REPORT No.: SZ23060013W01

TEST REPORT

APPLICANT	:	Shenzhen Xhorse Electronics Co., Ltd.
PRODUCT NAME	:	KEY TOOL LITE
MODEL NAME	:	XDKML0
BRAND NAME	:	Xhorse
FCC ID	:	2AI4T-XDKML0
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2023-06-09
TEST DATE	:	2023-06-16 to 2023-07-10
ISSUE DATE	:	2023-08-15

Edited by: Su xiaoxian

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DIRECTORY

Change History		
Version	**Date**	**Reason for change**
1.0	2023-08-15	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Shenzhen Xhorse Electronics Co., Ltd.
Applicant Address:	Floor 28, Block A, Building NO.6, international innovation Valley, Nanshan District, Shenzhen
Manufacturer:	Shenzhen Xhorse Electronics Co., Ltd.
Manufacturer Address:	Floor 28, Block A, Building NO.6, international innovation Valley, Nanshan District, Shenzhen

1.2. Equipment Under Test (EUT) Description

Product Name:	KEY TOOL LITE
Sample No.:	1#, 4#
Hardware Version:	VN10V06
Software Version:	V149
Operating Frequency:	13.56 MHz
Modulation Type:	ASK
Antenna Type:	FPC Antenna

Note 1: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15 (10-1-15 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result	Method Determination /Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	No deviation
2	15.207	Conducted Emission	N/A	N/A	N/A$_{Note1}$	N/A
3	15.209 15.225(a)(b)(c)(d)	Radiated Emission	Jun. 26, 2023	Lin Hanbin	PASS	No deviation
4	15.225(e)	Frequency Tolerance	Jun. 19, 2023	Zhong Yanshan	PASS	No deviation
5	15.215(c)	20 dB Bandwidth	Jul. 06, 2023	Lin Hanbin	PASS	No deviation

Note 1: Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.
Note 2: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013. The EUT has been tested under continuous operating condition.
Note 3: Additions to, deviation, or exclusions from the method shall be judged in the “method determination” column of add, deviate or exclude from the specific method shall be explained in the “Remark” of the above table.
Note 4: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

1.4. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15–35
Relative Humidity (%):	30–60
Atmospheric Pressure (kPa):	86–106

2. 47 CFR Part 15C Requirements

2.1. Antenna Requirement

2.1.1. Applicable Standard

According to FCC 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.

2.1.2. Test Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2. Conducted Emission

2.2.1. Test Requirement

According to FCC section 15.207, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH /50 Ω line impedance stabilization network (LISN).

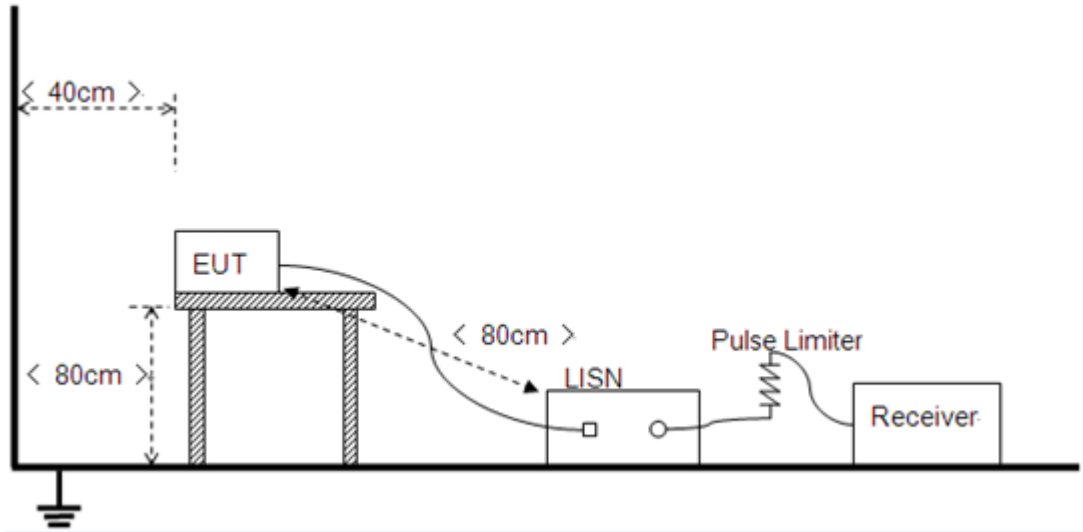
Frequency Range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15–0.50	66 to 56	56 to 46
0.50–5	56	46
5–30	60	50

NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

2.2.2. Test Setup



The EUT is placed on a 0.8 m high insulating table, which stands on the grounded conducting floor, and keeps 0.4 m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides 50 Ω/50 μH of coupling impedance for the measuring instrument. A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

2.2.3. Test Result

This test case does not apply this kind of EUT.

2.3. Radiated Emission

2.3.1. Test Requirement

Radiated Emission <30 MHz (9 kHz–30 MHz, E-field)

According to FCC section 15.225, for <30 MHz, Radiated emissions were measured according to ANSIC63.4. The EUT was set to transmit at the highest output power. The EUT was set 30 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the center of the loop. The measuring bandwidth was set to 10 KHz. (Note: During testing the receive antenna was rotated about its axis to maximize the emission from the EUT)

There was no detected Restricted bands and Radiated Spurious emission below 30 MHz. The 30 m limit was converted to 3 m Limit using square factor(x) as it was found by measurements as follows;

3 m Limit (dBuV/m) = 20 log(X) + 40 log(30/3) = 20 log(15848) + 40 log(30/3) = 124 dBuV

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency Range (MHz)	Field Strength@30 m		Field Strength@3 m
	μV/m	dBμV/m	dBμV/m
Below 13.110	30	29.5	69.5
13.110–13.410	106	40.5	80.5
13.410–13.553	334	50.5	90.5
13.553–13.567	15.848	84	124
13.567–13.710	334	50.5	90.5
13.710–14.010	106	40.5	80.5
Above 14.010	30	29.5	69.5

NOTE: a) Field Strength (dBμV/m) = 20 * log[Field Strength (μV/m)].

b) In the emission tables above, the tighter limit applies at the band edges.

Radiated Emission >30 MHz (30 MHz–1 GHz, E-field)

According to FCC section 15.205, the field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

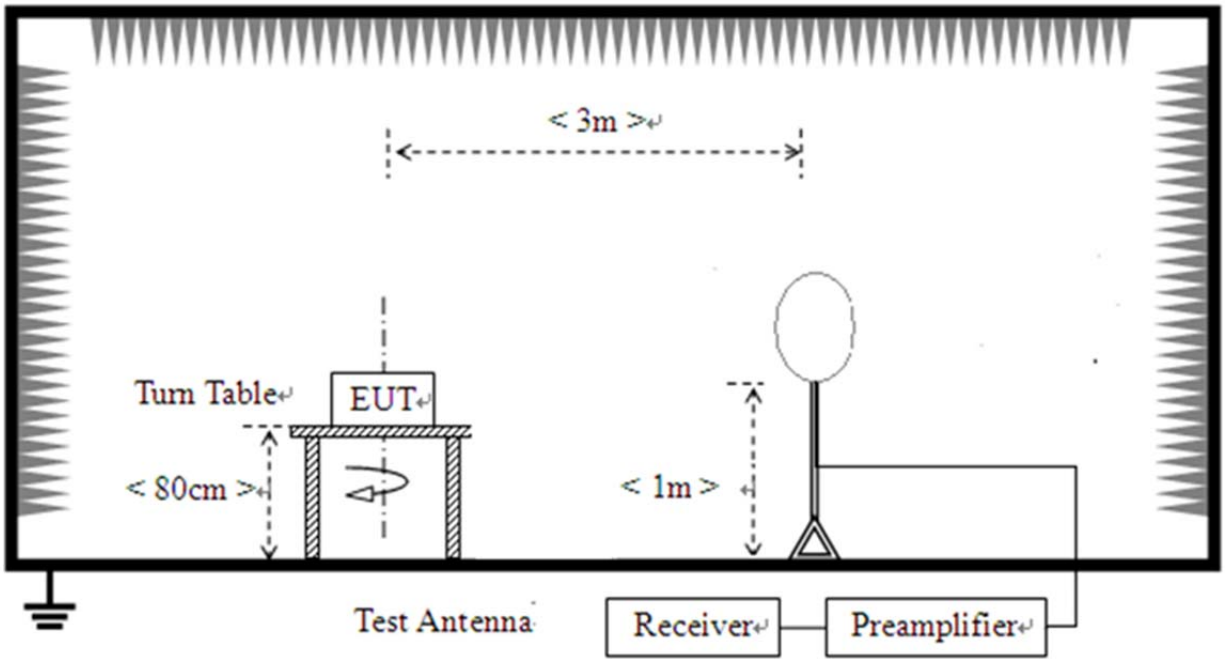
Frequency Range (MHz)	Field Strength	
	μV/m	dBμV/m
30–88	100	40
88–216	150	43.5
216–960	200	46
Above 960	500	54

NOTE: a) Field Strength (dBμV/m) = 20 * log[Field Strength (μV/m)].

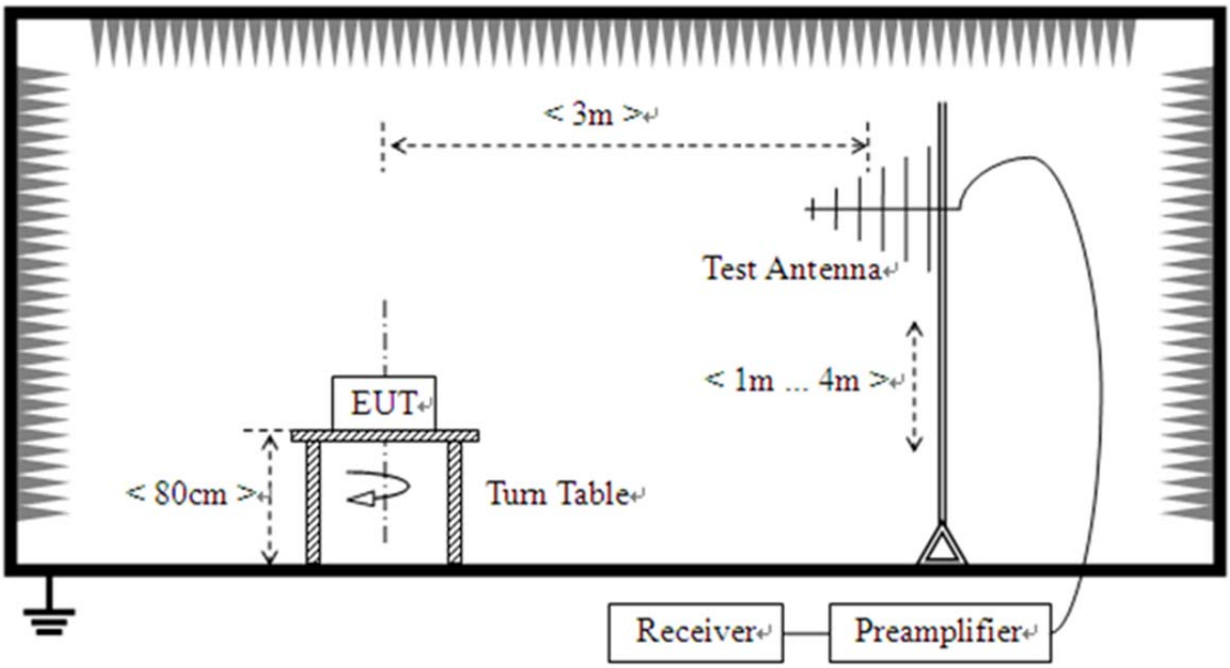
b) In the emission tables above, the tighter limit applies at the band edges.

2.3.2. Test Setup

1) For radiated emissions below 30MHz



2) For radiated emissions from 30 MHz to1 GHz



The test is performed in a 3 m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8 m high

insulating. Turn Table, and keeps 3 m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1 m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

In the frequency range above 30 MHz, Bi-Log Test Antenna (30 MHz to 1 GHz) was used. Test Antenna is 3 m away from the EUT. Test Antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

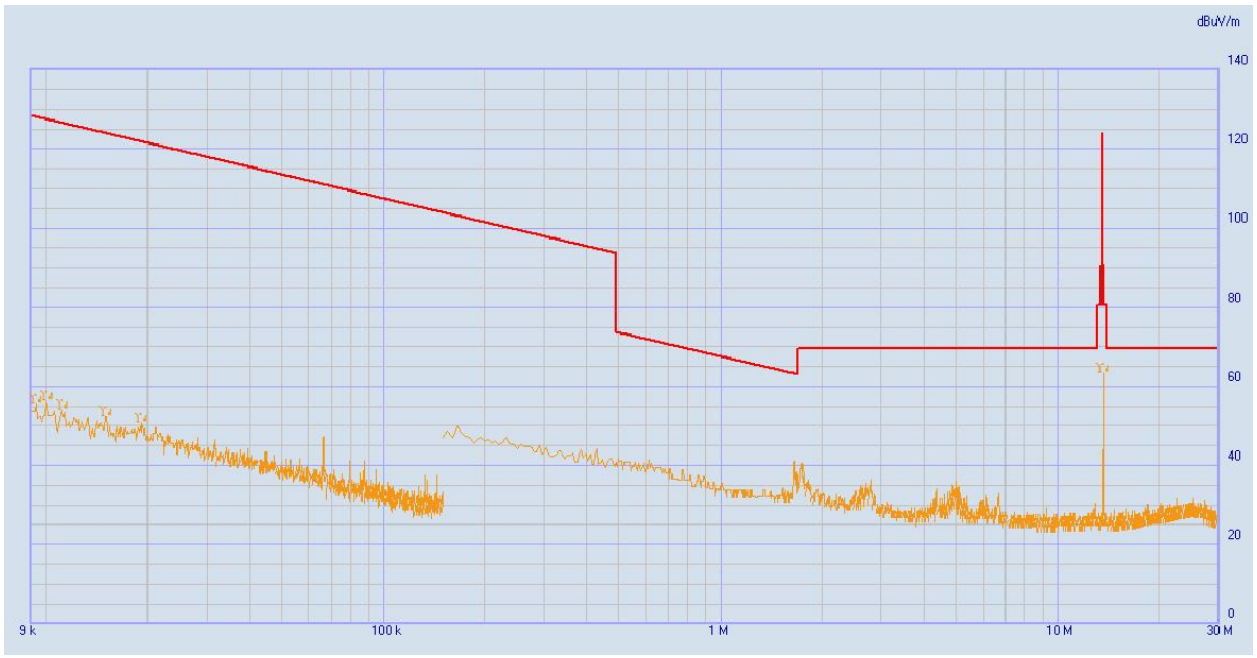
For measurements below 30 MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz–90 kHz, 110 kHz–490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector. For measurements frequency range from 0.009 MHz to 0.15 MHz, the resolution bandwidth is set to 200 Hz. For measurements frequency range from 0.15 MHz to 30 MHz the resolution bandwidth is set to 9 kHz.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

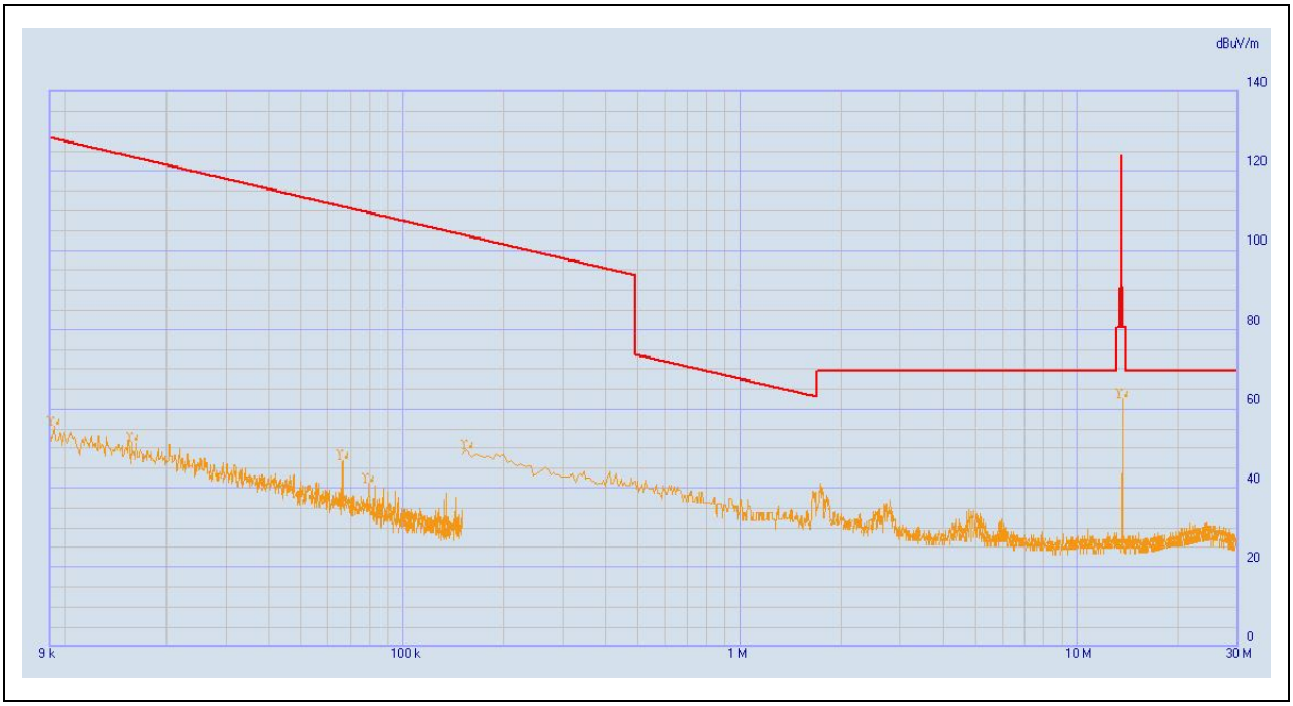
2.3.3. Test Result

A. Radiated Emission <30 MHz (9kHz–30 MHz, parallel)



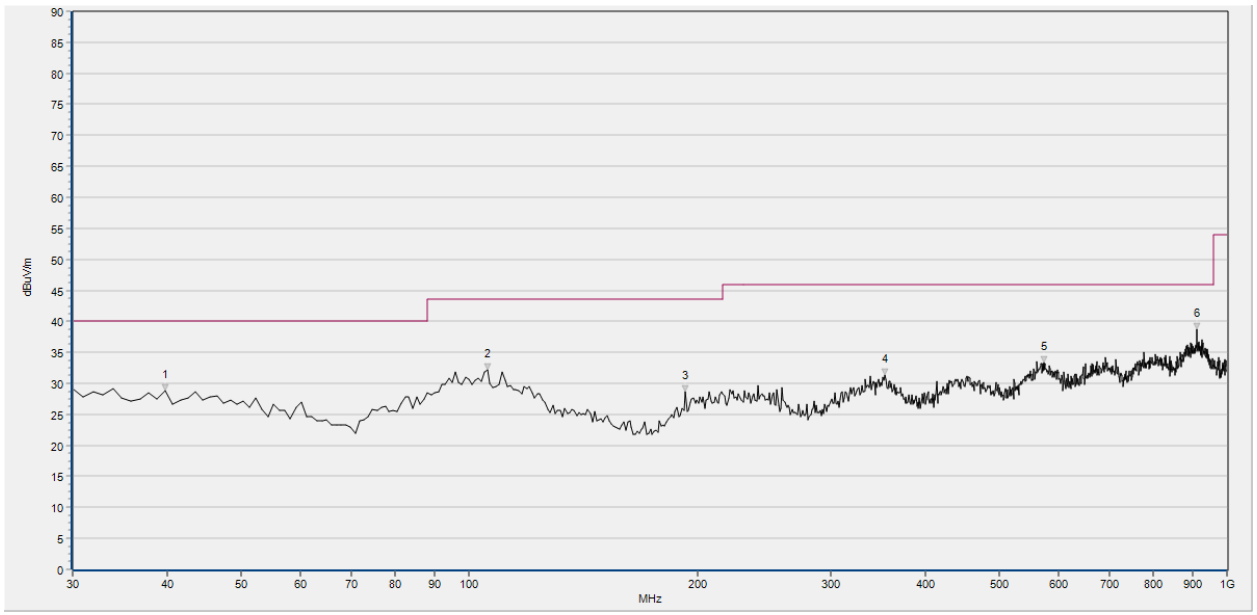
No.	Frequency (MHz)	Detector Type	Level at 3 m (dBμV/m)	Limit at 3 m (dBμV/m)
1	0.0093	Quasi Peak	55.52	128.23
2	0.01	Quasi Peak	56.18	127.60
3	0.0111	Quasi Peak	54.00	126.70
4	0.015	Quasi Peak	52.33	124.08
5	0.0191	Quasi Peak	50.75	121.98
6	13.56	Quasi Peak	63.31	124.0

B. Radiated Emission <30 MHz (9 kHz–30 MHz, perpendicular)



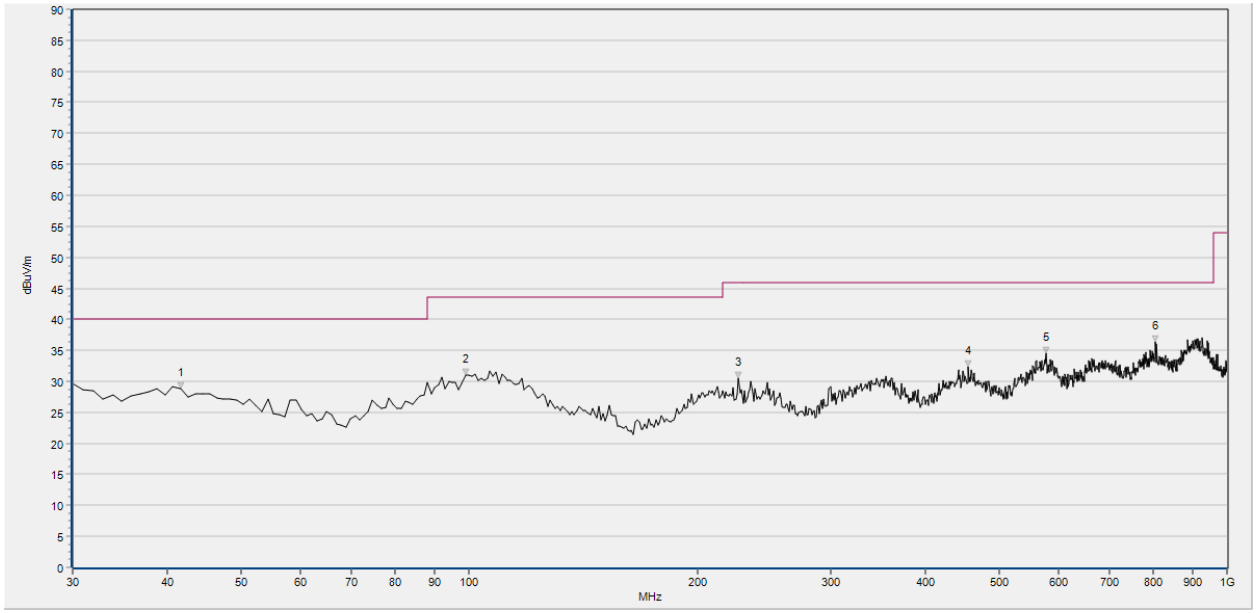
No.	Frequency (MHz)	Detector Type	Level at 3 m (dBµV/m)	Limit at 3 m (dBµV/m)
1	0.0092	Quasi Peak	55.57	128.33
2	0.0157	Quasi Peak	51.55	123.69
3	0.0661	Quasi Peak	47.10	111.20
4	0.0789	Quasi Peak	41.16	109.66
5	0.155	Quasi Peak	49.69	103.80
6	13.56	Quasi Peak	62.43	124.0

C. Radiated Emission >30 MHz (30 MHz–1 GHz)



(30 MHz–1 GHz, Test Antenna Horizontal)

No.	Fre. MHz	Pk dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	39.700	28.75	N/A	N/A	N/A	40.00	N/A	H	PASS
2	105.660	32.22	N/A	N/A	N/A	43.50	N/A	H	PASS
3	192.960	28.72	N/A	N/A	N/A	43.50	N/A	H	PASS
4	353.980	31.36	N/A	N/A	N/A	46.00	N/A	H	PASS
5	573.200	33.36	N/A	N/A	N/A	46.00	N/A	H	PASS
6	912.700	38.66	N/A	N/A	N/A	46.00	N/A	H	PASS



(30 MHz–1 GHz, Test Antenna Vertical)

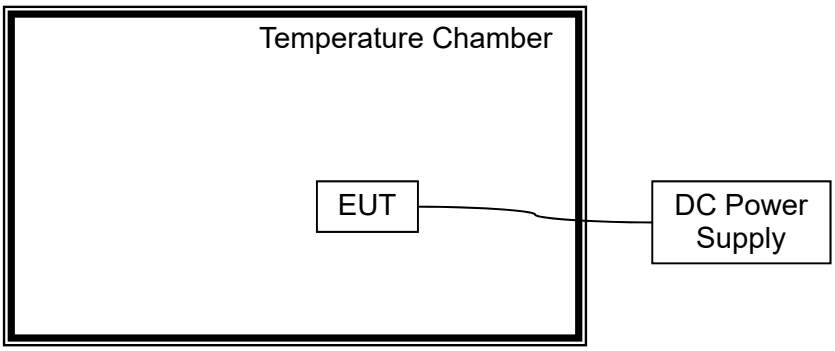
No.	Fre. MHz	Pk dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	41.640	28.81	N/A	N/A	N/A	40.00	N/A	V	PASS
2	98.870	30.92	N/A	N/A	N/A	43.50	N/A	V	PASS
3	226.910	30.47	N/A	N/A	N/A	46.00	N/A	V	PASS
4	455.830	32.34	N/A	N/A	N/A	46.00	N/A	V	PASS
5	577.080	34.58	N/A	N/A	N/A	46.00	N/A	V	PASS
6	805.030	36.39	N/A	N/A	N/A	46.00	N/A	V	PASS

2.4. Frequency Tolerance

2.4.1. Test Requirement

According to FCC section 15.225, the devices operating in the 13.553–13.567 MHz shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20°C to +50°C using an environmental chamber. The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

2.4.2. Test Setup



The EUT, which is powered by the DC Power Supply directly, is located in the Temperature Chamber. The EUT was measured by transmitter mode continuously.

2.4.3. Test Result

Operating Frequency: 13,560,000 Hz
Deference Voltage: 5.0 V
Deviant Limit: ±0.01%

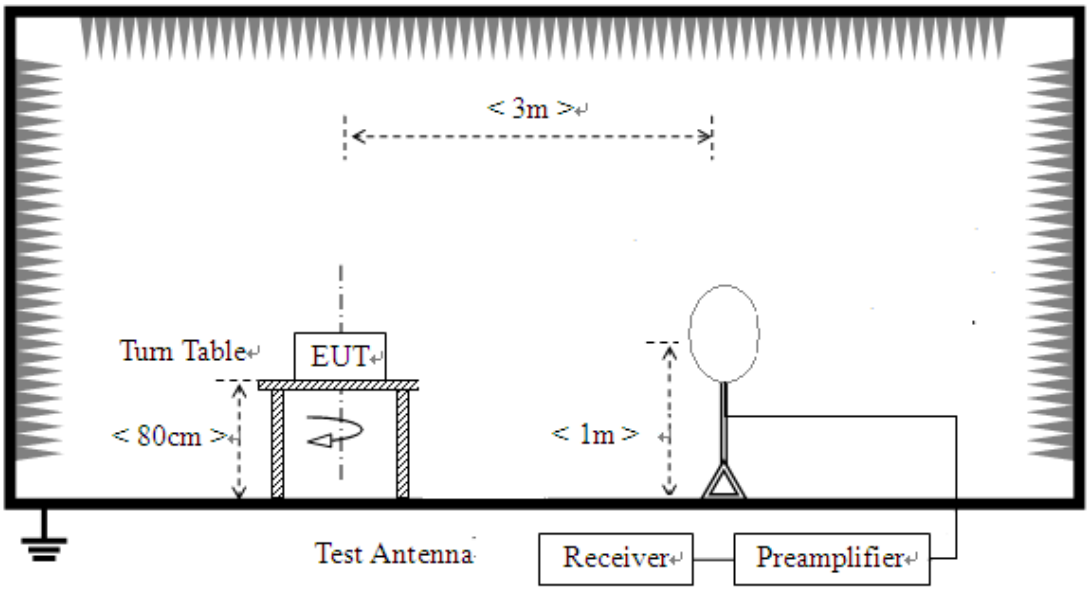
VOLTAGE (%)	Test Conditions		Fre. Dev. (Hz)	Deviation (%)	Verdict
	Power (VDC)	Temperature (°C)			
100	5.0	0	188	0.00139	
100		+10	155	0.00114	
100		+20	153	0.00113	
100		+25	141	0.00104	
100		+30	148	0.00109	
100		+40	152	0.00112	
100		+45	164	0.00121	
85	4.5	+20	172	0.00127	
115	5.5	+20	169	0.00125	

2.5. 20 dB Bandwidth

2.5.1. Standard Applicable

According to FCC section 15.215(c), the 20 dB bandwidth should be contained within the frequency band designated in the rule section under which the EUT is operated, it was measured with a spectrum analyzer connected the EUT while the EUT is operating in transmission mode.

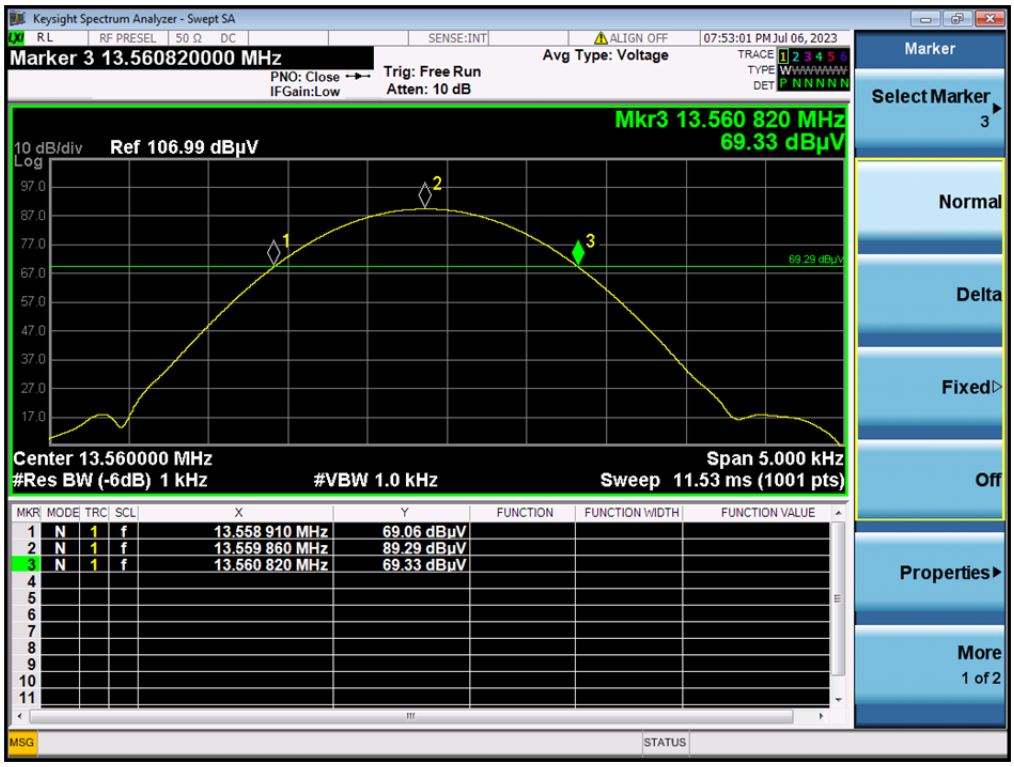
2.5.2. Test Setup



2.5.3. Test Result

Centre Frequency (MHz)	Measurement		Limit		Verdict
	20 dB Bandwidth (kHz)	Frequency Range (MHz)	20 dB Bandwidth (kHz)	Frequency Range(MHz)	
13.56	1.91	13.55891 to 13.56082	14	13.553 to 13.567	PASS

1



Annex A Test Uncertainty

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in Measurement” (GUM) published by ISO.

Radiated Emission:	±3.1 dB
Conducted Emission:	±1.8 dB
Bandwidth:	±5%
Frequency Tolerance:	±5%

Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.

4. Test Equipments Utilized

4.1 Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY54130016	N9038A	Agilent	2022.07.06	2023.07.05
				2023.06.21	2024.06.20
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2022.05.25	2025.05.24
Test Antenna - Loop	1520-022	FMZB1519	Schwarzbeck	2022.02.11	2025.02.10
Anechoic Chamber	N/A	9m*6m*6m	CRT	2022.05.10	2025.05.09
DC Power Supply	1709D361010	IV3610	IVYTECH	2022.10.10	2023.10.09
Temperature Chamber	12108015	DTL-003S101	YOMA	2022.10.10	2023.10.09

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2023.02.09	2024.02.08
LISN	8127449	NSLK 8127	Schwarzbeck	2023.02.21	2024.02.20
Pulse Limiter (10 dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2022.07.06	2023.07.05
				2023.06.27	2024.06.26
RF Coaxial Cable (DC-100 MHz)	BNC	MRE04	Qualwave	N/A	N/A

4.3 Test Software Utilized

Model	Software Version	Manufacturer
MORLAB EMCR V1.2	Version 1.0	MORLAB
PMM Emission Suite	Version 2.02	narda

END OF REPORT