

TEST REPORT

For RF

Report No. : CHTEW22120105 Report Verification: 

Project No. : SHT2210104803EW

FCC ID : 2AJ9T-21003

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. : FA2000

Listed Model(s) : -

Standard : FCC CFR Title 47 Part 15 Subpart C Section 15.209

Date of receipt of test sample : Dec.05, 2022

Date of testing : Dec.05, 2022- Dec.21, 2022

Date of issue : Dec.22, 2022

Result : PASS

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Testing Laboratory Name : Shenzhen Huatongwei International Inspection Co., Ltd.

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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 15.209](#): Radiated emission limits; general requirements

[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	2022-12-22	Original

2. TEST DESCRIPTION

Report clause	Test Item	Section in CFR 47	Result	Test Engineer
5.1	Antenna requirement	15.203	PASS	Xiaoxiao Li
5.2	AC Power Conducted Emissions	15.207	PASS	Junman Wang
5.3	20dB Bandwidth	2.1049	PASS	Xiaoxiao Li
5.4	Radiated Emission	15.209	PASS	Dongyang Wu

Noted: 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.:	FA2000
Listed Model(s):	-
Power supply:	DC 12V from Adapter
Hardware version:	V1.2
Software version:	V1.2.1
Accessory unit information:	
Adapter information:	Model: UES18LU-120150SPA Input: 100-240Va.c., 50/60Hz, 0.5A Output: 12.0Vd.c., 1.5A 18.0W

3.3. Radio Specification Description

Operation frequency:	125kHz
Channel number:	1
Modulation Type:	ASK
Antenna type:	FPC Antenna

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. EUT operation mode

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.

4.2. Test sample information

Test item	HTW sample no.
RF Radiated test items	YPHT22101048001
EMI test items	YPHT22101048005

Note:

RF Radiated test items: Radiated Emission, 20dB Bandwidth

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	3.21 dB
Radiated emissions below 1GHz	4.54dB
Radiated emissions above 1GHz	5.10 dB
Occupied Bandwidth	0.002%

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	2022/08/30	2023/08/29
●	Artificial Mains	SCHWARZBECK	HTWE0113	NNLK 8121	573	2022/08/29	2023/08/28
●	Pulse Limiter	R&S	HTWE0193	ESH3-Z2	101447	2022/08/29	2023/08/28
●	RF Connection Cable	HUBER+SUHNER	HTWE0113-02	ENVIROFLEX 142	EF-NM-BNCM-2M	2022/09/17	2023/09/16
●	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	2023/09/29
●	EMI Test Receiver	R&S	HTWE0099	ESCI	100900	2022/08/30	2023/08/29
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0547	VULB9163	945	2022/05/23	2025/05/22
●	Pre-Amplifier	SCHWARZBECK	HTWE0295	BBV 9742	N/A	2022/11/04	2023/11/03
●	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	2023/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2022/08/25	2023/08/24
●	Horn Antenna	ETS	HTWE0548	3117	240120	2022/05/20	2025/05/19
●	Broadband Pre-amplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2022/02/28	2023/02/27
●	RF Connection Cable	HUBER+SUHNER	HTWE0126-01	RE-7-FH	N/A	2022/03/04	2023/03/03
●	Test Software	Audix	N/A	E3	N/A	N/A	N/A

Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Signal and spectrum Analyzer	R&S	HTWE0242	FSV40	100048	2022/08/25	2023/08/24
●	Signal & Spectrum Analyzer	R&S	HTWE0262	FSW26	103440	2022/08/25	2023/08/24
●	Spectrum Analyzer	Agilent	HTWE0286	N9020A	MY50510187	2022/08/25	2023/08/24
●	Radio communication tester	R&S	HTWE0287	CMW500	137688-Lv	2022/08/25	2023/08/24
●	Test software	Tonscend	N/A	JS1120	N/A	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. Antenna requirement

Requirement

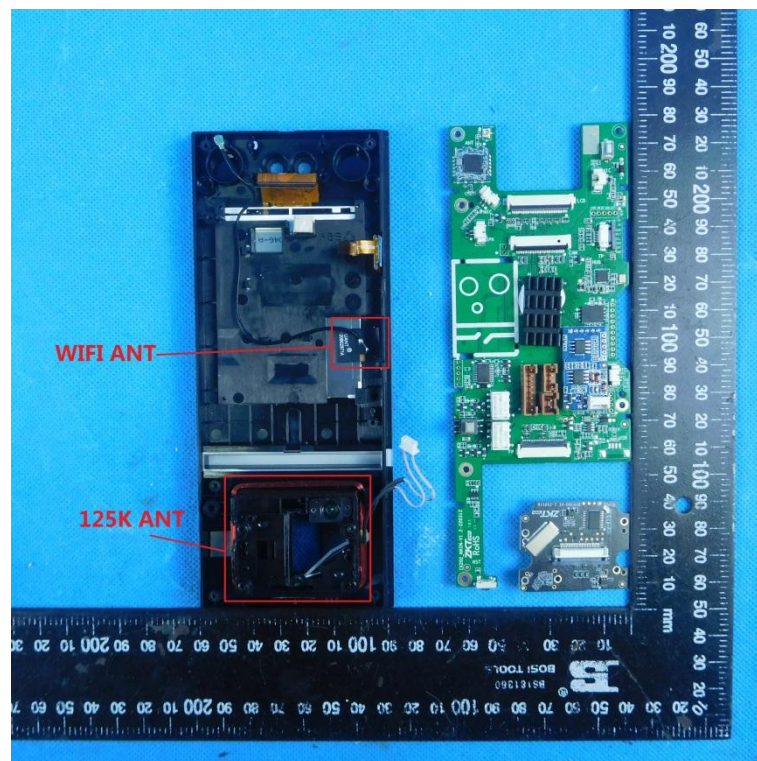
FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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 RESULTS

☒ Passed ☐ Not Applicable

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



5.2. AC Power Conducted Emissions

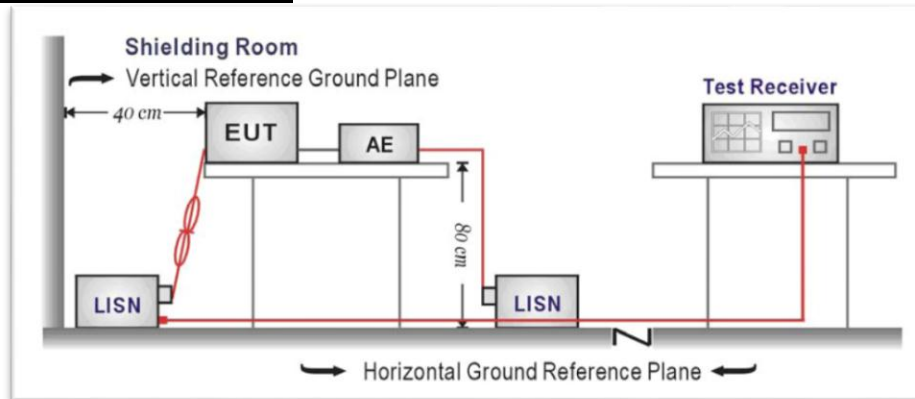
LIMIT

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:

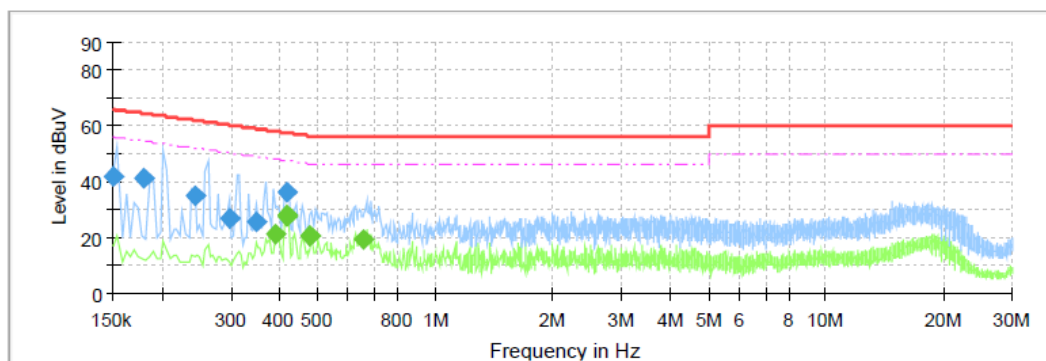
Please refer to the clause 4.1

TEST RESULTS

☒ Passed ☐ Not Applicable

Test Line:

L

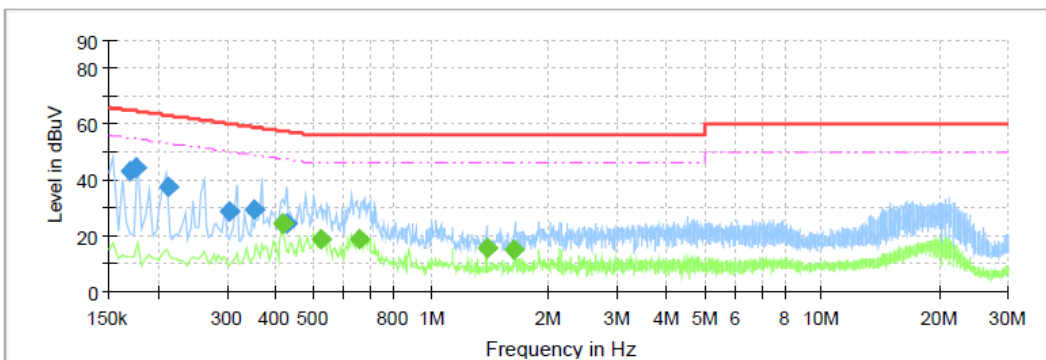


Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr. (dB)
0.150000	41.81	---	66.00	24.19	L1	10.0
0.179500	41.55	---	64.51	22.95	L1	10.0
0.243500	35.30	---	61.98	26.68	L1	10.0
0.299500	26.78	---	60.26	33.48	L1	10.0
0.347500	25.51	---	59.02	33.52	L1	10.0
0.391500	---	21.53	48.03	26.50	L1	10.0
0.415500	36.45	---	57.54	21.09	L1	10.0
0.415500	---	28.24	47.54	19.29	L1	10.0
0.416500	---	27.78	47.52	19.74	L1	10.0
0.479500	---	20.35	46.35	26.00	L1	10.0
0.480500	---	20.71	46.33	25.62	L1	10.0
0.655500	---	19.20	46.00	26.80	L1	10.0

Test Line:

N



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr. (dB)
0.170000	42.84	---	64.96	22.12	N	10.0
0.175500	44.55	---	64.70	20.15	N	10.0
0.211500	37.49	---	63.15	25.66	N	10.0
0.303500	28.52	---	60.15	31.62	N	10.0
0.351500	29.26	---	58.93	29.66	N	10.0
0.415500	---	24.34	47.54	23.19	N	10.0
0.416500	---	24.36	47.52	23.15	N	10.0
0.427500	24.31	---	57.30	33.00	N	10.0
0.524500	---	18.84	46.00	27.16	N	10.0
0.655500	---	18.65	46.00	27.35	N	10.0
1.383500	---	15.93	46.00	30.07	N	10.0
1.631500	---	14.86	46.00	31.14	N	10.0

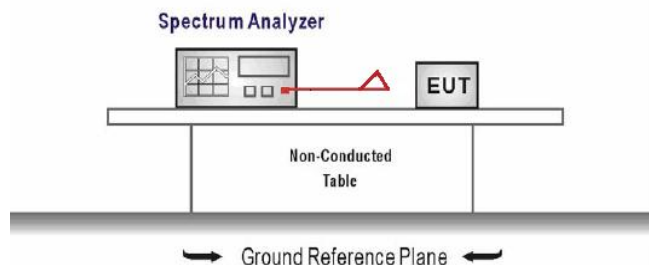
5.3. 20dB Bandwidth

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.

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.

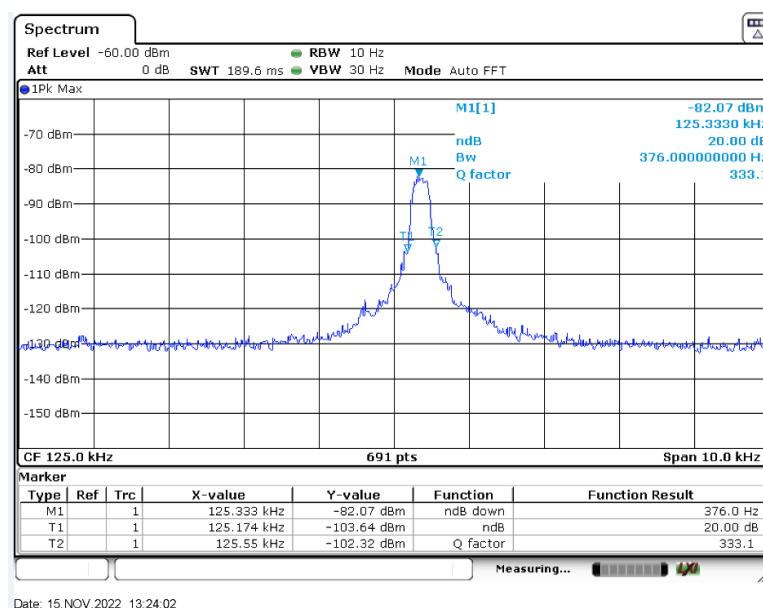
TEST MODE:

Please refer to the clause 4.1

TEST RESULTS

☒ Passed ☐ Not Applicable

20dB Bandwidth (Hz)	Limit (Hz)	Result
376	-	Pass



5.4. Radiated Emission

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

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,

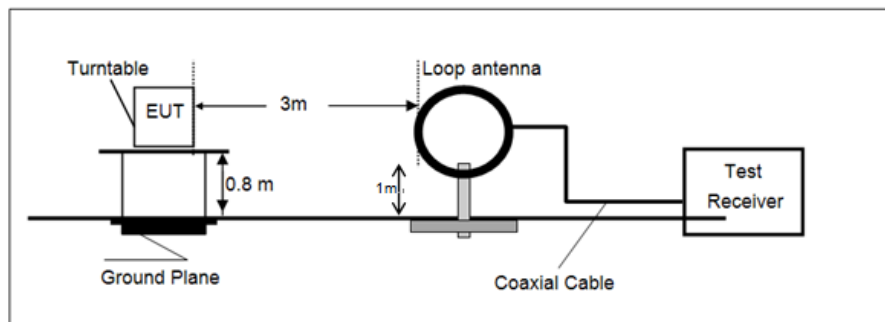
Limit dBuV/m @3m = Limit dBuV/m @30m +40*log(30/3)= Limit dBuV/m @30m + 40.

Limit for frequency above 30MHz:

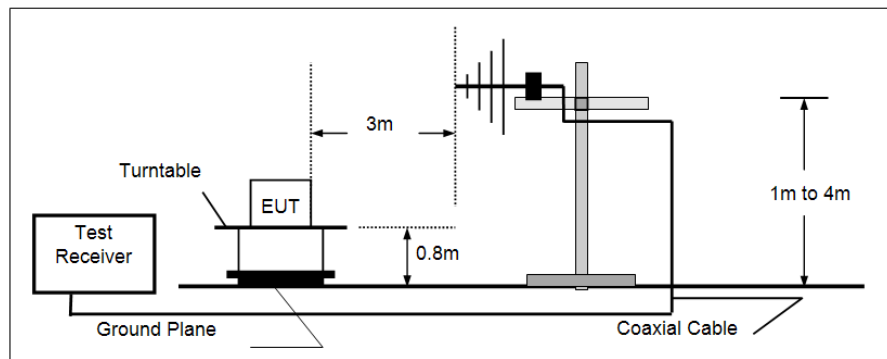
Frequency	Limit (dBuV/m@3m)	Remark
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak

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, 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
 - (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.
 - (4) From 1 GHz to 10th harmonic:
RBW=1MHz, VBW=3MHz Peak detector for Peak value.
RBW=1MHz, VBW=3MHz RMS detector for Average value.

TEST MODE:

Please refer to the clause 4.1

TEST RESULTS
☒ **Passed**
☐ **Not Applicable**

Test frequency range:						Below 30MHz			
Polarization: face									
Mark	Freq MHz	Reading dBuV/m	Ant dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	0.01	20.80	20.51	0.00	0.00	41.31	127.13	-85.82	Peak
2	0.13	33.81	20.20	0.10	0.00	54.11	105.65	-51.54	Peak
3	0.17	23.90	20.20	0.10	0.00	44.20	101.93	-57.73	Peak
4	0.63	18.00	20.10	0.20	0.00	38.30	71.66	-33.36	Peak
5	1.20	11.74	20.06	0.42	0.00	32.22	66.04	-33.82	Peak
6	8.68	7.04	20.00	0.70	0.00	27.74	69.54	-41.80	Peak

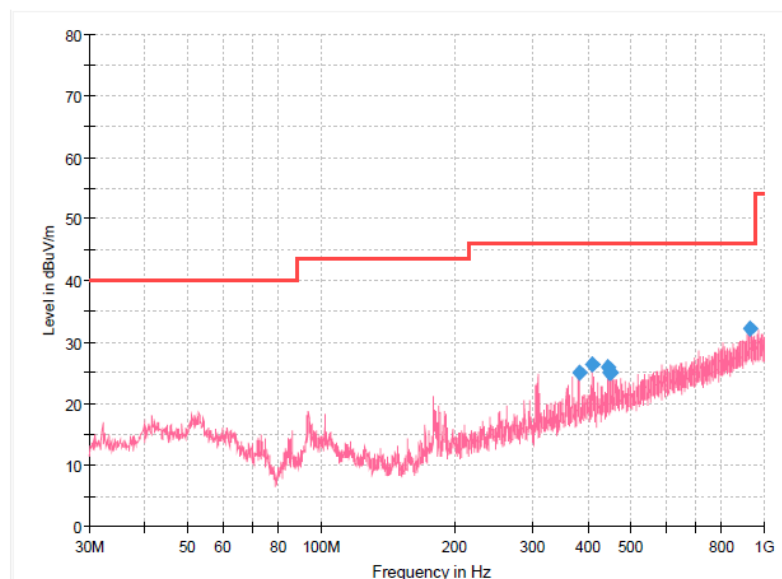
Polarization: side									
Mark	Freq MHz	Reading dBuV/m	Ant dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	0.01	20.69	20.51	0.00	0.00	41.20	127.13	-85.93	Peak
2	0.13	32.16	20.20	0.10	0.00	52.46	105.65	-53.19	Peak
3	0.17	22.31	20.20	0.10	0.00	42.61	101.93	-59.32	Peak
4	0.63	18.22	20.10	0.20	0.00	38.52	71.66	-33.14	Peak
5	1.20	11.47	20.06	0.42	0.00	31.95	66.04	-34.09	Peak
6	8.68	7.11	20.00	0.70	0.00	27.81	69.54	-41.73	Peak

Test frequency range:

30MHz~1000MHz

Polarization:

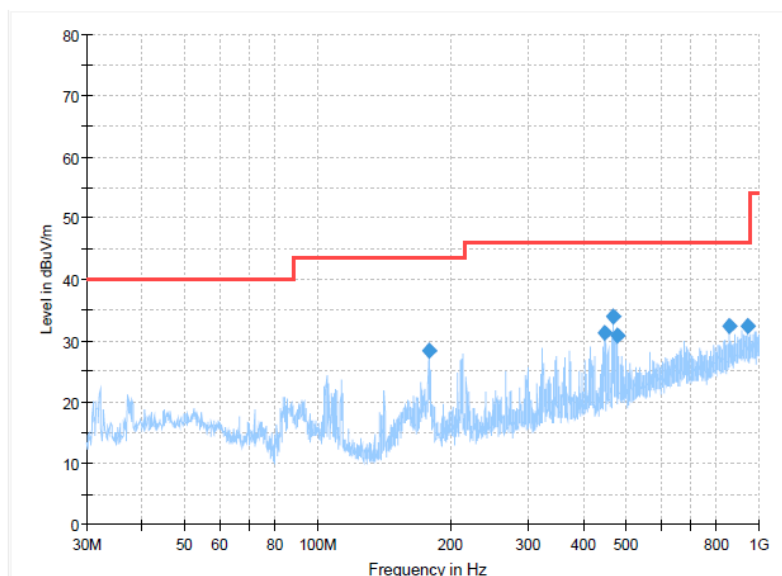
Vertical

**Final Result**

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
382.110000	25.11	46.00	20.89	100.0	V	26.0	-4.9
410.118750	26.37	46.00	19.63	100.0	V	0.0	-4.1
445.402500	25.86	46.00	20.14	100.0	V	114.0	-3.3
447.221250	25.13	46.00	20.87	100.0	V	114.0	-3.3
451.707500	25.04	46.00	20.96	100.0	V	150.0	-3.2
929.675000	32.17	46.00	13.83	100.0	V	261.0	7.0

Polarization:

Horizontal

**Final Result**

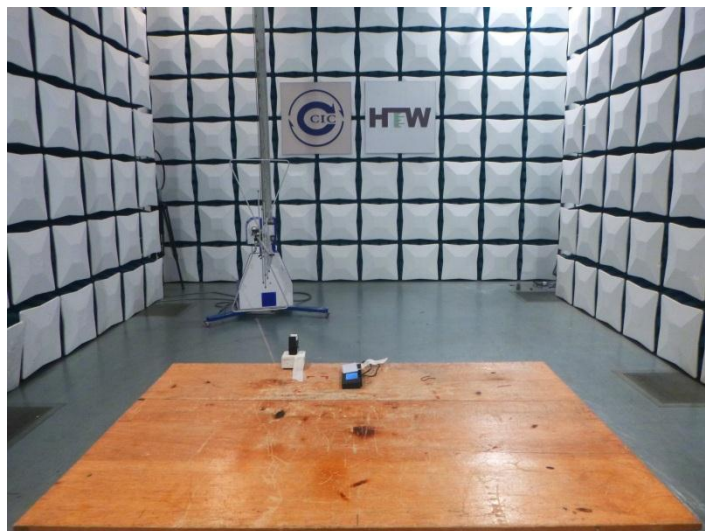
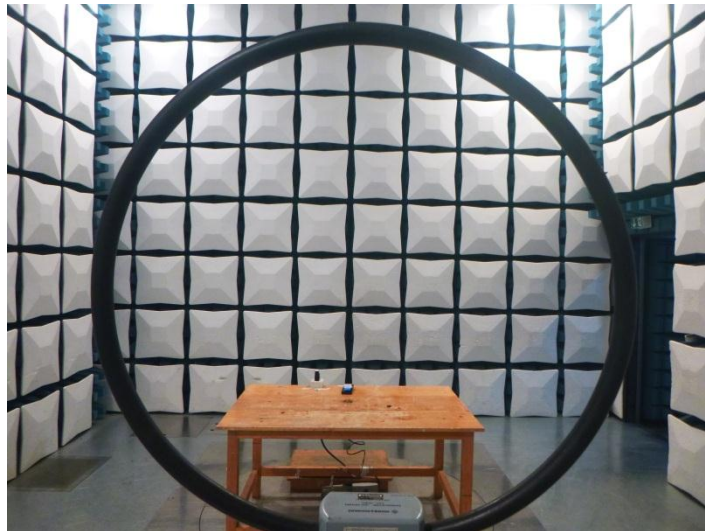
Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
178.531250	28.47	43.50	15.03	100.0	H	39.0	-12.5
448.555000	31.18	46.00	14.82	100.0	H	32.0	-3.2
467.106250	33.90	46.00	12.10	100.0	H	269.0	-2.8
478.018750	30.87	46.00	15.13	100.0	H	280.0	-2.6
857.410000	32.44	46.00	13.56	100.0	H	0.0	5.5
944.103750	32.48	46.00	13.52	100.0	H	0.0	7.2

6. TEST SETUP PHOTOS

Conducted Emissions (AC Mains)



Radiated Emissions



7. EXTERNAL AND INTERNAL PHOTOS OF THE EUT

Reference to the test report No. CHTEW22120104

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