

TEST REPORT

Report No. CISRR24040101102

Project No. CISRR240401011

FCC ID 2BFQI-V97

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 V97

Listed Model(s) V97S

Standard Part 15 Subpart C Section 15.249

Test date April 01, 2024 ~ May 08, 2024

Issue date May 09, 2024

Test result Complied

Kory Awang

GenryLong

Prepared by: Rory Huang

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	May 09, 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.:	V97	
Listed Model(s):	V97S	
Power supply: Input:DC 5V DC 3.7V from Battery		
Hardware version:	V1.0	
Software version:	V1.0	

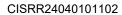
3.2. Radio Specification Description

Technology:	2.4G
Modulation:	GFSK
Operation frequency:	2402MHz~2480MHz
Channel number:	16
Antenna type:	PCB Antenna
Antenna gain:	1.3dBi



Channel list:

1CH	2402 MHz
2CH	2426 MHz
3CH	2440MHz
4CH	2463 MHz
5CH	2407 MHz
6CH	2422 MHz
7CH	2445 MHz
8CH	2466 MHz
9CH	2414 MHz
10CH	2436 MHz
11CH	2459 MHz
12CH	2473 MHz
13CH	2419 MHz
14CH	2439 MHz
15CH	2453 MHz
16CH	2480 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 (dBuV/m) = RA (dBuV) + AF (dB/m) + CL (dB) - AG (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 (dBuV) = RA (dBuV) + PL (dB) + CL (dB)

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

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4. TEST CONFIGURATION

4.1. Test frequency list

Channel	Frequency (MHz)
CH-L	2402
CH-M	2440
CH-H	2480

4.2. Test mode

For RF test items:

The engineering prototype is provided with key switching channel to realize EUT continuous transmission..Power setting Default.

Test Item	Modulation
Conducted test item	GFSK
Radiated test item	GFSK

Remark:

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

Туре	sample no.		
Engineer sample	CISR240401011-1#		
Normal sample	CISR240401011-2#		

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The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis)
data recorded in the report.



4.5. Testing environmental condition

Туре	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
	Nadiated Band Edge Emission	3.80dB for above 1GHz
9	Padiated Spurious Emission	3.76dB for 30MHz-1GHz
9	Radiated Spurious Emission	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	1	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	1	2024.01.08	1Year
6dB Attenuator	SKET	DC-6G	1	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

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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 response-ble 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 antenna type is a PCB antenna, Refer to the below 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.

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5.2. AC Conducted Emission

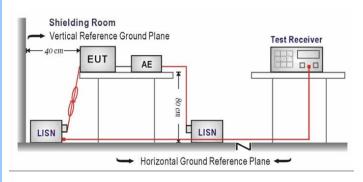
Limit:

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Fraguency range (MHz)	Limit (dBuV)		
Frequency range (MHz)	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)
- 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 4.3

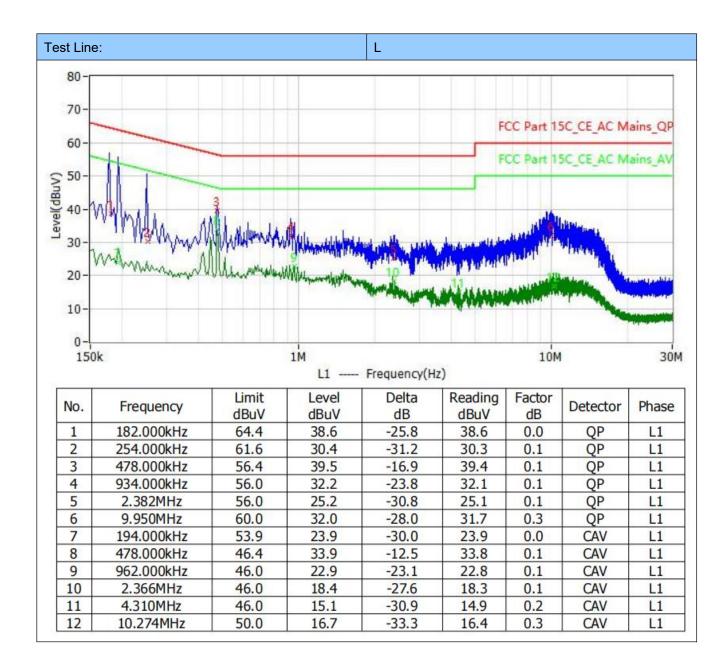
Result:

Passed

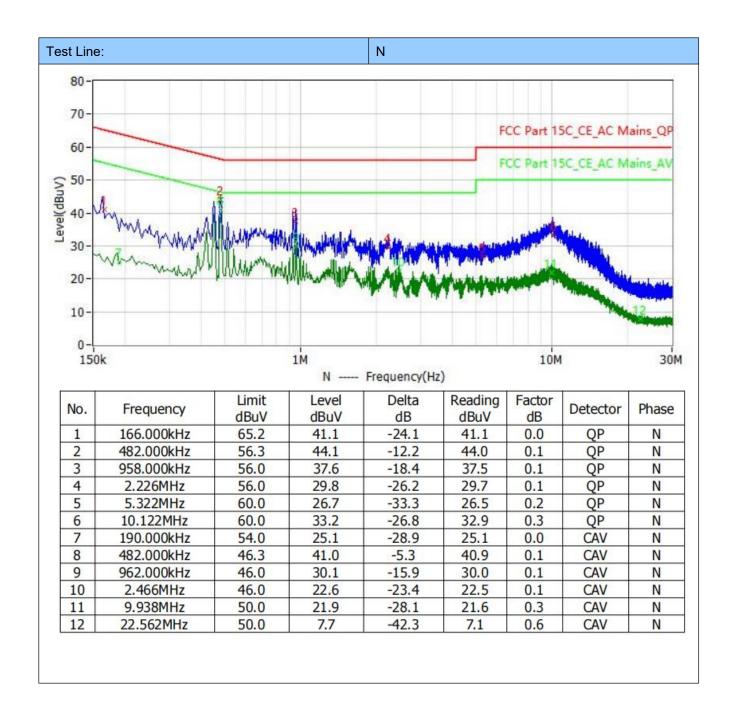
Note:

- 1. Factor = LISN Factor + Cable Factor
- 2. Level= Reading + Factor
- 3. Delta= Level Limit







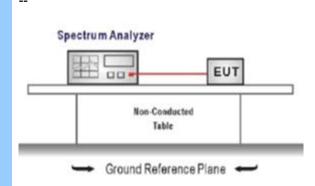




5.3. 20 dB Bandwidth

Limit:

Test configuration:



Test procedure:

- The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
- Set to the maximum power setting and enable the EUT transmit continuously
- Use the following spectrum analyzer settings:
 Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ 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 4.3

Result:

Passed









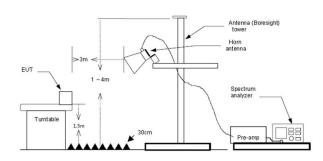
5.4. Radiated Band edge Emission

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.
- 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.
- 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
 For average measurement: use duty cycle correction factor method (DCCF)

Averager level = Peak level + DCCF

Test mode:

Refer to the clause 4.3

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 chan	Test channel:CH01										
Freq. (MHz)	Reading (dBuv)	Ant. Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Remark	Polarity		
2390.00	68.02	28.62	4.08	38.62	-5.92	74	11.90	Peak	Horizontal		
2390.00	49.80	28.62	4.08	38.62	-5.92	54	10.12	Average	Horizontal		
2390.00	70.50	28.62	4.08	38.62	-5.92	74	9.42	Peak	Vertical		
2390.00	51.16	28.62	4.08	38.62	-5.92	54	8.76	Average	Vertical		

Test chan	Test channel:CH16									
Freq. (MHz)	Reading (dBuv)	Ant. Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Remark	Polarity	
2483.50	68.96	29.45	3.91	40.17	-6.81	74	11.85	Peak	Horizontal	
2483.50	48.92	29.45	3.91	40.17	-6.81	54	11.89	Average	Horizontal	
2483.50	67.21	29.45	3.91	40.17	-6.81	74	13.60	Peak	Vertical	
2483.50	51.70	29.45	3.91	40.17	-6.81	54	9.11	Average	Vertical	



5.5. Radiated Spurious Emission

Limit:

FCC CFR Title 47 Part 15 Subpart C Section 15.209

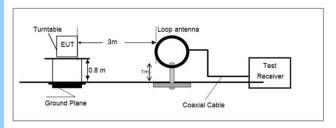
Frequency	Limit (dBuV/m)	Value
0.009 MHz ~0.49 MHz	2400/F(kHz) @300m	Quasi-peak
0.49 MHz ~ 1.705 MHz	24000/F(kHz) @30m	Quasi-peak
1.705 MHz ~30 MHz	30 @30m	Quasi-peak

Limit dBuV/m @3m = Limit dBuV/m @300m + 40*log(300/3 Limit dBuV/m @3m = Limit dBuV/m @30m +40*log(30/3)

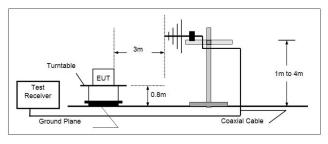
Frequency	Limit (dBuV/m @3m)	Value
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
Above IGHZ	74.00	Peak

Test configuration:

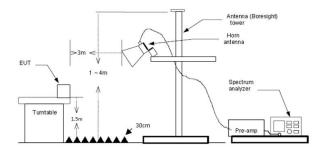
9kHz~30MHz

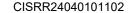


30 MHz ~ 1 GHz



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

For average measurement: use duty cycle correction factor method (DCCF)

Averager level = Peak level + DCCF

Test mode:

Refer to the clause 4.3

Result:

Passed

Note:

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

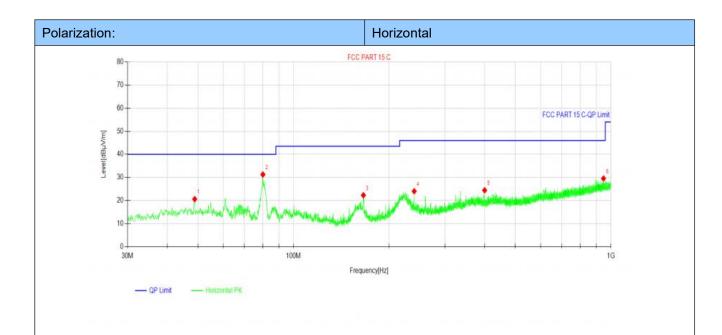
For 9 kHz ~ 30 MHz

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

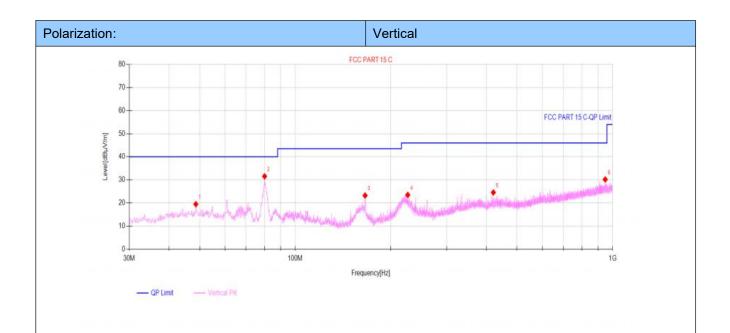
Have pre-scan all test channel, found CH1 which it was worst case, so only show the worst case's data on this report.



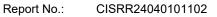


NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity	Verdict
1	48.818	20.63	15.52	40.00	19.37	Horizontal	PASS
2	80.052	31.27	9.69	40.00	8.73	Horizontal	PASS
3	165.994	22.30	11.04	43.50	21.20	Horizontal	PASS
4	240.005	24.05	14.40	46.00	21.95	Horizontal	PASS
5	400.055	24.45	17.96	46.00	21.55	Horizontal	PASS
6	947.62	29.54	25.82	46.00	16.46	Horizontal	PASS





NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Polarity	Verdict
1	48.624	19.50	15.52	40.00	20.50	Vertical	PASS
2	80.052	31.55	9.69	40.00	8.45	Vertical	PASS
3	165.994	23.25	11.04	43.50	20.25	Vertical	PASS
4	226.231	23.49	14.11	46.00	22.51	Vertical	PASS
5	420.813	24.57	18.19	46.00	21.43	Vertical	PASS
6	947.523	30.20	25.82	46.00	15.80	Vertical	PASS





For 1 GHz ~ 25 GHz

Field	Strength of Funda	mental	2402MHz			
Frequency (MHz)	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Polarity	
2402.00	90.88	78.24	114	94	Horizontal	
2402.00	81.05	67.22	114	94	Vertical	

Test channel:2402MHz															
Freq. (MHz)	Reading Fa		Ant. Factor (dB/m)	Cal Fac (dl	ctor amplifier		F	rrection actor dB/m)	Limit (dBuV/m)		Margin (dB)	Remark		Polarity	
4804.00	69.52 31.3		31.33	4.2	23	38.62		-3.06 74			7.54	Peak		Horizontal	
4804.00	51.38	1.38 31.33		4.2	23	38.62		-3.06	54		5.68	Aver	age	Horizontal	
4804.00	65.62	2	31.33	4.2	23	38.62		-3.06	74		11.44	Pe	ak	Vertical	
4804.00	50.7	50.75 31.33		4.2	23	38.62		-3.06	54		6.31	Aver	age	Vertical	
	Field Strength of Fundamental							2440MHz							
Frequency (MHz)			easure Re PK, dBuV/			easure Resi VG, dBuV/n		Peak Limit (dBuV/m)			AVG Limit (dBuV/m)			Polarity	
2440.00			92.91			79.86		114			94		Horizontal		
2440.00			82.67			68.06		114			94		Vertical		

Test channel:2440MHz											
Freq. (MHz)	Reading (dBuv)	Ant. Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Remark	Polarity		
4880.00	70.82	30.26	4.09	38.29	-3.94	74	7.12	Peak	Horizontal		
4880.00	50.58	30.26	4.09	38.29	-3.94	54	7.36	Average	Horizontal		
4880.00	65.98	30.26	4.09	38.29	-3.94	74	11.96	Peak	Vertical		
4880.00	51.73	30.26	4.09	38.29	-3.94	54	6.21	Average	Vertical		

Field S	Strength of Fundar	mental	2480MHz					
Frequency (MHz)	Measure Result (PK, dBuV/m)	Measure Result (AVG, dBuV/m)	Peak Limit (dBuV/m)	AVG Limit (dBuV/m)	Polarity			
2480.00	94.22	81.89	114	94	Horizontal			
2480.00	83.92	67.48	114	94	Vertical			

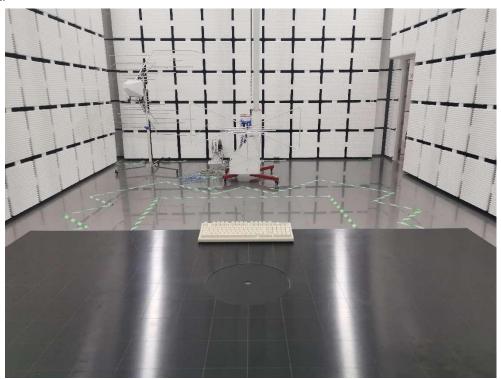
Test channel:2480MHz											
Freq. (MHz)	Reading (dBuv)	Ant. Factor (dB/m)	Cable Factor (dB)	Pre- amplifier (dB)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Remark	Polarity		
4960.00	62.87	31.97	4.11	38.47	-2.39	74	13.52	Peak	Horizontal		
4960.00	51.26	31.97	4.11	38.47	-2.39	54	5.13	Average	Horizontal		
4960.00	67.19	31.97	4.11	38.47	-2.39	74	9.20	Peak	Vertical		
4960.00	49.32	31.97	4.11	38.47	-2.39	54	7.07	Average	Vertical		

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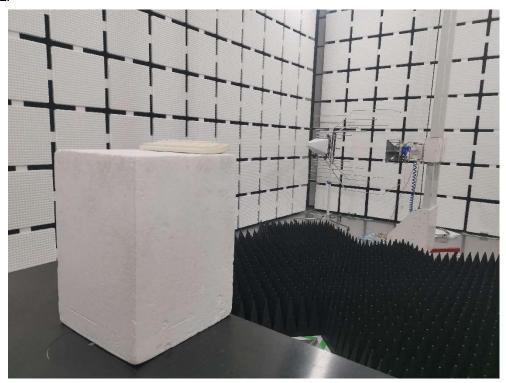


6. TEST SETUP PHOTOS

Radiated Emission Below 1GHz:

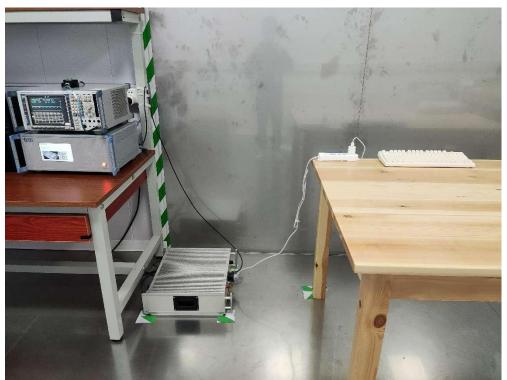


Above 1GHz:





AC Conducted Emission:





7. EXTERNAL AND INTERNAL PHOTOS

Please refer to the Report: CISRR24040101101

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