TEST REPORT

Reference No.	:	WTD21D11132168W001 V2
FCC ID	:	2AN7F-HDM03
Applicant	:	Shenzhen Haisen Technology Co., Ltd
Address	:	101, Building A1, KW High-Tech Park, HT Road, HP Community, XQ Street, BA Area, Shenzhen, China
Manufacturer	:	Dongguan HAISEN Technology Co., Ltd
Address	:	Room 1304, Building 1, Songhu Zhigu Industrial Building, No. 9, Liaobu Yanhe Road, Liaobu Town, Dongguan City, Guangdong Province, China
Product	:	Motion Sensor
Model(s)	:	HD401S
Standards	:	FCC CFR47 Part 15 Section 15.249: 2019
Date of Receipt sample	:	2021-12-02
Date of Test	:	2021-12-02 to 2021-12-06
Date of Issue	:	2021-12-22
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:

Daniel Liu / Designated Reviewer

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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD21D11132168W001	2021-12-02	2021-12-02 to 2021-12-06	2021-12-06	Original	-	Replaced
WTD21D11132168W001 V1	2021-12-02	2021-12-02 to 2021-12-06	2021-12-21	Version 1	Updated	Replaced
WTD21D11132168W001 V2	2021-12-02	2021-12-02 to 2021-12-06	2021-12-22	Version 2	Updated	Valid

4 General Information

4.1 General Description of E.U.T

Product:	Motion Sensor
Model(s):	HD401S
Model Differences:	N/A
Type of Modulation:	FM-CW
Frequency Range:	5725MHz-5875MHz
Hardware Version:	V1.0
Software Version:	V1.0
Antenna Gain:	5.42dBi
Antenna installation:	Internal Antenna

4.2 Details of E.U.T.

Ratings: AC 120-277V, 50/60Hz

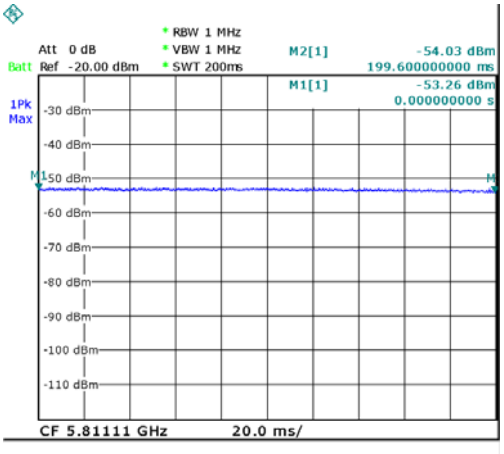
4.3 Channel List

Channel No.	Frequency (MHz)
1	5811

4.4 Duty cycle

Duty cycle	100%

Test Plot:



4.5 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	Channel No.
Transmitting	5811MHz

5 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Emission	15.249(a) 15.209 15.205(a)	PASS
Outside Restricted band	15.249 15.205 15.209	PASS
20dB Bandwidth	15:215(c)	PASS
Antenna Requirement	15.203	PASS

6 Equipment Used during Test

6.1 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	2021-07-26	2022-07-25
2.	LISN	R&S	ENV216	101215	2021-07-26	2022-07-25
3.	Cable	Top	TYPE16(3.5M)	-	2021-07-26	2022-07-25
3m Semi-anechoic Chamber for Radiation Emissions						
1	Test Receiver	R&S	ESCI	101296	2021-04-26	2022-04-25
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2021-10-31	2022-10-30
3	Amplifier	ANRITSU	MH648A	M43381	2021-04-26	2022-04-25
4	Cable	HUBER+SUHNER	CBL2	525178	2021-04-26	2022-04-25
5	Spectrum Analyzer	R&S	FSP30	100091	2021-04-29	2022-04-28
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2021-04-30	2022-04-29
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2021-07-26	2022-07-25
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	Spectrum Analyzer	Agilent	N9020A	MY49100060	2021-07-26	2022-07-25
2	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2021-07-26	2022-07-25
3	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	2021-07-26	2022-07-25
4	EXA Signal Analyzer	Keysight	N9010A	MY50520207526B25MPBW7X	2021-04-26	2022-04-25
"*": 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.						

6.2 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 (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)

6.3 Test Facility

The test facility has a test site registered with the following organizations:

ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, October 15, 2016.

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.

Waltek Testing Group Co., Ltd. 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 our files. Registration number 523476, September 10, 2019.

6.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., L TD. address is No.163, Pingyun Rd. West of Huangpu Ave,Tianhe District, Guangzhou, Guangdong, China.

7 Conducted Emission

Test Requirement: FCC CFR 47 Part 15 Section 15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Limit:

Frequency (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5.0	56	46
5.0 to 30	60	50
*Decreases with the logarithm of the frequency.		

7.1. E.U.T. Operation

Operating Environment:

Temperature: 22.4 °C

Humidity: 53.7 % RH

Atmospheric Pressure: 101.8kPa

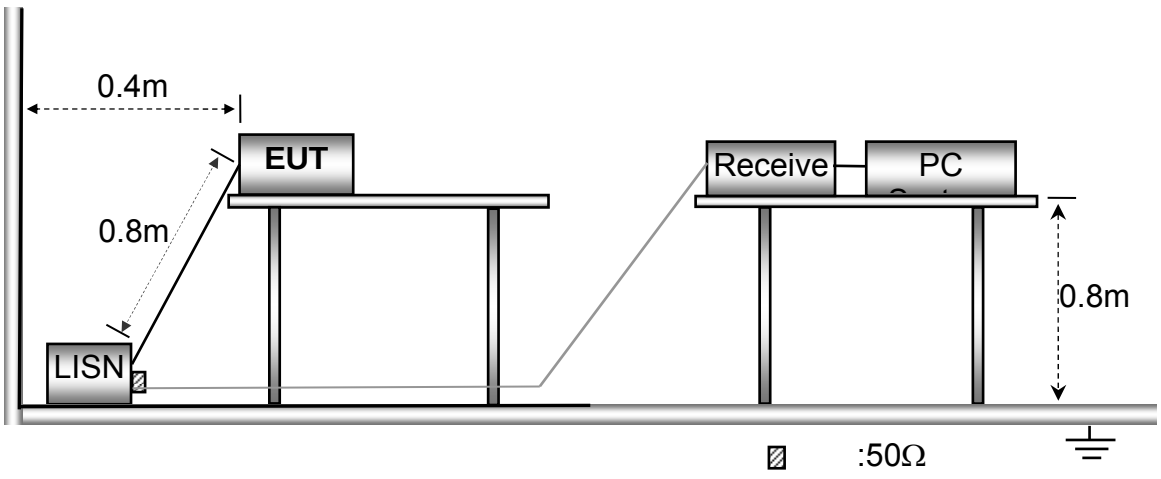
Test Voltage: AC 120V, 60Hz

EUT Operation:

The test was performed in Transmitting mode

7.2. EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.

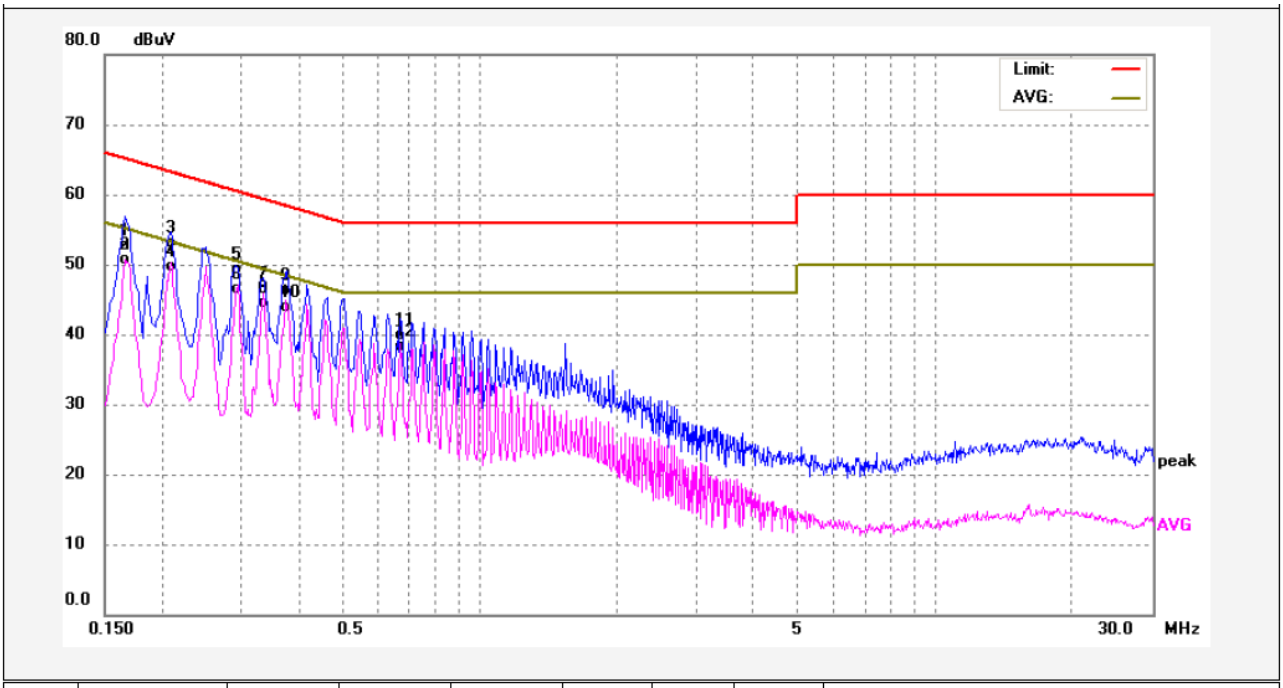


7.3. Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

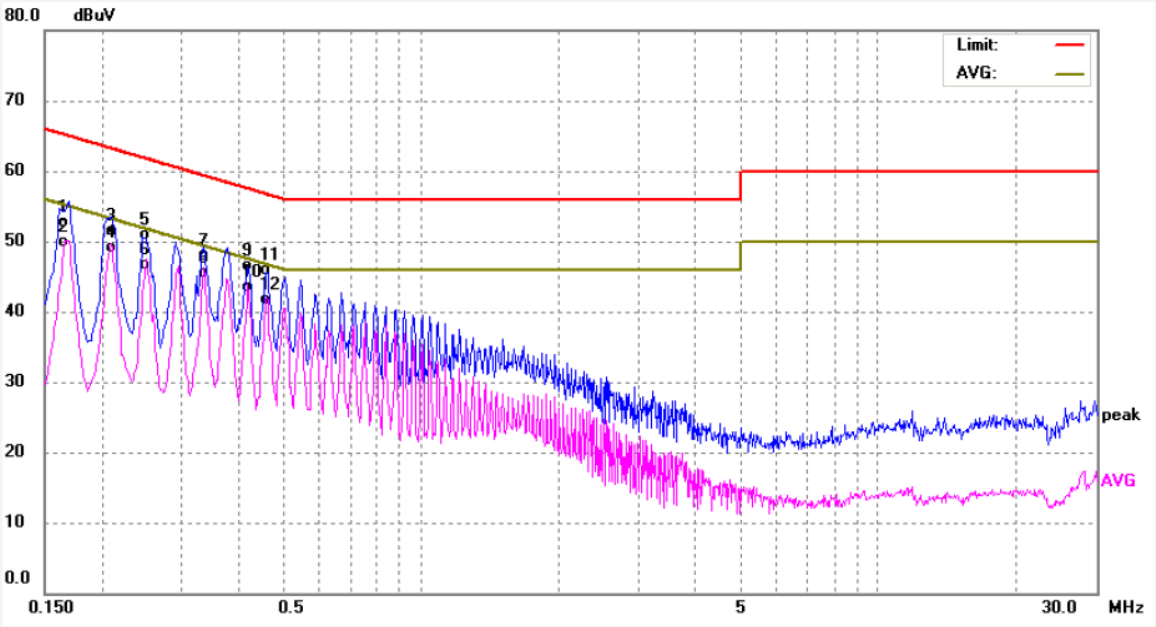
7.4. Conducted Emission Test Result

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1660	42.85	9.92	52.77	65.15	-12.38	QP	
2	0.1660	40.71	9.92	50.63	55.15	-4.52	AVG	
3	0.2100	43.26	9.88	53.14	63.20	-10.06	QP	
4	0.2100	39.73	9.88	49.61	53.20	-3.59	AVG	
5	0.2900	39.49	9.89	49.38	60.52	-11.14	QP	
6	0.2900	36.56	9.89	46.45	50.52	-4.07	AVG	
7	0.3339	36.71	9.89	46.60	59.35	-12.75	QP	
8	0.3339	34.55	9.89	44.44	49.35	-4.91	AVG	
9	0.3780	36.41	9.89	46.30	58.32	-12.02	QP	
10	0.3780	34.11	9.89	44.00	48.32	-4.32	AVG	
11	0.6700	30.00	9.87	39.87	56.00	-16.13	QP	
12	0.6700	28.37	9.87	38.24	46.00	-7.76	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1660	42.83	9.92	52.75	65.15	-12.40	QP	
2	0.1660	39.97	9.92	49.89	55.15	-5.26	AVG	
3	0.2100	41.66	9.88	51.54	63.20	-11.66	QP	
4	0.2100	39.23	9.88	49.11	53.20	-4.09	AVG	
5	0.2500	40.97	9.89	50.86	61.75	-10.89	QP	
6	0.2500	36.75	9.89	46.64	51.75	-5.11	AVG	
7	0.3339	38.05	9.89	47.94	59.35	-11.41	QP	
8	0.3339	35.61	9.89	45.50	49.35	-3.85	AVG	
9	0.4180	36.70	9.90	46.60	57.49	-10.89	QP	
10	0.4180	33.68	9.90	43.58	47.49	-3.91	AVG	
11	0.4580	35.99	9.90	45.89	56.73	-10.84	QP	
12	0.4580	31.81	9.90	41.71	46.73	-5.02	AVG	

8 Radiation Emission Test

Test Requirement: FCC Part15 Paragraph 15.249&15.209&15.205

Test Method: ANSI 63.10: 2013

Measurement Distance: 3m

Test Result: PASS

15.249(a)Limit:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

15.209 Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Note: RF Voltage(dBuV)=20 $\log_{10}$ RF Voltage(uV)

8.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 51.1 % RH

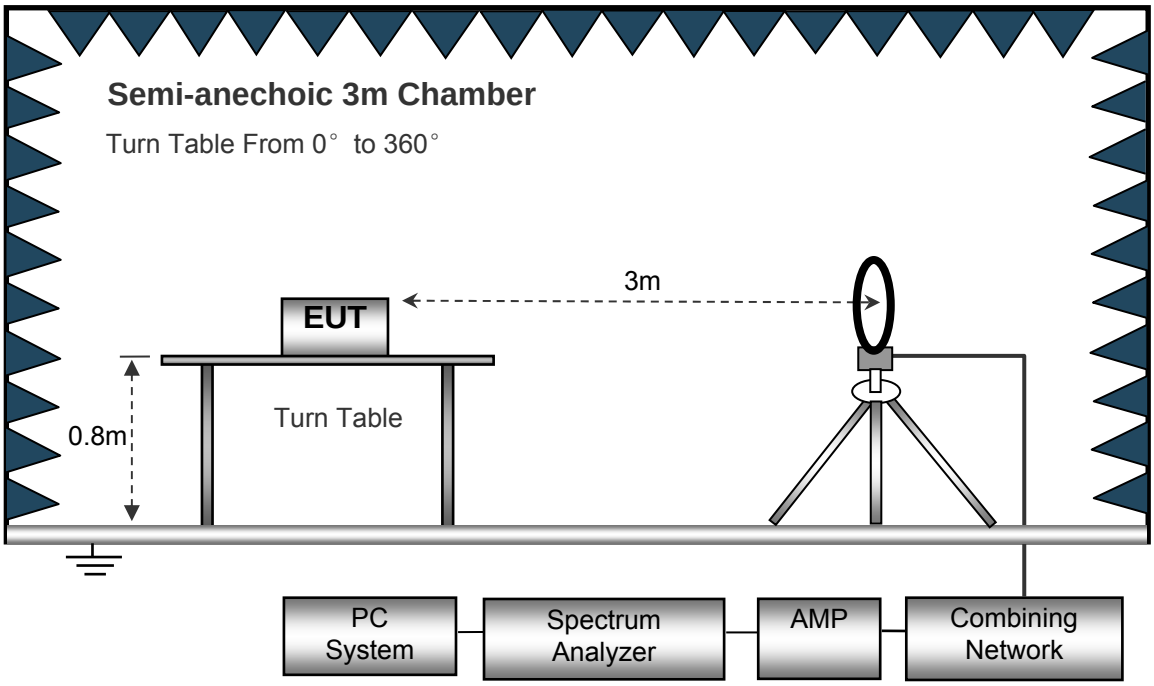
Atmospheric Pressure: 101.2kPa

EUT Operation **:**

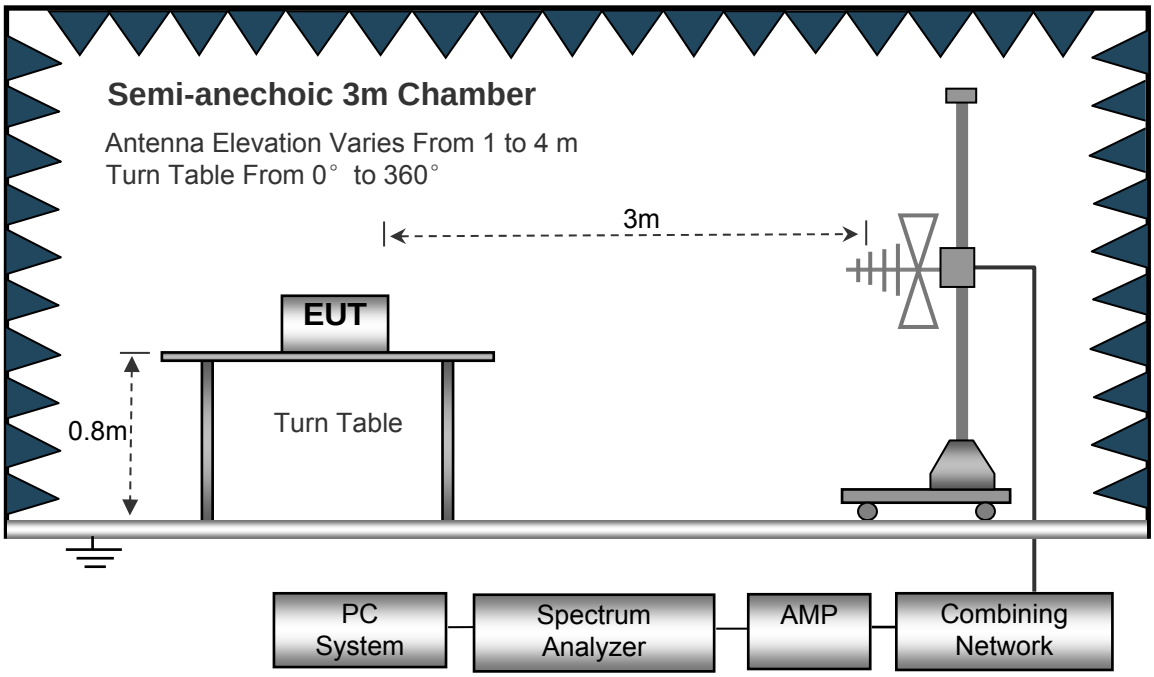
The test was performed in transmitting mode, the test data were shown in the report.

8.2 Test Setup

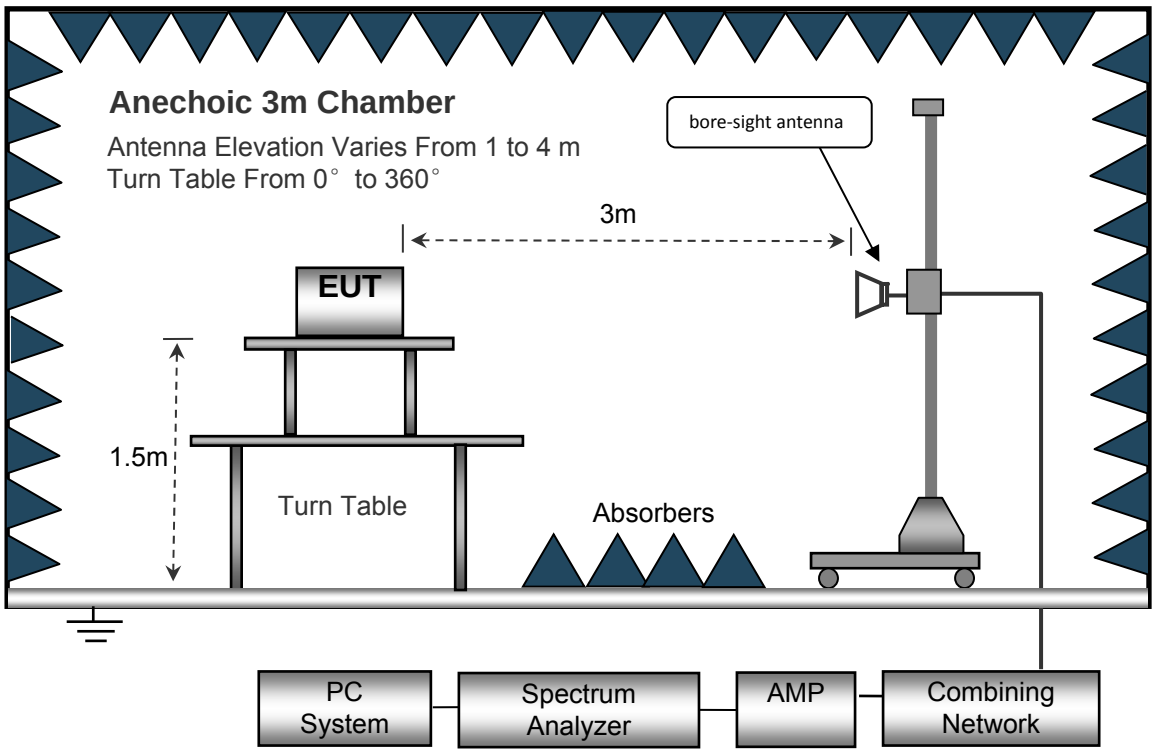
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10.
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



8.3 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
Detector ..... Ave.
Resolution Bandwidth..... 1MHz
Video Bandwidth 10Hz

8.4 Test Procedure

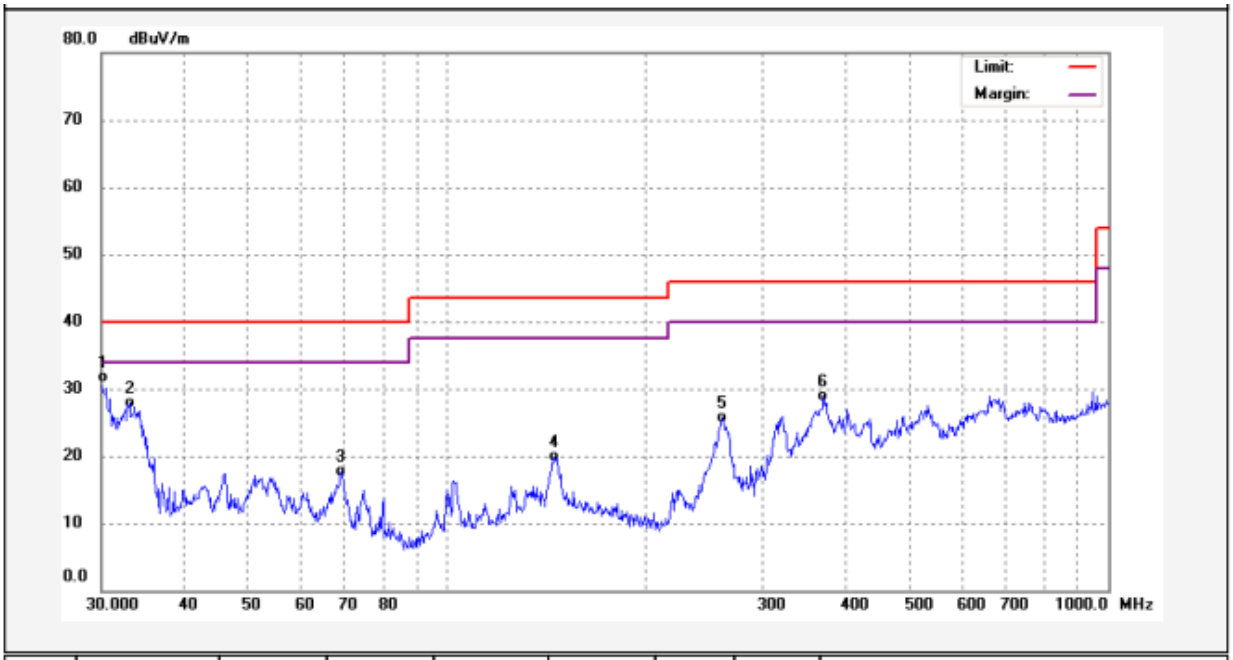
1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the 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.

8.5 Test Result

Test Frequency : 9KHz~ 30MHz
The measurements were more than 20 dB below the limit and not reported.

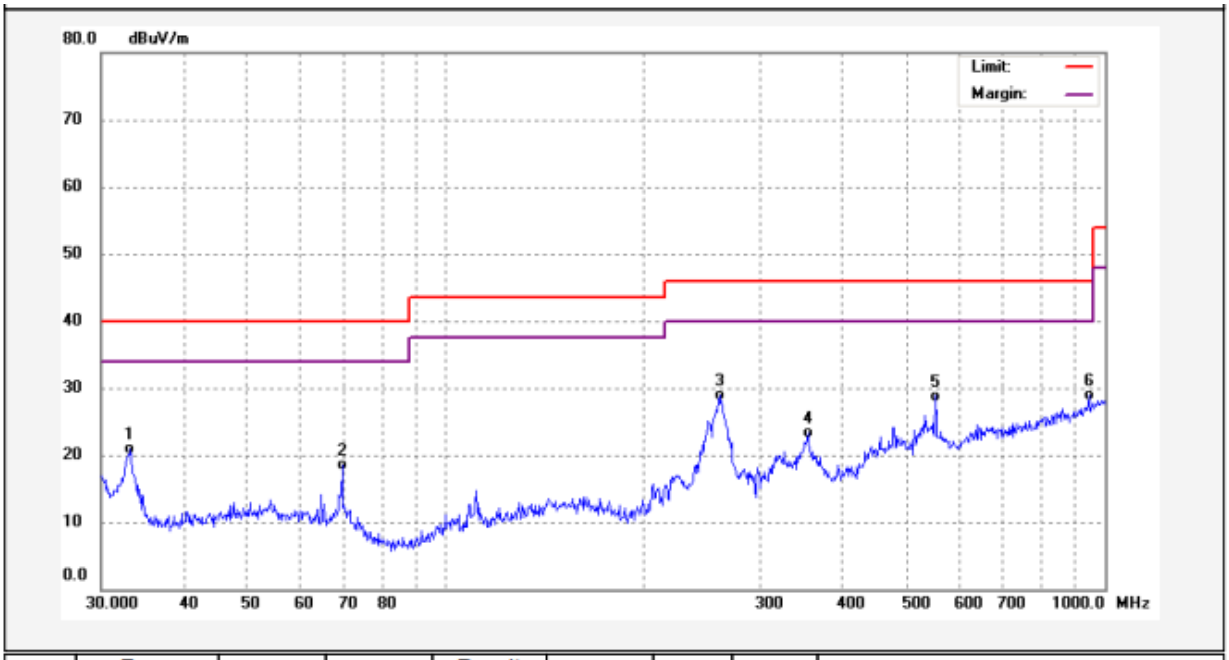
Test Frequency: 30MHz ~ 1GHz

Antenna Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.0000	49.77	-18.16	31.61	40.00	-8.39	QP	
2	33.0950	45.85	-18.04	27.81	40.00	-12.19	QP	
3	69.1141	36.31	-18.51	17.80	40.00	-22.20	QP	
4	145.3506	35.46	-15.55	19.91	43.50	-23.59	QP	
5	260.1444	41.95	-16.28	25.67	46.00	-20.33	QP	
6	370.7023	42.09	-13.16	28.93	46.00	-17.07	QP	

Antenna Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	33.2112	38.96	-18.03	20.93	40.00	-19.07	QP	
2	69.6005	37.14	-18.57	18.57	40.00	-21.43	QP	
3	260.1444	45.12	-16.28	28.84	46.00	-17.16	QP	
4	354.1831	36.80	-13.57	23.23	46.00	-22.77	QP	
5	552.8832	37.68	-8.88	28.80	46.00	-17.20	QP	
6	945.4399	31.12	-2.14	28.98	46.00	-17.02	QP	

Test Frequency: 1GHz ~ 40GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.249/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
Low channel: 5811MHz									
2453.00	45.32	PK	1	1.8	H	-13.19	32.13	74	-41.87
2453.60	43.25	PK	245	1.2	V	-13.19	30.06	74	-43.94
5720.00	42.39	PK	113	1.2	H	-13.14	29.25	74	-44.75
5720.00	42.38	PK	234	1.9	V	-13.14	29.24	74	-44.76
5811.00	86.35	PK	328	1.7	H	-2.23	84.12	114	-29.88
5811.00	80.36	PK	197	1.5	V	-2.23	78.13	114	-35.87
11550.48	45.23	PK	2	1.9	H	-13.19	32.04	74	-41.96
11550.48	43.21	PK	18	1.2	V	-13.19	30.02	74	-43.98
17325.72	41.39	PK	279	1.4	H	-13.14	28.25	74	-45.75
17325.72	41.26	PK	303	1.0	V	-13.14	28.12	74	-45.88
23100.96	42.31	PK	69	1.3	H	-13.08	29.23	74	-44.77
23100.96	41.29	PK	129	1.6	V	-13.08	28.21	74	-45.79
23101.96	43.21	PK	279	1.5	V	0.09	43.30	74	-30.70
23102.96	41.25	PK	38	1.7	V	0.09	41.34	74	-32.66
23103.96	45.39	PK	185	1.1	V	3.01	48.40	74	-25.60
23104.96	46.35	PK	302	1.4	V	3.01	49.36	74	-24.64

AV = Peak +20Log10(duty cycle) =PK+(0) [refer to section 8 for more detail]

Frequency	PK	Turn table Angle	RX Antenna		Duty cycle Factor	AV	FCC Part 15.249/209/205	
			Height	Polar			Limit	Margin
(MHz)	(dBμV/m)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Low channel: 5811MHz								
2453.00	32.13	1	1.8	H	0.00	32.13	54	-21.87
2453.60	30.06	245	1.2	V	0.00	30.06	54	-23.94
5720.00	29.25	113	1.2	H	0.00	29.25	54	-24.75
5720.00	29.24	234	1.9	V	0.00	29.24	54	-24.76
5811.00	84.12	328	1.7	H	0.00	84.12	94.00	-9.88
5811.00	78.13	197	1.5	V	0.00	78.13	94.00	-15.87
11622.00	32.04	2	1.9	H	0.00	32.04	54	-21.96
11622.00	30.02	18	1.2	V	0.00	30.02	54	-23.98
17433.00	28.25	279	1.4	H	0.00	28.25	54	-25.75
17433.00	28.12	303	1.0	V	0.00	28.12	54	-25.88
23244.00	29.23	69	1.3	H	0.00	29.23	54	-24.77
23244.00	28.21	129	1.6	V	0.00	28.21	54	-25.79
23102.85	43.30	279	1.5	V	0.00	43.30	54	-10.70
23102.85	41.34	38	1.7	V	0.00	41.34	54	-12.66
23103.96	48.40	185	1.1	V	0.00	48.40	54	-5.60
23104.96	49.36	302	1.4	V	0.00	49.36	54	-4.64

Other test data, the measurements were more than 20 dB below the limit and not reported.

9 Restricted band

Test Requirement: FCC Part15 Paragraph 15.205

Test Method: ANSI C63.10: 2013

Test Result: N/A

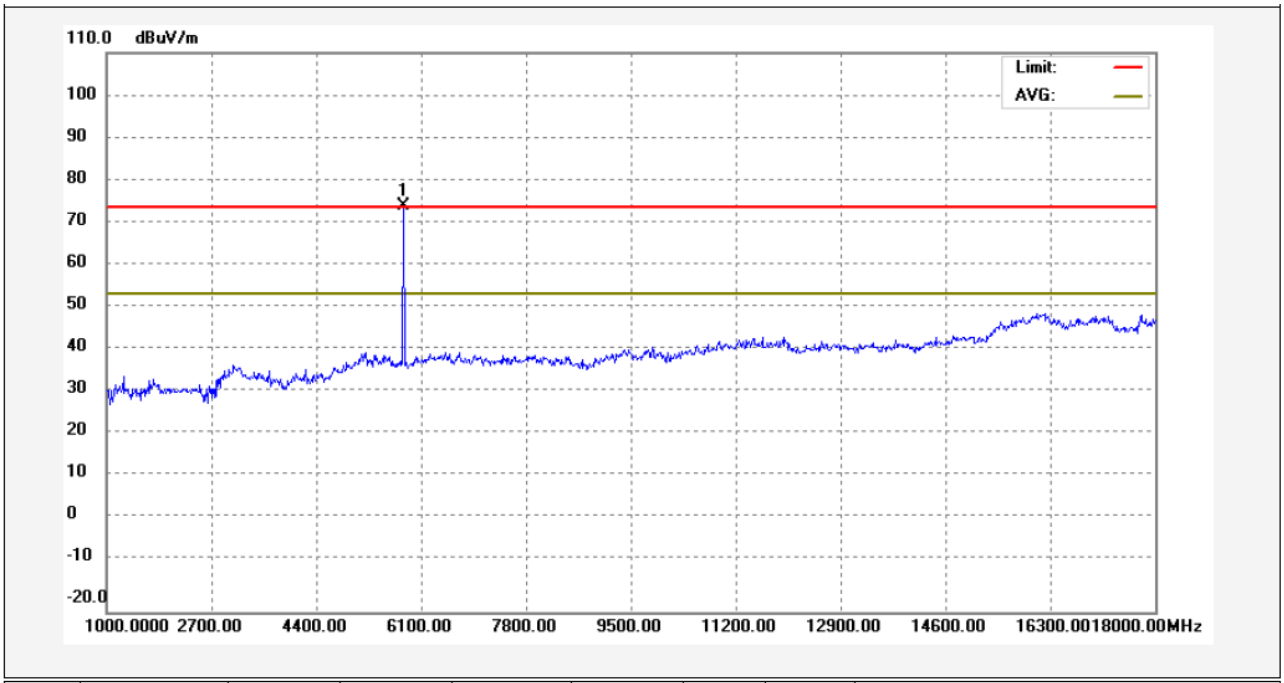
9.1 Requiments:

emissions that fall in the restricted bands(15.205).Above 1000MHz, compliance with the emissions limits in section 15.209 shall be demonstrated based on the average value of the measured emissions, The provisions in section 15.35apply to these measurements.

9.2 Test Result

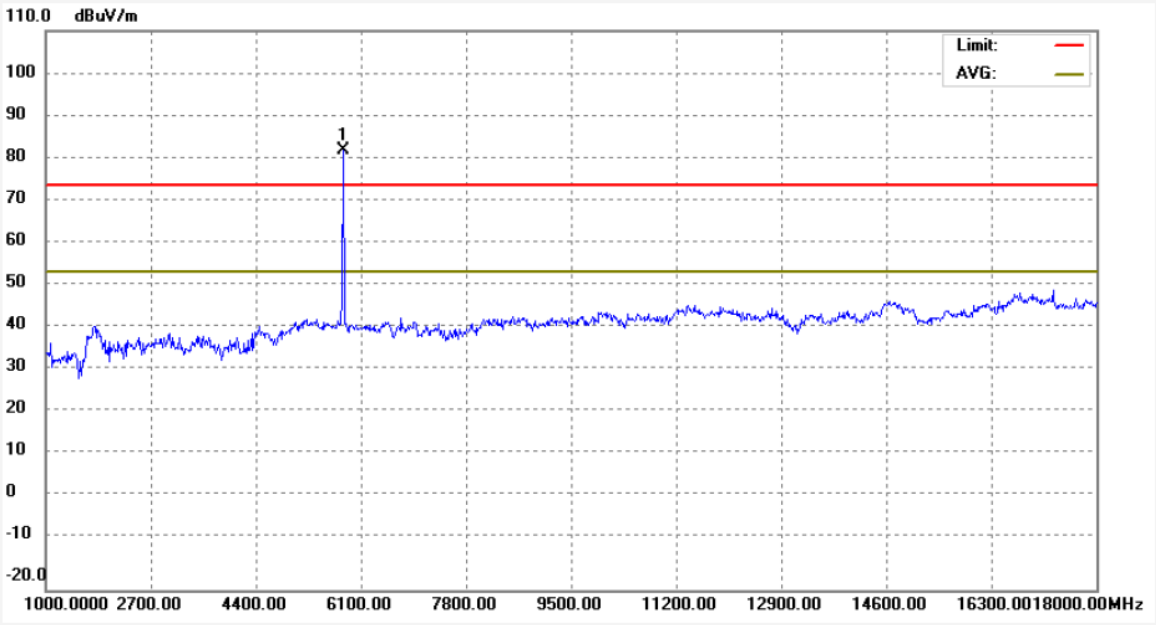
Mode: Continuously Transmitting

Antenna Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	5811.000	64.05	10.35	74.40	74.00	0.40	peak	

Antenna Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	5811.000	72.17	9.93	82.10	74.00	8.10	peak	

10 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.215(c)

Test Method: ANSI C63.10:2013

Test Mode: Transmitting

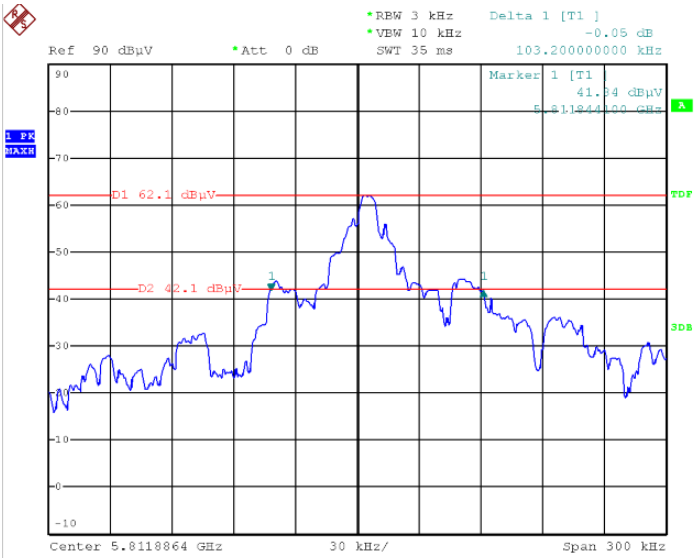
10.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 1%-5% OBW, VBW = 3RBW

10.2 Test Result

Frequency (MHz)	Bandwidth Emission (KHz)
5811	103.20

Low channel Test plots



11 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has a Internal Antenna, fulfil the requirement of this section.

12 Photographs - Constructional Details

Note: Please refer to appendix: Appendix-HD401S-Photos.

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