

3.7. Time of Occupancy (Dwell Time)

Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Report No.: HK2402290877-4E

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 3MHz VBW, Span 0Hz.

Test Configuration



Test Results

Modulation	Packet	Pulse time (ms)	Dwell time (second)	Limit (second)	Result
GFSK	DH1	0.381	0.122	0.40	PASS
	DH3	1.638	0.262		
	DH5	2.885	0.308		
π/4DQPSK	2-DH1	0.390	0.125	0.40	PASS
	2-DH3	1.642	0.263		
	2-DH5	2.891	0.308		
8DPSK	3-DH1	0.390	0.125		
	3-DH3	1.642	0.263	0.40	PASS
	3-DH5	2.892	0.308		

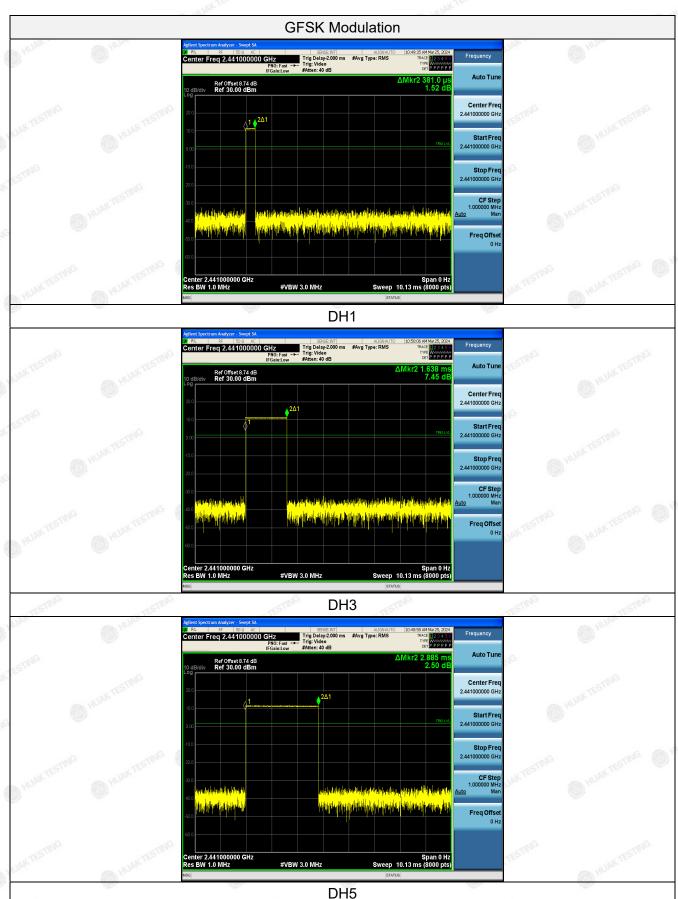
Note:

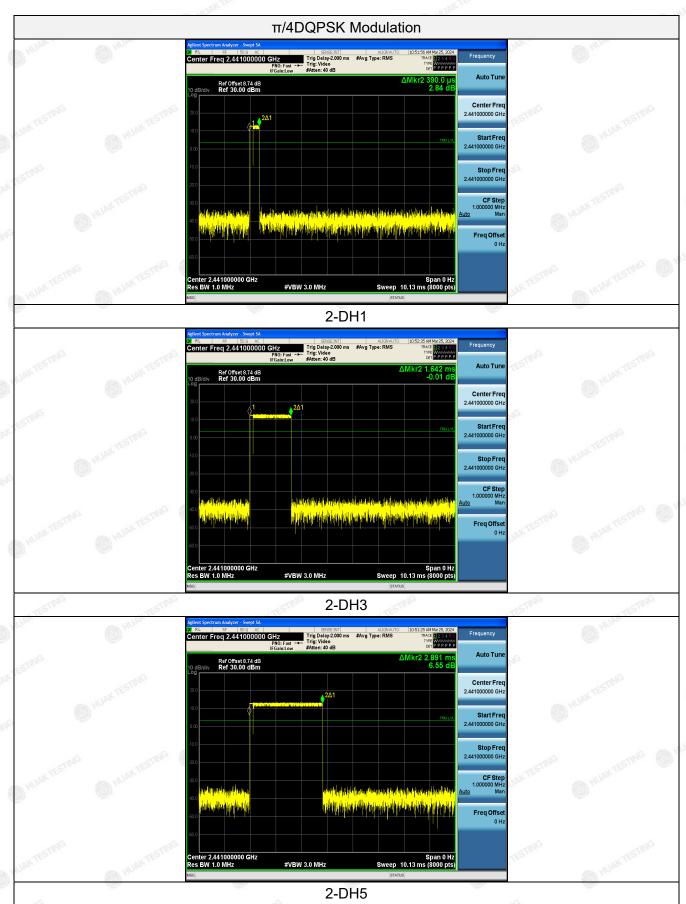
- 1. We have tested all mode at high, middle and low channel, and recoreded worst case at middle channel.
- Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second for DH1, 2-DH1, 3-DH1
 Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second for DH3, 2-DH3, 3-DH3
 Dwell time=Pulse time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second for DH5, 2-DH5, 3-DH5

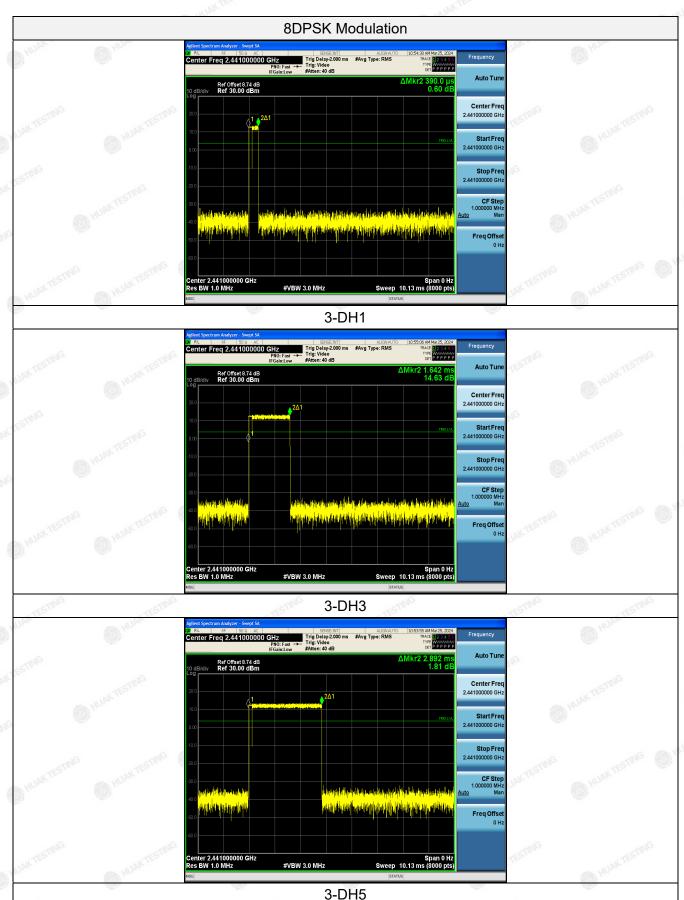
Test plot as follows:

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannon be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at http://www.cer-mark.com

TEL: +86-755 2302 9901 FAX: +86-755 2302 9901 E-mail: service@cer-mark.com









3.8. Out-of-Band Emissions

Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these setting are made of the in-band reference level, band edge and out-of-band emissions.

Test Configuration



Test Results

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

We measured all conditions (DH1, DH3, DH5) and recorded worst case at DH5, 2DH5 and 3DH5.

Test plot as follows:

C al

Report No.: HK2402290877-4E

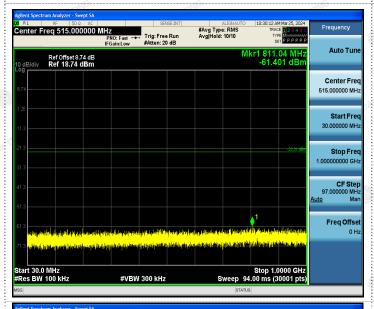
Page 40 of 53 Report No.: HK2402290877-4E

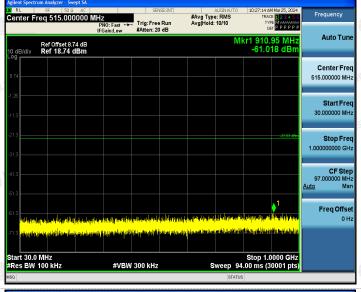
GFSK

CH00 CH39

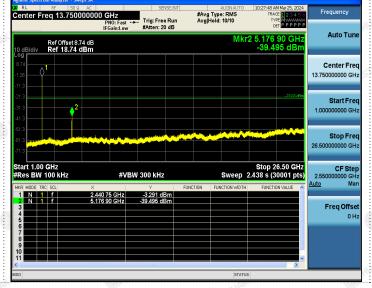








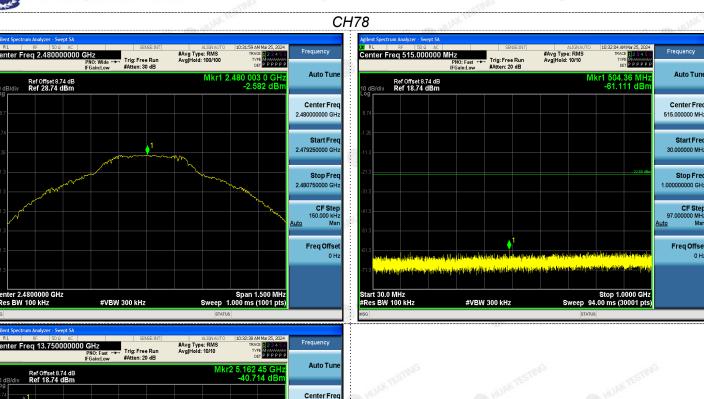


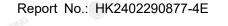


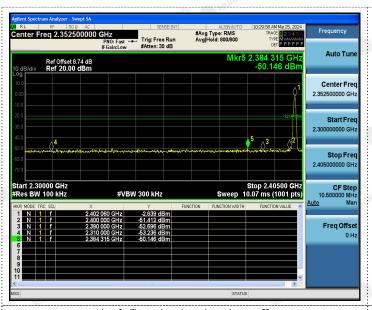
#VBW 300 kHz

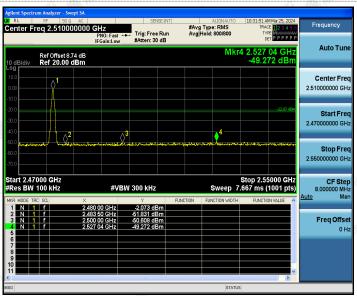
-2.350 dBm -40.714 dBm

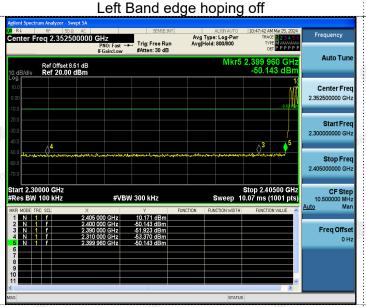
2.479 85 GHz 5.162 45 GHz

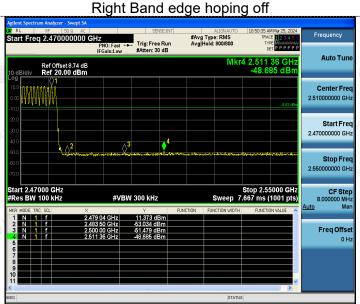












Left Band edge hoping on

Right Band edge hoping on

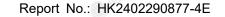
NG

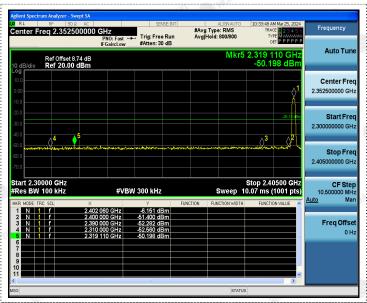
π/4DQPSK **CH00 CH39** #Avg Type: RMS Avg|Hold: 100/100 #Avg Type: RMS Avg|Hold: 100/100 Auto Tun Auto Tune 1 031 5 GF 6.347 dBı-2 034 5 GH -6.437 dBn Ref Offset 8.74 dB Ref 28.74 dBm Ref Offset 8.74 dB Ref 28.74 dBm Center Fred Center Free 2.401250000 GH 2.440250000 GH Stop Freq 2.402750000 GHz Stop Free 2.441750000 GH Freq Offse Freq Offse Center 2.4020000 GHz Res BW 100 kHz Span 1.500 MHz Sweep 1.000 ms (1001 pts Center 2.4410000 GHz #Res BW 100 kHz #VBW 300 kHz #VBW 300 kHz #Avg Type: RMS Avg|Hold: 10/10 #Avg Type: RMS Avg|Hold: 10/10 PNO: Fast --- Trig: Free Run IFGain:Low #Atten: 20 dB r1 545.01 M -61.260 dl 1 110.28 MF -61.146 dB Ref Offset 8.74 dB Ref 18.74 dBm Ref Offset 8.74 dB Ref 18.74 dBm Center Freq Center Free 515.000000 MH 30.000000 MH: Stop Free 1.000000000 GH 1.000000000 GH CF Step 97.000000 MH CF Ste 97.000000 MH Freq Offse Freq Offse Frequency Frequency Center Freq 13.750000000 GHz #Avg Type: RMS Avg|Hold: 10/10 enter Freg 13.750000000 GHz #Avg Type: RMS Avg|Hold: 10/10 Trig: Free Run #Atten: 20 dB Trig: Free Run #Atten: 20 dB Auto Tun Auto Tun Ref Offset 8.74 dB Ref 18.74 dBm Ref Offset 8.74 dB Ref 18.74 dBm Center Free Center Free 13.750000000 GH Start Fred Start Freq Stop Free Stop Fred 26.500000000 GH: CF Step CF Step 2.550000000 GH: 2.401 65 GHz 5.233 00 GHz -6.905 dBn -47.339 dBn 2.440 75 GHz 25.730 75 GHz -7.149 dBm -48.788 dBm Frea Offse Frea Offse

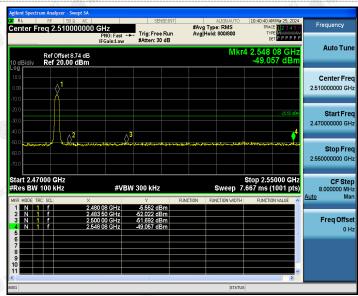
#VBW 300 kHz

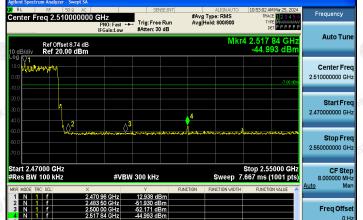
X Y
2.479 85 GHz -5.622 dBm
5.199 85 GHz -59.574 dBm









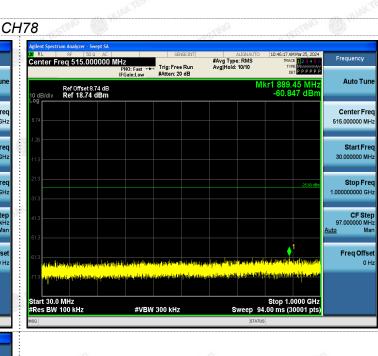


Right Band edge hoping off

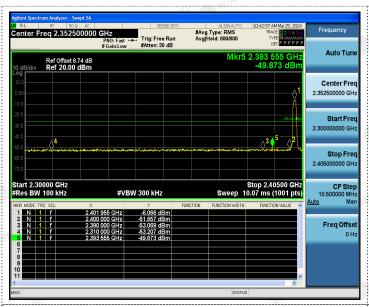
Left Band edge hoping on

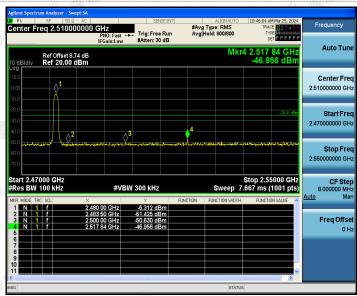
Right Band edge hoping on

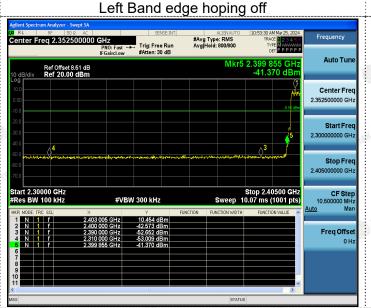
8DPSK **CH00 CH39** RL RF 50Ω AC nter Freq 2.402000000 GHz PNO: Wide RL RF 50.Ω AC enter Freq 2.441000000 GHz PN0: Wide → PN0: Wide → Trig: Free Run PRO: Mide → Matten: 30 dB #Avg Type: RMS AvaiHold: 100/100 #Avg Type: RMS AvalHold: 100/100 Auto Tun Ref Offset 8.74 dB Ref 28.74 dBm Ref Offset 8.74 dB Ref 28.74 dBm Center Free Center Free 2.402000000 GHz 2.441000000 GH Start Freq CF Step 150.000 kH CF Step 150.000 kH Freq Offse Freq Offse enter 2.4020000 GHz Res BW 100 kHz #VBW 300 kHz #VBW 300 kHz #Avg Type: RMS Avg|Hold: 10/10 #Avg Type: RMS Avg|Hold: 10/10 PNO: Fast --- Trig: Free Run PNO: Fast --- Trig: Free Run Auto Tun Auto Tun 804.67 MH 60.872 dB-Ref Offset 8.74 dB Ref 18.74 dBm Ref Offset 8.74 dB Ref 18.74 dBm Center Fred Center Fred 515.000000 MHz 30.000000 MH: Stop Free 1.000000000 GH Freq Offse Freq Offse ter Freq 13.750000000 GHz #Avg Type: RMS Avg|Hold: 10/10 nter Freq 13.750000000 GHz #Avg Type: RMS Avg|Hold: 10/10 Auto Tun Auto Tun 5.170 10 G -40 235 dl Ref Offset 8.74 dB Ref 18.74 dBm Ref Offset 8.74 dB Ref 18.74 dBm Center Fre Center Fred 13.750000000 GH Start Fre Start Fred 1.000000000 GH 1.000000000 GH **Stop Fre** 26.500000000 GH Stop Fre CF Step 2.550000000 GHz CF Ster 2.402 50 GHz 25.770 70 GHz -7.900 dBm -49.058 dBm 2.440 75 GHz 5.170 10 GHz Freq Offse Freq Offse













Left Band edge hoping on

Right Band edge hoping on



3.9. Pseudorandom Frequency Hopping Sequence

TEST APPLICABLE

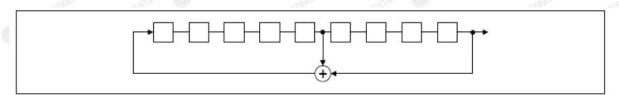
For 47 CFR Part 15C section 15.247 (a) (1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence Requirement

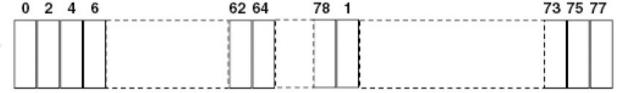
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannon be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at http://www.cer-mark.com.

TEL: +86-755 2302 9901 FAX: +86-755 2302 9901 E-mail: service@cer-mark.com



3.10. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR 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. And according to FCC 47 CFR Section 15.247, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

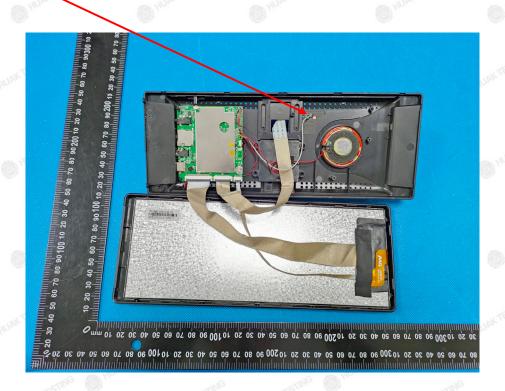
Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The antenna used in this product is a FPC Antenna, need professional installation. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 3.46dBi.

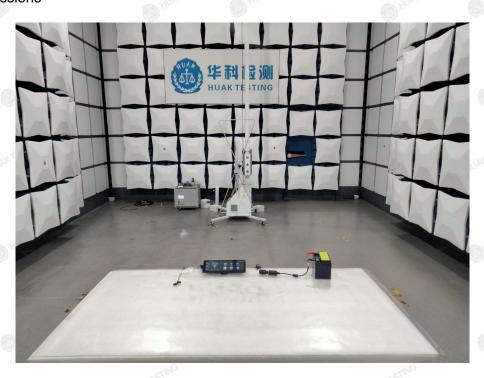
Antenna





4. Test Setup Photos of the EUT

Radiated Emissions





The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannont be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at http://www.cer-mark.com.

TEL: +86-755 2302 9901 FAX: +86-755 2302 9901 E-mail: service@cer-mark.com



Conducted Emission





5. Photos of the EUT

Reference to the report: ANNEX A of external photos and ANNEX B of internal photos.

End of test report

The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by HUAK, this document cannont be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at http://www.cer-mark.com.

TEL: +86-755 2302 9901 FAX: +86-755 2302 9901 E-mail: service@cer-mark.com