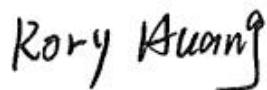


TEST REPORT

Report No.	CISRR24051304303
Project No.	CISR240513043
FCC ID	2BFQI-TK950
Applicant	Jiangxi Jichi Technology Co., Ltd
Address	Plant No.3,Block B13-1-2, B14-1, Jinggangshan Economic and Development Zone,Ji 'an,Jiangxi,China
Manufacturer	Jiangxi Jichi Technology Co., Ltd
Address	Plant No.3,Block B13-1-2, B14-1, Jinggangshan Economic and Development Zone,Ji 'an,Jiangxi,China
Product Name	keyboard
Trade Mark	--
Model/Type reference	TK950
Listed Model(s)	--
Standard	Part 15 Subpart C Section 15.249
Test date	May 13, 2023 ~ June 28, 2024
Issue date	June 28, 2024
Test result	Complied



Prepared by: Rory Huang



Approved by: Genry Long

The test results relate only to the tested samples.

The test report should not be reproduced except in full without the written approval of Shenzhen Bangce Testing Technology Co., Ltd.

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1. **REPORT VERSION**

Version No.	Issue date	Description
00	June 28, 2024	Original

2. SUMMARY OF TEST RESULT

Report clause	Test Item	Standard Requirement	Result
5.1	Antenna Requirement	15.203/15.247 (c)	PASS
5.2	AC Conducted Emission	15.207	PASS
5.3	20 dB Bandwidth	15.215 (c)	PASS
5.4	Radiated Band Edge Emission	15.205/15.209	PASS
5.5	Radiated Spurious Emission	15.249(a)(c)/15.205/15.209	PASS

Note:

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

3. SUMMARY

3.1. Product Description

Main unit information:	
Product Name:	keyboard
Trade Mark:	--
Model No.:	TK950
Listed Model(s):	--
Power supply:	Input:DC 5V DC 3.7V from Battery
Hardware version:	2023-10-27
Software version:	V1.5

3.2. Radio Specification Description

Technology:	2.4G
Modulation:	GFSK
Operation frequency:	2405MHz~2475MHz
Channel number:	16
Antenna type:	PCB Antenna
Antenna gain:	2.34dBi

Channel list:

CH1	2405 MHz	CH9	2414 MHz
CH2	2463 MHz	CH10	2471 MHz
CH3	2441 MHz	CH11	2459 MHz
CH4	2426 MHz	CH12	2436 MHz
CH5	2408 MHz	CH13	2419 MHz
CH6	2466 MHz	CH14	2475 MHz
CH7	2445 MHz	CH15	2453 MHz
CH8	2422 MHz	CH16	2439 MHz

3.3. Modification of EUT

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

3.4. 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
FCC registration number	736346

3.5. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS (\text{dBuV/m}) = RA (\text{dBuV}) + AF (\text{dB/m}) + CL (\text{dB}) - AG (\text{dB})$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

3.6. DISTURBANCE Calculation

The AC mains conducted disturbance is calculated by adding the 10dB Pulse Limiter and Cable Factor and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$CD (\text{dBuV}) = RA (\text{dBuV}) + PL (\text{dB}) + CL (\text{dB})$$

Where CD = Conducted Disturbance	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	PL = 10 dB Pulse Limiter Factor

4. TEST CONFIGURATION

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.

4.1. Test frequency list

Channel	Frequency (MHz)
CH-L	2405
CH-M	2441
CH-H	2475

4.2. Test mode

For RF test items:		
The engineering test method is provided to realize the continuous transmission of EUT by pressing keys. Power Settings Default.		
Test Item	Test Mode	Modulation
Conducted test item	TX CH-L	GFSK
	TX CH-M	GFSK
	TX CH-H	GFSK
	Normal link	--
Radiated test item	TX CH-L	GFSK
	TX CH-M	GFSK
	TX CH-H	GFSK
	Normal link	--
Remark: – The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.		

4.3. Support unit used in test configuration and system

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	Adapter	Huawei	HW-05002000C

4.4. Test sample information

Type	sample no.
Engineer sample	CISR240513043-1#
Normal sample	CISR240513043-2#

4.5. Testing environmental condition

Type	Requirement	Actual
Temperature:	15~35°C	25°C
Relative Humidity:	25~75%	50%
Air Pressure:	860~1060mbar	1000mbar

4.6. Statement of the measurement uncertainty

No.	Test Items	Measurement Uncertainty
1	AC Conducted Emission	1.63dB
2	Peak Output Power	1.34dB
3	Power Spectral Density	1.34dB
4	6dB Bandwidth	0.002%
5	99% Occupied Bandwidth	0.002%
6	Duty cycle	-
7	Conducted Band Edge and Spurious Emission	1.93dB
8	Radiated Band Edge Emission	3.76dB for 30MHz-1GHz 3.80dB for above 1GHz
9	Radiated Spurious Emission	3.76dB for 30MHz-1GHz 3.80dB for above 1GHz

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

4.7. Equipment Used during the Test

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	SKET	9.3*6.3*6	N/A	2021.10.15	3Year
Spectrum analyzer	Agilent	N9020A	MY50530263	2024.01.08	1Year
Receiver	ROHDE&SCHWARZ	ESCI	100853	2024.01.08	1Year
Spectrum analyzer	R&S	FSV-40N	/	2024.01.08	1Year
Bilog Antenna	Schwarzbeck	VULB 9163	1463	2023.01.09	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	2487	2023.01.09	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	/	2023.01.09	2Year
RF Cable	Tonscend	Cable 1	/	2024.01.08	1Year
RF Cable	Tonscend	Cable 2	/	2024.01.08	1Year
RF Cable	SKET	Cable 3	/	2024.01.08	1Year
Pre-amplifier	Tonscend	TAP9K3G32	AP21G806153	2024.01.08	1Year
Pre-amplifier	Tonscend	TAP01018050	AP22E806229	2024.01.08	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8127	/	2024.01.08	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	2024.01.08	1Year
Horn Antenna	SCHWARZBECK	BBHA9170	1130	2023.01.09	2 Year
Preamplifier	Tonscend	TAP18040048	AP21C806126	2024.01.08	1Year
variable-frequency power source	Pinhong	PH1110	/	2024.01.08	1Year
6dB Attenuator	SKET	DC-6G	/	N/A	N/A
Artificial power network	Schwarzbeck	NSLK8127	8127-01096	2024.01.08	1Year
EMI Test Receiver	Rohde&schwarz	ESCI7	100853	2024.01.08	1Year
8-wire Impedance Stabilization Network	Schwarzbeck	NTFM 8158	8158-00337	2024.01.08	1Year
Artificial power network	Schwarzbeck	ENV216	/	2024.01.08	1Year
Antenna tower	SKET	Bk-4AT-BS	AT2021040101-V1	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. Antenna Requirement

Standard Applicable

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Description

The EUT antenna is PCB antenna (2.34dBi), the directional gain of the antenna less than 6dBi. It complies 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.

Remark: The antenna gain is provided by the customer, if the data provided by the customer is not accurate, Shenzhen Bangce Testing Technology Co., Ltd. does not assume any responsibility.

5.2. AC Conducted Emission

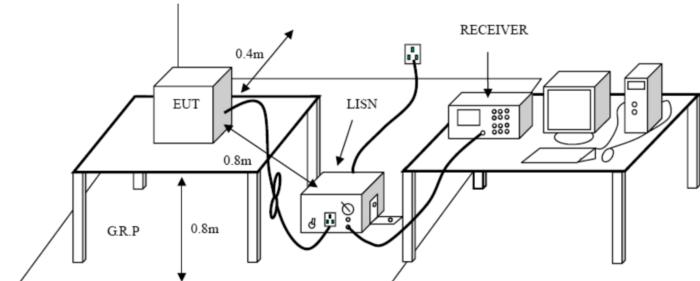
Limit:

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	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 configuration:



Test 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.

Test mode:

Refer to the clause 4.2

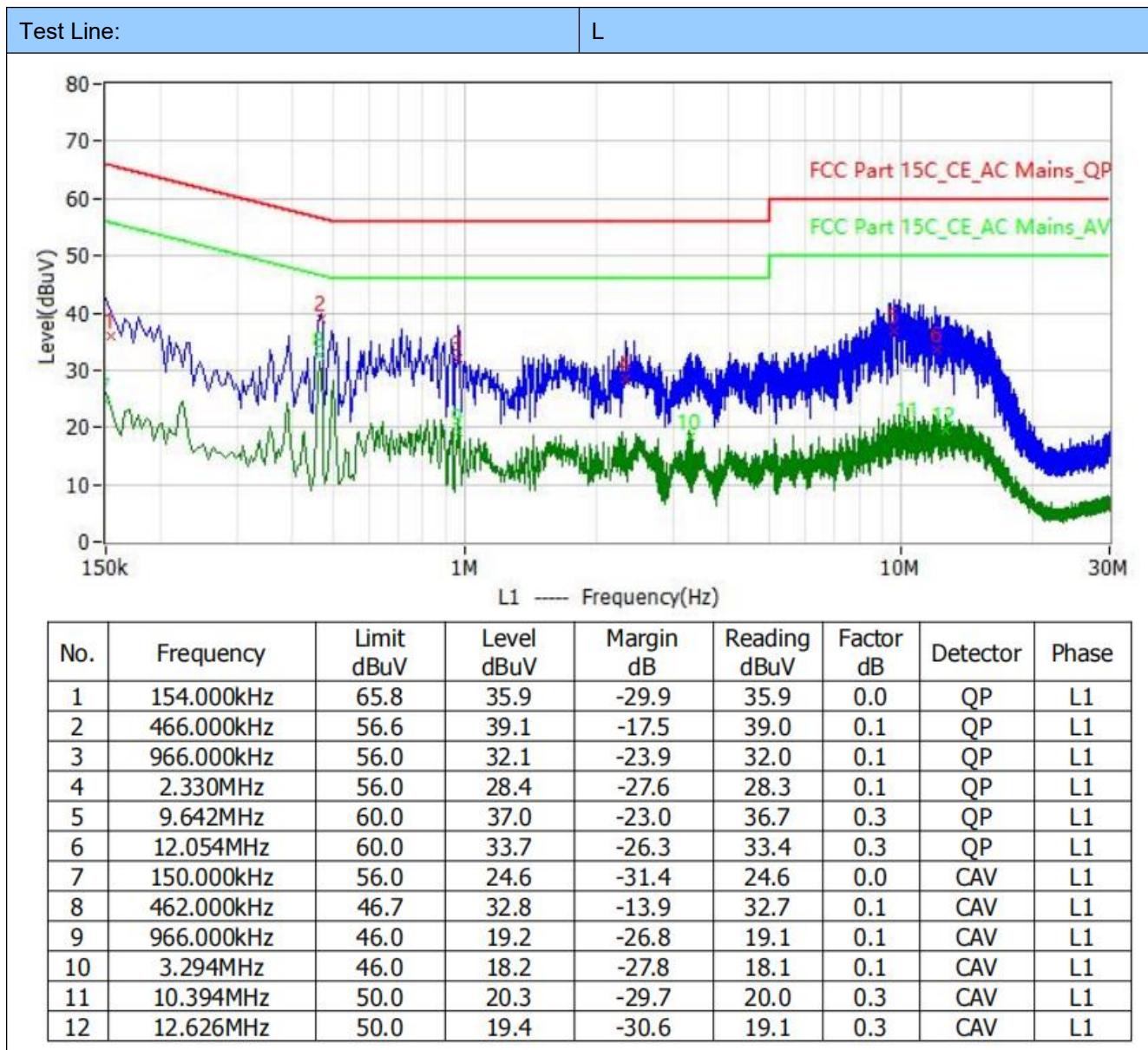
Result:

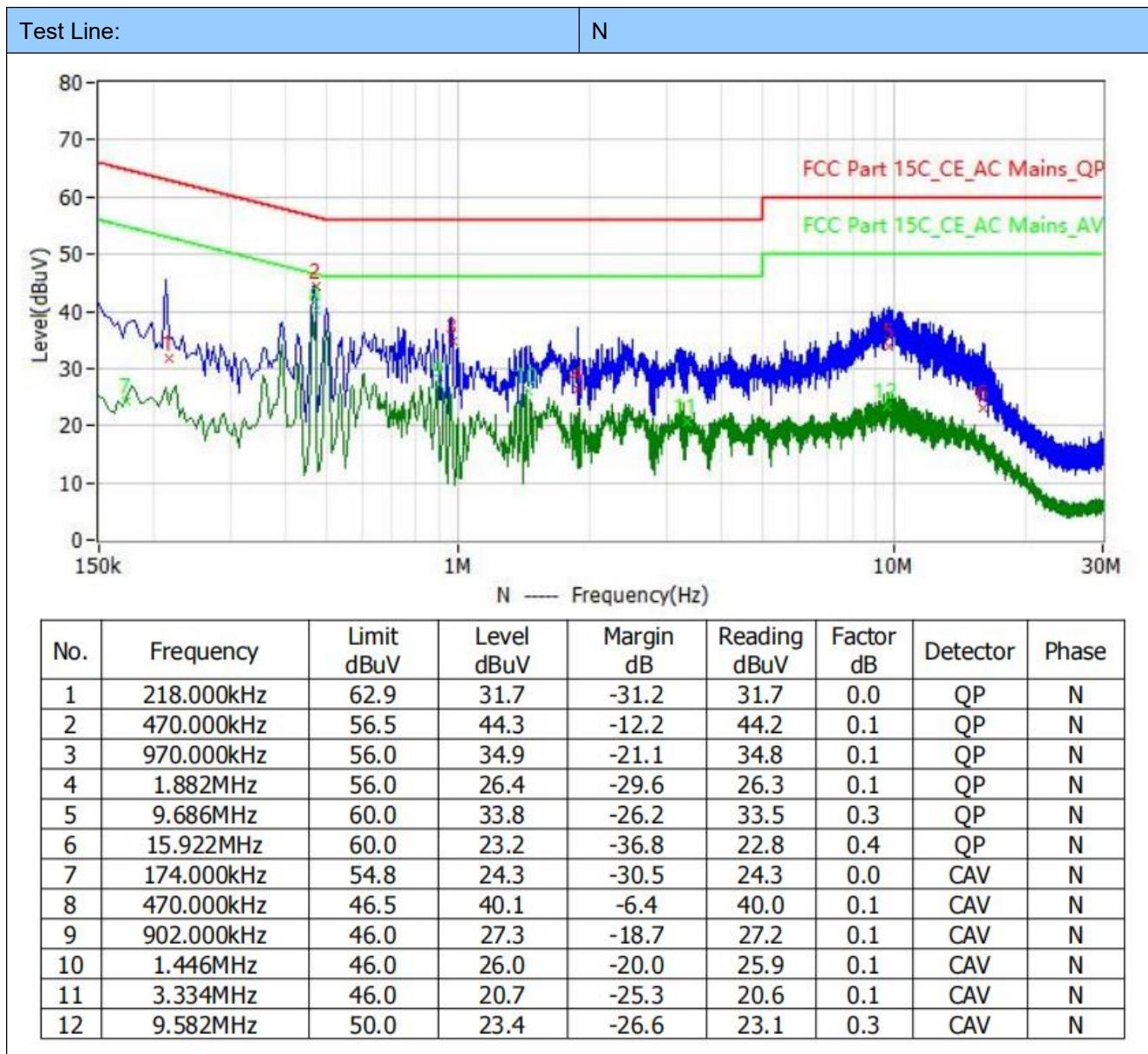
Passed

Note:

1. Factor = LISN Factor + Cable Factor
2. Level= Reading + Factor
3. Margin= Level – Limit

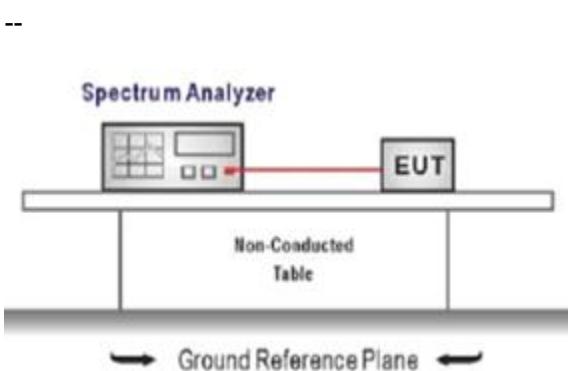
Have pre-scan all test channel, found CH1 which it was worst case, so only show the worst case's data on this report.





5.3. 20 dB Bandwidth

Limit:



Test configuration:

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW \geq 1% of the 20 dB bandwidth, VBW \geq RBW
Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

Test mode:

Refer to the clause 4.2

Result:

Passed

Test Result of 20dB Bandwidth Measurement

Test Frequency(MHz)	20dB Bandwidth(MHz)	Limit(MHz)
2405	1.400	Non-Specified
2441	1.390	Non-Specified
2475	1.392	Non-Specified

20dB Bandwidth



2405MHz

2441MHz



2475MHz

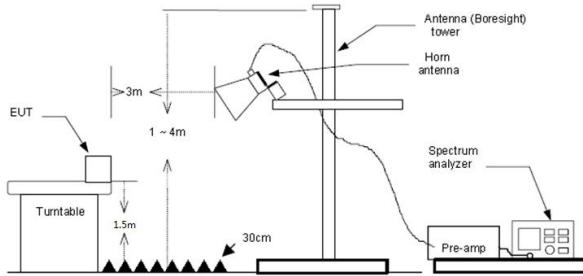
5.4. Radiated Band edge Emission

Limit:

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, Radiated Emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the Radiated Emissions limits specified in §15.209(a) (see §15.205(c)).

Test configuration:



Test procedure:

1. The 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. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum 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=100kHz for <1GHz, VBW=3*RBW, Sweep time=auto, Detector=peak, Trace=max hold
 - c) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement
 - d) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=Average, Trace=RMS for Average measurement

Test mode:

Refer to the clause 4.2

Result:

Passed

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
- 4) The other emission levels were very low against the limit.

Test channel:CH1

Freq. (MHz)	Reading (dBuv)	Ant. Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correc tion Factor (dB/m)	Level (dBuv)	Limit (dBu V/m)	Margin (dB)	Remark	Polarity
2390.00	69.92	28.62	4.08	38.62	-5.92	64.00	74	10.00	Peak	Horizontal
2390.00	51.95	28.62	4.08	38.62	-5.92	46.03	54	7.97	Average	Horizontal
2390.00	69.23	28.62	4.08	38.62	-5.92	63.31	74	10.69	Peak	Vertical
2390.00	50.03	28.62	4.08	38.62	-5.92	44.11	54	9.89	Average	Vertical

Test channel:CH14

Freq. (MHz)	Reading (dBuv)	Ant. Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correc tion Factor (dB/m)	Level (dBuv)	Limit (dBu V/m)	Margin (dB)	Remark	Polarity
2483.50	69.69	29.45	3.91	40.17	-6.81	62.88	74	11.12	Peak	Horizontal
2483.50	49.85	29.45	3.91	40.17	-6.81	43.04	54	10.96	Average	Horizontal
2483.50	67.98	29.45	3.91	40.17	-6.81	61.17	74	12.83	Peak	Vertical
2483.50	50.97	29.45	3.91	40.17	-6.81	44.16	54	9.84	Average	Vertical

5.5. Radiated Spurious Emission

Limit:

FCC CFR Title 47 Part 15 Subpart C Section 15.209

Frequency	Limit (dB _{UV} /m)	Value
0.009 MHz ~0.49 MHz	2400/F(kHz) @300m	Quasi-peak
0.49 MHz ~ 1.705 MHz	24000/F(kHz) @30m	Quasi-peak
1.705 MHz ~30 MHz	30 @30m	Quasi-peak

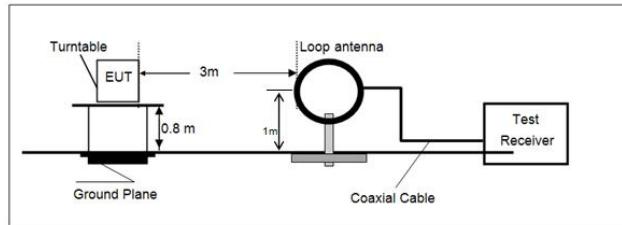
Limit dB_{UV}/m @3m = Limit dB_{UV}/m @300m + 40*log(300/3)

Limit dB_{UV}/m @3m = Limit dB_{UV}/m @30m +40*log(30/3)

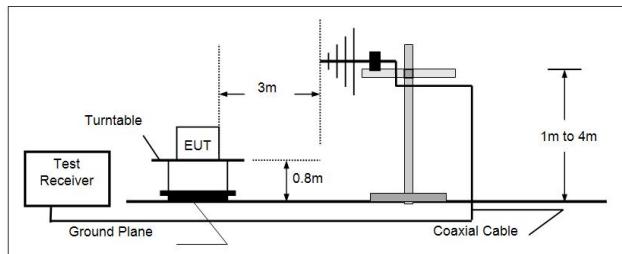
Frequency	Limit (dB _{UV} /m @3m)	Value
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak
Above 1GHz(Field strength of fundamental)	94.00	Average
	114.00	Peak
Above 1GHz(Field strength of harmonics)	54.00	Average
	74.00	Peak

Test configuration:

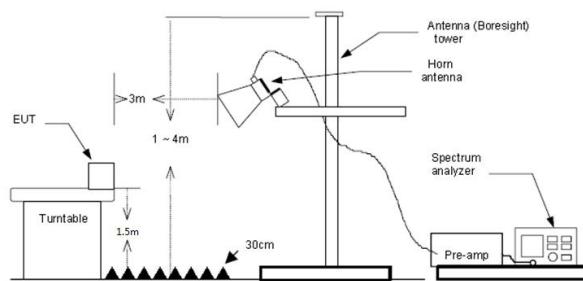
9kHz~30MHz



30 MHz ~ 1 GHz



Above 1 GHz



Test 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) Below 1 GHz:
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.
 - c) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement
 - d) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=Average, Trace=RMS for Average measurement

Test mode:

Refer to the clause 4.2

Result:

Passed

Note:

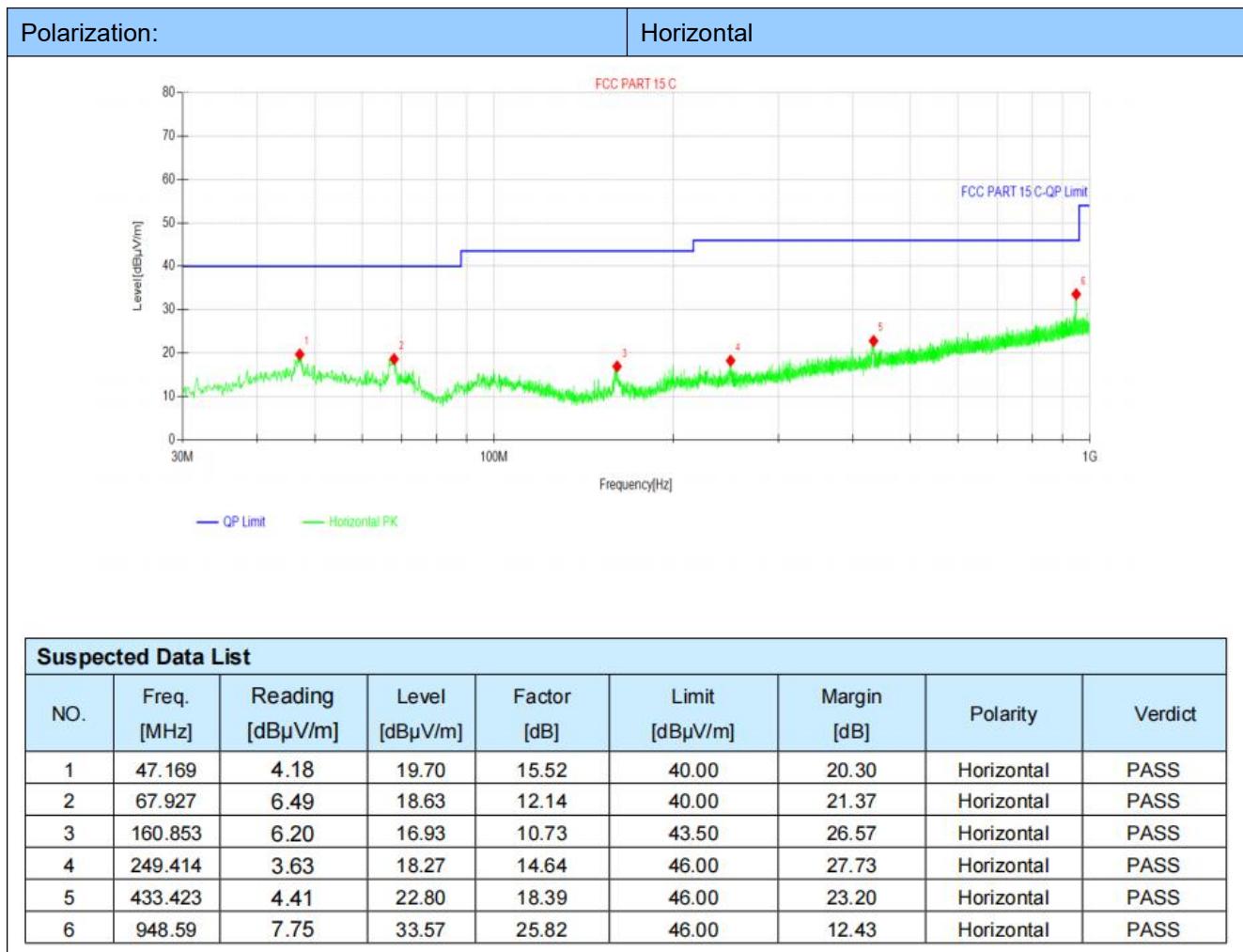
- 1) Level= Reading + Correction Factor; Correction Factor =Antenna Factor+ Cable Loss- Preamp Factor
- 2) Margin= Limit-Level
- 3) Average measurement was not performed if peak level is lower than average limit(54 dBuV/m) for above 1GHz.

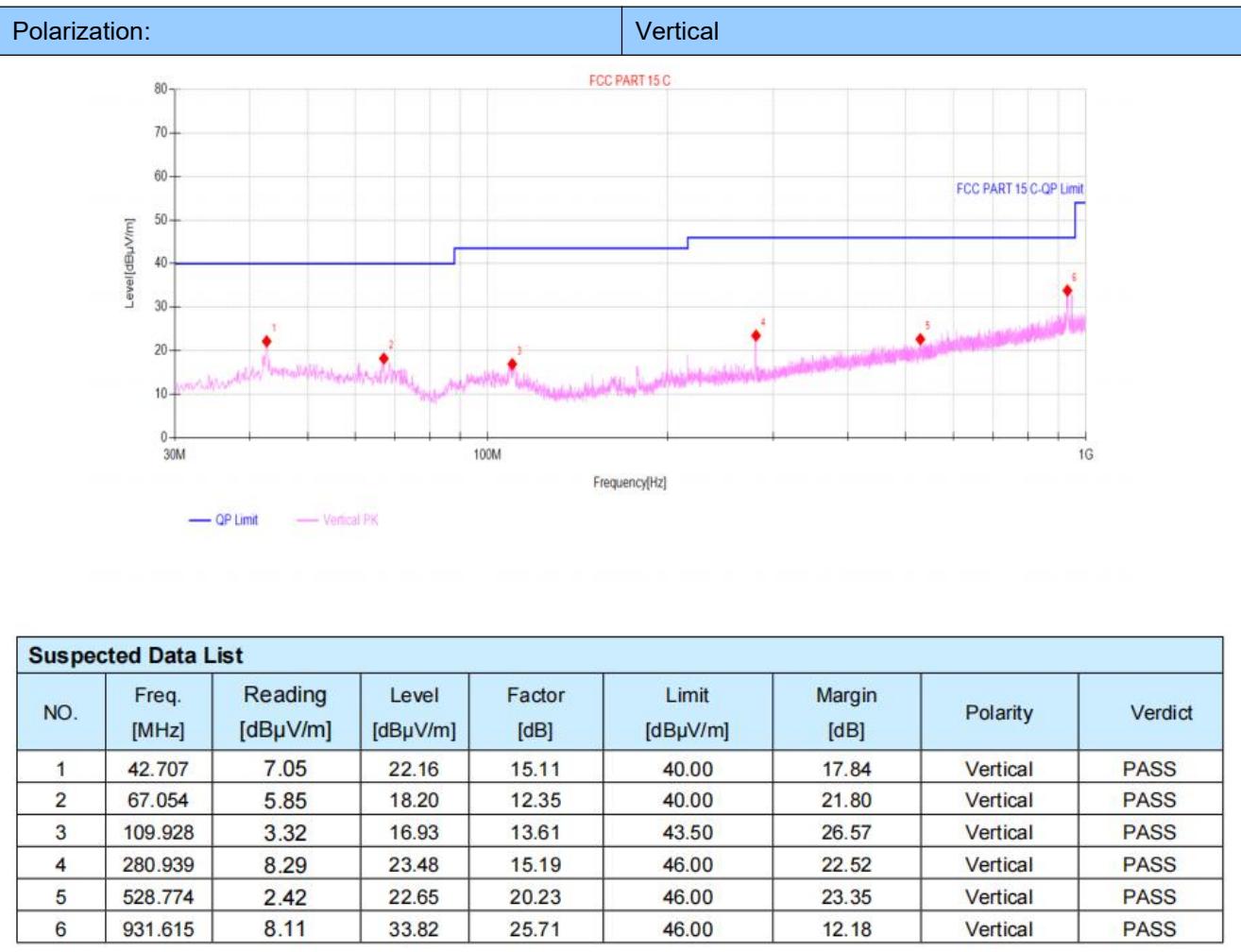
For 9 kHz ~ 30 MHz

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.

For 30 MHz ~ 1000 MHz

Have pre-scan all test channel, found CH1 which it was worst case, so only show the worst case's data on this report.





For 1 GHz ~ 25 GHz

Test channel:2405MHz										
Freq. (MHz)	Reading (dBuv)	Ant. Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)	Level (dBuv)	Limit (dBuV/m)	Margin (dB)	Remark	Polarity
2405.00	92.47	29.18	4.02	38.35	-5.15	87.32	114	26.68	Peak	Horizontal
2405.00	80.72	29.18	4.02	38.35	-5.15	75.57	94	18.43	Average	Horizontal
2405.00	81.26	29.18	4.02	38.35	-5.15	76.11	114	37.89	Peak	Vertical
2405.00	67.12	29.18	4.02	38.35	-5.15	61.97	94	32.03	Average	Vertical
4810.00	69.77	31.33	4.23	38.62	-3.06	66.71	74	7.29	Peak	Horizontal
4810.00	50.62	31.33	4.23	38.62	-3.06	47.56	54	6.44	Average	Horizontal
4810.00	65.75	31.33	4.23	38.62	-3.06	62.69	74	11.31	Peak	Vertical
4810.00	50.34	31.33	4.23	38.62	-3.06	47.28	54	6.72	Average	Vertical

Test channel:2441MHz										
Freq. (MHz)	Reading (dBuv)	Ant. Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)	Level (dBuv)	Limit (dBuV/m)	Margin (dB)	Remark	Polarity
2441.00	92.49	29.23	4.02	38.2	-4.95	87.54	114	26.46	Peak	Horizontal
2441.00	80.88	29.23	4.02	38.2	-4.95	75.93	94	18.07	Average	Horizontal
2441.00	82.84	29.23	4.02	38.2	-4.95	77.89	114	36.11	Peak	Vertical
2441.00	69.04	29.23	4.02	38.2	-4.95	64.09	94	29.91	Average	Vertical
4880.00	70.70	30.26	4.09	38.29	-3.94	66.76	74	7.24	Peak	Horizontal
4880.00	51.89	30.26	4.09	38.29	-3.94	47.95	54	6.05	Average	Horizontal
4880.00	67.41	30.26	4.09	38.29	-3.94	63.47	74	10.53	Peak	Vertical
4880.00	52.33	30.26	4.09	38.29	-3.94	48.39	54	5.61	Average	Vertical

Test channel:2475MHz										
Freq. (MHz)	Reading (dBuv)	Ant. Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)	Level (dBuv)	Limit (dBuV/m)	Margin (dB)	Remark	Polarity
2475.00	94.02	29.2	4.02	38.3	-5.08	88.94	114	25.06	Peak	Horizontal
2475.00	80.96	29.2	4.02	38.3	-5.08	75.88	94	18.12	Average	Horizontal
2475.00	82.51	29.2	4.02	38.3	-5.08	77.43	114	36.57	Peak	Vertical
2475.00	67.34	29.2	4.02	38.3	-5.08	62.26	94	31.74	Average	Vertical
4950.00	63.95	31.97	4.11	38.47	-2.39	61.56	74	12.44	Peak	Horizontal
4950.00	51.52	31.97	4.11	38.47	-2.39	49.13	54	4.87	Average	Horizontal
4950.00	66.69	31.97	4.11	38.47	-2.39	64.30	74	9.70	Peak	Vertical
4950.00	50.08	31.97	4.11	38.47	-2.39	47.69	54	6.31	Average	Vertical

6. TEST SETUP PHOTOS

Please refer to separated files for Test Setup Photos of the EUT.

7. EXTERNAL AND INTERNAL PHOTOS

7.1. External Photos

Please refer to separated files for External Photos of the EUT.

7.2. Internal photos

Please refer to separated files for Internal Photos of the EUT.

-----End of the report-----