



FCC Test Report

Test Report

On Behalf of

ZHONGSHAN STARWILL ELECTRIC APPLIANCE CO.,LTD.

For

Wireless switch

Model No.: SW0801A, SW02, SW04, SW06, SW08, SW10(receiver), 01A, 01B, 01C, 01D, 01E, 01F, 02A, 02B, 02C, 02D, 02E, 02F, 03A, 03B, 03C, 03D, 03E, 03F(transmitter)

FCC ID: 2BQ5R-SW0801A

Prepared For: **ZHONGSHAN STARWILL ELECTRIC APPLIANCE CO.,LTD.**

No.2 Area B 2nd floor Building B, No.11 Wencheng West Road 1st street Xiaolan Town Zhongshan city Guangdong province, China

Prepared By: **Shenzhen HUAK Testing Technology Co., Ltd.**
1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Date of Test: **Jan. 09, 2025 ~ May 21, 2025**

Date of Report: **May 21, 2025**

Report Number: **HK2501090210-E**

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Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Test Result Certification

Applicant's Name: ZHONGSHAN STARWILL ELECTRIC APPLIANCE CO.,LTD.
Address: No.2 Area B 2nd floor Building B, No.11 Wencheng West Road 1st streetXiaolan Town Zhongshan city Guangdong province, China

Manufacturer's Name: ZHONGSHAN ZOGIN ELECTRIC APPLIANCE CO.,LTD.
Address: No.10, Lianying Road North, Jixi community, Xiaolan, Zhongshan, Guangdong, China

Product Description

Trade Mark: N/A

Product Name: Wireless switch

Model and/or Type Reference: SW0801A, SW02, SW04, SW06, SW08, SW10(receiver), 01A, 01B, 01C, 01D, 01E, 01F, 02A, 02B, 02C, 02D, 02E, 02F, 03A, 03B, 03C, 03D, 03E, 03F(transmitter)

Standards: FCC Part15 Subpart C 2017, Section 15.231
ANSI C63.10: 2020

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Date of Test:

Date (s) of Performance of Tests: **Jan. 09, 2025 ~ May 21, 2025**

Date of Issue: **May 21, 2025**

Test Result: **Pass**

Testing Engineer



Len Liao

Technical Manager



Sliver Wan

Authorized Signatory



Jason Zhou



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** Modified History **

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	May 21, 2025	Jason Zhou
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1. Test Summary

1.1 Test Facility

Standard Section	Test Item	Result
15.203	Antenna Requirement	PASS
15.207	Conducted Emission	N/A
15.205/15.209/15.231(b)	Spurious Emission	PASS
15.231(c)	20dB Occupied Bandwidth	PASS
15.231(a)	Deactivation Testing	PASS

1.2 Information of the Test Laboratory

Shenzhen HUAK Testing Technology Co., Ltd.

Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization:

A2LA Accreditation Code is 4781.01.

FCC Designation Number is CN1229.

Canada IC CAB identifier is CN0045.

CNAS Registration Number is L9589.

1.3 Measurement Uncertainty

Measurement Uncertainty		
Parameter	Conditions	Uncertainty
Occupied Bandwidth	Conducted	±1.5%
Conducted Spurious Emission	Conducted	±2.17dB
Transmission Time	Conducted	±5%
Conducted Emissions	Conducted	±2.88dB
Transmitter Spurious Emissions	Radiated	±5.1dB

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Add : 1-2/F, Building B2, Junfeng Zhongcheng Zhibao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China. Tel: +86-0755-2522 5501 E-mail: info@nuak.com Web: www.nuak.com

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2. General Information

2.1 Description of Device (EUT)

Product Name	:	Wireless switch
Model No.	:	SW0801A
Series Models	:	SW02, SW04, SW06, SW08, SW10(receiver), 01A, 01B, 01C, 01D, 01E, 01F, 02A, 02B, 02C, 02D, 02E, 02F, 03A, 03B, 03C, 03D, 03E, 03F(transmitter)
Model Difference	:	All model's the function, software and electric circuit are the same, only with product model named different. Test sample model: SW0801A.
Trade Mark	:	N/A
Test Power Supply	:	Kinetic energy self-generation
Product Description	Operation Frequency:	433.92MHz
	Number of Channel:	1 Channels
	Modulation Type:	OOK
	Antenna Type:	PCB antenna
	Antenna Gain(Peak):	0dBi

Remark:

- 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- 2) Antenna gain Refer to the antenna specifications.
- 3) The cable loss data is obtained from the supplier.
- 4) The test results in the report only apply to the tested sample.

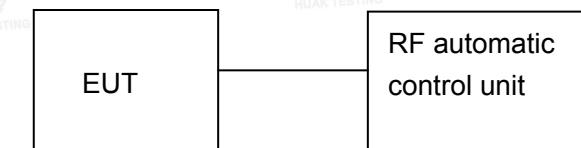


2.2 Description of Test Setup

Operation of EUT during Radiation Testing and:



Operation of EUT during RF conducted testing:



The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed.

During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations.

The emissions worst-case are shown in Test Results of the following pages. The worst case is X position

2.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Trade Mark	Model/Type No.	Specification	Note
1	Wireless switch	N/A	SW0801A	N/A	EUT

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

2.4 List of Channels

Channel	Freq. (MHz)	Note (Modulation Type)
01	433.92	OOK



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2.5 Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N.	R&S	ENV216	HKE-002	2024/02/20	1 Year
2	L.I.S.N.	R&S	ENV216	HKE-059	2024/02/20	1 Year
3	EMI Test Receiver	R&S	ESR	HKE-005	2024/02/20	1 Year
4	Spectrum analyzer	Agilent	N9020A	HKE-025	2024/02/20	1 Year
5	Spectrum analyzer	Agilent	N9020A	HKE-025	2024/02/20	1 Year
6	Spectrum analyzer	R&S	FSV3044	HKE-126	2024/02/20	1 Year
7	Preamplifier	EMCI	EMC051845S	HKE-006	2024/02/20	1 Year
8	Preamplifier	Schwarzbeck	BBV 9743	HKE-016	2024/02/20	1 Year
9	Preamplifier	A.H. Systems	SAS-574	HKE-182	2024/02/20	1 Year
10	6dB Attenuator	Pasternack	6db	HKE-184	2024/02/20	1 Year
11	EMI Test Receiver	Rohde & Schwarz	ESR-7	HKE-010	2024/02/20	1 Year
12	Broadband Antenna	Schwarzbeck	VULB9168	HKE-167	2024/02/21	2 Year
13	Loop Antenna	COM-POWER	AL-130R	HKE-014	2024/02/21	2 Year
14	Horn Antenna	Schwarzbeck	9120D	HKE-013	2024/02/21	2 Year
15	EMI Test Software	Tonscend	JS32-CE 2.5.0.6	HKE-081	/	/
16	EMI Test Software	Tonscend	JS32-RE 5.0.0	HKE-082	/	/
17	RF Automatic control unit	Tonscend	JS0806-2	HKE-060	2024/02/20	1 Year
18	High pass filter unit	Tonscend	JS0806-F	HKE-055	2024/02/20	1 Year
19	Wireless Communication Test Set	R&S	CMU200	HKE-026	2024/02/20	1 Year
20	Wireless Communication Test Set	R&S	CMW500	HKE-027	2024/02/20	1 Year
21	High-low temperature chamber	Guangke	HT-80L	HKE-118	2024/06/11	1 Year
22	Temperature and humidity meter	Boyang	HTC-1	HKE-075	2024/06/11	1 Year
23	RF Test Software	Tonscend	JS1120-3 Version 3.5.39	HKE-083	/	/
24	10dB Attenuator	Schwarzbeck	VTSD9561F	HKE-153	2024/02/20	1 Year
25	RSE Test Software	Tonscend	JS36-RSE 5.0.0	HKE-184	/	/

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4. Radiated Emissions

4.1 Standard Applicable

According to §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

4.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2020 measurement procedure. The specification used was with the FCC Part 15.205 15.231(b) and FCC Part 15.209 Limit.

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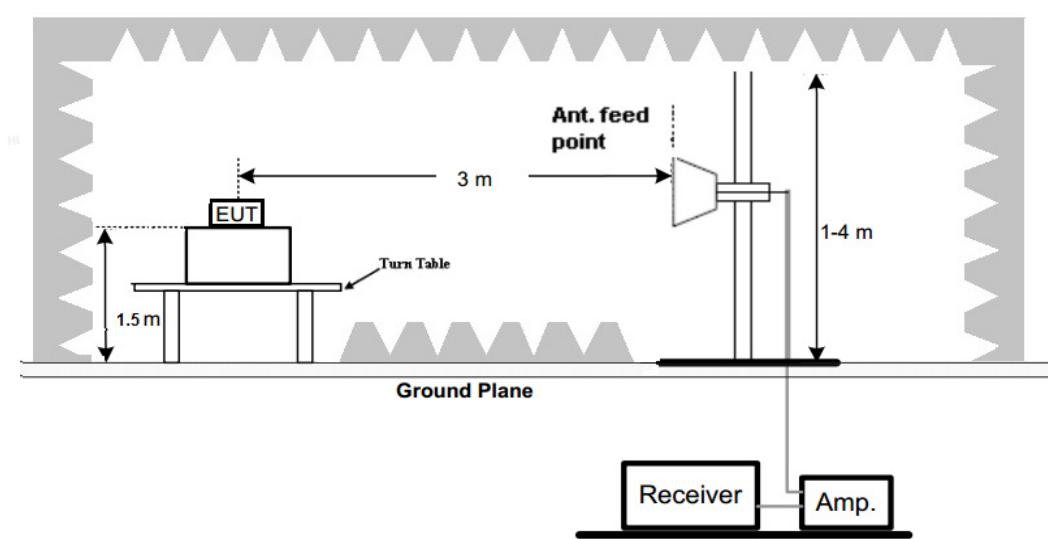
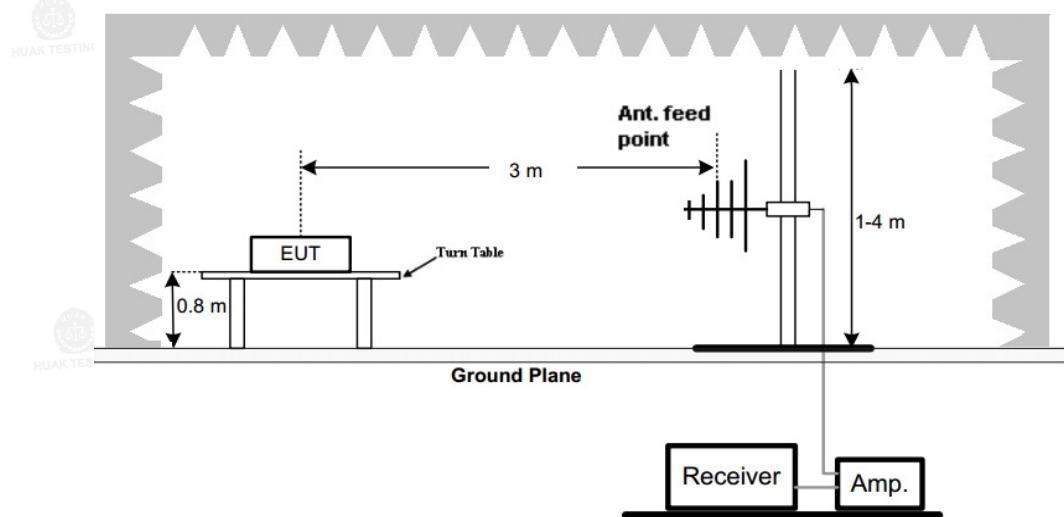
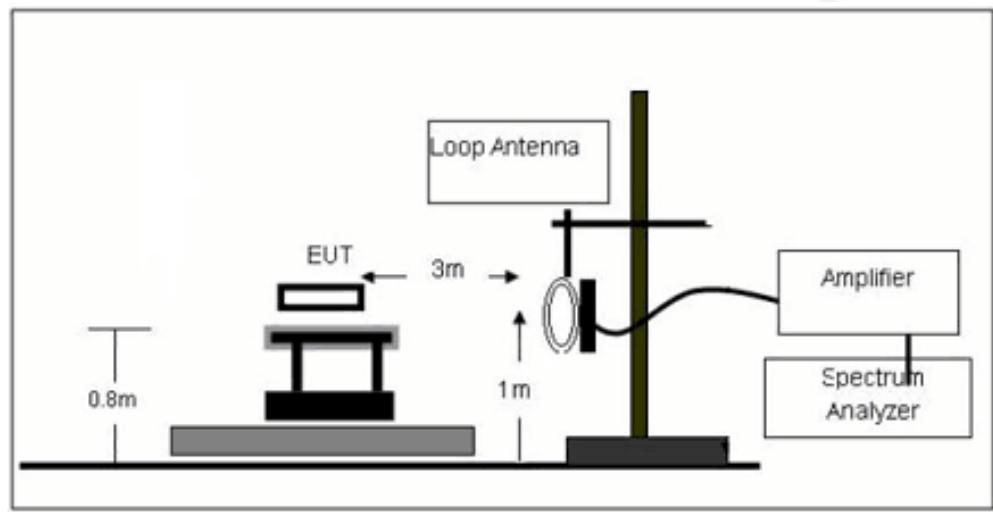
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4.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant.Loss} + \text{Cab. Loss} - \text{Ampl.Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part15C Limit}$$

4.4 Environmental Conditions

Temperature:	21°C
Relative Humidity:	50%
ATM Pressure:	1011 mbar

4.5 Test Data

According to the data below, the FCC Part 15.205, 15.209 and 15.231 standards, and had the worst margin of:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

(Fundamental 433.92MHz)

No.	Frequency	Reading	Corr.	Duty cycle	Result	Limit	Margin	Deg.	Height	Polarity	Remark
	MHz	dBuV/m	Factor (dB)	Factor (dB)	dBuV/m	dBuV/m	dB	(°)	(cm)		
1	433.9200	75.31	12.33	N/A	87.45	100.8	-13.35	177	100	H	Peak
2	433.9200	N/A	N/A	-17.32	70.13	80.83	-10.70	177	100	H	AV
3	433.9200	63.04	12.33	N/A	83.39	100.8	-17.41	177	100	V	Peak
4	433.9200	N/A	N/A	-17.32	66.07	80.83	-14.76	117	100	V	AV

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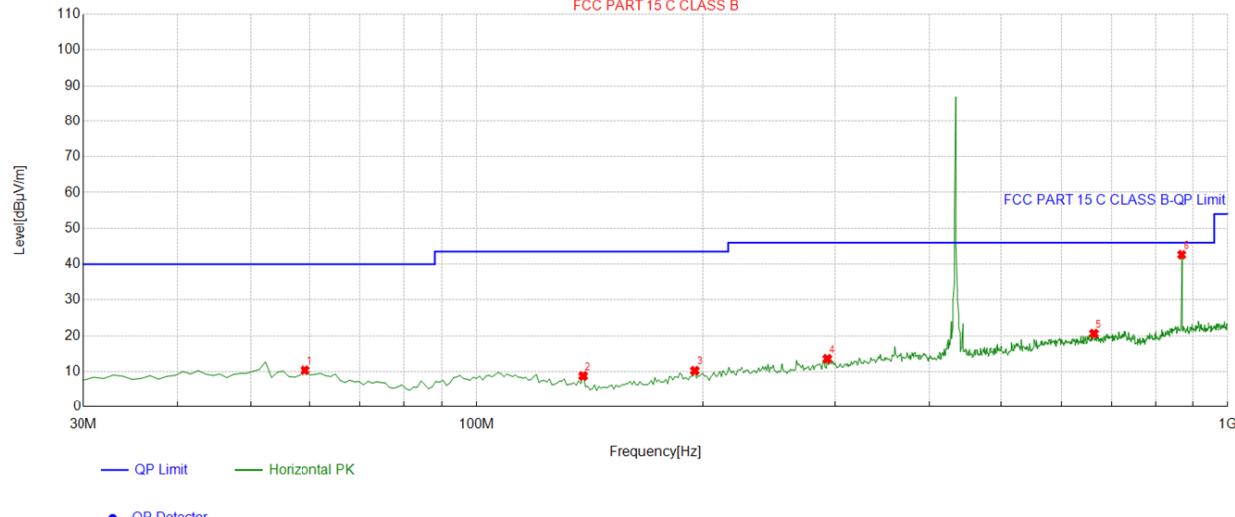


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Radiated Emission

Antenna polarity: H



Suspected List

NO.	Freq. [MHz]	Factor [dB]	Reading [dB μ V/m]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	59.129129	-13.54	23.93	10.39	40.00	29.61	100	342	Horizontal
2	138.74874	-17.98	26.78	8.80	43.50	34.70	100	330	Horizontal
3	195.06506	-15.20	25.47	10.27	43.50	33.23	100	184	Horizontal
4	293.13313	-11.96	25.54	13.58	46.00	32.42	100	229	Horizontal
5	663.07307	-4.76	25.38	20.62	46.00	25.38	100	59	Horizontal
6	867.94794	-1.60	44.24	42.64	46.00	3.36	100	198	Horizontal

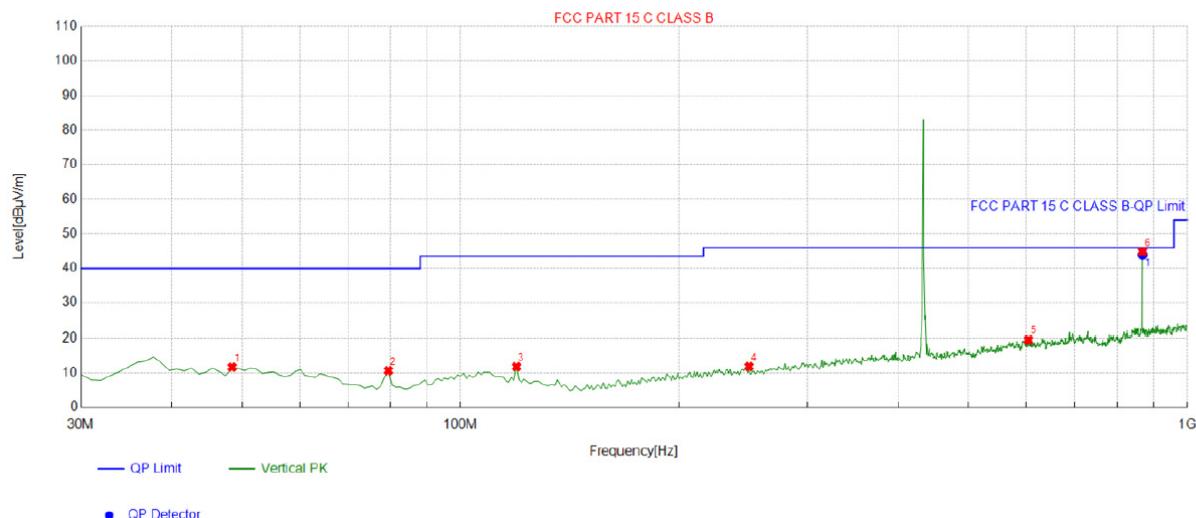
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor;
Margin = Limit – Level;

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Antenna polarity: V



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dB μ V/m]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	48.448448	-13.49	25.19	11.70	40.00	28.30	100	235	Vertical
2	79.51952	-18.01	28.71	10.70	40.00	29.30	100	342	Vertical
3	119.32932	-15.94	27.77	11.83	43.50	31.67	100	241	Vertical
4	249.43943	-13.41	25.27	11.86	46.00	34.14	100	160	Vertical
5	604.81481	-5.09	24.58	19.49	46.00	26.51	100	348	Vertical
6	867.94794	-1.60	46.46	44.86	46.00	1.14	100	64	Vertical

Final Data List									
NO.	Freq. [MHz]	Factor [dB]	QP Reading [dB μ V/m]	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [$^{\circ}$]	Polarity
1	867.9479	-1.60	45.51	43.91	46.00	2.09	100	64	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor;
Margin = Limit – Level:

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Above 1GHz

Horizontal:

No.	Frequency	Reading	Corr.	Duty cycle	Result	Limit	Margin	Deg.	Height	Remark
	MHz	dB μ V/m	Factor (dB)	Factor (dB)	dB μ V/m	dB μ V/m	dB	(°)	(cm)	
1	1301.76	25.19	25.83	N/A	51.02	74	-22.98	41	100	Peak
	1301.76	/	/	-17.32	33.70	54	-20.30	306	100	Ave
2	1735.68	24.37	27.25	N/A	51.62	74	-22.38	204	100	Peak
	1735.68	/	/	-17.32	34.30	54	-19.70	87	100	Ave

Vertical:

No.	Frequency	Reading	Corr.	Duty cycle	Result	Limit	Margin	Deg.	Height	Remark
	MHz	dB μ V/m	Factor (dB)	Factor (dB)	dB μ V/m	dB μ V/m	dB	(°)	(cm)	
1	1301.76	24.65	25.83	N/A	50.48	74	-23.52	151	100	Peak
	1301.76	/	/	-17.32	33.16	54	-20.84	74	100	Ave
2	1735.68	25.04	27.25	N/A	52.29	74	-21.71	332	100	Peak
	1735.68	/	/	-17.32	34.97	54	-19.03	51	100	Ave

Note: Testing is carried out with frequency rang 30MHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the operating frequency 433.92MHz.

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dB μ V/m)		Limit@3m (dB μ V/m)	
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--

Note: 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

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5. 20dB Occupy Bandwidth Test

5.1 Standard Applicable

According to FCC Part 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.2 Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT's operation band.

Temperature:	21°C	 HUAK TESTING
Relative Humidity:	52%	
ATM Pressure:	1011 mbar	

5.3 Test Data

Freq. (MHz)	Modulation Type	Bandwidth (kHz)	Limit (kHz)	Results
433.92	OOK	48.16	<1084.8	PASS



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6. Transmission Time

6.1 Standard Applicable

According to FCC Part 15.231(a), the transmitter shall be complied the following requirements:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

6.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, then set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

6.3 Environmental Conditions

Temperature:	20°C
Relative Humidity:	52%
ATM Pressure:	1011 mbar



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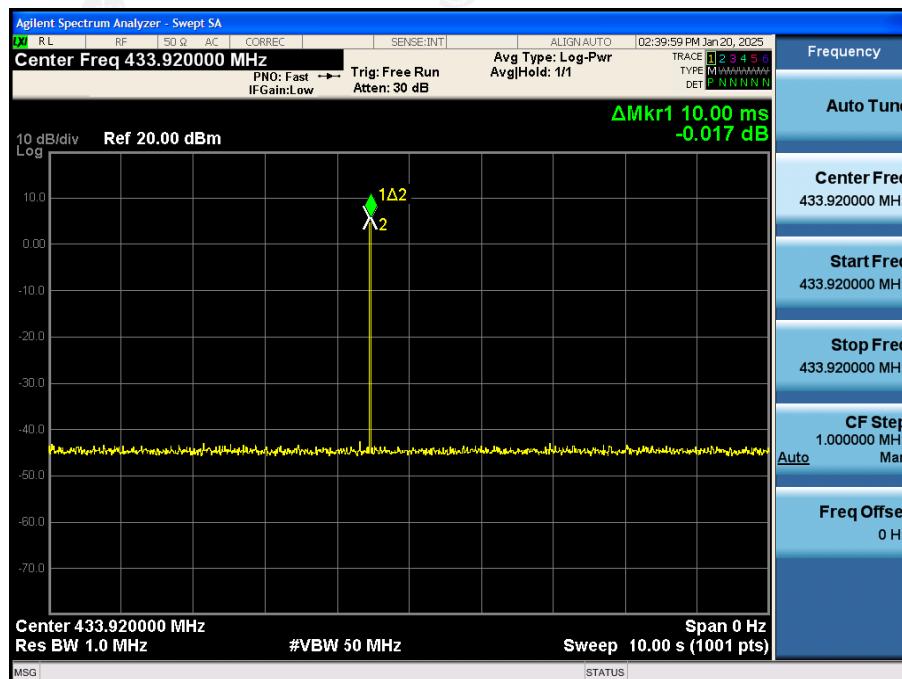
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6.4 Test Data

Transmission Type	Test Frequency MHz	Transmission Time seconds	Limit s	Result
Manually	433.92	0.01	5	PASS

Please refer the following plot.



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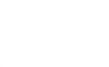
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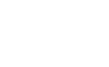
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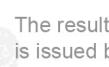
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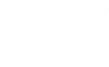
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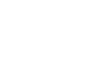


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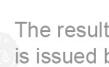
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7. Duty Cycle

7.1 Standard Applicable

According to FCC Part 15.231(b)(2) and 15.35 (c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

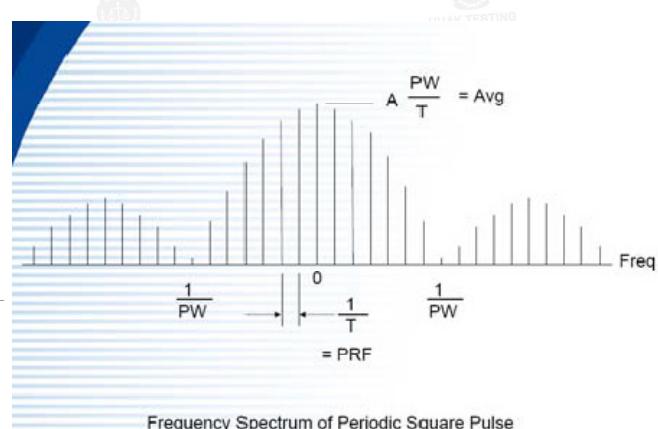
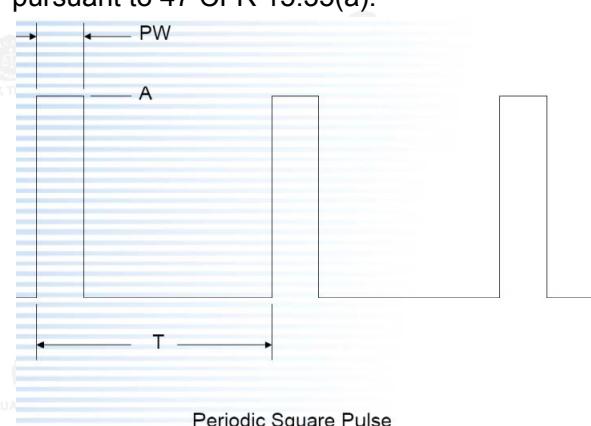
7.2 Test Procedure

- 1) The EUT was placed on a turntable which is 0.8m above ground plane.
- 2) Set EUT operating in continuous transmitting mode
- 3) Set Test Receiver into spectrum analyzer mode, Tune the spectrum analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth(RBW) to 1000kHz and video bandwidth(VBW) to 1000kHz, Span was set to 0Hz.
- 4) The Duty Cycle was measured and recorded.

7.3 Introduction to PDCF Reference:

(§15.35 Measurement detector functions and bandwidths.)

1) Part 15 of the FCC Rules provides for the operation of low power communication devices without an individual license (e.g., intrusion detectors, pulsed water tank level gauges, etc.), subject to certain requirements. Some of these devices use extremely narrow pulses to generate wideband emissions, which are measured to determine compliance with the rules. These measurements are typically performed with a receiver or spectrum analyzer. Depending on a number of factors (e.g., resolution bandwidth, pulse width, etc.), the spectrum analyzer may not always display the true peak value of the measured emission. This effect, called "pulse desensitization," relates to the capabilities of the measuring instrument. For the measurement and reporting of the true peak of pulsed emissions, it may be necessary to apply a "pulse desensitization correction factor" (PDCF) to the measured value, pursuant to 47 CFR 15.35(a).



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If using spectrum analyzer to measure pulse signal, it have to make sure the RBW use is at least 2/PW.

- When RBW is less than $2/PW$, you are able to measure the true peak level of the pulse signal. If this is the case,

PDCF is required to compensate to determine true peak value.

Pulse desensitization:

PW =29250usec (0.6* 13+ 1.65*13). Period=67500usec. Level=A

BBW \geq 2/PW=0.068K 1/T=0.15K

NOTE: 2 / PW < RBW first don't need

2). For the actual test, please refer to the ANSI C63.10, Annex C refer to section 5 for more detail

7.4 Test Data

Type of Pulse	Width of Pulse ms	Quantity of Pulse	Transmission Time ms	Total Time (T _{on}) ms
Pulse 1	0.04	1	0.04	
Pulse 2	3.22	1	3.22	
Pulse 3	3.22	1	3.22	
Pulse 4	3.24	1	3.24	
Pulse 5	3.22	1	3.22	
Pulse 6	0.68	1	0.68	13.62

Test Period (T_p) ms	Total Time (T_{on}) ms	Duty Cycle %	Duty Cycle Factor dB
100.00	13.62	13.62	-17.32

Remark: Duty Cycle Factor=20*log (Duty Cycle)

Please refer to the attached test plots



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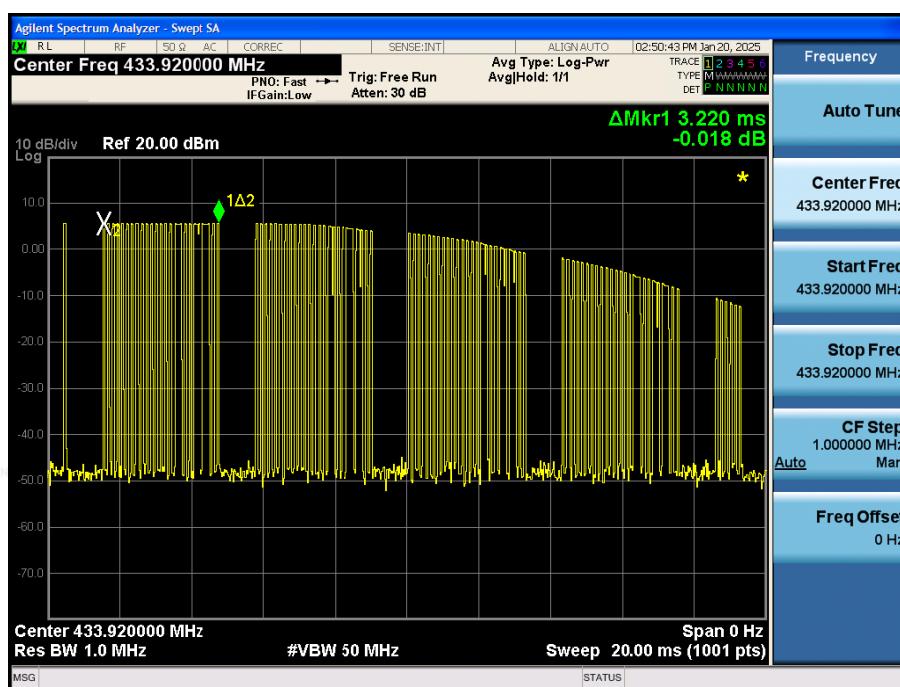
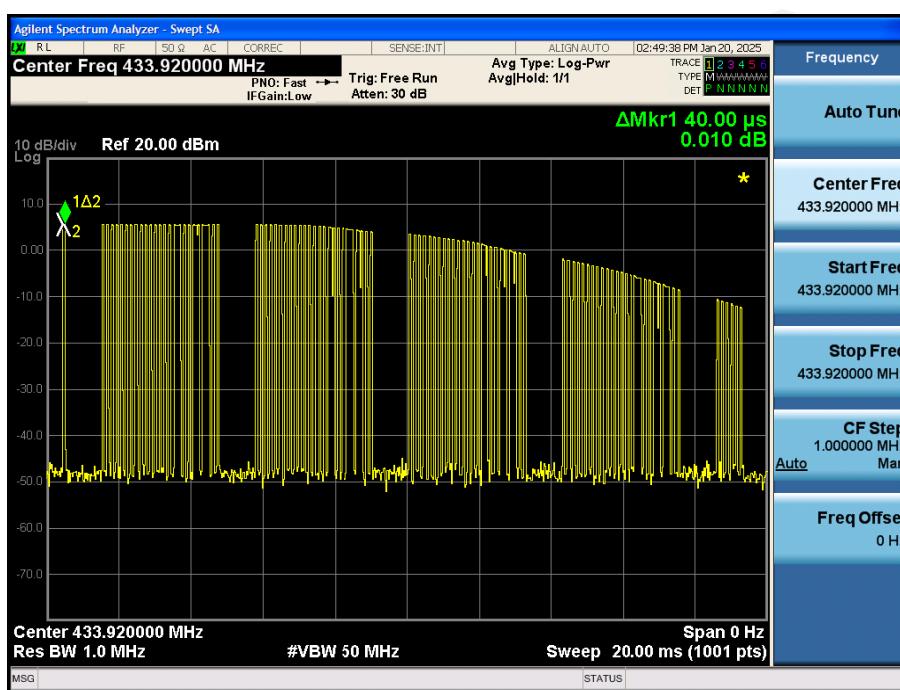
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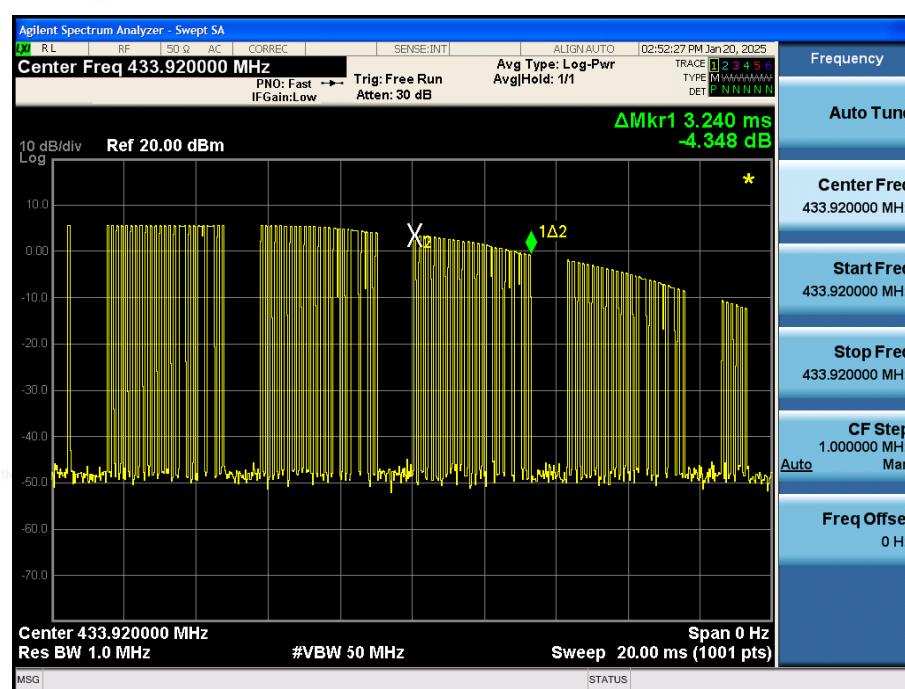
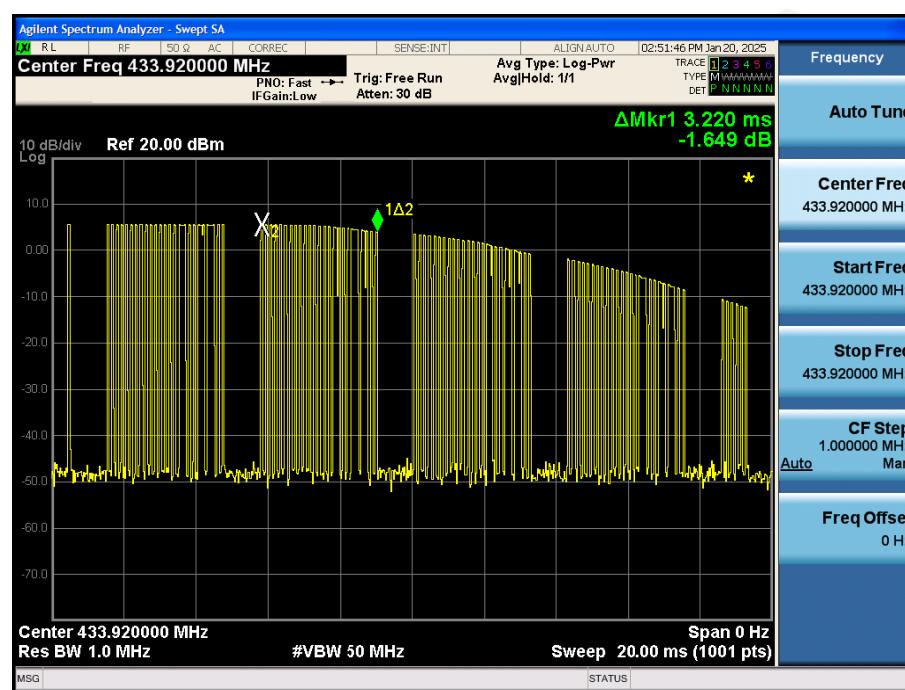
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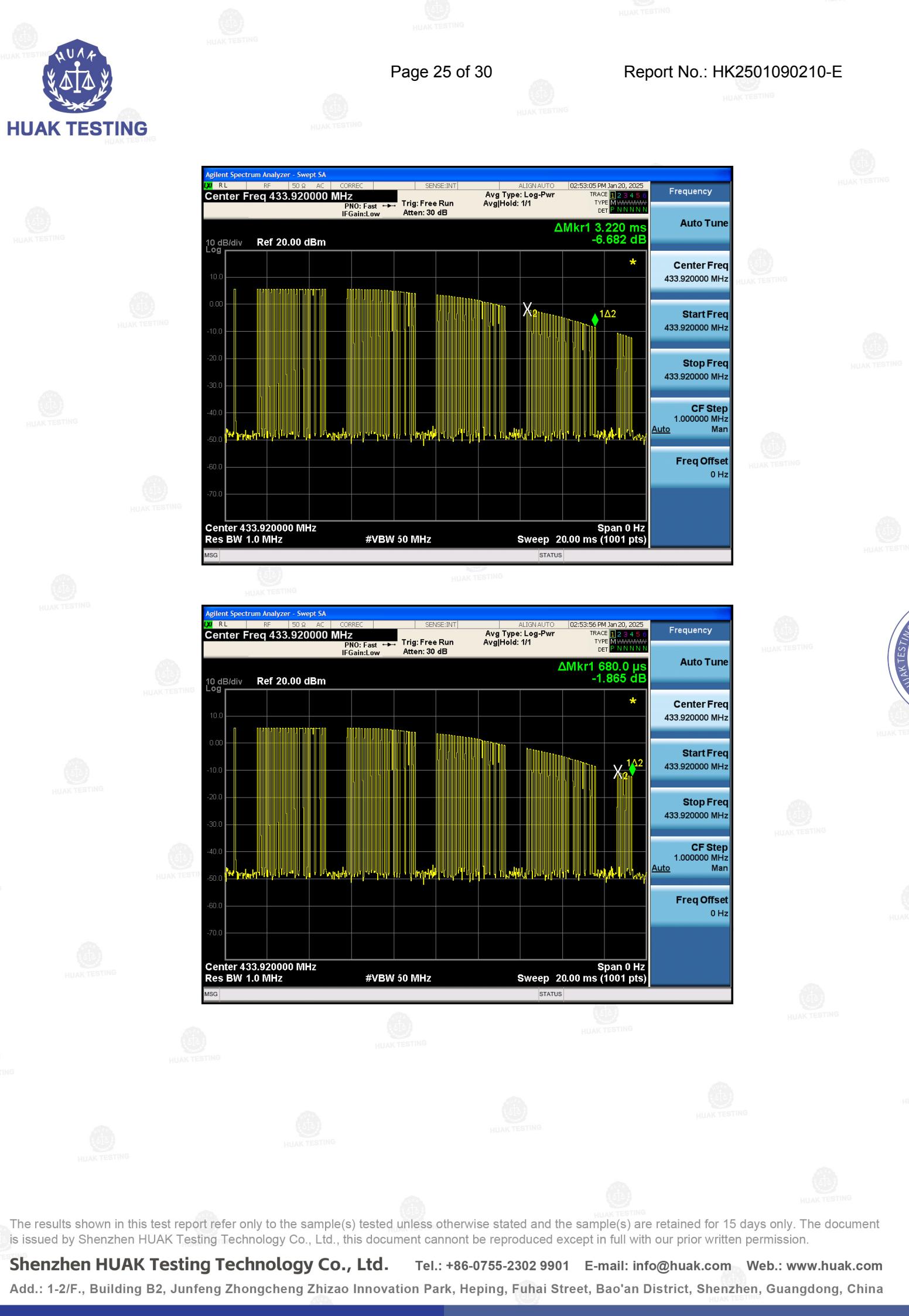
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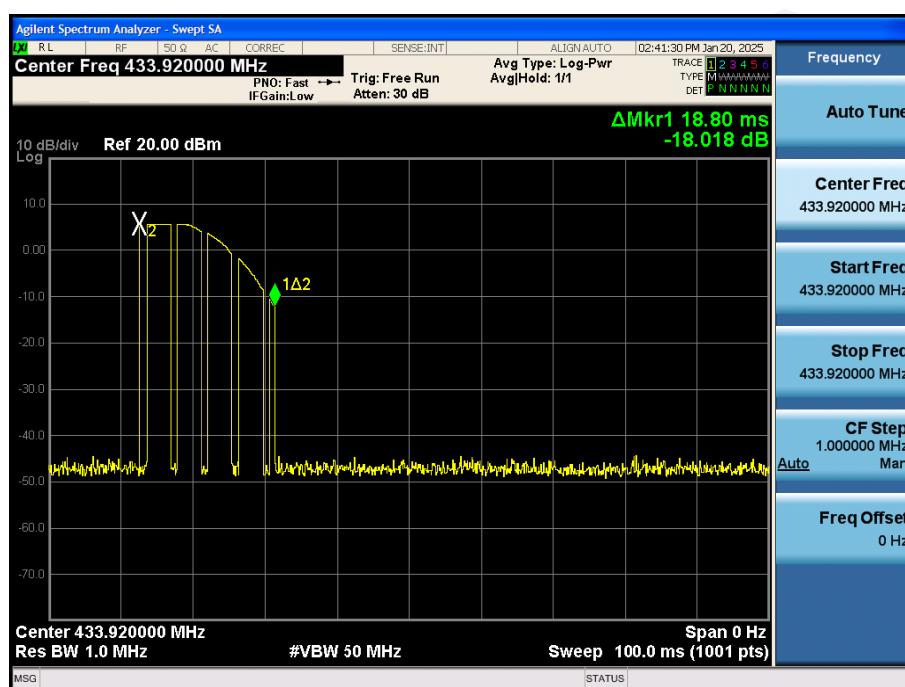




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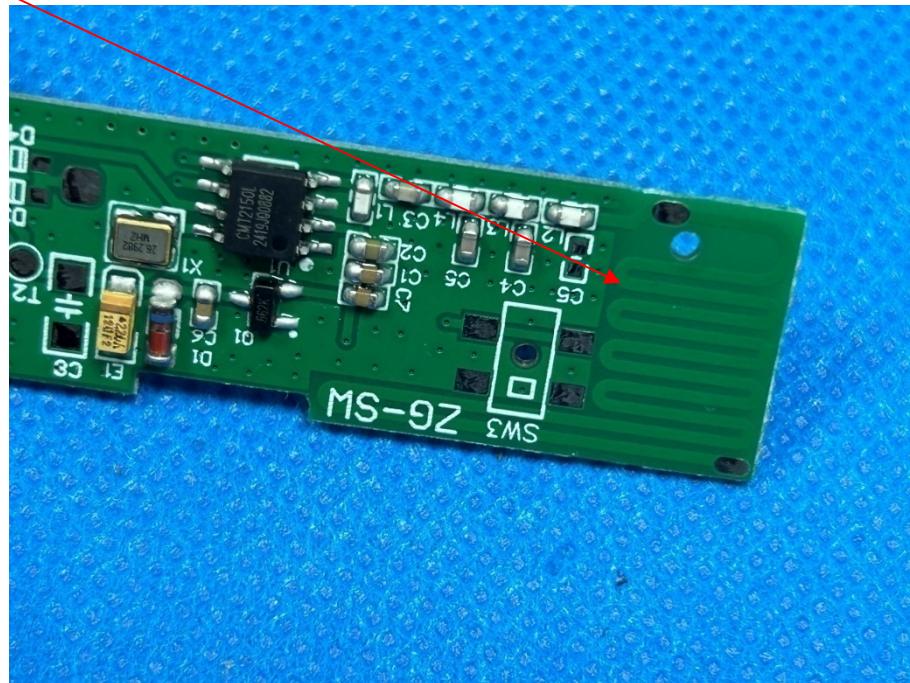
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8. Antenna Connected Construction

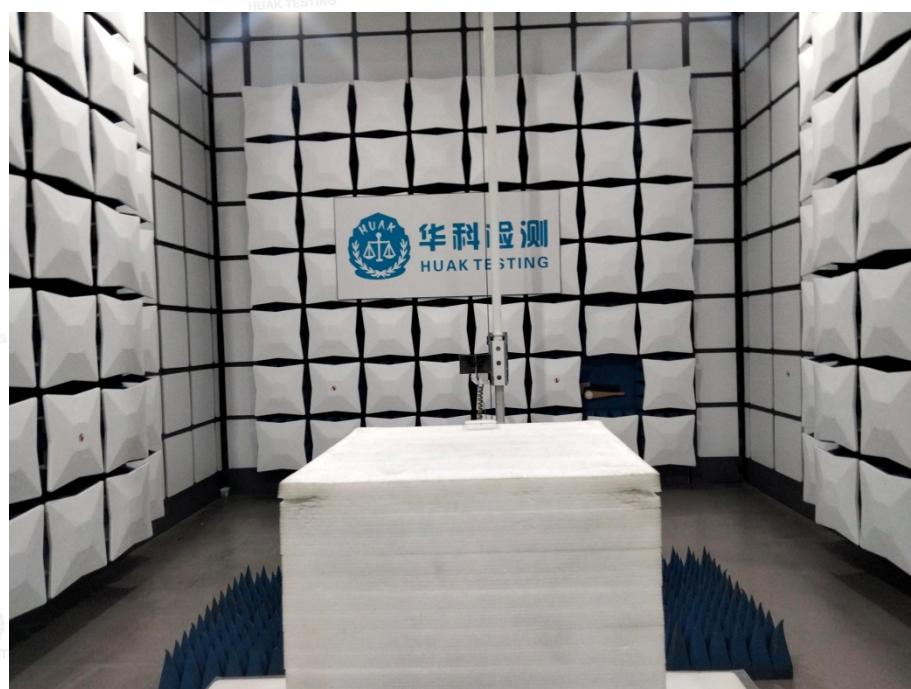
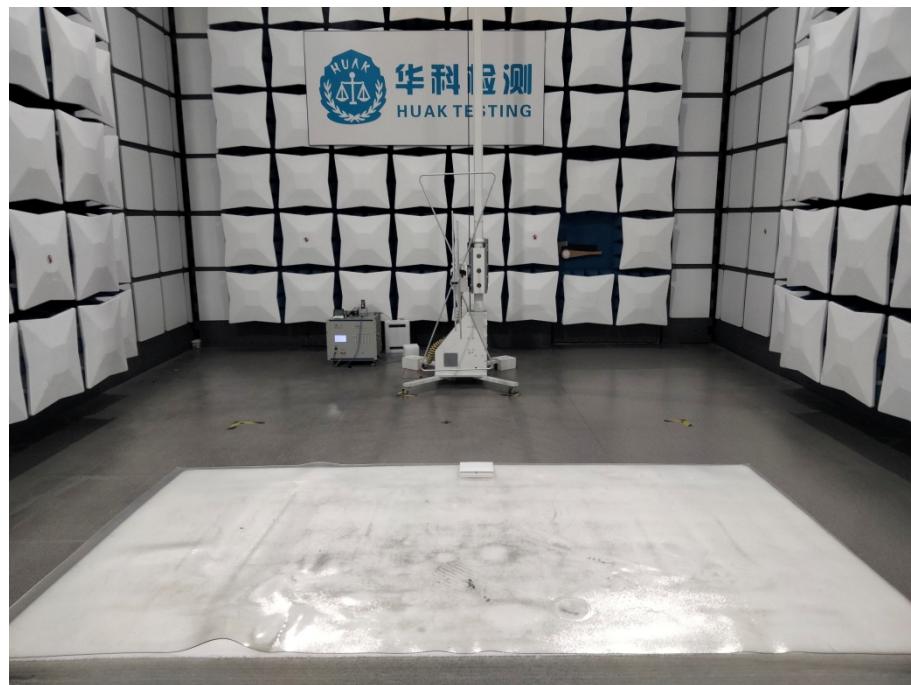
The antenna used in this product is a PCB Antenna, is a permanently attached antenna on the PCB. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 0dBi.

Antenna



9. Photographs of Test

Radiated Emission



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RF conducted Emission

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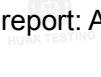
10. Photos of the EUT

Reference to the report: ANNEX A of External photos and ANNEX B of Internal photos

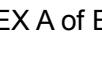
*****End of Report*****



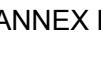
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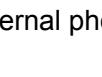
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