3.8 Out-of-Band Emissions

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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



<u>Test Results</u>

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 and 3DH5

Test plot as follows:

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Page 40 of 53

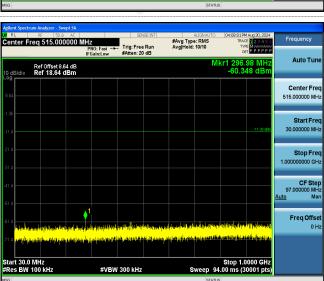
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Report No.: HK2408274970-2E





| lent Spect | rum Analyzer - Sv | | | | | | | | | |
|-------------------|---------------------------|---|-----------------------|----------------------|---------------|----------------------------------|--|--------------------|--|---------------------------------------|
| | req 515.00 | 2 AC 0000 N | AHZ PNO: Fast ↔ | T | | #Avg T Avg Ho | ALIGNAUTO /pe: RMS Id: 10/10 | TRAC | Aug 30, 2024 1 2 3 4 5 6 E MINNIM | Frequency |
| dB/div | Ref Offset 8 Ref 18.64 | 64 dB dBm | FGame | Pricen. 24 | | | М | kr1 930. -60.73 | 77 MHz 35 dBm | Auto Tui |
| 9 54 | | | | | | | | | | Center Fr 515.000000 Mi |
| 5 4 | | | | | | | | | -11.25 dBm | Start Fro 30.000000 Mi |
| | | | | | | | | | | Stop Fr 1.000000000 G |
| - | | | | | | | | | | CF St 97.000000 M <u>Auto</u> M |
| | lumpanta estal | a da la | 1. Hanyatetadilea | | | | palatet dite | | | Freq Offs 0 |
| | | ipic ^L itano | representation of the | in the second second | addina an a'r | <mark>in an inferience de</mark> | <mark>, ang ang Kanal Jula Aku</mark> ng Ang Kanalang Kanalang Ang Kanalang | | | |
| art 30.0 es BW | MHz 100 kHz | | #VBW | 300 kHz | | | Sweep 94 | Stop 1.0 | 000 GHz | |



| | | Q AC | | SENSE:INT | | ALIGNAUTO | 04:07:03 PM Aug 30, 2024 | Frequency |
|---------------------|----------------|---------------------------|---------|-------------------------------|----------|--------------------------|---|-------------------------------------|
| nter F | req 13.750 | | East T | rig: Free Run Atten: 20 dB | | Type: RMS Hold: 10/10 | TRACE 123456 TYPE MONOTONIC DET PPPPP | |
| dB/div | Ref Offset | | | | | Mkr | 2 4.804 60 GHz -44.175 dBm | Auto Tun |
| 9 54 36 .4 | ⟩1 | | | | | | -11.25 dBn | Center Fre 13.750000000 GH |
| .4 | ¢² | | | | | | | Start Fre 1.000000000 GH |
| 4 4 4 | | | , | | | | | Stop Fre 26.50000000 GF |
| art 1.00 es BW | GHz 100 kHz | | #VBW 30 | 0 kHz | | Sweep 2 | Stop 26.50 GHz 2.438 s (30001 pts) | CF Ste 2.550000000 GH Auto Ma |
| N MODE TH | f | × 2.401 65 4.804 60 | | γ 3.703 dBm | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE | |
| N 1 | | 4.804 60 | JHZ -44 | l.175 dBm | | | | Freq Offs 0 F |
| | | | | | | | | |
| | | | | | | | | |

| enter Fi | | 2 AC 000000 GH: | 7 | SENSE: INT | | ALIGNAUTO | 04:08:34 PM TRACE | 123456 | Frequency |
|---------------------------------|----------------------------|-------------------------|--------------------------|---------------------|----------|---------------|------------------------|-----------------------|--------------------------|
| | | PNO: IFGai | Fast Trig: | Free Run n:20 dB | Avg Ho | id: 10/10 | TVP | MWWWWWW PPPPPP | |
| 0 dB/div | Ref Offset 8. Ref 18.64 | | | | | Mkr | 2 4.881 9 -43.40 | 95 GHz 1 dBm | Auto Tur |
| . og 8.64 | ∑1 | | | | | | | | Center Fre |
| 1.36 | | | | | | | | | 13.750000000 Gł |
| 11.4 | | | | | | | | -11,38 dBm | |
| 21.4 | | | | | | | | | Start Fr |
| 41.4 | | | | | | | | | 1.00000000 GI |
| 51.4 | | | | | | | | al de la cital | |
| 51.4 1.4 | New York Party | , and the second second | A strategic physical and | | | - | | | Stop Fr 26.50000000 G |
| '1.4 | | | | | | | | | |
| tart 1.00 Res BW |) GHz 100 kHz | | #VBW 300 k | Hz | | Sweep 2 | Stop 26 2.438 s (30 | i.50 GHz 1001 pts) | CF Sto 2.55000000 G |
| KR MODE TF | | × 2.440 75 G | Y 0.24 | FU 1 dBm | NCTION F | UNCTION WIDTH | FUNCTION | VALUE | Auto M |
| 4 N 4 | | 4.881 95 0 | Hz -43.40 | 1 dBm | | | | | Freq Offs |
| 1 N 1 2 N 1 | | | | | | | | | 0 |
| 2 N 1 3 4 | | | | | | | | | |
| 2 N 1 3 4 5 6 | | | | | | | | | |
| 2 N 1 3 4 5 5 6 7 8 | | | | | | | | | |
| 2 N 1 3 4 5 6 7 7 | | | | | | | | | |

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Page 41 of 53

Report No.: HK2408274970-2E

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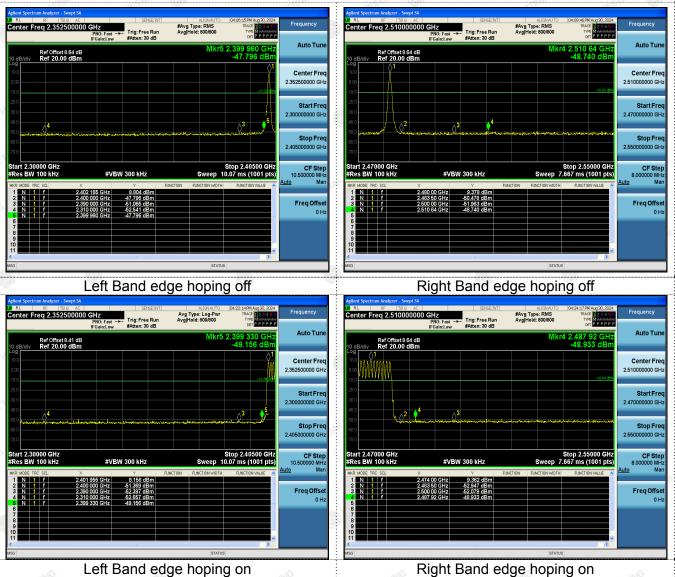


Page 42 of 53

Report No.: HK2408274970-2E

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Left Band edge hoping on

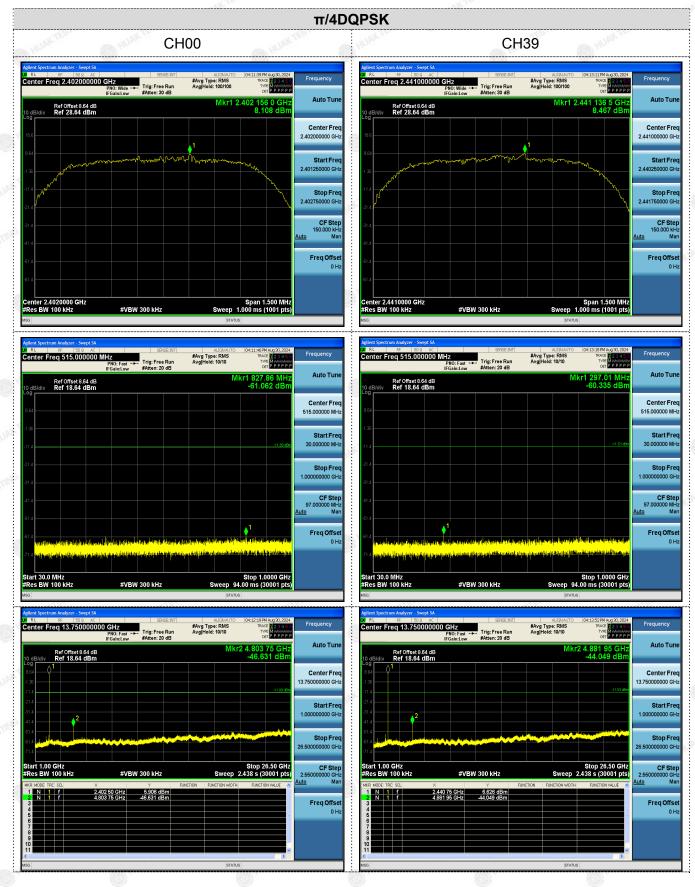
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Page 43 of 53

Report No.: HK2408274970-2E



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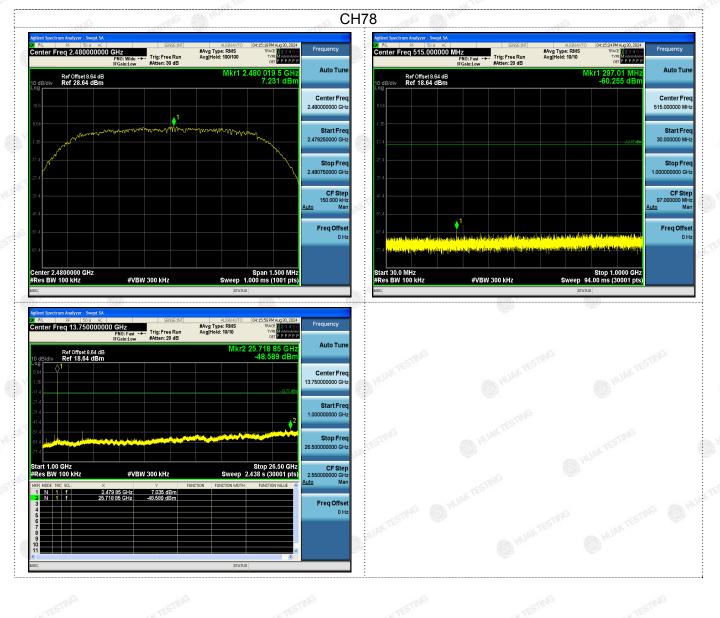
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Page 44 of 53

Report No.: HK2408274970-2E

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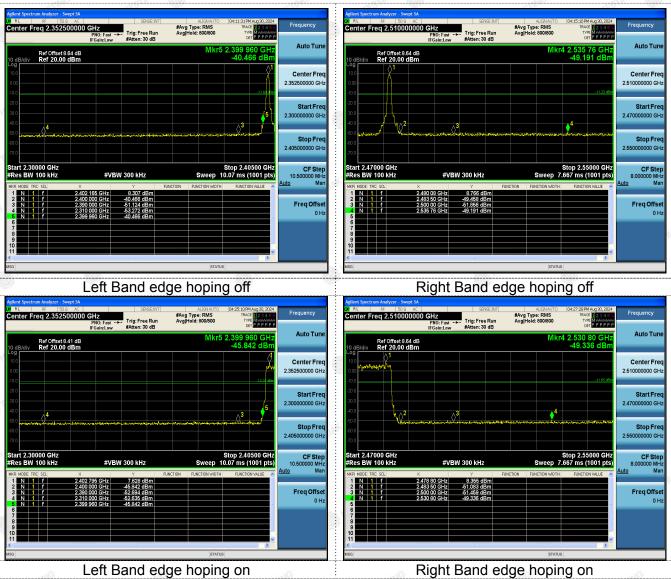
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Page 45 of 53

Report No.: HK2408274970-2E



Left Band edge hoping on

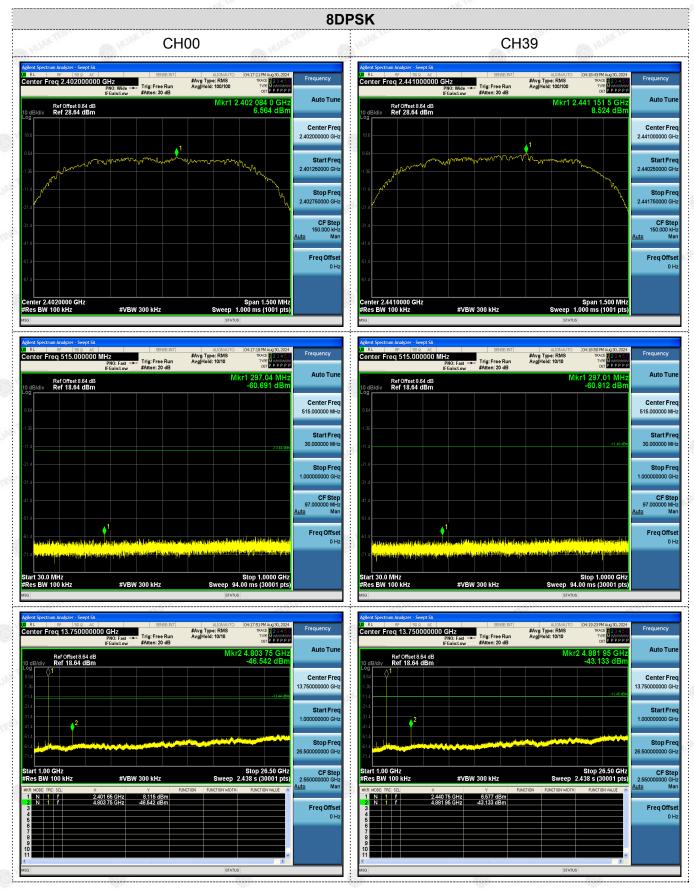
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Page 46 of 53

Report No.: HK2408274970-2E



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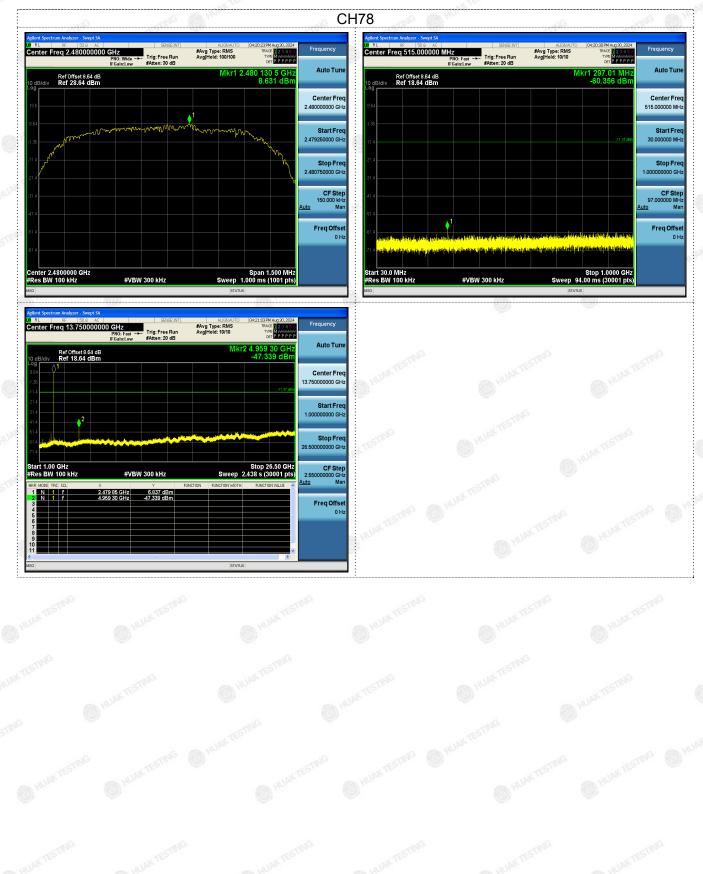


Page 47 of 53

Report No.: HK2408274970-2E

51

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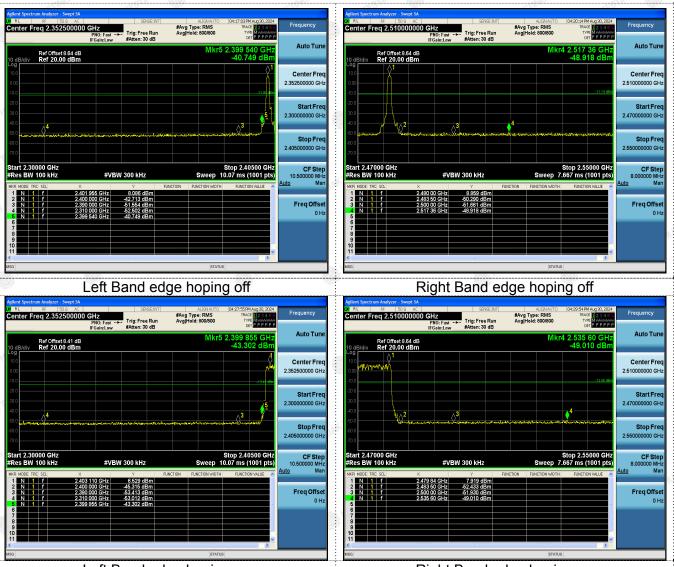
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Page 48 of 53

Report No.: HK2408274970-2E

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Left Band edge hoping on

Right Band edge hoping on

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3.9 Pseudorandom Frequency Hopping Sequence

Test Applicable

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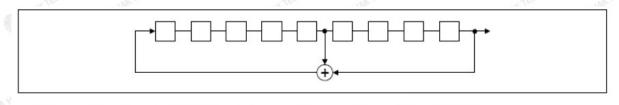
For 47 CFR Part 15C section 15.247 (a) (1):

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

| 0 | 2 | 4 | 6 | 62 6 | 4 78 | 3 1 | 73 75 7 |
|---|---|---|---|------|------|-----|---------|
| | | | | | | | |
| | | | | 11 | | | |
| | | | | | | | |

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.

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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

10 20 30

90 200

8

2

8

50

The antenna used in this product is a FPC antenna, need professional installation, not easy to remove. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 2.02dBi.

Antenna



30 50 10 300 30 80 10 60 20 40 30 50 10 500 30 80 10 60 20 40 30 50 10 100 30 80 10 60 20 40 30 50 20

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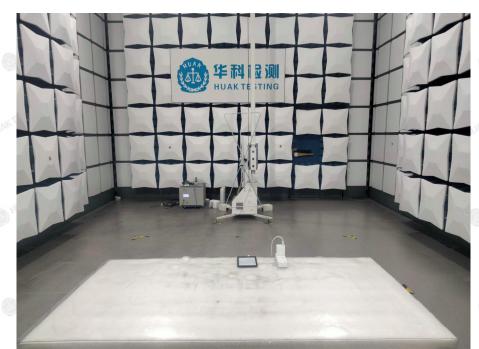
Page 51 of 53

Report No.: HK2408274970-2E

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4. Test Setup Photos of the EUT

Radiated Emission





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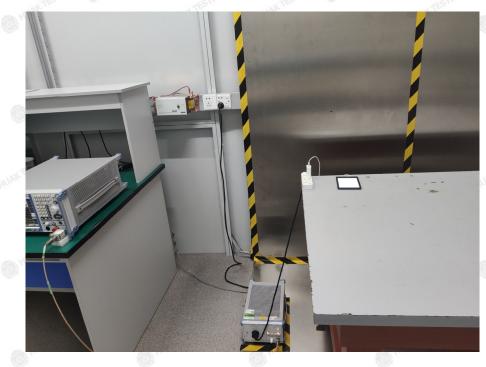
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Page 52 of 53

Report No.: HK2408274970-2E

Conducted Emission



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Page 53 of 53

Report No.: HK2408274970-2E

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5. Photos of the EUT

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

-----End of test report-----

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