TEST REPORT

Client Information:

Applicant:	Shenzhen Wuxiandian Technology Co., Ltd
Applicant add.:	5th Floor,Building D, Longda Industrial Park,Huating Road,Dalang Street,Longhua New District, Shenzhen, China
Manufacturer:	Shenzhen Wuxiandian Technology Co., Ltd
Manufacturer add.:	5th Floor,Building D, Longda Industrial Park,Huating Road,Dalang Street,Longhua New District, Shenzhen, China

Product Information:

Product Name:	Keyboard
Model No.:	V8, I8, V18, A8, T18, T18+, M9, B033, F68, D8, I8, PLUS, A36, I8S, I9 PLUS, V28, V38, V58, V68, G13, I4
Brand Name:	N/A
FCC ID:	2BD3P-V8

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249

Prepared By:

Dongguan Yaxu (AiT) Technology Limited

No.22, Jinqianling 3rd Street, Jitigang, Huangjiang,Dongguan, Guangdong, China

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Date of Receipt:	Dec. 11, 2023	Date of Test:	Dec. 12, 2023~Dec. 18, 2023
Date of Issue:	Dec. 19, 2023	Test Result:	Pass

This device described above has been tested by Dongguan Yaxu (AiT) Technology Limited and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Note: This report shall not be reproduced except in full, without the written approval of Dongguan Yaxu (AiT) Technology Limited, this document may be altered or revised by Dongguan Yaxu (AiT) Technology Limited, personal only, and shall be noted in the revision of the document. This test report must not be used by the client to claim product endorsement.

Reviewed by: Simba Huang Simba Huang **Approved by:** Seal-Chen Seal.chen

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Revision History

Revision	Issue Date	Revisions	Revised By
000	Dec. 19, 2023	Initial Issue	Seal Chen

2 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	§15.203	Pass
AC Power Line Conducted Emission	§15.207	Pass
Fundamental &Radiated Spurious Emission Measurement	§15.249 (a)/ §15.209	Pass
20dB Channel Bandwidth	15.215(c)	Pass
Band Edge	§15.249 (d)/ §15.205	Pass

Note

1. *Test according to ANSI C63.10:2013.*
2. *The measurement uncertainty is not included in the test result.*

2.1 Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the AiT quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

2.2 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	0.009MHz-30MHz	3.10dB	(1)
Radiated Emission	30MHz-1GHz	3.75dB	(1)
Radiated Emission	1GHz-18GHz	3.88dB	(1)
Radiated Emission	18GHz-40GHz	3.88dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	1.20dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

3 Test Facility

The test facility is recognized, certified or accredited by the following organizations:

.CNAS- Registration No: L6177

Dongguan Yaxu (AiT) technology Limited is accredited to ISO/IEC 17025:2017 general Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the competence of testing and calibration laboratories) on April 18, 2022

FCC-Registration No.: 703111 Designation Number: CN1313

Dongguan Yaxu (AiT) technology Limited 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.

IC —Registration No.: 6819A CAB identifier: CN0122

The 3m Semi-anechoic chamber of Dongguan Yaxu (AiT) technology Limited has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 6819A

A2LA-Lab Cert. No.: 6317.01

Dongguan Yaxu (AiT) technology Limited has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

3.1 Deviation from standard

None

3.2 Abnormalities from standard conditions

None

3.3 Test Location

Dongguan Yaxu (AiT) Technology Limited

Address: No.22, Jinqianling 3rd Street, Jitigang, Huangjiang,Dongguan, Guangdong, China

Tel.: +86-769-8202 0499

Fax.: +86-769-8202 0495

4 General Information

EUT Name:	Keyboard
Model No:	V8
Serial Model:	I8, V18, A8, T18, T18+, M9, B033, F68, D8, I8, PLUS, A36, I8S, I9 PLUS, V28, V38, V58, V68, G13, I4
Test sample(s) ID:	23121101-1
Sample(s) Status:	Engineer sample
Operation frequency:	2402MHz-2480MHz
Channel Number:	40 channels
Modulation Technology:	GFSK
Antenna Type:	PCB Antenna
Antenna gain:	-6.93dBi
H/W No.:	N/A
S/W No.:	N/A
Power supply:	DC 5V from adapter DC 3.7V from battery
Battery:	Model: BL-5C DC 3.7 V 1020mAh
Model different:	The circuit design and PCB design of the product are the same as the internal structure, only the appearance is different.
Note:	For a more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.

4.1 Test frequencies

EUT channels and frequencies list

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	14	2430	28	2458
01	2404	15	2432	29	2460
02	2406	16	2434	30	2462
03	2408	17	2436	31	2464
04	2410	18	2438	32	2466
05	2412	19	2440	33	2468
06	2414	20	2442	34	2470
07	2416	21	2444	35	2472
08	2418	22	2446	36	2474
09	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454	--	--
13	2428	27	2456	--	--

4.2 EUT Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

4.3 Test Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	Signal cord
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

4.4 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Dongguan Yaxu (AiT) Technology Limit.

EUT Configuration

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

EUT Exercise

The EUT was operated in the normal operating mode and a continuous transmits mode for other tests.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C and RSS-247 Issue 2, RSS-Gen Issue 5.

General Test Procedures

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

4.5 Description of Test Modes

The EUT has been tested under operating condition.

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was determined to be TX(1Mbps-Low Channel).

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Transmitting mode	Keep the EUT in continuously transmitting mode.		
Test software:	fixed in EUT by manufacturer		
Frequency	2402 MHz	2440 MHz	2480 MHz
Parameters(1Mbps)	Default	Default	Default

5 Equipment Used during Test

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	R&S	FSV40	101470	2023.09.08	2024.09.07
2	EMI Measuring Receiver	R&S	ESR	101160	2023.09.08	2024.09.07
3	Low Noise Pre Amplifier	HP	HP8447E	1937A01855	2023.09.08	2024.09.07
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2023.09.08	2024.09.07
5	Passive Loop	ETS	6512	00165355	2022.09.04	2024.09.03
6	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2021.08.29	2024.08.28
7	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2021.08.29	2024.08.28
8	SHF-EHF Horn Antenna 15-40GHz	SCHWARZBECK	BBHA9170	BBHA9170367d	2021.11.24	2024.11.23
9	EMI Test Receiver	R&S	ESCI	100124	2023.09.08	2024.09.07
10	LISN	Kyoritsu	KNW-242	8-837-4	2023.09.08	2024.09.07
11	LISN	R&S	ESH3-Z2	0357.8810.54-101161-S2	2023.09.08	2024.09.07
12	Pro.Temp&Humi.chamber	MENTEK	MHP-150-1C	MAA08112501	2023.09.08	2024.09.07
13	RF Automatic Test system	MW	MW100-RFCB	21033016	2023.09.08	2024.09.07
14	Signal Generator	Agilent	N5182A	MY50143009	2023.09.08	2024.09.07
15	Wideband Radio communication tester	R&S	CMW500	1201.0002K50	2023.09.08	2024.09.07
16	RF Automatic Test system	MW	MW100-RFCB	21033016	2023.09.08	2024.09.07
17	DC power supply	ZHAOXIN	RXN-305D-2	28070002559	N/A	N/A
18	RE Software	EZ	EZ-EMC_RE	Ver.AIT-03A	N/A	N/A
19	CE Software	EZ	EZ-EMC_CE	Ver.AIT-03A	N/A	N/A
20	RF Software	MW	MTS 8310	2.0.0.0	N/A	N/A
21	temporary antenna connector(Note)	NTS	R001	N/A	N/A	N/A
22	Pulse Limiter	R&S	ESH3-Z2	03578810.54	2023.09.08	2024.09.07
23	Switch	MFJ Rhinos	MFJ-2702	CZ3457	2023.09.08	2024.09.07
Note: 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 Test Results and Measurement Data

6.1 Antenna requirement

6.1.1 Standard requirement:
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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.
6.1.2 EUT Antenna:
The antenna is PCB Antenna, the best case gain of the antenna is -6.93dBi, reference to the appendix for details

6.2 20 dB Spectrum Bandwidth Measurement

6.4.1 Standard requirement:

FCC Part15 C Section part 15.249/15.215(c):

FCC Part15 (15.249) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
Part 15.215(c)	Bandwidth	2400-2483.5	PASS

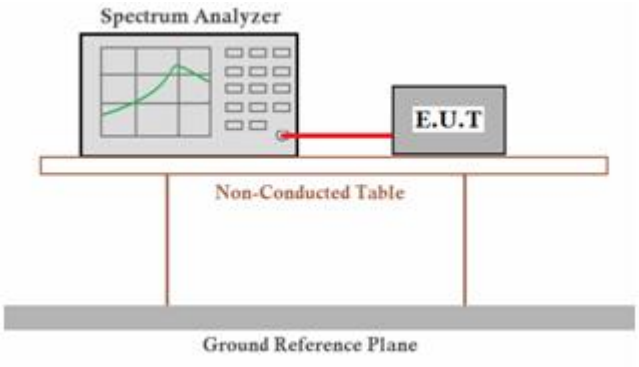
6.4.2 Measuring Instruments:

Please refer to equipment's list in this report.

6.4.3 Test Procedures

1. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

6.4.4 Test Setup Layout



6.4.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

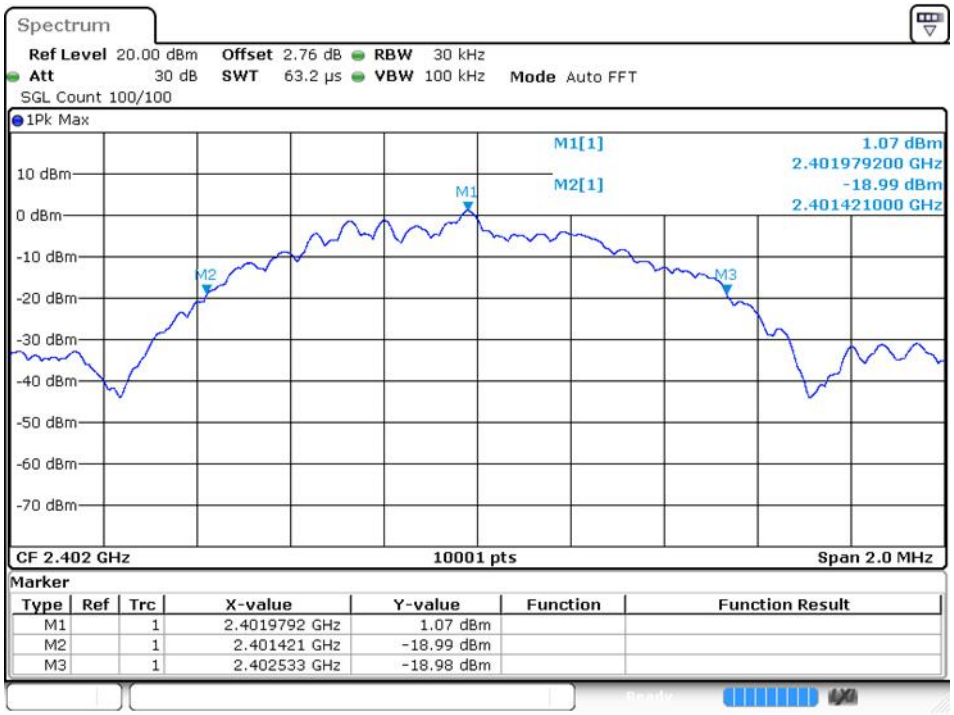
6.4.6 Test result

PASS

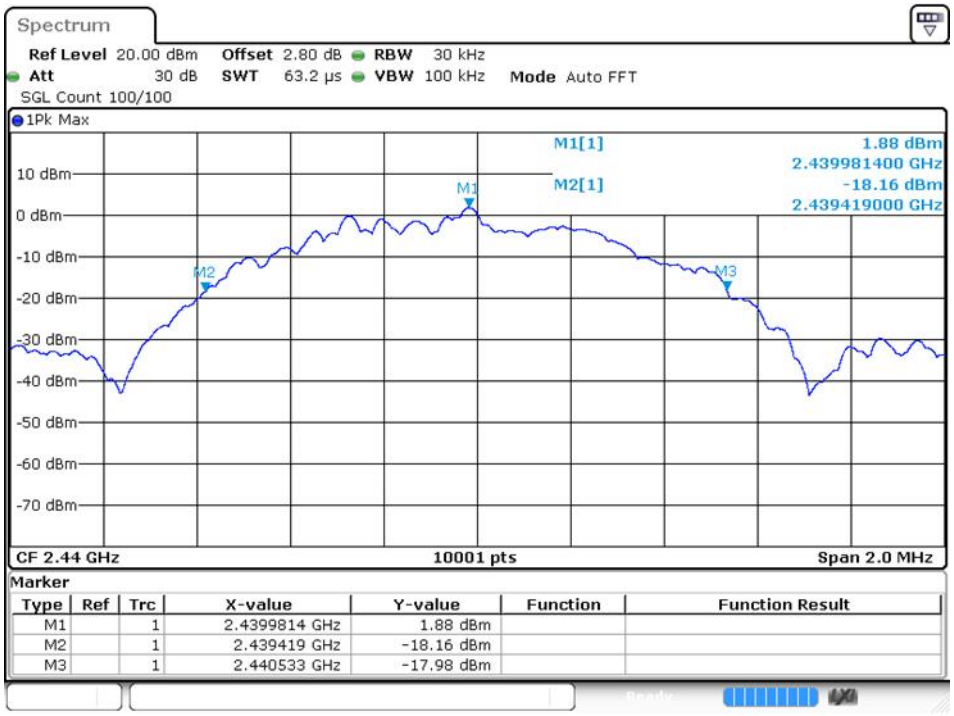
Frequency (MHz)	Ant.	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
2402	Ant1	1.111	/	Pass
2440	Ant1	1.114	/	Pass
2480	Ant1	1.11	/	Pass

Test Graphs

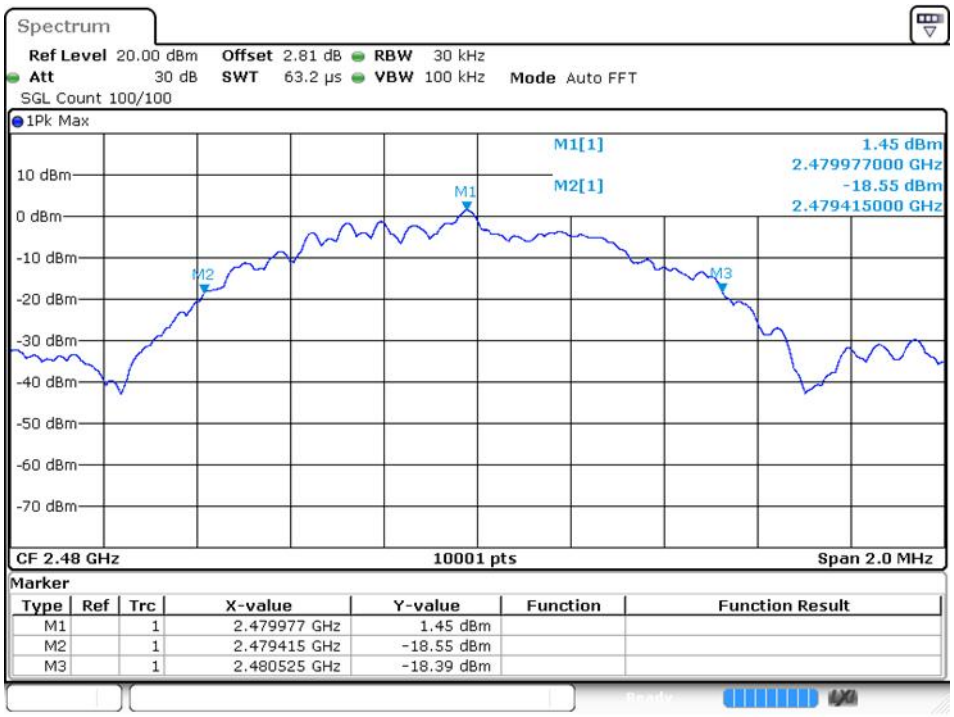
2402MHz Ant1



2440MHz Ant1



2480MHz Ant1



Remark:

1). Measured 20dB Bandwidth at difference data rate for each mode and recorded worst case for each mode.

2). Test results including cable loss;

6.3 Radiated Emissions Measurement

6.8.1 Standard requirement:

FCC Part15 C Section 15.209 :

Frequencies (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

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

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

Band-edge Measurements

According to §15.249 (d)Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation

6.8.2 Measuring Instruments and Setting:

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

6.8.3 Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.0 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

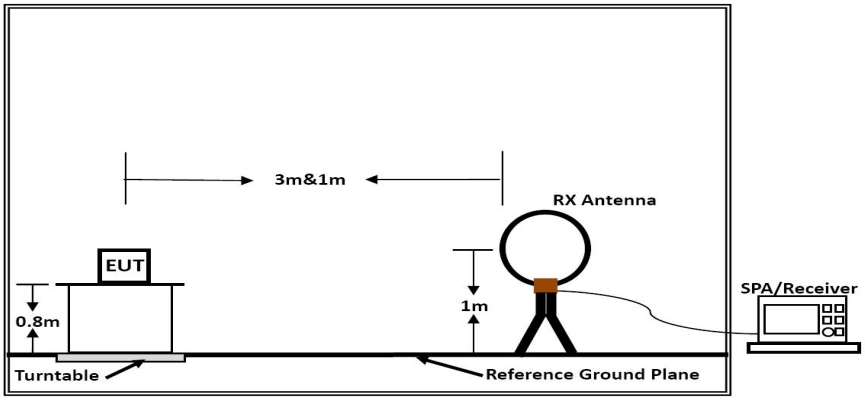
--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

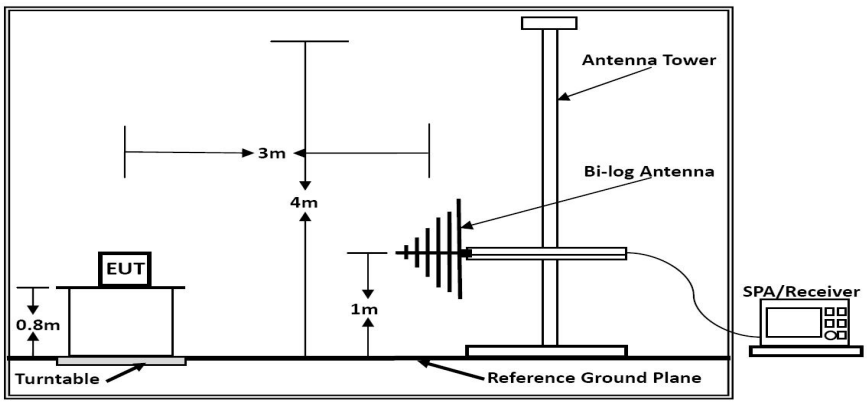
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

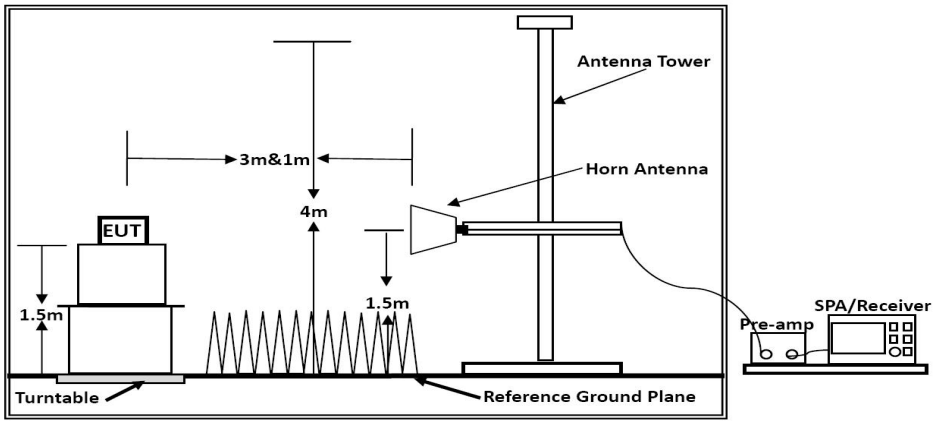
6.8.4 Test Setup Layout



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

6.8.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.8.6 Test result

.

Temperature	25.5℃	Humidity	52.6%
Test Engineer	Simba Huang	Configurations	TX

Remarks:

1. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

6.3.1 Field Strength of the Fundamental Signal

Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2402	91.16	-5.68	85.48	114.00	-28.52	Vertical
2402	93.53	-5.68	87.85	114.00	-26.15	Horizontal
2440	87.36	-5.34	82.02	114.00	-31.98	Vertical
2440	89.42	-5.34	84.08	114.00	-29.92	Horizontal
2480	90.02	-5.00	85.02	114.00	-28.98	Vertical
2480	90.19	-5.00	85.19	114.00	-28.81	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2402	77.56	-5.68	71.88	94.00	-22.12	Vertical
2402	81.56	-5.68	75.88	94.00	-18.12	Horizontal
2440	77.52	-5.34	72.18	94.00	-21.82	Vertical
2440	82.52	-5.34	77.18	94.00	-16.82	Horizontal
2480	76.76	-5.00	71.76	94.00	-22.24	Vertical
2480	75.56	-5.00	70.56	94.00	-23.44	Horizontal

Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

6.3.2 Spurious emissions

■ **Results of Radiated Emissions (9 KHz~30MHz)**

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

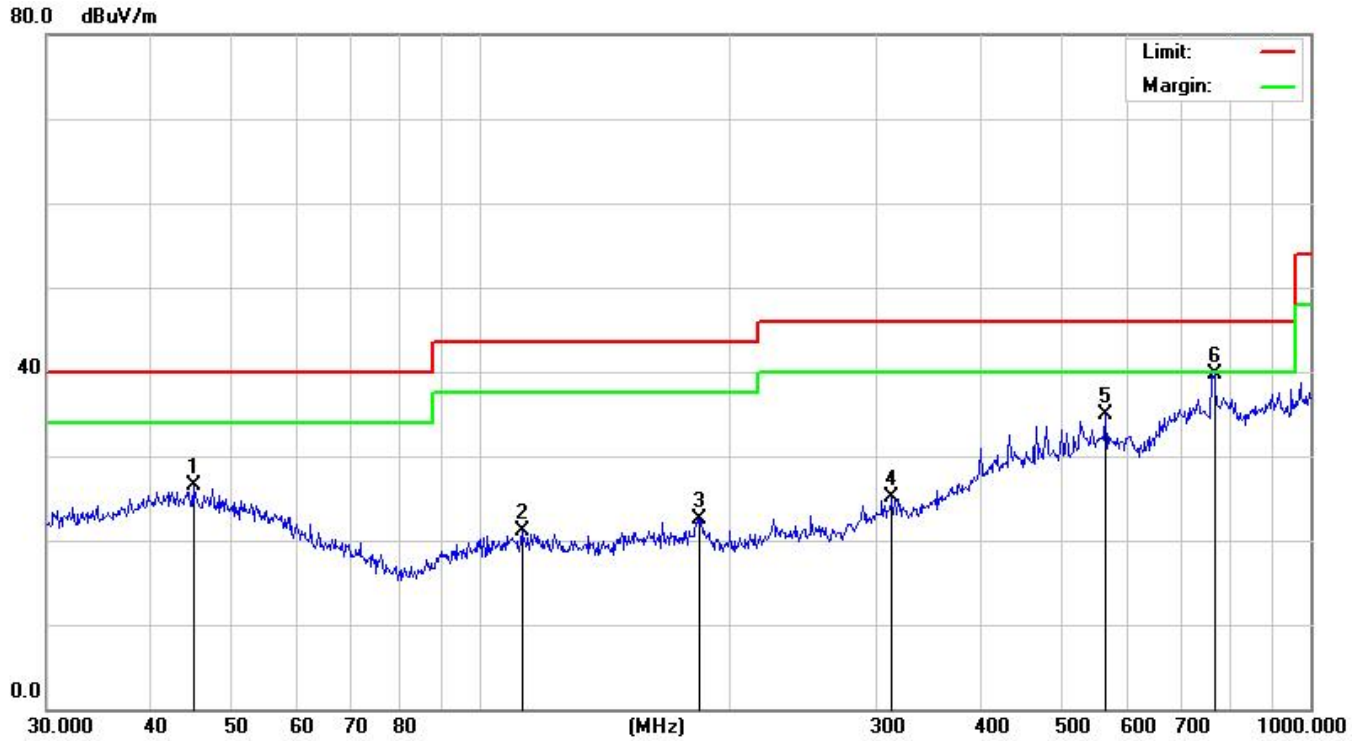
The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

■ **Results of Radiated Emissions (30MHz~1GHz)**

Pre-scan all test modes, found worst case at GFSK (LCH), and so only show the test result of GFSK (LCH).

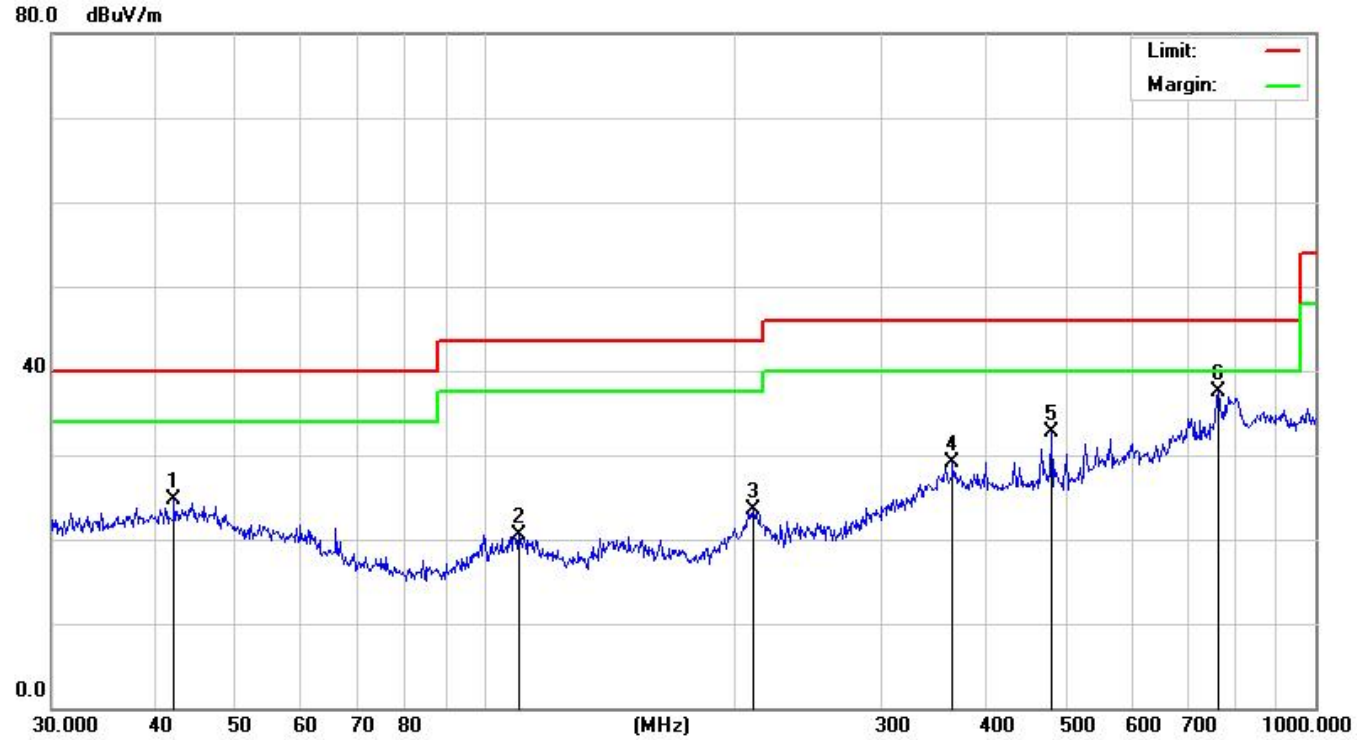
Model name:	V8	Test Date :	2023-12-15
Polarization :	Horizontal	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		45.0583	22.90	3.57	26.47	40.00	-13.53	QP
2		112.1305	22.29	-1.26	21.03	43.50	-22.47	QP
3		183.8440	22.20	0.38	22.58	43.50	-20.92	QP
4		313.2760	23.23	1.82	25.05	46.00	-20.95	QP
5		566.6223	25.42	9.47	34.89	46.00	-11.11	QP
6	*	766.0571	27.32	12.39	39.71	46.00	-6.29	QP

Model name:	V8	Test Date :	2023-12-15
Polarization :	Vertical	Test Result:	☒ Pass ☐ Fail



Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Measurement Result=Reading Level +Correct Factor;
Over Limit= Measurement Result- Limit;

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		42.1542	23.11	1.51	24.62	40.00	-15.38	QP
2		109.7960	22.23	-1.73	20.50	43.50	-23.00	QP
3		210.0482	21.31	2.18	23.49	43.50	-20.01	QP
4		365.5391	23.73	5.45	29.18	46.00	-16.82	QP
5		480.5276	27.45	5.20	32.65	46.00	-13.35	QP
6	*	763.3757	26.57	11.01	37.58	46.00	-8.42	QP

Results for Radiated Emissions (1- 26 GHz)

Test channel:	Lowest

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.000	46.58	5.10	51.68	74.00	-22.32	Vertical
7206.000	37.69	7.26	44.95	74.00	-29.05	Vertical
4804.000	47.57	5.10	52.67	74.00	-21.33	Horizontal
7206.000	39.48	7.26	46.74	74.00	-27.26	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.000	34.53	5.10	39.63	54.00	-14.37	Vertical
7206.000	32.07	7.26	39.33	54.00	-14.67	Vertical
4804.000	36.23	5.10	41.33	54.00	-12.67	Horizontal
7206.000	30.19	7.26	37.45	54.00	-16.55	Horizontal

Test channel:	Middle

Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.000	47.03	5.14	52.17	74.00	-21.83	Vertical
7320.000	41.32	7.52	48.84	74.00	-25.16	Vertical
4880.000	46.63	5.14	51.77	74.00	-22.23	Horizontal
7320.000	43.77	7.52	51.29	74.00	-22.71	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.000	37.11	5.14	42.25	54.00	-11.75	Vertical
7320.000	33.29	7.52	40.81	54.00	-13.19	Vertical
4880.000	38.36	5.14	43.50	54.00	-10.50	Horizontal
7320.000	32.25	7.52	39.77	54.00	-14.23	Horizontal

Test channel:	Highest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.000	49.39	5.18	54.57	74.00	-19.43	Vertical
7440.000	46.11	7.80	53.91	74.00	-20.09	Vertical
4960.000	47.09	5.18	52.27	74.00	-21.73	Horizontal
7440.000	42.19	7.80	49.99	74.00	-24.01	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.000	34.85	5.18	40.03	54.00	-13.97	Vertical
7440.000	30.80	7.80	38.60	54.00	-15.40	Vertical
4960.000	35.17	5.18	40.35	54.00	-13.65	Horizontal
7440.000	32.44	7.80	40.24	54.00	-13.76	Horizontal

Remarks:

1). Measuring frequencies from 9 KHz - 10th harmonic or 26.5GHz (which is less), No emission found between lowest internal used/generated frequency to 30MHz.
2). Radiated emissions *measured in frequency range from 9 KHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.*
3). 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.
4). Margin= Final Level – Limit
5).Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
6). All the modes have been tested and the only shows the worst case GFSK mode

6.3.3 Band-edge Measurements

All of the restriction bands were tested, and only the data of worst case was exhibited.

Test channel:	Lowest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2310.000	44.19	-5.92	38.27	74.00	-35.73	Vertical
2390.000	45.05	-5.79	39.26	74.00	-34.74	Vertical
2310.000	46.30	-5.92	40.38	74.00	-33.62	Horizontal
2390.000	44.75	-5.79	38.96	74.00	-35.04	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2310.000	29.55	-5.92	23.63	54.00	-30.37	Vertical
2390.000	30.37	-5.79	24.58	54.00	-29.42	Vertical
2310.000	29.99	-5.92	24.07	54.00	-29.93	Horizontal
2390.000	30.32	-5.79	24.53	54.00	-29.47	Horizontal

Test channel:	Highest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2483.500	44.37	-4.98	39.39	74.00	-34.61	Vertical
2500.00	46.01	-4.83	41.18	74.00	-32.82	Vertical
2483.500	44.44	-4.98	39.46	74.00	-34.54	Horizontal
2500.000	45.06	-4.83	40.23	74.00	-33.77	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2483.500	30.49	-4.98	25.51	54.00	-28.49	Vertical
2500.00	35.93	-4.83	31.10	54.00	-22.90	Vertical
2483.500	31.81	-4.98	26.83	54.00	-27.17	Horizontal
2500.000	27.96	-4.83	23.13	54.00	-30.87	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*

6.4 Conducted Emissions

6.9.1 Standard requirement:

According to §15.207 (a): For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

6.9.2 Measuring Instruments and Setting:

Please refer to equipment list in this report. The following table is the setting of the spectrum analyzer.

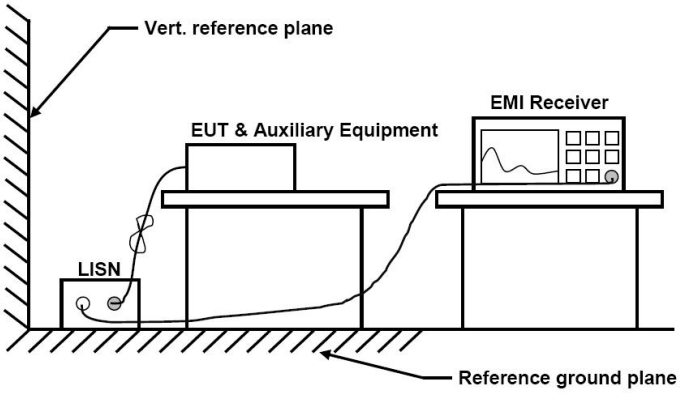
Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
RB / VB (Emission in restricted band)	100KHz/300KHz
RB / VB (Emission in non-restricted band)	100KHz/300KHz

6.9.3 Test Procedures

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

The spectrum from 9 kHz to 26.5GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

6.9.4 Test Setup Layout



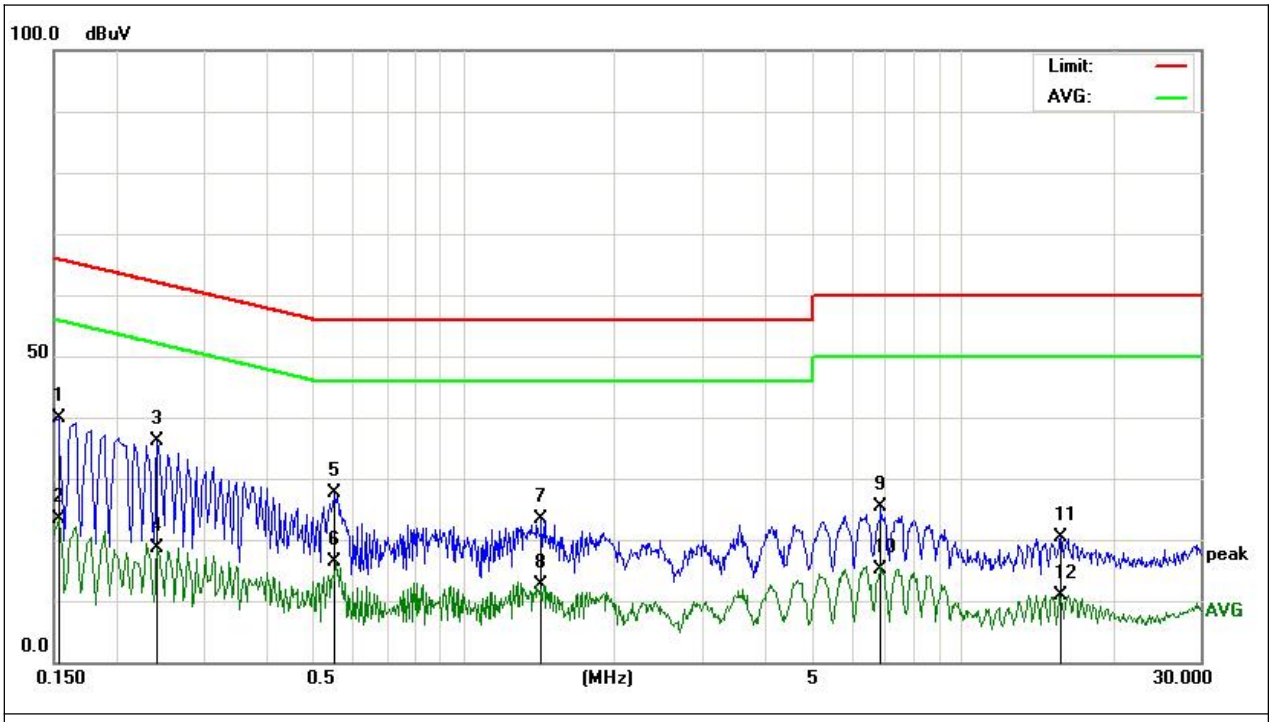
6.9.5 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.9.6 Test result

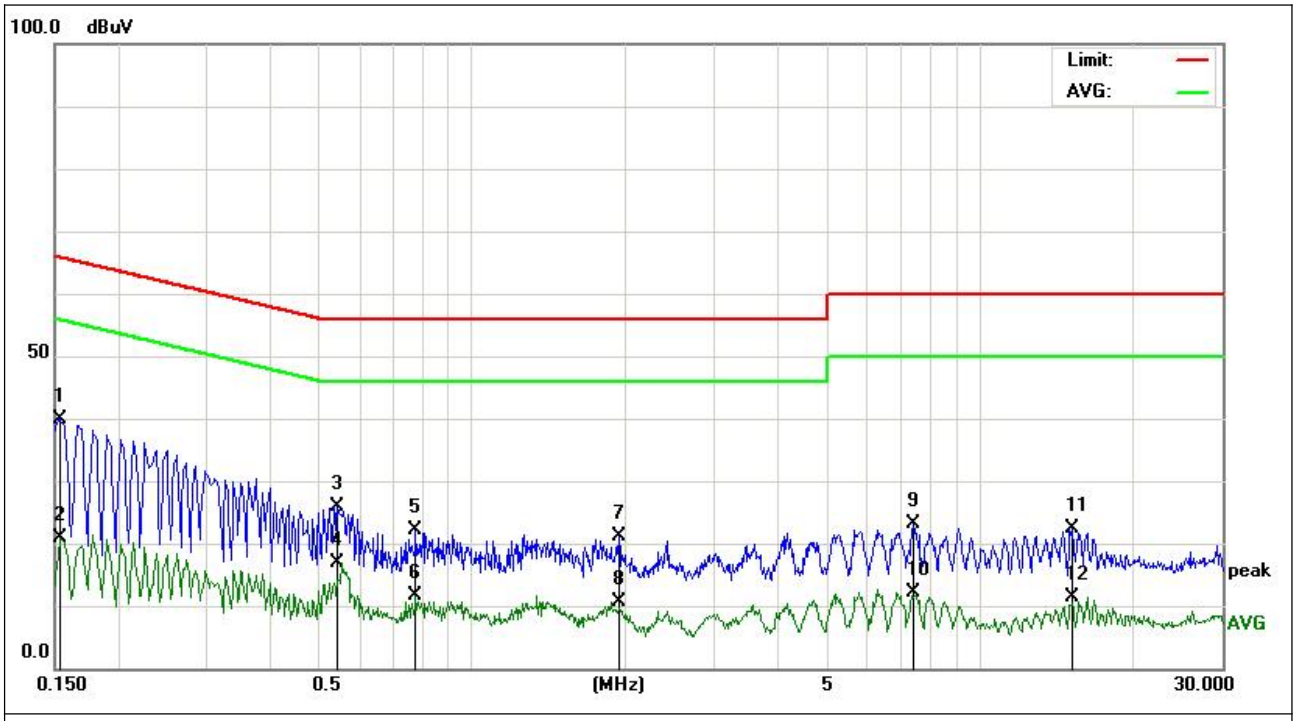
PASS

Temperature:	25.5℃	Relative Humidity:	52.3%
Pressure:	101kPa	Phase :	L
Test Voltage :	AC 120V/60Hz		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1539	27.99	11.84	39.83	65.78	-25.95	QP
2		0.1539	11.55	11.84	23.39	55.78	-32.39	AVG
3	*	0.2420	25.24	10.91	36.15	62.02	-25.87	QP
4		0.2420	7.80	10.91	18.71	52.02	-33.31	AVG
5		0.5500	17.66	9.97	27.63	56.00	-28.37	QP
6		0.5500	6.48	9.97	16.45	46.00	-29.55	AVG
7		1.4299	13.33	9.93	23.26	56.00	-32.74	QP
8		1.4299	2.79	9.93	12.72	46.00	-33.28	AVG
9		6.8740	15.23	10.10	25.33	60.00	-34.67	QP
10		6.8740	4.93	10.10	15.03	50.00	-34.97	AVG
11		15.7580	19.07	1.32	20.39	60.00	-39.61	QP
12		15.7580	9.64	1.32	10.96	50.00	-39.04	AVG

Temperature:	25.5℃	Relative Humidity:	52.3%
Pressure:	101kPa	Phase :	N
Test Voltage :	AC 120V/60Hz		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1539	28.16	11.84	40.00	65.78	-25.78	QP
2		0.1539	9.15	11.84	20.99	55.78	-34.79	AVG
3		0.5420	16.00	10.00	26.00	56.00	-30.00	QP
4		0.5420	6.87	10.00	16.87	46.00	-29.13	AVG
5		0.7740	12.10	9.97	22.07	56.00	-33.93	QP
6		0.7740	1.62	9.97	11.59	46.00	-34.41	AVG
7		1.9460	11.09	9.99	21.08	56.00	-34.92	QP
8		1.9460	0.71	9.99	10.70	46.00	-35.30	AVG
9		7.3860	12.88	10.18	23.06	60.00	-36.94	QP
10		7.3860	1.93	10.18	12.11	50.00	-37.89	AVG
11		15.1780	20.97	1.42	22.39	60.00	-37.61	QP
12		15.1780	9.87	1.42	11.29	50.00	-38.71	AVG

Notes:

1.An initial pre-scan was performed on the line and neutral lines with peak detector.

2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.

3.Mesurement Level = Reading level + Correct Factor

7 Test Setup Photo

Reference to the **appendix Setup photo** for details.

8 EUT Constructional Details

Reference to the appendix **External EUT photo & Internal EUT photo** for details.

------End------