


TEST REPORT

For RF

Report No.: **CHTEW22060107** **Report verification:** 
Project No.: **SHT2205024705EW**
FCC ID: **2AJ9T-20805**
Applicant's name: **ZKTECO CO., LTD.**
Address: No.32, Pingshan Industrial Avenue, Tangxia Town, Dongguan City, Guangdong Province, China 523728
Product Name: **Smart Access Control Terminal**
Trade Mark: -
Model No.: ProFace X(DS)
Listed Model(s): ProFace X(CH/DS)
Standard: **FCC CFR Title 47 Part 15 Subpart C Section 15.225**
Date of receipt of test sample: May 13, 2022
Date of testing: May 13, 2022- Jun.15, 2022
Date of issue: Jun.16, 2022
Result: **PASS**

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Kiki Kong

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Hans Hu

Testing Laboratory Name: **Shenzhen Huatongwei International Inspection Co., Ltd.**
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The test report merely correspond to the test sample.

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1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:

[FCC Rules Part 15.225](#): Operation within the band 13.110-14.010 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices.

1.2. Report version information

Revision No.	Date of issue	Description
N/A	2022-06-16	Original

2. TEST DESCRIPTION

Report clause	Test Items	Standard Requirement	Result	Test Engineer
5.1	Antenna requirement	15.203	PASS	Yifan Wang
5.2	AC Power Conducted Emissions	15.207	PASS	Hongtao Meng
5.3	Field Strength of the Fundamental and Mask Measurement	15.225(a)(b)(c)	PASS	Yifan Wang
5.4	20dB Bandwidth	15.215	PASS	Yifan Wang
5.5	Radiated Spurious Emission	15.225(d)&15.209	PASS	Dongyang Wu
5.6	Frequency Stability	15.225(e)	PASS	Yifan Wang

Note: The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Client Information

Applicant:	ZKTECO CO., LTD.
Address:	No.32,Pingshan Industrial Avenue,Tangxia Town,Dongguan City,Guangdong Province,China 523728
Manufacturer:	ZKTECO CO., LTD.
Address:	No.32,Pingshan Industrial Avenue,Tangxia Town,Dongguan City,Guangdong Province,China 523728

3.2. Product Description

Main unit information:	
Product Name:	Smart Access Control Terminal
Trade Mark:	-
Model No.:	ProFace X(DS)
Listed Model(s):	ProFace X(CH/DS)
Power supply:	AC 120V
Hardware version:	V1.4
Software version:	V1.1.2
Accessory unit information:	
Adapter information:	Model: ADS-40SI-12-3 12036E Input: 100-240Va.c.,50/60Hz 1.0A max Output:12.0Vd.c.,3.0A 36.0W

3.3. Radio Specification Description

Modulation:	ASK
Operation frequency:	13.56MHz
Channel number:	1

3.4. Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China	
Connect information:	Phone: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn	
Qualifications	Type	Accreditation Number
	FCC	762235

4. TEST CONFIGURATION

4.1. Test mode

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit.
For AC power line conducted emissions:
The engineering test program was provided and enabled to make EUT continuous transmit.
For Radiated spurious emissions test item:
The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data Recorded in the report.

4.2. Test sample information

Test item	HTW sample no.
RF Radiated test items	YPHT22050247002
EMI test items	YPHT22050247001

Note:

RF Radiated test items: Field Strength of the Fundamental and Mask Measurement, 20dB Bandwidth, Radiated Spurious Emission, Frequency Stability

EMI test items : AC Power Conducted Emissions

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:

Whether support unit is used?			
✓ No			
Item	Equipement	Trade Name	Model No.
1			
2			

4.4. Testing environmental condition

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

4.5. Statement of the measurement uncertainty

Test Items	Measurement Uncertainty
AC Power Conducted Emissions	3.00 dB
Radiated emissions below 1GHz	4.36 dB
Radiated emissions above 1GHz	5.10 dB
Occupied Bandwidth	70Hz for <1GHz 130Hz for >1GHz

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

4.6. Equipments Used during the Test

● Conducted Emission							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Shielded Room	Albatross projects	HTWE0114	N/A	N/A	2018/09/28	2023/09/27
●	EMI Test Receiver	R&S	HTWE0111	ESCI	101247	2021/09/14	2022/09/13
●	Artificial Mains	SCHWARZBECK	HTWE0113	NNLK 8121	573	2021/09/17	2022/09/16
●	Pulse Limiter	R&S	HTWE0193	ESH3-Z2	101447	2021/09/16	2022/09/15
●	RF Connection Cable	HUBER+SUHNER	HTWE0113-02	ENVIROFLEX 142	EF-NM-BNCM-2M	2021/09/17	2022/09/16
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-6th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0127	SAC-3m-02	C11121	2018/09/30	2022/09/29
●	EMI Test Receiver	R&S	HTWE0099	ESCI	100900	2021/09/14	2022/09/13
●	Loop Antenna	R&S	HTWE0170	HFH2-Z2	100020	2021/04/06	2024/04/05
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0123	VULB9163	538	2021/04/06	2024/04/05
●	Pre-Amplifier	SCHWARZBECK	HTWE0295	BBV 9742	N/A	2021/11/05	2022/11/04
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-01	N/A	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-02	SUCOFLEX104	501184/4	2022/02/25	2023/02/24
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-7th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0122	SAC-3m-01	C11121	2018/09/27	2022/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2021/09/13	2022/09/12
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Broadband Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	BBHA9170472	2020/04/27	2023/04/26
●	Pre-amplifier	CD	HTWE0071	PAP-0102	12004	2021/11/05	2022/11/04
●	Broadband Pre-amplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2022/02/28	2023/02/27
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-01	6m 18GHz S Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-02	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0119-05	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-04	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	Test Software	Audix	N/A	E3	N/A	N/A	N/A

● RF Conducted Method						
Used	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Signal and spectrum Analyzer	R&S	FSV40	100048	2021/09/13	2022/09/12
●	Spectrum Analyzer	Agilent	N9020A	MY50510187	2021/09/13	2022/09/12
●	Power Meter	Anritsu	ML249A	N/A	2021/09/13	2022/09/12
○	Radio communication tester	R&S	CMW500	137688-Lv	2021/09/13	2022/09/12

5. TEST CONDITIONS AND RESULTS

5.1. Antenna requirement

Requirement

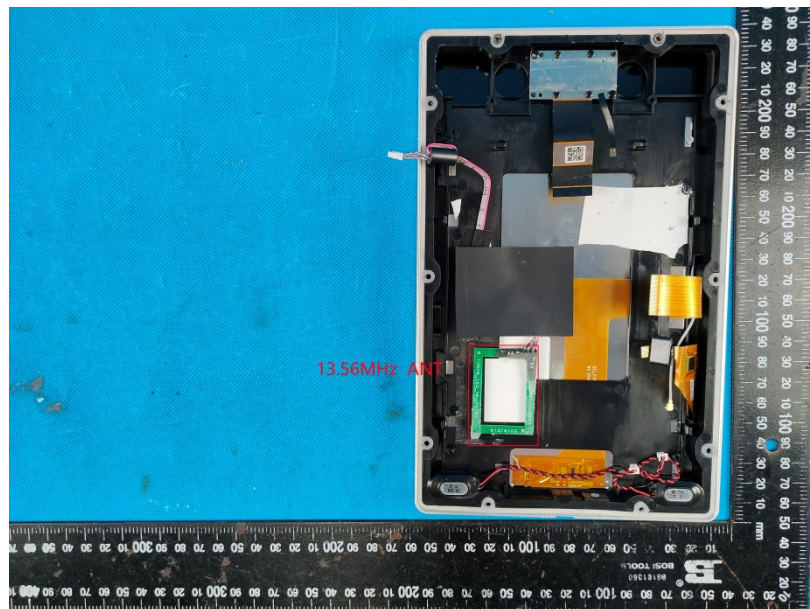
FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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.

TEST RESULT

☒ **Passed** ☐ **Not Applicable**

The antenna type is a PCB antenna, please refer to the below antenna photo.



5.2. AC Power Conducted Emissions

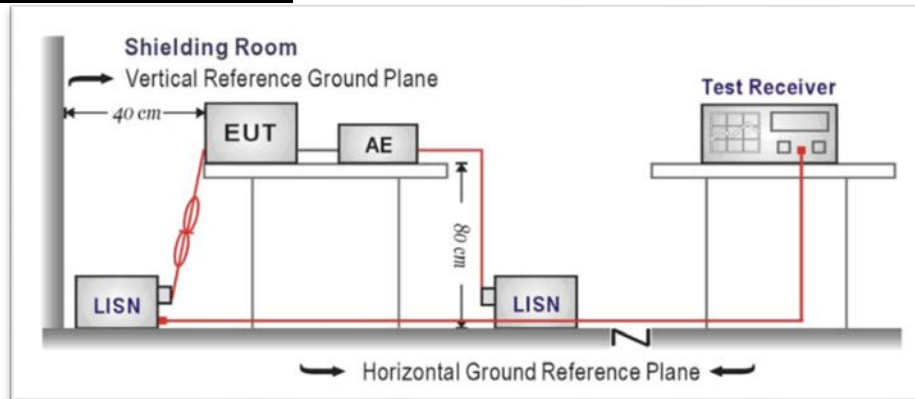
LIMIT

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
2. The EUT was placed on a plat form 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 impedance stabilization network (LISN). The LISN provides a 50ohm / 50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please 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:

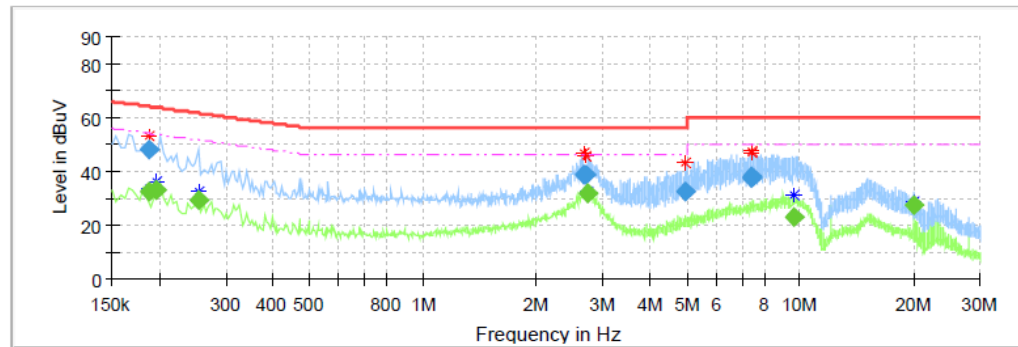
Please refer to the clause 4.1

TEST RESULTS

☒ Passed ☐ Not Applicable

Test Line:

L

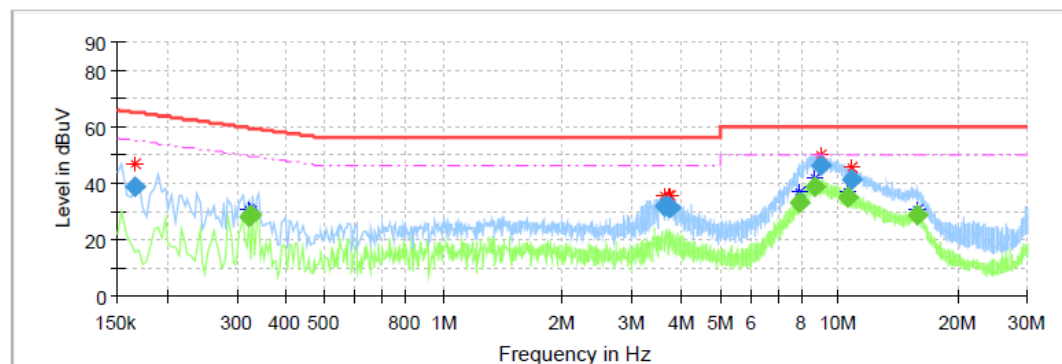


Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr. (dB)
0.187500	---	32.64	54.15	21.50	L1	10.1
0.187500	47.95	---	64.15	16.20	L1	10.1
0.195500	---	32.92	53.80	20.88	L1	10.1
0.255500	---	29.19	51.58	22.39	L1	10.1
2.659500	38.64	---	56.00	17.36	L1	10.2
2.707500	38.84	---	56.00	17.16	L1	10.2
2.719500	---	31.63	46.00	14.37	L1	10.2
4.971500	32.38	---	56.00	23.62	L1	10.3
7.468500	38.04	---	60.00	21.96	L1	10.4
7.471500	37.72	---	60.00	22.28	L1	10.4
9.583500	---	22.84	50.00	27.16	L1	10.5
20.003500	---	27.50	50.00	22.50	L1	10.8

Test Line:

N



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr. (dB)
0.166000	38.75	---	65.16	26.41	N	10.1
0.323500	---	27.94	49.62	21.68	N	10.1
0.327500	---	28.83	49.51	20.68	N	10.1
3.619500	31.97	---	56.00	24.03	N	10.2
3.691500	32.04	---	56.00	23.96	N	10.2
3.759500	30.96	---	56.00	25.04	N	10.2
7.932500	---	33.43	50.00	16.57	N	10.3
8.695500	---	38.80	50.00	11.20	N	10.3
9.043500	46.12	---	60.00	13.88	N	10.3
10.487500	---	34.92	50.00	15.08	N	10.2
10.759500	41.24	---	60.00	18.76	N	10.3
15.735500	---	28.93	50.00	21.07	N	10.6

5.3. Field Strength of the Fundamental and Mask Measurement

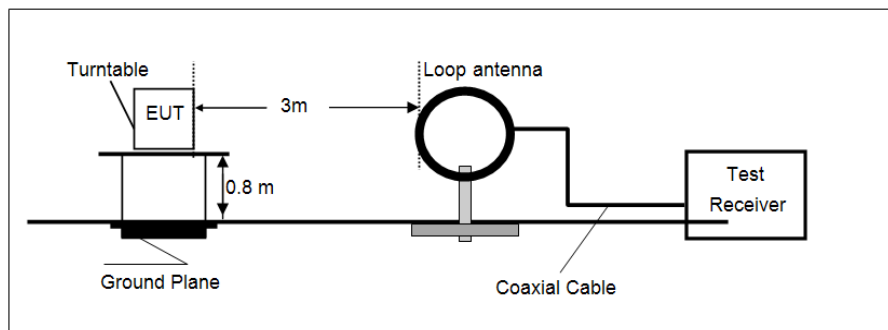
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.225(a)(b)(c)

Fundamental frequency(MHz)	Field strength of fundamental (uV/m @30m)	Field strength of fundamental (dBuV/m @3m)
13.553-13.567	15848	124.0
13.410-13.553&13.567-13.710	334	90.5
13.110-13.410&13.710-14.010	106	80.5

Note: Limit dBuV/m @3m =Limit dBuV/m @30m +40*log(30/3)= Limit dBuV/m @30m + 40.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned 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.

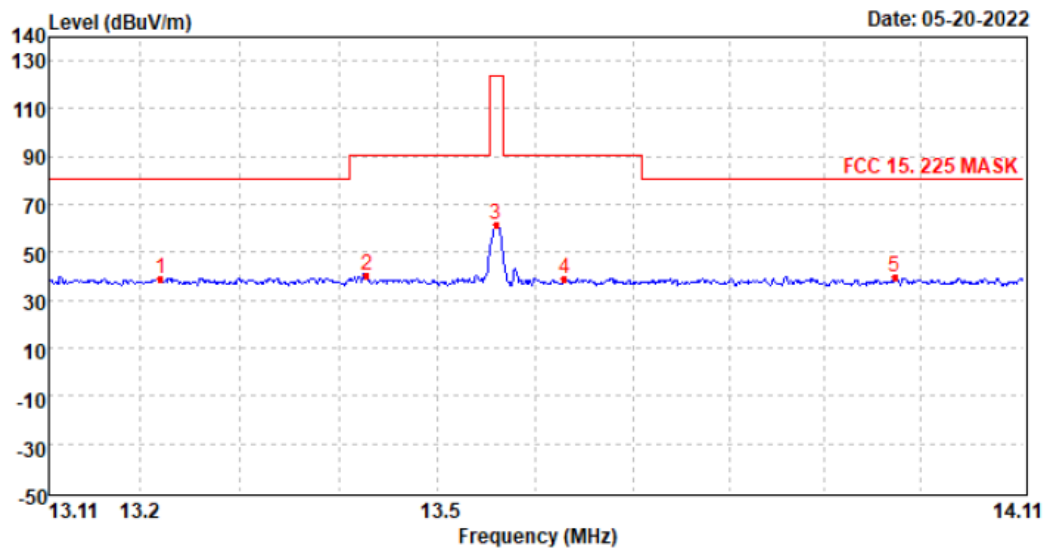
TEST MODE:

Please refer to the clause 4.1

TEST RESULTS

☒ Passed ☐ Not Applicable

Field Strength of The Fundamental and Mask



Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	13.22	12.41	20.18	6.68	0.00	39.27	80.50	-41.23	Peak
2	13.43	13.51	20.10	6.66	0.00	40.27	90.50	-50.23	Peak
3	13.56	34.89	20.05	6.65	0.00	61.59	124.00	-62.41	Peak
4	13.63	12.49	20.02	6.65	0.00	39.16	90.50	-51.34	Peak
5	13.97	13.24	19.88	6.63	0.00	39.75	80.50	-40.75	Peak

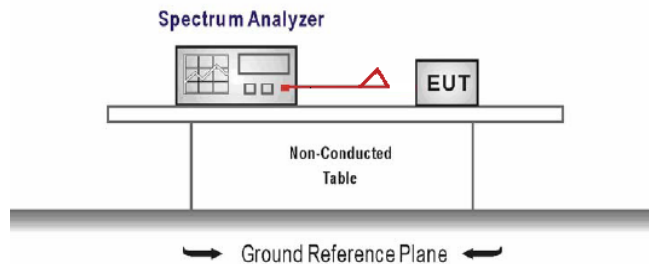
5.4. 20dB Bandwidth

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.215

Intentional radiators must be designed to ensure that the 20dB emission bandwidth in the specific band 13.553~13.567MHz.

TEST CONFIGURATION



TEST PROCEDURE

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.

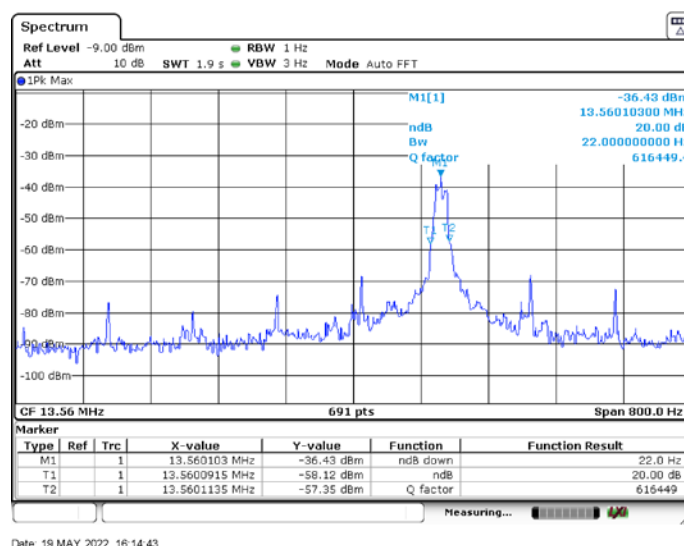
TEST MODE:

Please refer to the clause 4.1

TEST RESULTS

☒ Passed ☐ Not Applicable

Frequency	Measurement data (MHz)	Limit (MHz)	Result
f_L	13.5600915	>13.553	PASS
f_H	13.5601135	<13.567	PASS



Date: 19 MAY 2022 16:14:43

5.5. Radiated Spurious Emission

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209&15.225(d)

Limit for frequency below 30MHz:

Frequency	Limit (uV/m)	Measurement Distance(m)	Remark
0.009~0.490	2400/F(kHz)	300	Quasi-peak
0.490~1.705	24000/F(kHz)	30	Quasi-peak
1.705~30.0	30	30	Quasi-peak

Note: Limit dBuV/m @3m = Limit dBuV/m @300m + 40*log(300/3)= Limit dBuV/m @300m +80,

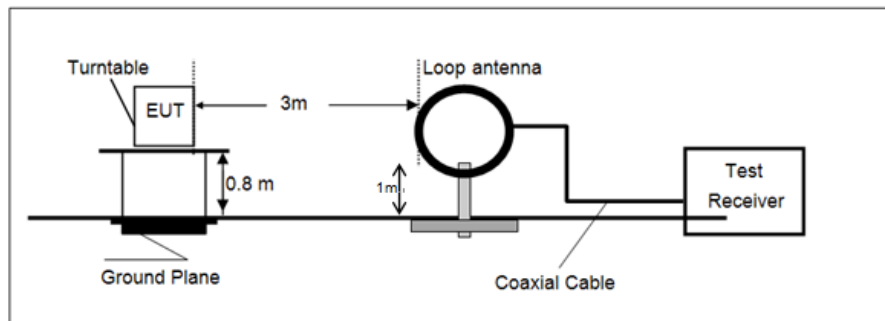
Limit dBuV/m @3m = Limit dBuV/m @30m +40*log(30/3)= Limit dBuV/m @30m + 40.

Limit for frequency above 30MHz:

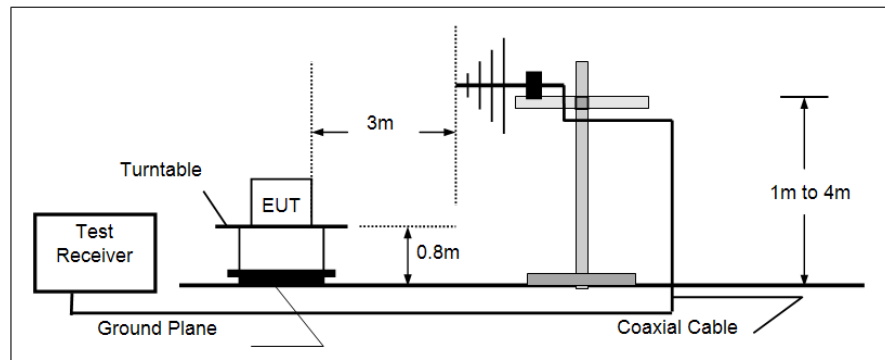
Frequency	Limit (dBuV/m@3m)	Remark
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

- 9 kHz ~ 30 MHz



- 30 MHz ~ 1 GHz



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10 requirements.
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 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
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Below 30MHz:
RBW=10 kHz, VBW=30 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
 - (3) 30MHz to 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.

TEST MODE:

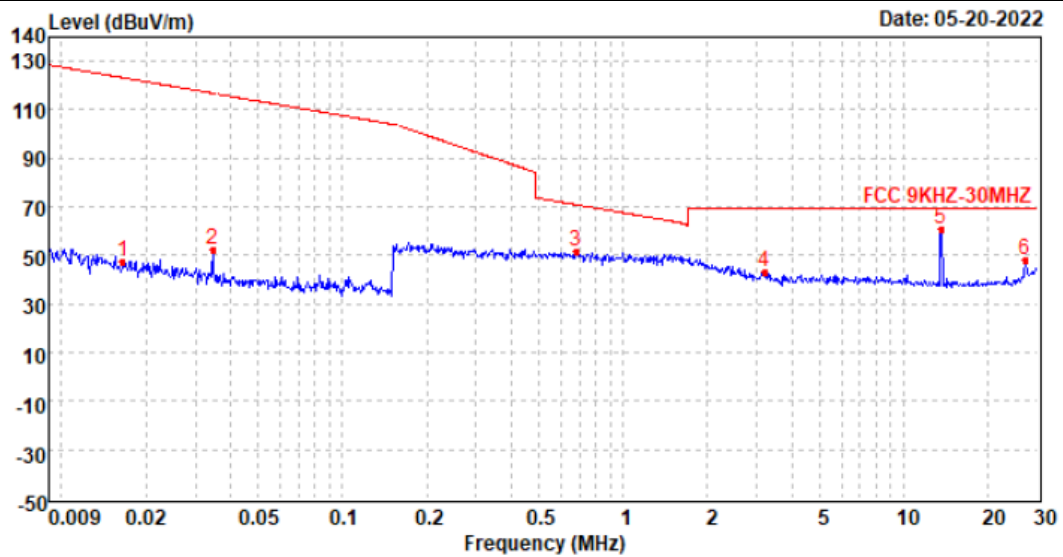
Please refer to the clause 4.1

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Test frequency range:

Below 30MHz



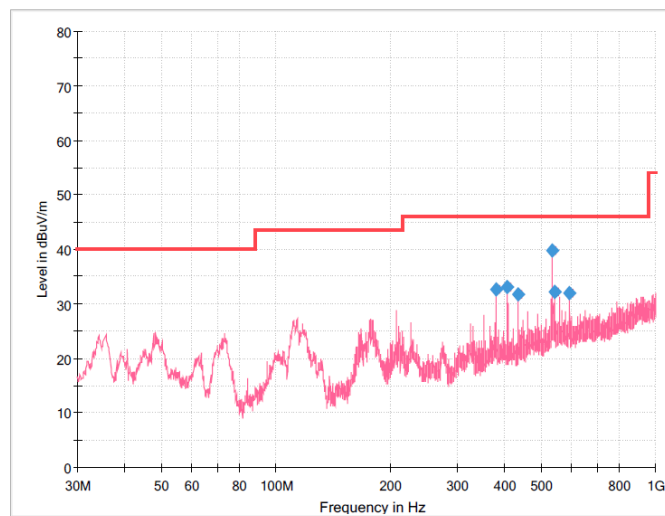
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	0.02	18.01	22.35	7.21	0.00	47.57	123.22	-75.65	Peak
2	0.03	22.96	22.34	7.21	0.00	52.51	116.84	-64.33	Peak
3	0.68	22.18	22.20	7.20	0.00	51.58	70.96	-19.38	Peak
4	3.19	13.56	22.20	7.18	0.00	42.94	69.54	-26.60	Peak
5	13.62	34.22	20.02	6.65	0.00	60.89	69.54	-8.65	Peak
6	27.13	17.44	24.04	6.76	0.00	48.24	69.54	-21.30	Peak

Test frequency range:

30MHz~1000MHz

Polarization:

Vertical



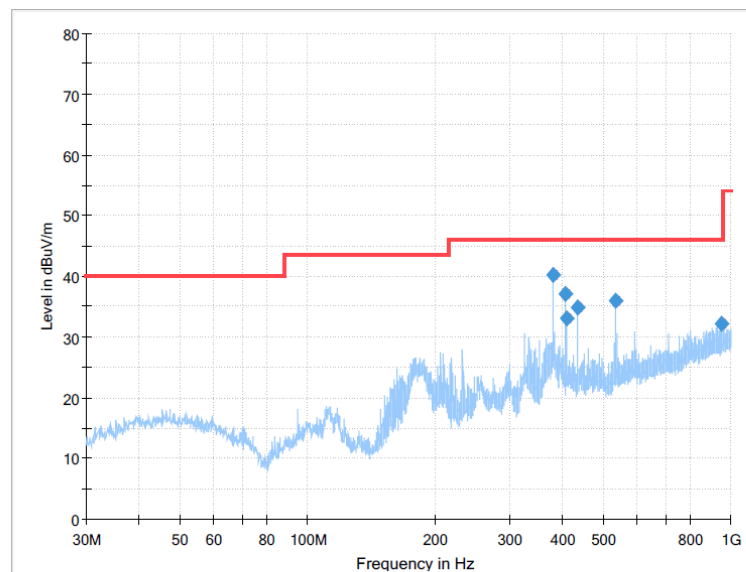
Serif;

Final Result

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
379.685000	32.60	46.00	13.40	100.0	V	0.0	-5.0
406.845000	32.99	46.00	13.01	100.0	V	0.0	-4.2
433.883750	31.70	46.00	14.30	100.0	V	0.0	-3.6
534.036250	39.80	46.00	6.20	100.0	V	62.0	-0.9
542.402500	32.22	46.00	13.78	100.0	V	62.0	-0.6
593.812500	31.85	46.00	14.15	100.0	V	252.0	0.6

Polarization:

Horizontal



Serif;

Final Result

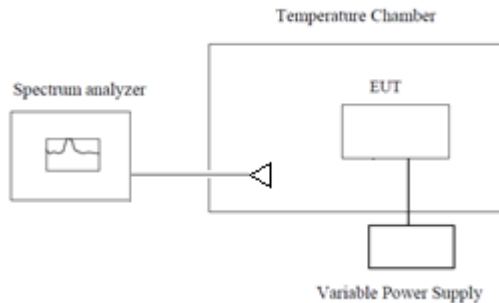
Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
379.685000	40.20	46.00	5.80	100.0	H	85.0	-5.0
406.845000	37.03	46.00	8.97	100.0	H	62.0	-4.2
408.421250	33.16	46.00	12.84	100.0	H	73.0	-4.2
433.883750	34.92	46.00	11.08	100.0	H	73.0	-3.6
534.036250	35.99	46.00	10.01	100.0	H	250.0	-0.9
946.407500	32.07	46.00	13.93	100.0	H	291.0	7.2

5.6. Frequency Stability

LIMIT

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST CONFIGURATION



TEST PROCEDURE

1. The equipment under test was connected to an external power supply.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to -20°C . After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10°C increased per stage until the highest temperature of $+50^{\circ}\text{C}$ reached.

TEST MODE:

Please refer to the clause 4.1

TEST RESULTS

☒ Passed ☐ Not Applicable

Test Enviroment		Frequency Reading(MHz)	Frequency Error(%)	Limit	Result Voltage
Voltage	Temperature(°C)				
AC 120V	-20	13.56000	0.0000	±0.01%	AC 120V
	-10	13.56005	0.0004	±0.01%	Pass
	0	13.56010	0.0007	±0.01%	Pass
	10	13.56002	0.0001	±0.01%	Pass
	20	13.56004	0.0003	±0.01%	Pass
	30	13.56009	0.0007	±0.01%	Pass
	40	13.56007	0.0005	±0.01%	Pass
	50	13.56003	0.0002	±0.01%	Pass
AC 132V	20	13.56002	0.0001	±0.01%	AC 132V
AC 108V	20	13.56011	0.0008	±0.01%	AC 108V

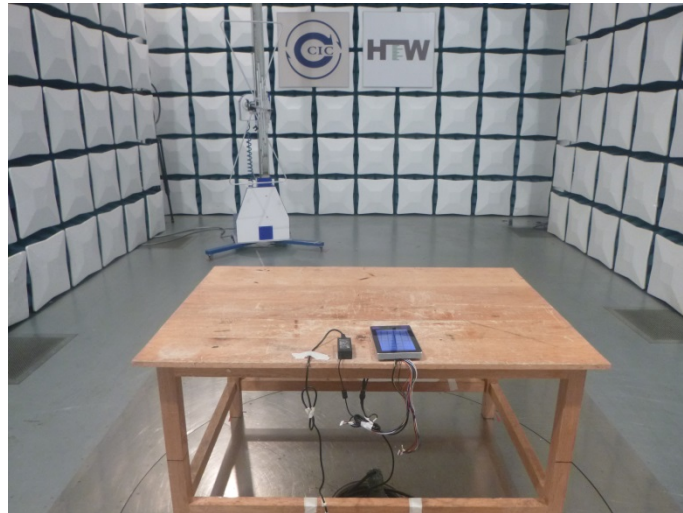
6. TEST SETUP PHOTOS

Conducted Emissions (AC Mains)



Radiated Emissions





7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Reference to the test report No. CHTEW22060106

-----End of Report-----