenna jack or electrical connector for antenna replacement
  - ☐ The antenna has to be professionally installed (please provide method of installation)

which in accordance to section 15.203 and RSS-GEN Clause 6.8, please refer to the internal photos.



Detail of factor for radiated emission

Frequency(MHz)	Ant_F(dB)	Cab_L(dB)	Preamp(dB)	Correct Factor(dB)
0.009	20.6	0.03	\	20.63
0.15	20.7	0.1	\	20.8
1	20.9	0.15	\	21.05
10	20.1	0.28	\	20.38
30	18.8	0.45	\	19.25
30	11.7	0.62	27.9	-15.58
100	12.5	1.02	27.8	-14.28
300	12.9	1.91	27.5	-12.69
600	19.2	2.92	27	-4.88
800	21.1	3.54	26.6	-1.96
1000	22.3	4.17	26.2	0.27
1000	25.6	1.76	41.4	-14.04
3000	28.9	3.27	43.2	-11.03
5000	31.1	4.2	44.6	-9.3
8000	36.2	5.95	44.7	-2.55
10000	38.4	6.3	43.9	0.8
12000	38.5	7.14	42.3	3.34
15000	40.2	8.15	41.4	6.95
18000	45.4	9.02	41.3	13.12
18000	37.9	1.81	47.9	-8.19
21000	37.9	1.95	48.7	-8.85
25000	39.3	2.01	42.8	-1.49
28000	39.6	2.16	46.0	-4.24
31000	41.2	2.24	44.5	-1.06
34000	41.5	2.29	46.6	-2.81
37000	43.8	2.30	46.4	-0.3
40000	43.2	2.50	42.2	3.5

\*\*\* End of Report \*\*\*