TEST REPORT

Report No.	CISRR25011311102
Project No.	CISR250113111
FCC ID	2BNUT-AW869A
Applicant	SHENZHEN RSCHIP TECHNOLOGY CO.,LTD
Address	9A201,Taihua Wutong Industrial Park, Sanwei Community, Hangcheng Stret, Baoan District, Shenzhen, China
Manufacturer	HUNAN CDTECH TECHNOLOGY CO.,LTD
Address	3/F, Buiding 1, Xiangjiang Kunpeng Industrial Park, No.67 Ziyuan Road, Xuejie Street, Yuele District, Changsha City, Hunan Province
Product Name	5.8GHz/5.1GHz/2.4GHz WLAN/Bluetooth module
Trade Mark	N/A
Model/Type reference	AW869A
Listed Model(s)	N/A
Standard	47 CFR Part 15.247
Test date	February 11, 2025 to February 22, 2025
Issue date	February 25, 2025
Test result	**Complied**

Edward Wang

Prepared by: Edward Wang

Genry Long

Approved by: Genry Long

The test results relate only to the tested samples.

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1. REPORT VERSION

Version No.	Issue date	Description
00	February 25, 2025	Original

2. TEST DESCRIPTION

No.	Test Item	Standard Requirement	Result
1	Antenna Requirement	47 CFR 15.203	Pass
2	Conducted Emission at AC power line	47 CFR 15.207(a)	Pass
3	6dB Bandwidth	47 CFR 15.247(a)(2)	Pass
4	Maximum Conducted Output Power	47 CFR 15.247(b)(3)	Pass
5	Power Spectral Density	47 CFR 15.247(e)	Pass
6	Conducted band edge and spurious emission	47 CFR 15.247(d), 15.209, 15.205	Pass
7	Radiated band edge emission	47 CFR 15.247(d), 15.209, 15.205	Pass
8	Radiated Spurious Emission (below 1GHz)	47 CFR 15.247(d), 15.209, 15.205	Pass
9	Radiated Spurious Emission (Above 1GHz)	47 CFR 15.247(d), 15.209, 15.205	Pass

Note:

– The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Product Description *

Main unit information:	
Product Name:	5.8GHz/5.1GHz/2.4GHz WLAN/Bluetooth module
Trade Mark:	N/A
Model No.:	AW869A
Listed Model(s):	N/A
Model difference:	N/A
Power supply:	Input:DC 5V
Hardware version:	N/A
Software version:	N/A
Accessory unit information:	
Battery information:	N/A

3.2. Radio Specification Description *

Modulation type:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2MHz
Antenna type:	External Antenna
Antenna gain:	1.78dBi

Note:

1) *: Since the above information is provided by the applicant relevant results or conclusions of this report are only made for these information , Bangce is not responsible for the authenticity, integrity and results of the information and/or the validity of the conclusion.
2) Operation frequency list as follow:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474

7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

3.3. Modification of EUT

No modifications are made to the EUT during all test items.

3.4. Deviation from standards

None

3.5. Testing Site

Laboratory Name	Shenzhen Bangce Testing Technology Co., Ltd.
Laboratory Location	101, building 10, Yunli Intelligent Park, Shutianpu community, Matian Street, Guangming District, Shenzhen，Guangdong, China
Contact information	Tel: 86-755-2319 6848, email: service@cis-cn.net Website: http://www.cis-cn.net/
FCC registration number	736346
FCC designation number	CN1372

4. TEST CONFIGURATION

4.1. Test frequency list

Lowest Channel (LCH) (MHz)	Middle Channel (MCH) (MHz)	Highest Channel (HCH) (MHz)
2402	2440	2480

4.2. Descriptions of test mode

No	Test mode	Description
TM1	TX mode	Keep the EUT in continuously transmitting mode with GFSK modulation at lowest, middle and highest channel.
TM2	Link mode	Keep the EUT in Bluetooth linking mode with AE.

4.3. Support unit used in test configuration

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following peripheral devices and interface cables were connected during the measurement:

Item	Equipment name	Trade Name	Model No.
1	--	--	--

4.4. Test sample information

Type	Sample No.
Engineer sample	CISR250113111-S01
Normal sample	CISR250113111-S02

4.5. Environmental conditions

Type	Requirement
Temperature:	15~35°C
Relative Humidity:	25~75%
Air Pressure:	860~1060mbar

4.6. Equipment Used during the Test

Conducted Emission at AC power line						
Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	EMI Test Receiver	Rohde&schwarz	ESCI7	100853	2025-01-08	2026-01-07
2	Artificial power network	Schwarzbeck	NSLK8127	8127-01096	2025-01-08	2026-01-07
3	8-wire Impedance Stabilization Network	Schwarzbeck	NTFM 8158	8158-00337	2025-01-08	2026-01-07
4	Artificial power network	Schwarzbeck	ENV216	/	2025-01-08	2026-01-07

Power Spectral Density Emissions in non-restricted frequency bands 6dB Bandwidth Maximum Conducted Output Power						
Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	MXG RF Signal Generator	Agilent	N5181A	MY50145362	2025-01-08	2026-01-07
2	Spectrum analyzer	R&S	FSV-40N	102130	2025-01-08	2026-01-07
3	Vector Signal Generator	Agilent	N5182A	MY50142364	2025-01-08	2026-01-07
4	Power Meter	WCS	WCS-PM	WCSPM230405A	2025-01-08	2026-01-07

Emissions in frequency bands (above 1GHz) Band edge emissions (Radiated) Emissions in frequency bands (below 1GHz)						
Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	EMI Test Receiver	Rohde&schwarz	ESCI7	100853	2025-01-08	2026-01-07
2	Amplifier	Tonscend	TAP9K3G40	AP23A8060270	2025-01-08	2026-01-07
3	Prime amplifier	Tonscend	TAP01018050	AP23A8060280	2025-01-08	2026-01-07
4	9*6*6 anechoic chamber	SKET	9.3*6.3*6	N/A	2024-09-02	2027-09-01
5	Spectrum analyzer	Agilent	N9020A	MY50530263	2025-01-08	2026-01-07
6	Spectrum analyzer	R&S	FSV-40N	102130	2025-01-08	2026-01-07
7	Bilog Antenna	Schwarzbeck	VULB 9163	1463	2023-01-09	2026-01-08
8	Horn Antenna	SCHWARZBECK	BBHA 9120 D	2487	2023-01-09	2026-01-08
9	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	/	2023-01-09	2026-01-08

10	RF Cable	Tonscend	Cable 1	/	2025-01-08	2026-01-07
11	RF Cable	Tonscend	Cable 2	/	2025-01-08	2026-01-07
12	RF Cable	SKET	Cable 3	/	2025-01-08	2026-01-07
13	L.I.S.N.#1	Schwarzbeck	NSLK8127	/	2025-01-08	2026-01-07
14	L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	2025-01-08	2026-01-07
15	Horn Antenna	SCHWARZBECK	BBHA9170	1130	2023-01-09	2026-01-08
16	Preamplifier	Tonscend	TAP18040048	AP21C806126	2025-01-08	2026-01-07
17	Variable-frequency power source	Pinhong	PH1110	/	2025-01-08	2026-01-07
18	6dB Attenuator	SKET	DC-6G	/	2025-01-08	2026-01-07
19	Antenna tower	SKT	Bk-4AT-BS	AT2021040101-V1	2025-01-08	2026-01-07

5. TEST RESULTS

5.1. Evaluation Results (Evaluation)

5.1.1. Antenna Requirement

Test Requirement:	Refer to 47 CFR 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.

5.1.1.1. Test Result

Pass

5.1.1.2. Conclusion:

The EUT antenna is External Antenna(1.78dBi), the directional gain of the antenna less than 6dBi. It comply with the standard requirement. In case of replacement of broken antenna the same antenna type must be used.Antenna structure please refer to the EUT internal photographs antenna photo.

5.2. Radio Spectrum Matter Test Results (RF)

5.2.1. Conducted Emission at AC power line

Test Requirement:	Refer to 47 CFR 15.207(a), Except as shown in paragraphs (b)and (c)of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).
Test Limit:	

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

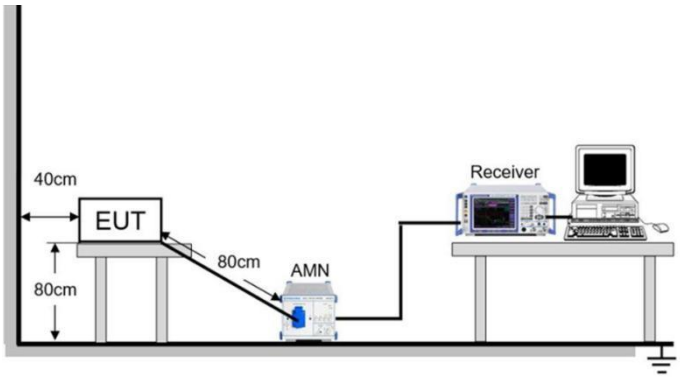
*Decreases with the logarithm of the frequency.

Test Method:	ANSI C63.10-2020 section 6.2
Procedure:	1. The EUT was setup according to ANSI C63.10 requirements. 2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. 3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. 4. The peripheral devices are also connected to the main power through a LISN. (Refer to the block diagram of the test setup and photographs) 5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source. 6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. 7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz. 8. During the above scans, the emissions were maximized by cable manipulation.

5.2.1.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.5 °C	Humidity:	55.8 %	Atmospheric Pressure:	103 kPa
Pre test mode:	TM2				
Final test mode:	TM2				

5.2.1.2. Test Setup Diagram

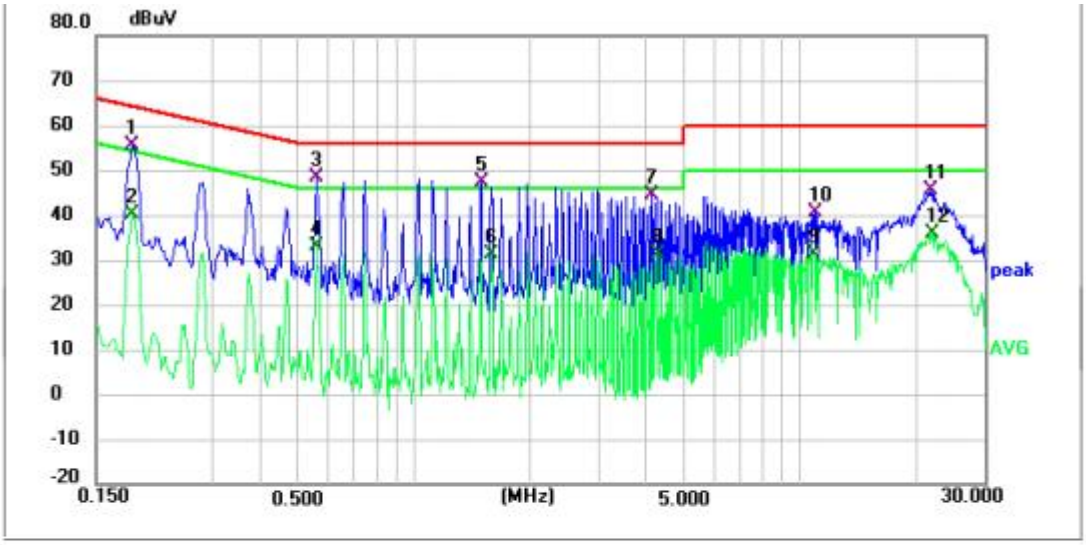


5.2.1.3. Test Result

Pass

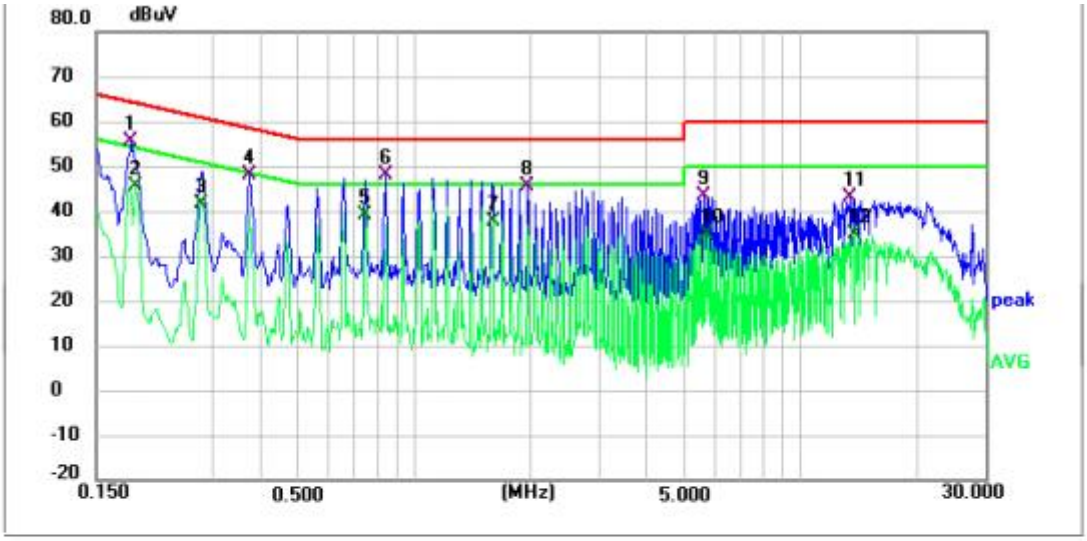
5.2.1.4. Test Data

Mode2 / Line: Line



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.186	45.59	10.11	55.70	64.21	-8.51	QP
2	0.186	30.10	10.11	40.21	54.21	-14.00	AVG
3 *	0.562	38.15	10.14	48.29	56.00	-7.71	QP
4	0.562	22.78	10.14	32.92	46.00	-13.08	AVG
5	1.498	37.34	10.16	47.50	56.00	-8.50	QP
6	1.590	21.02	10.17	31.19	46.00	-14.81	AVG
7	4.114	34.09	10.24	44.33	56.00	-11.67	QP
8	4.298	21.16	10.25	31.41	46.00	-14.59	AVG
9	10.842	20.93	10.49	31.42	50.00	-18.58	AVG
10	10.934	29.94	10.49	40.43	60.00	-19.57	QP
11	21.874	34.48	11.18	45.66	60.00	-14.34	QP
12	21.970	24.85	11.18	36.03	50.00	-13.97	AVG

Mode2 / Line: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.184	45.26	10.10	55.36	64.30	-8.94	QP
2	0.190	35.55	10.10	45.65	54.04	-8.39	AVG
3	0.282	31.54	10.09	41.63	50.76	-9.13	AVG
4	0.374	37.85	10.10	47.95	58.41	-10.46	QP
5 *	0.746	28.84	10.15	38.99	46.00	-7.01	AVG
6	0.842	37.99	10.15	48.14	56.00	-7.86	QP
7	1.594	27.63	10.15	37.78	46.00	-8.22	AVG
8	1.962	35.53	10.15	45.68	56.00	-10.32	QP
9	5.614	33.07	10.32	43.39	60.00	-16.61	QP
10	5.706	24.60	10.32	34.92	50.00	-15.08	AVG
11	13.478	32.51	10.62	43.13	60.00	-16.87	QP
12	13.758	24.05	10.63	34.68	50.00	-15.32	AVG

Note:
1). Result = Reading +Correct (Insertion Loss + Cable Loss + Attenuator Factor)
2). Margin = Result - Limit

5.2.2. 6dB Bandwidth

Test Requirement:	47 CFR 15.247(a)(2)
Test Limit:	Refer to 47 CFR 15.247(a)(2), Systems using digital modulation techniques may operate in the 902-928 MHz, and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Test Method:	ANSI C63.10-2020, section 11.8
Procedure:	11.8.1 Option 1 The steps for the first option are as follows: a) Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz. b) Set the VBW ≥ [3 × RBW]. c) Detector = peak. d) Trace mode = max-hold. e) Sweep = No faster than coupled (auto) time. f) Allow the trace to stabilize. g) Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “−6 dB down amplitude”. If a marker is below this “−6 dB down amplitude” value, then it shall be as close as possible to this value. 11.8.2 Option 2 The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW ≥ 3 × RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.

5.2.2.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.5 °C	Humidity:	55.8 %	Atmospheric Pressure:	103 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

5.2.2.2. Test Setup Diagram

5.2.2.3. Test Result

Pass

5.2.2.4. Test Data

Please Refer to Appendix for Details.

5.2.3. Maximum Conducted Output Power

Test Requirement:	47 CFR 15.247(b)(3)
Test Limit:	Refer to 47 CFR 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
Test Method:	ANSI C63.10-2020 section 11.9.1
Procedure:	ANSI C63.10-2020, section 11.9.1 Maximum peak conducted output power

5.2.3.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.5 °C	Humidity:	55.8 %	Atmospheric Pressure:	103 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

5.2.3.2. Test Setup Diagram

5.2.3.3. Test Result

Pass

5.2.3.4. Test Data

Please Refer to Appendix for Details.

5.2.4. Power Spectral Density

Test Requirement:	47 CFR 15.247(e)
Test Limit:	Refer to 47 CFR 15.247(e), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Test Method:	ANSI C63.10-2020, section 11.10
Procedure:	ANSI C63.10-2020, section 11.10, Maximum power spectral density level in the fundamental emission

5.2.4.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.5 °C	Humidity:	55.8 %	Atmospheric Pressure:	103 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

5.2.4.2. Test Setup Diagram

5.2.4.3. Test Result

Pass

5.2.4.4. Test Data

Please Refer to Appendix for Details.

5.2.5. Conducted band edge and spurious emission

Test Requirement:	47 CFR 15.247(d), 15.209, 15.205
Test Limit:	Refer to 47 CFR 15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Test Method:	ANSI C63.10-2020 section 11.11
Procedure:	ANSI C63.10-2020 Section 11.11.1, Section 11.11.2, Section 11.11.3

5.2.5.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.5 °C	Humidity:	55.8 %	Atmospheric Pressure:	103 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

5.2.5.2. Test Setup Diagram

5.2.5.3. Test Result

Pass

5.2.5.4. Test Data

Please Refer to Appendix for Details.

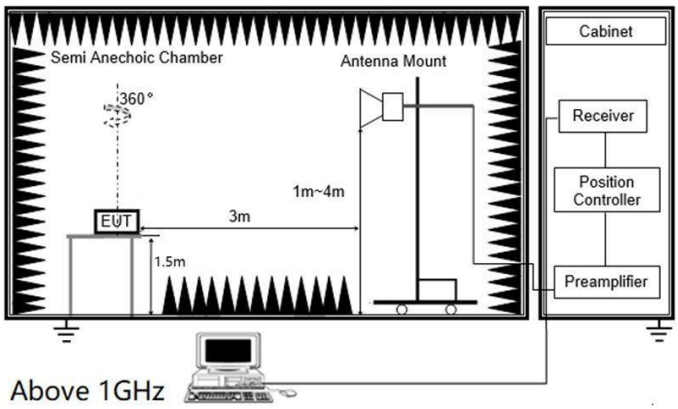
5.2.6. Radiated band edge emission

<table>
<tr><td>Test Requirement:</td><td>Refer to 47 CFR 15.247(d), In addition, 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)).`</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10-2020 section 6.10</td></tr>
<tr><td>Procedure:</td><td>1. EUT was setup and tested according to ANSI C63.10 .
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. Thisis repeated for both horizontal and vertical polarization of the antenna. In order to find themaximum emission, all of the interface cables were manipulated according to ANSI C63.10 on radiated measurement.
5. Use the following spectrum analyzer settings:
a) Span shall wide enough to fully capture the emission being measured
b) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement
For average measurement: use duty cycle correction factor method (DCCF), Averager level = Peak level + DCCF</td></tr>
</table>

5.2.6.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.3 °C	Humidity:	55.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

5.2.6.2. Test Setup Diagram



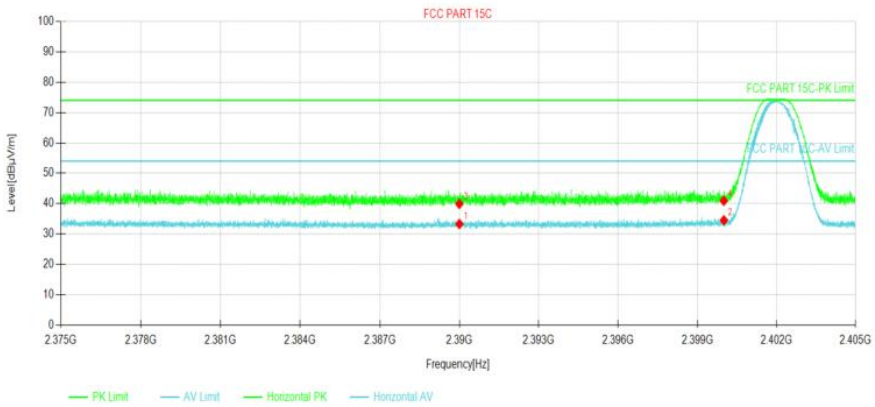
5.2.6.3. Test Result

Pass

5.2.6.4. Test Data

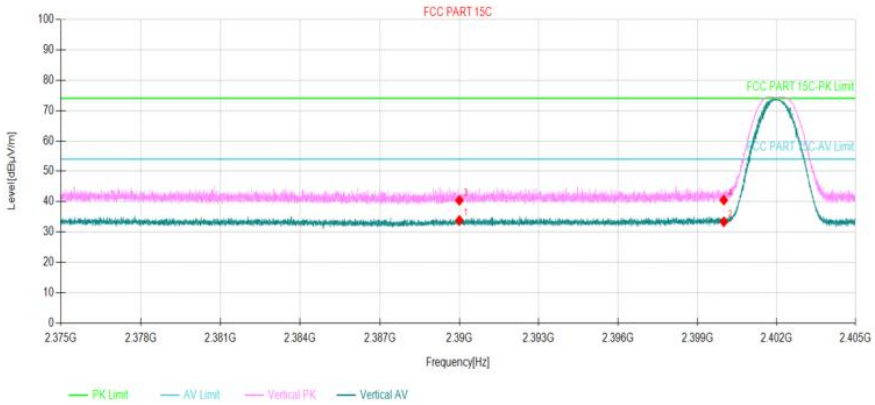
Have pre-scan all test mode, found GFSK 1M mode which it was worst case, so only show the worst case’s data on this report.

Mode1 / Polarization: Horizontal / CH: L



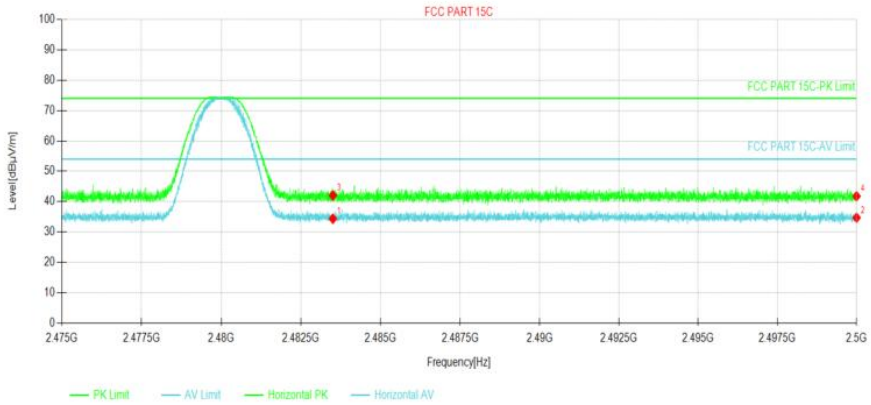
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	2390	26.75	33.31	6.56	54.00	20.69	Horizontal	PASS
2	2400.00	27.91	34.52	6.61	54.00	19.48	Horizontal	PASS
3	2390	33.37	39.93	6.56	74.00	34.07	Horizontal	PASS
4	2400.00	34.35	40.96	6.61	74.00	33.04	Horizontal	PASS

Mode1 / Polarization: Vertical / CH: L



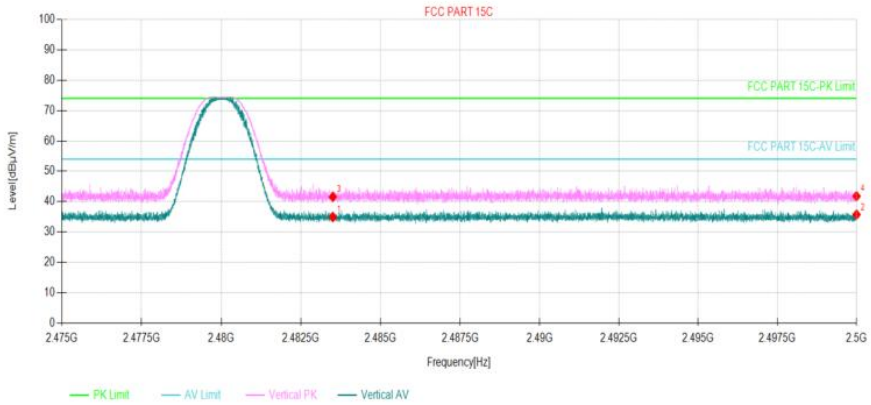
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity	Verdict
1	2390	27.28	33.84	6.56	54.00	20.16	Vertical	PASS
2	2400.00	26.75	33.36	6.61	54.00	20.64	Vertical	PASS
3	2390	33.87	40.43	6.56	74.00	33.57	Vertical	PASS
4	2400.00	33.91	40.52	6.61	74.00	33.48	Vertical	PASS

Mode1 / Polarization: Horizontal / CH: H



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	2483.5	27.82	34.38	6.56	54.00	19.62	Horizontal	PASS
2	2500	28.18	34.73	6.55	54.00	19.27	Horizontal	PASS
3	2483.5	35.50	42.06	6.56	74.00	31.94	Horizontal	PASS
4	2500	35.26	41.81	6.55	74.00	32.19	Horizontal	PASS

Mode1 / Polarization: Vertical / CH: H



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	2483.5	28.42	34.98	6.56	54.00	19.02	Vertical	PASS
2	2500	29.20	35.75	6.55	54.00	18.25	Vertical	PASS
3	2483.5	35.04	41.60	6.56	74.00	32.40	Vertical	PASS
4	2500	35.25	41.80	6.55	74.00	32.20	Vertical	PASS

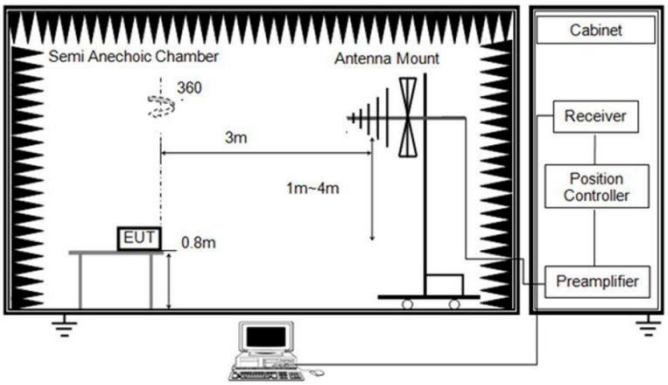
5.2.7. Radiated Spurious Emission (below 1GHz)

<table>
<tr><td>Test Requirement:</td><td>Refer to 47 CFR 15.247(d), In addition, 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)).`</td></tr>
<tr><td>Test Limit:</td><td>
<table>
<tr><td>Frequency (MHz)</td><td>Field strength (microvolts/meter)</td><td>Measurement distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(kHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(kHz)</td><td>30</td></tr>
<tr><td>1.705-30.0</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100 **</td><td>3</td></tr>
<tr><td>88-216</td><td>150 **</td><td>3</td></tr>
<tr><td>216-960</td><td>200 **</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10-2020 section 6.6.4</td></tr>
<tr><td>Procedure:</td><td>1. The EUT was setup and tested according to ANSI C63.10.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
a) Span shall wide enough to fully capture the emission being measured;
b) RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.</td></tr>
</table>

5.2.7.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.3 °C	Humidity:	55.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

5.2.7.2. Test Setup Diagram



Below 1 GHz and above 30 MHz

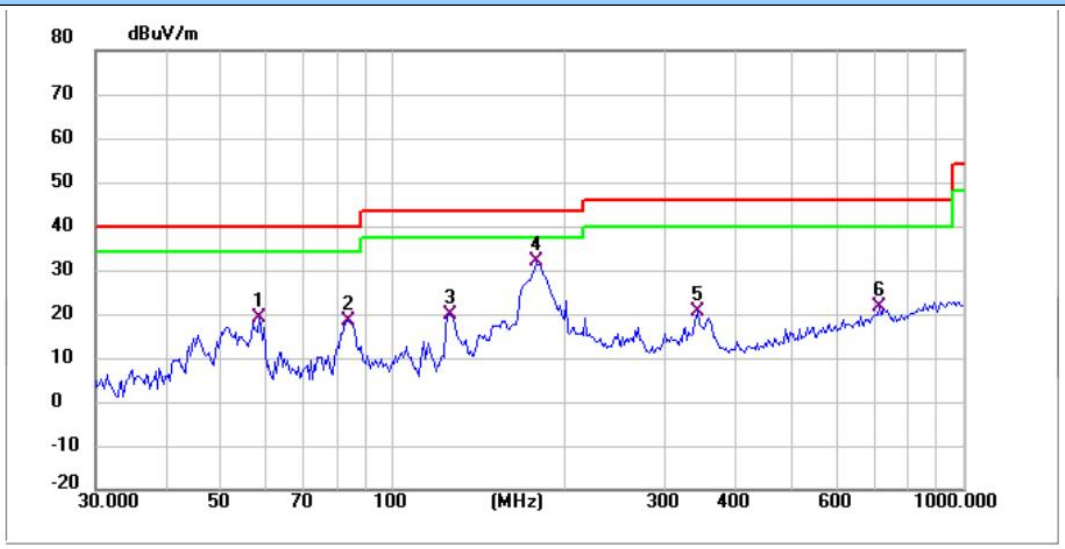
5.2.7.3. Test Result

Pass

5.2.7.4. Test Data

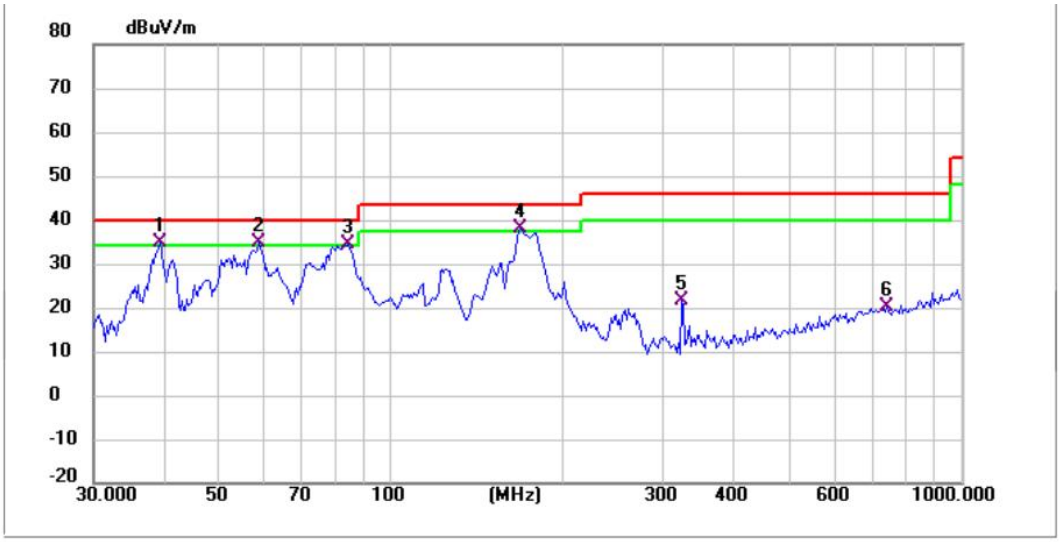
Have pre-scan all test channel, found CH00(GFSK 1M) mode which it was worst case, so only show the worst case's data on this report.

Mode1 / Polarization: Horizontal / CH: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	57.999	49.53	-30.55	18.98	40.00	-21.02	QP
2	83.522	52.73	-34.24	18.49	40.00	-21.51	QP
3	125.446	52.63	-32.87	19.76	43.50	-23.74	QP
4 *	178.133	63.65	-31.80	31.85	43.50	-11.65	QP
5	341.979	46.34	-25.78	20.56	46.00	-25.44	QP
6	714.173	38.43	-16.82	21.61	46.00	-24.39	QP

Mode1 / Polarization: Vertical / CH: L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 *	39.161	65.85	-30.94	34.91	40.00	-5.09	QP
2 !	58.407	65.25	-30.59	34.66	40.00	-5.34	QP
3 !	84.110	68.61	-34.10	34.51	40.00	-5.49	QP
4 !	168.414	70.46	-32.36	38.10	43.50	-5.40	QP
5	323.320	48.23	-26.62	21.61	46.00	-24.39	QP
6	739.660	37.02	-16.99	20.03	46.00	-25.97	QP

Note:
1) For 9 kHz ~ 30 MHz Measurement
The EUT was pre-scanned this frequency band, found the radiated level 20dB lower than the limit, so don't show data on this report.
2) Level= Reading + Factor; Factor =Antenna Factor+ Cable Loss- Preamp Factor
3) Margin = Limit – Level

5.2.8. Radiated Spurious Emission (Above 1GHz)

Test Requirement:	In addition, 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)).`
Test Limit:	

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

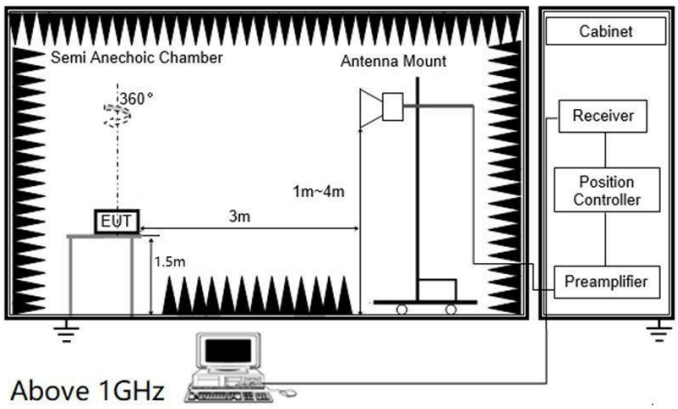
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.
In the emission table above, the tighter limit applies at the band edges.
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

Test Method:	ANSI C63.10-2020 section 6.6.4
Procedure:	1. The EUT was setup and tested according to ANSI C63.10. 2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level. 3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower. 4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines. 5. Set to the maximum power setting and enable the EUT transmit continuously. 6. Use the following spectrum analyzer settings a) Span shall wide enough to fully capture the emission being measured; b) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement For average measurement: use duty cycle correction factor method (DCCF)Averager level = Peak level + DCCF

5.2.8.1. E.U.T. Operation

Operating Environment:					
Temperature:	23.3 °C	Humidity:	55.4 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

5.2.8.2. Test Setup Diagram



5.2.8.3. Test Result

Pass

5.2.8.4. Test Data

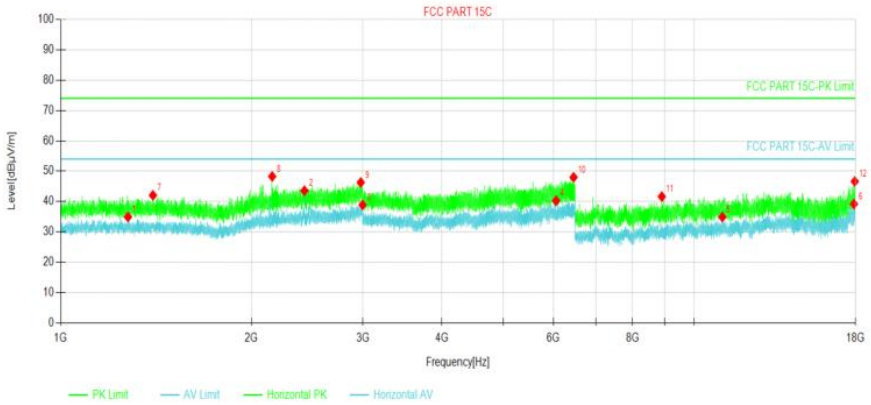
Note:

1. In order to prevent the amplifier from saturating, we add a band-stop filter that filters out the main frequency.

2.18GHz-25GHz is the background of the site, there is no radiated spurious.

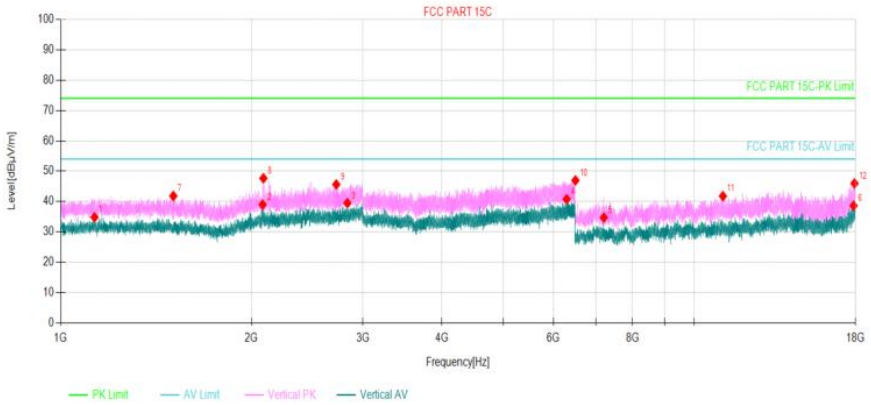
3.Have pre-scan all test mode, found GFSK 1M which it was worst case, so only show the worst case’s data on this report.

Mode1 / Polarization: Horizontal / CH: L



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	1277	32.66	34.92	2.26	54.00	19.08	Horizontal	PASS
2	2426.2	36.40	43.59	7.19	54.00	10.41	Horizontal	PASS
3	2997.4	28.92	38.87	9.95	54.00	15.13	Horizontal	PASS
4	6057.25	34.94	40.28	5.34	54.00	13.72	Horizontal	PASS
5	11089.6	30.11	34.90	4.79	54.00	19.10	Horizontal	PASS
6	17895.3	26.30	39.21	12.91	54.00	14.79	Horizontal	PASS
7	1398.6	39.14	42.06	2.92	74.00	31.94	Horizontal	PASS
8	2157.8	42.43	48.29	5.86	74.00	25.71	Horizontal	PASS
9	2977.8	36.51	46.29	9.78	74.00	27.71	Horizontal	PASS
10	6456.25	41.47	48.00	6.53	74.00	26.00	Horizontal	PASS
11	8898.9	39.55	41.64	2.09	74.00	32.36	Horizontal	PASS
12	17947.1	33.46	46.65	13.19	74.00	27.35	Horizontal	PASS

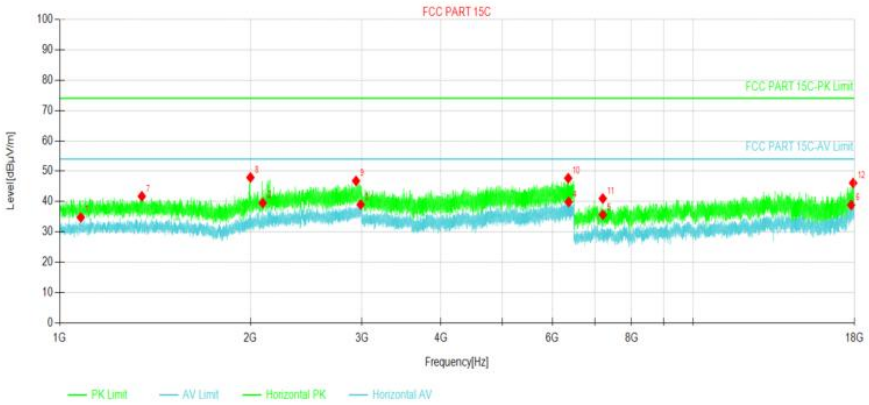
Mode1 / Polarization: Vertical / CH: L



Suspected Data List

NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity	Verdict
1	1130.8	33.52	34.82	1.30	54.00	19.18	Vertical	PASS
2	2083.8	33.59	39.00	5.41	54.00	15.00	Vertical	PASS
3	2836.2	30.80	39.48	8.68	54.00	14.52	Vertical	PASS
4	6295.6	34.91	40.78	5.87	54.00	13.22	Vertical	PASS
5	7207.25	35.10	34.74	-0.36	54.00	19.26	Vertical	PASS
6	17872.3	25.68	38.64	12.96	54.00	15.36	Vertical	PASS
7	1506.2	38.60	41.83	3.23	74.00	32.17	Vertical	PASS
8	2089.8	42.22	47.67	5.45	74.00	26.33	Vertical	PASS
9	2724	37.69	45.64	7.95	74.00	28.36	Vertical	PASS
10	6498.6	40.45	46.98	6.53	74.00	27.02	Vertical	PASS
11	11110.3	36.98	41.79	4.81	74.00	32.21	Vertical	PASS
12	17932.1	32.90	46.00	13.10	74.00	28.00	Vertical	PASS

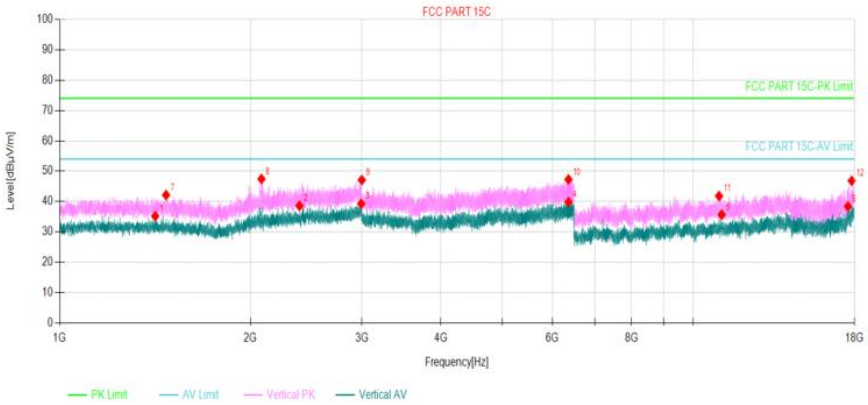
Mode1 / Polarization: Horizontal / CH: M



Suspected Data List

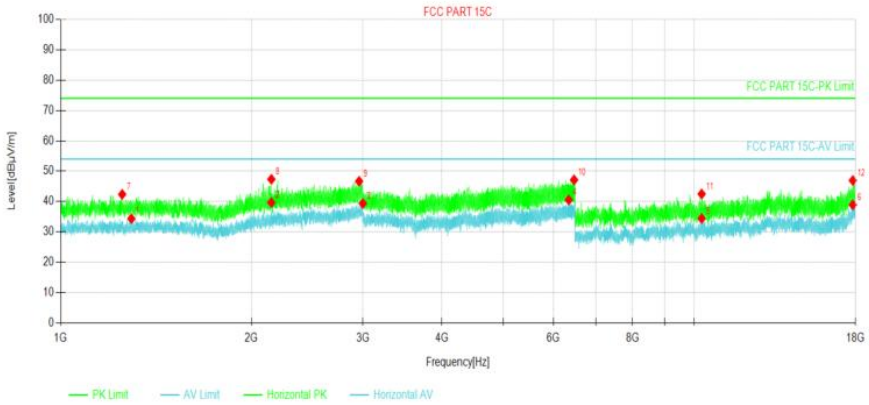
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	1079.6	33.94	34.78	0.84	54.00	19.22	Horizontal	PASS
2	2092.6	34.07	39.54	5.47	54.00	14.46	Horizontal	PASS
3	2987.2	29.14	39.00	9.86	54.00	15.00	Horizontal	PASS
4	6362.8	33.57	39.86	6.29	54.00	14.14	Horizontal	PASS
5	7207.25	36.01	35.65	-0.36	54.00	18.35	Horizontal	PASS
6	17789.5	25.88	38.87	12.99	54.00	15.13	Horizontal	PASS
7	1348	39.07	41.73	2.66	74.00	32.27	Horizontal	PASS
8	2000.8	43.08	47.95	4.87	74.00	26.05	Horizontal	PASS
9	2937.4	37.38	46.82	9.44	74.00	27.18	Horizontal	PASS
10	6354.75	41.47	47.71	6.24	74.00	26.29	Horizontal	PASS
11	7206.1	41.36	41.00	-0.36	74.00	33.00	Horizontal	PASS
12	17906.8	33.19	46.13	12.94	74.00	27.87	Horizontal	PASS

Mode1 / Polarization: Vertical / CH: M



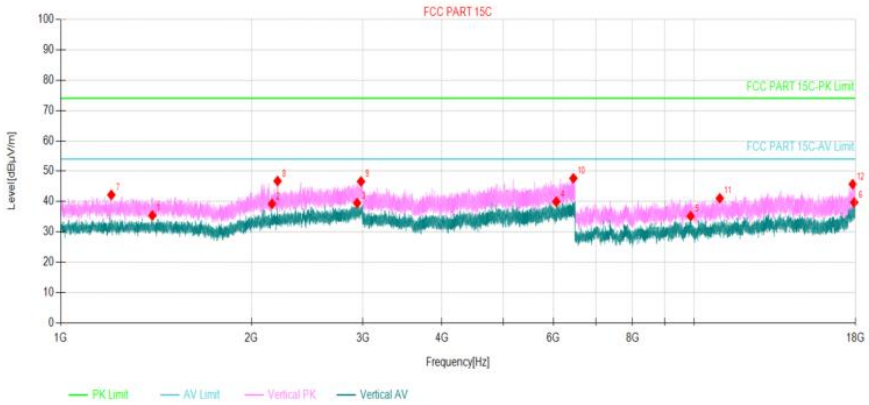
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV/m]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Polarity	Verdict
1	1415.2	32.21	35.19	2.98	54.00	18.81	Vertical	PASS
2	2391.2	31.66	38.61	6.95	54.00	15.39	Vertical	PASS
3	2993.2	29.37	39.28	9.91	54.00	14.72	Vertical	PASS
4	6361.4	33.52	39.80	6.28	54.00	14.20	Vertical	PASS
5	11100	30.85	35.67	4.82	54.00	18.33	Vertical	PASS
6	17575.6	26.42	38.39	11.97	54.00	15.61	Vertical	PASS
7	1472.2	39.02	42.17	3.15	74.00	31.83	Vertical	PASS
8	2082.8	42.03	47.44	5.41	74.00	26.56	Vertical	PASS
9	2999.6	37.13	47.10	9.97	74.00	26.90	Vertical	PASS
10	6361.05	41.00	47.28	6.28	74.00	26.72	Vertical	PASS
11	10997.6	37.28	41.82	4.54	74.00	32.18	Vertical	PASS
12	17816	33.75	46.84	13.09	74.00	27.16	Vertical	PASS

Mode1 / Polarization: Horizontal / CH: H



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity	Verdict
1	1293.2	32.00	34.36	2.36	54.00	19.64	Horizontal	PASS
2	2151	33.86	39.68	5.82	54.00	14.32	Horizontal	PASS
3	3000	29.39	39.36	9.97	54.00	14.64	Horizontal	PASS
4	6342.15	34.40	40.55	6.15	54.00	13.45	Horizontal	PASS
5	10286.9	30.25	34.41	4.16	54.00	19.59	Horizontal	PASS
6	17822.9	25.86	38.94	13.08	54.00	15.06	Horizontal	PASS
7	1250.6	40.29	42.38	2.09	74.00	31.62	Horizontal	PASS
8	2151.4	41.53	47.35	5.82	74.00	26.65	Horizontal	PASS
9	2960	37.05	46.68	9.63	74.00	27.32	Horizontal	PASS
10	6467.8	40.62	47.15	6.53	74.00	26.85	Horizontal	PASS
11	10285.8	38.36	42.51	4.15	74.00	31.49	Horizontal	PASS
12	17821.7	33.87	46.95	13.08	74.00	27.05	Horizontal	PASS

Mode1 / Polarization: Vertical / CH: H



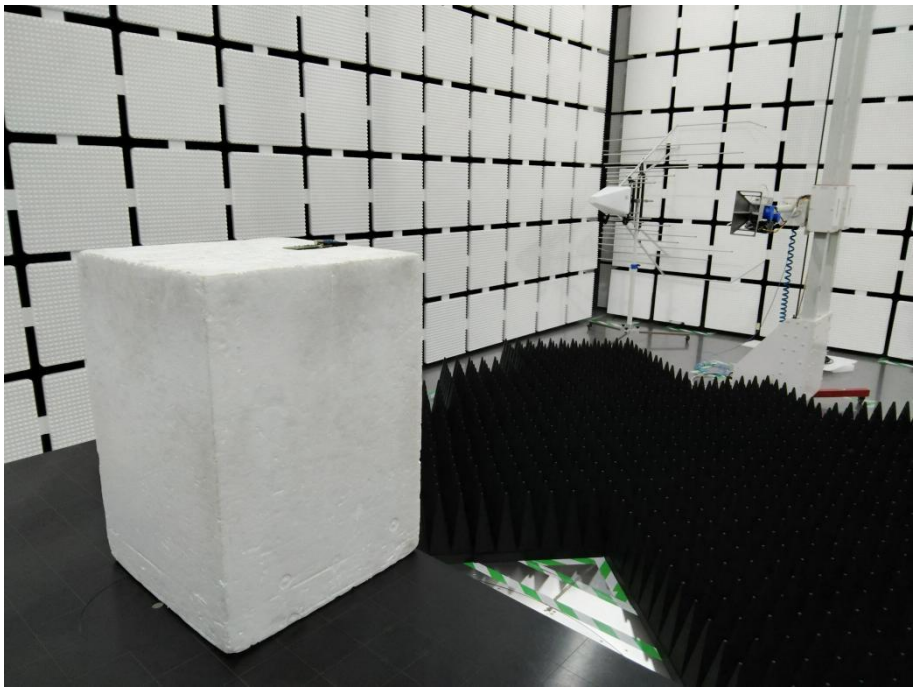
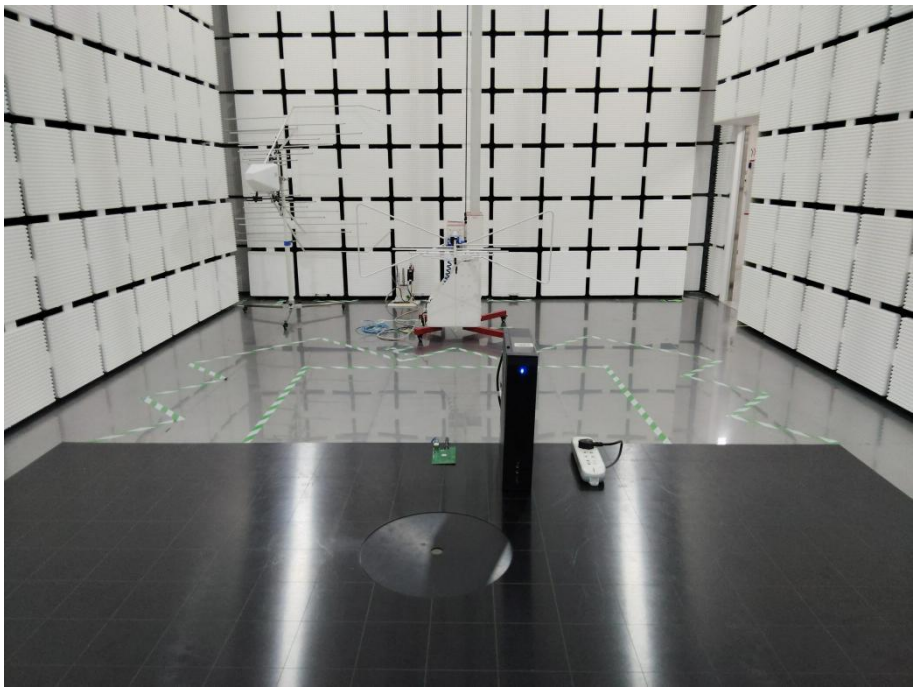
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity	Verdict
1	1395.6	32.48	35.39	2.91	54.00	18.61	Vertical	PASS
2	2156	33.39	39.24	5.85	54.00	14.76	Vertical	PASS
3	2938.6	30.05	39.50	9.45	54.00	14.50	Vertical	PASS
4	6062.85	34.61	39.95	5.34	54.00	14.05	Vertical	PASS
5	9882.15	31.73	35.16	3.43	54.00	18.84	Vertical	PASS
6	17911.4	26.75	39.72	12.97	54.00	14.28	Vertical	PASS
7	1202.2	40.41	42.19	1.78	74.00	31.81	Vertical	PASS
8	2200.6	40.66	46.77	6.11	74.00	27.23	Vertical	PASS
9	2980.2	36.80	46.60	9.80	74.00	27.40	Vertical	PASS
10	6451.7	41.15	47.68	6.53	74.00	26.32	Vertical	PASS
11	10987.3	36.52	41.08	4.56	74.00	32.92	Vertical	PASS
12	17813.7	32.62	45.72	13.10	74.00	28.28	Vertical	PASS

Note:
1) Level= Reading + Factor; Factor =Antenna Factor+ Cable Loss- Preamp Factor
2) Margin = Limit – Level
3) Average measurement was not performed if peak level is lower than average limit (54dBuV/m) for above 1GHz.

6. TEST SETUP PHOTOS

Conducted Emission at AC power line

Band edge emissions (Radiated)
Undesirable emission limits (above 1GHz)



Undesirable emission limits (below 1GHz)