

FCC Test Report

Report No.: AGC00803210903FE03

FCC ID : 2AKHJ-HW308
APPLICATION PURPOSE : Original Equipment
PRODUCT DESIGNATION : 2.4G Keyboard
BRAND NAME : N/A
MODEL NAME : HW308
APPLICANT : Shenzhen Hangshi Technology Co., Ltd
DATE OF ISSUE : Oct. 14, 2021
STANDARD(S) : FCC Part 15 Rules
TEST PROCEDURE(S)
REPORT VERSION : V1.0

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REPORT REVISE RECORD

| Report Version | Revise Time | Issued Date | Valid Version | Notes |
|----------------|-------------|---------------|---------------|-----------------|
| V1.0 | / | Oct. 14, 2021 | Valid | Initial Release |

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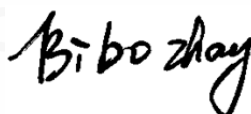
1. VERIFICATION OF CONFORMITY

| | |
|---------------------------------|---|
| Applicant | Shenzhen Hangshi Technology Co., Ltd |
| Address | Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China |
| Manufacturer | Shenzhen Hangshi Technology Co., Ltd |
| Address | Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China |
| Factory | Shenzhen Hangshi Technology Co., Ltd |
| Address | Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China |
| Product Designation | 2.4G Keyboard |
| Brand Name | N/A |
| Test Model | HW308 |
| Date of test | Sep. 07, 2021 to Oct. 14, 2021 |
| Deviation | No any deviation from the test method |
| Condition of Test Sample | Normal |
| Test Result | Pass |
| Report Template | AGCRT-US-BR/RF |

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.249.

Prepared By



Bibo Zhang
(Project Engineer) Oct. 14, 2021

Reviewed By



Calvin Liu
(Reviewer) Oct. 14, 2021

Approved By



Max Zhang
(Authorized Officer) Oct. 14, 2021

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

A major technical description of EUT is described as following

| | |
|-------------------------------|--|
| Operation Frequency | 2405MHz-2470MHz |
| Maximum field strength | 82.46dBuV/m(Average)@3m |
| Modulation | GFSK |
| Number of channels | 8 |
| Antenna Gain | 1.87dBi |
| Antenna Designation | PCB Antenna |
| Hardware Version | V1.0 |
| Software Version | V1.0 |
| Power Supply | DC 3.7V by battery or DC 5V by adapter |

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2.2. TABLE OF CARRIER FREQUENCY

| Frequency Band | Channel Number | Frequency(MHZ) | Channel Number | Frequency(MHZ) |
|----------------|----------------|----------------|----------------|----------------|
| 2400~2483.5MHZ | 1 | 2405 | 5 | 2440 |
| | 2 | 2413 | 6 | 2450 |
| | 3 | 2422 | 7 | 2460 |
| | 4 | 2430 | 8 | 2470 |

2.3. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

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3. MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI.

- Uncertainty of Conducted Emission, $U_c = \pm 3.1$ dB
- Uncertainty of Radiated Emission below 1GHz, $U_c = \pm 4.0$ dB
- Uncertainty of Radiated Emission above 1GHz, $U_c = \pm 4.8$ dB

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4. DESCRIPTION OF TEST MODES

| NO. | TEST MODE DESCRIPTION |
|--|-----------------------|
| 1 | TX mode at 2405MHz |
| 2 | TX mode at 2430MHz |
| 3 | TX mode at 2470MHz |
| <p>Note:</p> <ol style="list-style-type: none"> 1. All the test modes can be supply by battery, only the result of the worst case was recorded in the report, if no other cases. 2. For Radiated Emission, 3axis were chosen for testing for each applicable mode. 3. Set the EUT into the individual test modes by pressing the EUT buttons. | |

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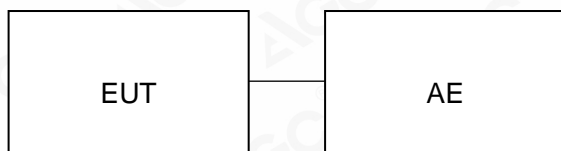
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5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Configure:



5.2 EQUIPMENT USED IN TESTED SYSTEM

| Item | Equipment | Model No. | ID or Specification | Remark |
|------|---------------|-----------|---------------------|--------|
| 1 | 2.4G Keyboard | HW308 | 2AKHJ-HW308 | EUT |

5.3. SUMMARY OF TEST RESULTS

| FCC RULES | DESCRIPTION OF TEST | RESULT |
|----------------|---------------------|-----------|
| §15.249&15.209 | Radiated Emission | Compliant |
| §15.249 | Band Edges | Compliant |
| §15.215 | 20dB bandwidth | Compliant |
| §15.207 | Conducted Emission | Compliant |

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6. TEST FACILITY

| | |
|--|--|
| Test Site | Attestation of Global Compliance (Shenzhen) Co., Ltd |
| Location | 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China |
| Designation Number | CN1259 |
| FCC Test Firm Registration Number | 975832 |
| A2LA Cert. No. | 5054.02 |
| Description | Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA |

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

| Equipment | Manufacturer | Model | S/N | Cal. Date | Cal. Due |
|---------------|--------------|------------------|--------|---------------|---------------|
| TEST RECEIVER | R&S | ESPI | 101206 | May 15, 2021 | May 14, 2022 |
| LISN | R&S | ESH2-Z5 | 100086 | Jun. 09, 2021 | Jun. 08, 2022 |
| Test software | R&S | ES-K1(Ver.V1.71) | N/A | N/A | N/A |

TEST EQUIPMENT OF RADIATED EMISSION TEST

| Equipment | Manufacturer | Model | S/N | Cal. Date | Cal. Due |
|--------------------------------|----------------|-------------------|------------|---------------|---------------|
| TEST RECEIVER | R&S | ESCI | 10096 | Apr. 14, 2021 | Apr. 13, 2022 |
| EXA Signal Analyzer | Agilent | N9010A | MY53470504 | Dec. 07, 2020 | Dec. 06, 2021 |
| 2.4GHz Fliter | EM Electronics | 2400-2500MHz | N/A | Mar. 23, 2020 | Mar. 22, 2022 |
| Attenuator | ZHINAN | E-002 | N/A | Sep. 03, 2020 | Sep. 02, 2022 |
| Horn antenna | SCHWARZBECK | BBHA 9170 | #768 | Oct. 09, 2019 | Oct. 08, 2021 |
| Active loop antenna (9K-30MHz) | ZHINAN | ZN30900C | 18051 | May 22, 2020 | May 21, 2022 |
| Double-Ridged Waveguide Horn | ETS LINDGREN | 3117 | 00154520 | Oct. 26, 2019 | Oct. 25, 2021 |
| Broadband Preamplifier | ETS LINDGREN | 3117PA | 00225134 | Oct. 15, 2019 | Oct. 16, 2021 |
| ANTENNA | SCHWARZBECK | VULB9168 | 494 | Jan. 08, 2021 | Jan. 07, 2023 |
| Test software | Tonscend | JS32-RE (Ver.2.5) | N/A | N/A | N/A |

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7. RADIATED EMISSION

7.1 TEST LIMIT

Standard FCC15.249

| Fundamental Frequency | Field Strength of Fundamental (millivolts/meter) | Field Strength of Harmonics (microvolts/meter) |
|-----------------------|---|---|
| 900-928MHz | 50 | 500 |
| 2400-2483.5MHz | 50 | 500 |
| 5725-5875MHz | 50 | 500 |
| 24.0-24.25GHz | 250 | 2500 |

Standard FCC 15.209

| Frequency (MHz) | Distance Meters | Field Strengths Limit | |
|--------------------|--------------------|---|----------------|
| | | μ V/m | dB(μ V)/m |
| 0.009 ~ 0.490 | 300 | 2400/F(kHz) | --- |
| 0.490 ~ 1.705 | 30 | 24000/F(kHz) | --- |
| 1.705 ~ 30 | 30 | 30 | --- |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| 960 ~ 1000 | 3 | 500 | 54.0 |
| Above 1000 | 3 | Other: 74.0 dB(μ V)/m (Peak) 54.0 dB(μ V)/m (Average) | |

Remark: (1) Emission level $\text{dB } \mu\text{V} = 20 \log \text{Emission level } \mu\text{V/m}$
(2) The smaller limit shall apply at the cross point between two frequency bands.
(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

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7.2. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use minimum resolution bandwidth of 1 MHz. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

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The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter | Setting |
|-----------------------|---|
| Start ~Stop Frequency | 9KHz~150KHz/RB 200Hz for QP |
| Start ~Stop Frequency | 150KHz~30MHz/RB 9KHz for QP |
| Start ~Stop Frequency | 30MHz~1000MHz/RB 120KHz for QP |
| Start ~Stop Frequency | 1GHz~26.5GHz RBW 2.4MHz/ VBW 8MHz for Peak, RBW 2.4MHz/3MHz for Average |

| Receiver Parameter | Setting |
|-----------------------|--------------------------------|
| Start ~Stop Frequency | 9KHz~150KHz/RB 200Hz for QP |
| Start ~Stop Frequency | 150KHz~30MHz/RB 9KHz for QP |
| Start ~Stop Frequency | 30MHz~1000MHz/RB 120KHz for QP |

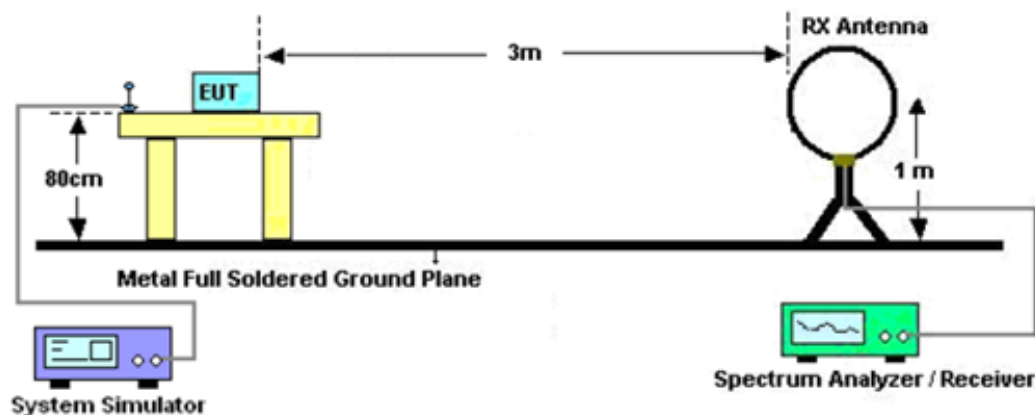
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7.3. TEST SETUP

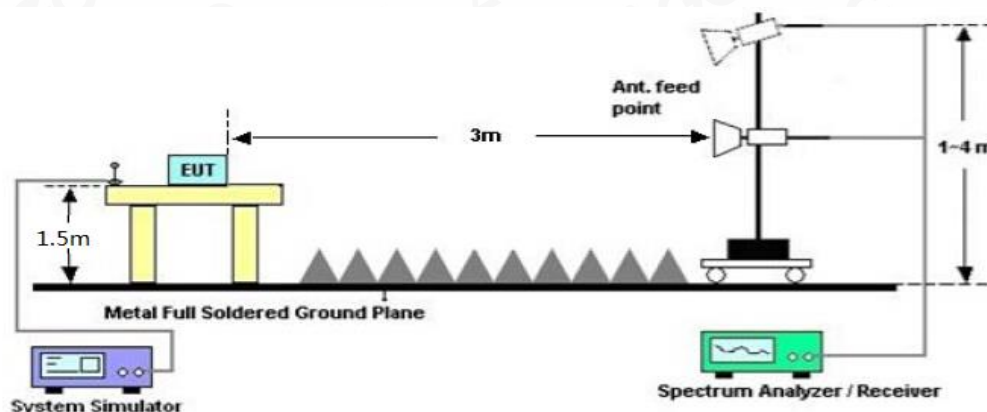
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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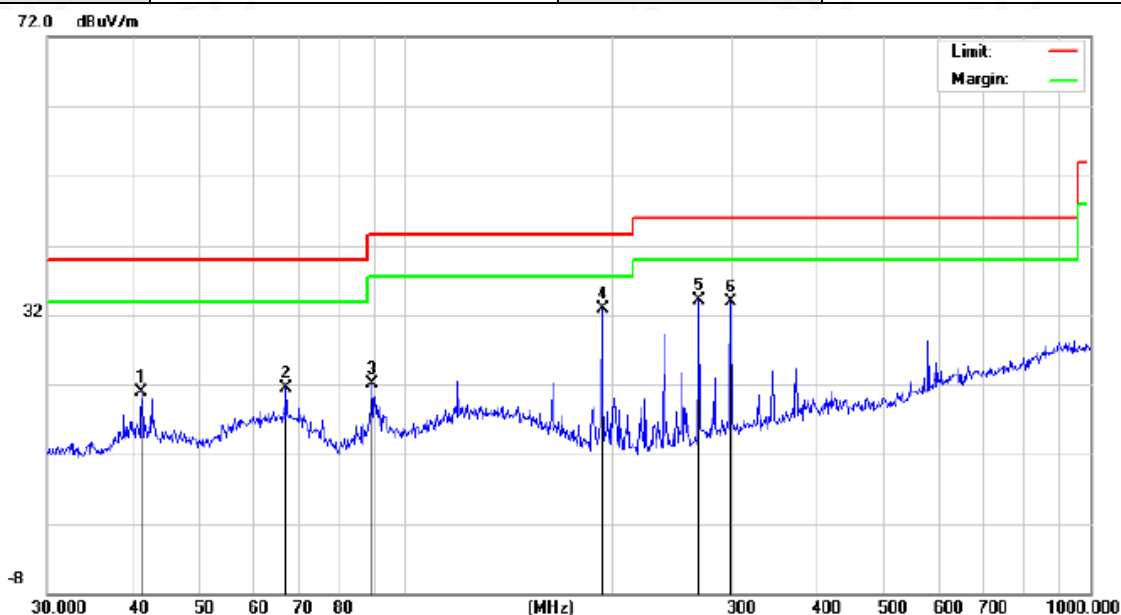
7.4. TEST RESULT

RADIATED EMISSION BELOW 30MHZ

The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

RADIATED EMISSION 30MHz- 1GHZ

| | | | |
|-------------|---------------|-------------------|------------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 1 | Polarization | Horizontal |



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Over dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|----------|
| 1 | | 41.1320 | 10.99 | 9.94 | 20.93 | 40.00 | -19.07 | peak |
| 2 | | 66.9669 | 9.53 | 11.92 | 21.45 | 40.00 | -18.55 | peak |
| 3 | | 89.2764 | 12.31 | 9.83 | 22.14 | 43.50 | -21.36 | peak |
| 4 | * | 193.7728 | 23.90 | 9.04 | 32.94 | 43.50 | -10.56 | peak |
| 5 | | 268.4853 | 25.16 | 9.00 | 34.16 | 46.00 | -11.84 | peak |
| 6 | | 298.2681 | 22.95 | 10.86 | 33.81 | 46.00 | -12.19 | peak |

RESULT: PASS

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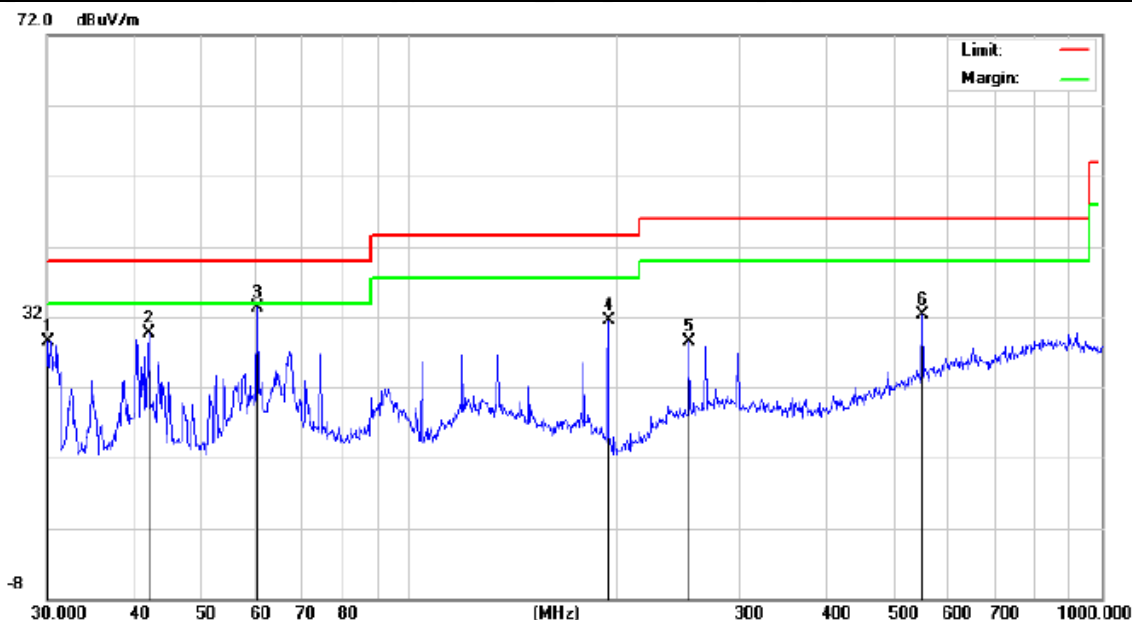
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| | | | |
|-------------|---------------|-------------------|----------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 1 | Polarization | Vertical |



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Over dB | Detector |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|----------|
| 1 | | 30.0000 | 21.40 | 7.17 | 28.57 | 40.00 | -11.43 | peak |
| 2 | | 42.1542 | 19.92 | 9.72 | 29.64 | 40.00 | -10.36 | peak |
| 3 | * | 60.2801 | 21.41 | 11.88 | 33.29 | 40.00 | -6.71 | peak |
| 4 | | 193.7728 | 22.08 | 9.33 | 31.41 | 43.50 | -12.09 | peak |
| 5 | | 252.9482 | 15.01 | 13.43 | 28.44 | 46.00 | -17.56 | peak |
| 6 | | 550.9480 | 13.76 | 18.50 | 32.26 | 46.00 | -13.74 | peak |

RESULT: PASS

Note: Factor=Antenna Factor + Cable loss, Margin=Limit-Level

The "Factor" value can be calculated automatically by software of measurement system.

All modes of each antenna are tested. The mode 1 is the worst case and recorded in the report.

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FIELD STRENGTH OF FUNDAMENTAL

| | | | |
|-----------------|---------------|-------------------|------------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Modulation | GFSK | Polarization | Horizontal |

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Value Type |
|---|---------------|--------|----------------|----------|--------|------------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2405 | 32.31 | 49.05 | 81.36 | 114.00 | -32.64 | peak |
| 2405 | 30.01 | 49.05 | 79.06 | 94.00 | -14.94 | AVG |
| 2430 | 33.37 | 49.12 | 82.49 | 114.00 | -31.51 | peak |
| 2430 | 31.85 | 49.12 | 80.97 | 94.00 | -13.03 | AVG |
| 2470 | 34.92 | 49.25 | 84.17 | 114.00 | -29.83 | peak |
| 2470 | 33.21 | 49.25 | 82.46 | 94.00 | -11.54 | AVG |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|-----------------|---------------|-------------------|----------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Modulation | GFSK | Polarization | Vertical |

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Value Type |
|---|---------------|--------|----------------|----------|--------|------------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2405 | 44.37 | 49.05 | 78.93 | 114.00 | -35.07 | peak |
| 2405 | 29.51 | 49.05 | 77.11 | 94.00 | -16.89 | AVG |
| 2430 | 45.31 | 49.12 | 80.46 | 114.00 | -33.54 | peak |
| 2430 | 30.11 | 49.12 | 78.86 | 94.00 | -15.14 | AVG |
| 2470 | 40.78 | 49.25 | 82.18 | 114.00 | -31.82 | peak |
| 2470 | 30.48 | 49.25 | 80.53 | 94.00 | -13.47 | AVG |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

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RADIATED EMISSION ABOVE 1GHZ

| | | | |
|-------------|---------------|-------------------|------------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 1 | Polarization | Horizontal |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|-------------------------|----------------|----------------------------|--------------------|----------------|------------|
| 4810 | 44.15 | 0.08 | 44.23 | 74.00 | -29.77 | peak |
| 4810 | 34.59 | 0.08 | 34.67 | 54.00 | -19.33 | AVG |
| 7215 | 39.45 | 2.21 | 41.66 | 74.00 | -32.34 | peak |
| 7215 | 30.41 | 2.21 | 32.62 | 54.00 | -21.38 | AVG |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|-------------|---------------|-------------------|----------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 1 | Polarization | Vertical |

| Frequency (MHz) | Meter Reading (dBμV) | Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Value Type |
|---|-------------------------|----------------|----------------------------|--------------------|----------------|------------|
| 4810 | 42.19 | 0.08 | 42.27 | 74.00 | -31.73 | peak |
| 4810 | 36.57 | 0.08 | 36.65 | 54.00 | -17.35 | AVG |
| 7215 | 38.92 | 2.21 | 41.13 | 74.00 | -32.87 | peak |
| 7215 | 32.14 | 2.21 | 34.35 | 54.00 | -19.65 | AVG |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

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| | | | |
|-------------|---------------|-------------------|------------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 2 | Polarization | Horizontal |

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Value Type |
|---|---------------|--------|----------------|----------|--------|------------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 4860 | 45.16 | 0.14 | 45.30 | 74.00 | -28.70 | peak |
| 4860 | 36.87 | 0.14 | 37.01 | 54.00 | -16.99 | AVG |
| 7290 | 36.49 | 2.36 | 38.85 | 74.00 | -35.15 | peak |
| 7290 | 30.75 | 2.36 | 33.11 | 54.00 | -20.89 | AVG |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|-------------|---------------|-------------------|----------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 2 | Polarization | Vertical |

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Value Type |
|---|---------------|--------|----------------|----------|--------|------------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 4860 | 43.49 | 0.14 | 43.63 | 74.00 | -30.37 | peak |
| 4860 | 36.71 | 0.14 | 36.85 | 54.00 | -17.15 | AVG |
| 7290 | 37.88 | 2.36 | 40.24 | 74.00 | -33.76 | peak |
| 7290 | 30.26 | 2.36 | 32.62 | 54.00 | -21.38 | AVG |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

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| | | | |
|-------------|---------------|-------------------|------------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 3 | Polarization | Horizontal |

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Value Type |
|---|---------------|--------|----------------|----------|--------|------------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 4940 | 43.16 | 0.22 | 43.38 | 74.00 | -30.62 | peak |
| 4940 | 36.28 | 0.22 | 36.50 | 54.00 | -17.50 | AVG |
| 7410 | 37.15 | 2.64 | 39.79 | 74.00 | -34.21 | peak |
| 7410 | 33.49 | 2.64 | 36.13 | 54.00 | -17.87 | AVG |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

| | | | |
|-------------|---------------|-------------------|----------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 3 | Polarization | Vertical |

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Value Type |
|---|---------------|--------|----------------|----------|--------|------------|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 4940 | 43.19 | 0.22 | 43.41 | 74.00 | -30.59 | peak |
| 4940 | 35.27 | 0.22 | 35.49 | 54.00 | -18.51 | AVG |
| 7419 | 36.45 | 2.64 | 39.09 | 74.00 | -34.91 | peak |
| 7419 | 30.44 | 2.64 | 33.08 | 54.00 | -20.92 | AVG |
| Remark: | | | | | | |
| Factor = Antenna Factor + Cable Loss – Pre-amplifier. | | | | | | |

Note: The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.

Factor=Antenna Factor + Cable loss - Amplifier gain, Margin=Level-Limit.

The “Factor” value can be calculated automatically by software of measurement system.

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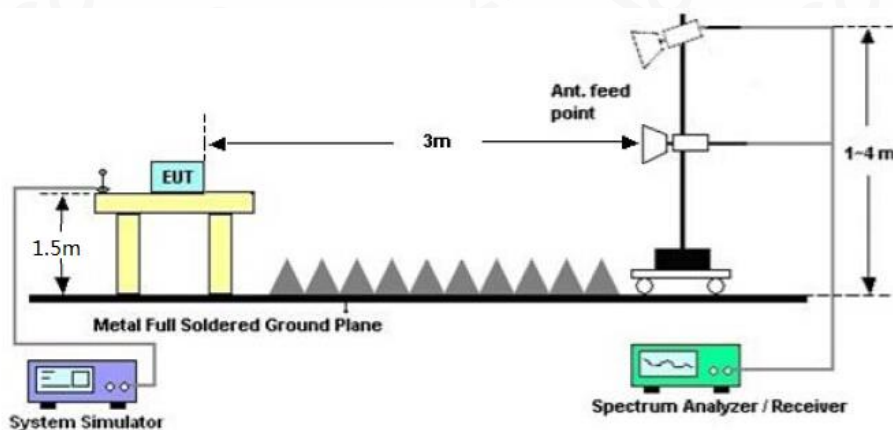
8. BAND EDGE EMISSION

8.1. MEASUREMENT PROCEDURE

1. The EUT operates at transmitting mode. The operate channel is tested to verify the largest transmission and spurious emissions power at the continuous transmission mode.
2. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission: (a) PEAK: RBW=1MHz, VBW=3MHz / Sweep=AUTO
(b) AVERAGE: RBW=1MHz ; VBW=3MHz / Sweep=AUTO
3. Other procedures refer to clause 7.2.

8.2 TEST SETUP

RADIATED EMISSION TEST SETUP



8.3 RADIATED TEST RESULT

Note:

1. Factor=Antenna Factor + Cable loss - Amplifier gain. Field Strength=Factor + Reading level
2. The factor had been edited in the "Input Correction" of the Spectrum Analyzer. So the Amplitude of test plots is equal to Reading level plus the Factor in dB. Use the A dB(μ V) to represent the Amplitude. Use the F dB(μ V/m) to represent the Field Strength. So A=F.

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| | | | |
|-------------|---------------|-------------------|------------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 1 | Polarization | Horizontal |

Peak Value



Average Value



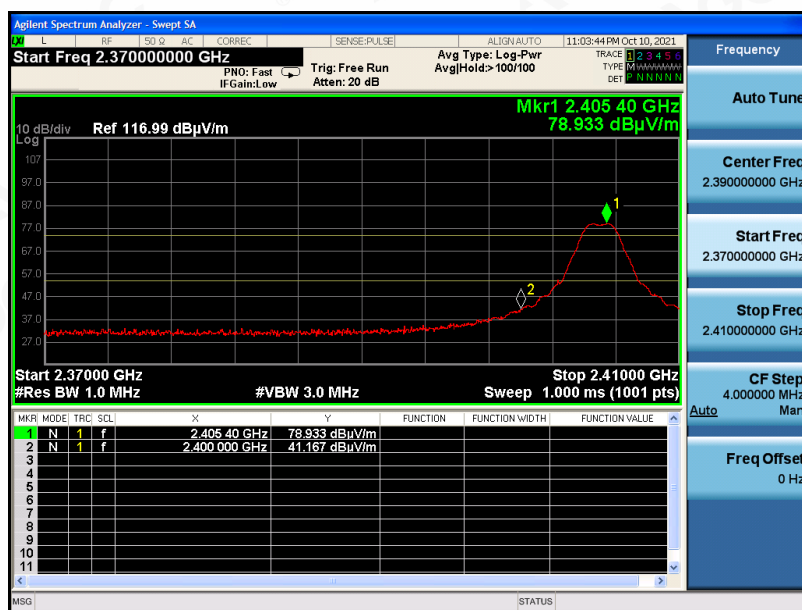
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| | | | |
|-------------|---------------|-------------------|----------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 1 | Polarization | Vertical |

Peak Value



Average Value



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| | | | |
|-------------|---------------|-------------------|------------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 3 | Polarization | Horizontal |

Peak Value



Average Value



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| | | | |
|-------------|---------------|-------------------|----------|
| EUT | 2.4G Keyboard | Model Name | HW308 |
| Temperature | 25°C | Relative Humidity | 60% |
| Pressure | 101kPa | Test Voltage | DC 3.7V |
| Test Mode | Mode 3 | Polarization | Vertical |

Peak Value



Average Value



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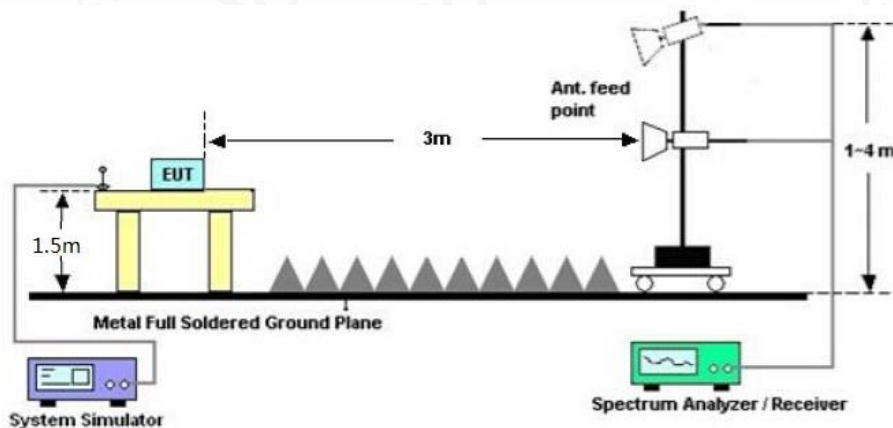


9. 20DB BANDWIDTH

9.1. MEASUREMENT PROCEDURE

1. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
2. Set SPA Centre Frequency = Operation Frequency, RBW= 30 KHz, VBW $\geq 3 \times$ RBW.
3. Set SPA Trace 1 Max hold, then View.

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



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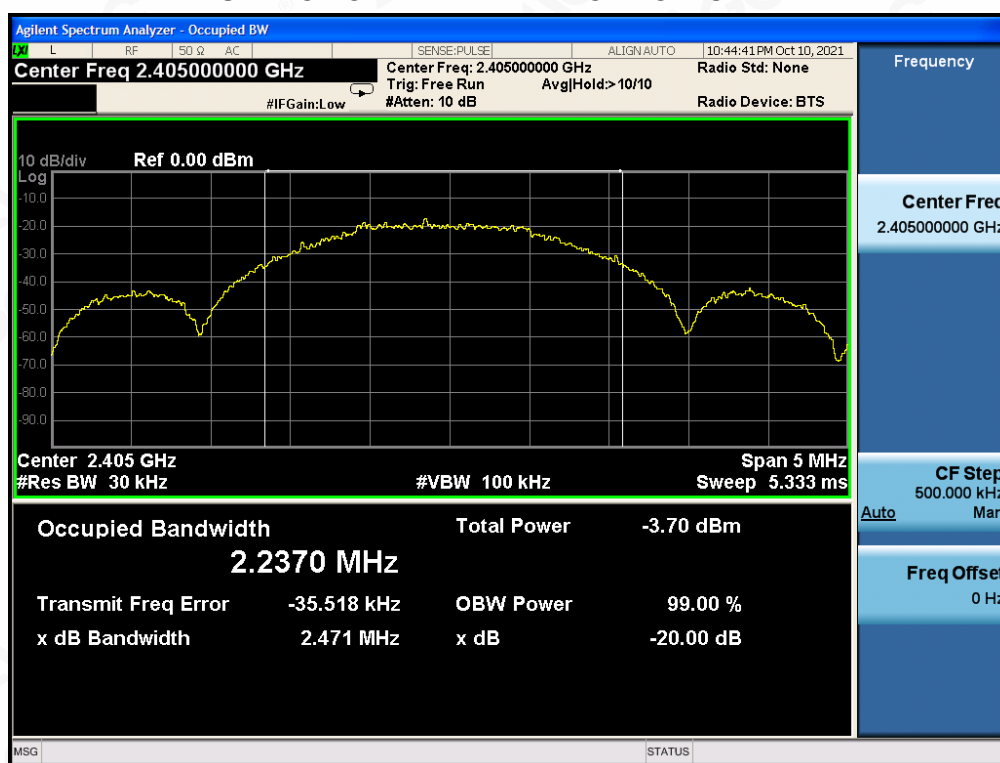


9.3. MEASUREMENT RESULTS

| | |
|-----------------|----------------|
| TEST ITEM | 20DB BANDWIDTH |
| TEST MODULATION | GFSK |

| Test Channel (MHz) | 20DB BANDWIDTH (MHz) | 99% BANDWIDTH (MHz) | Criteria |
|--------------------|----------------------|---------------------|----------|
| 2405 | 2.471 | 2.237 | PASS |
| 2430 | 2.530 | 2.265 | PASS |
| 2470 | 2.503 | 2.265 | PASS |

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

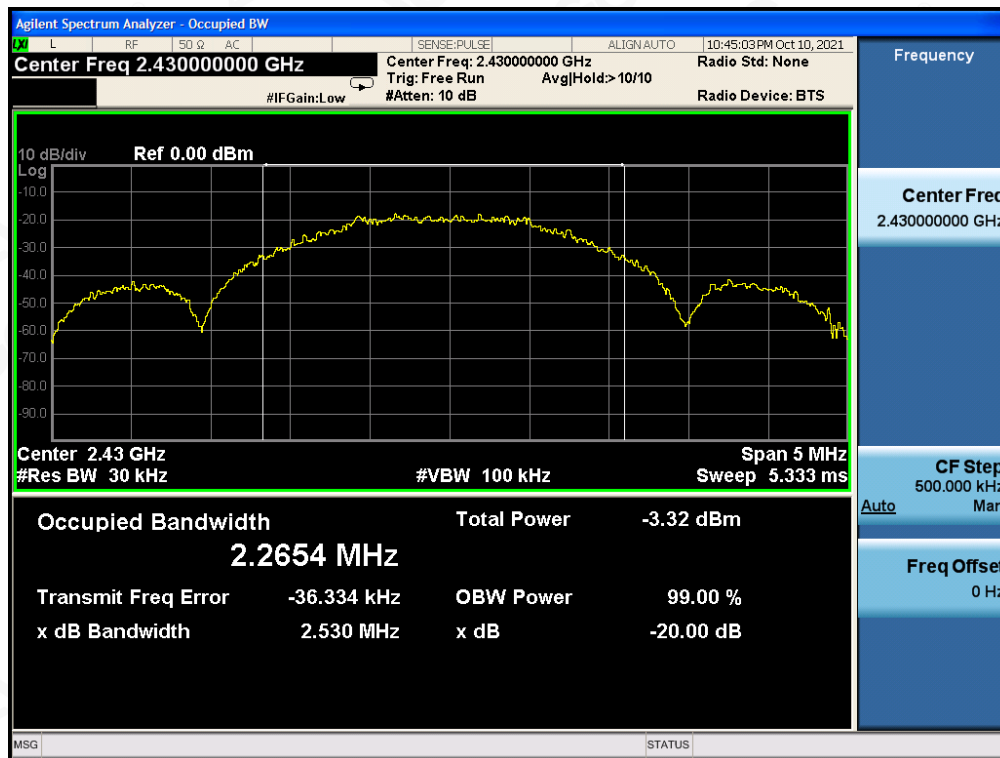


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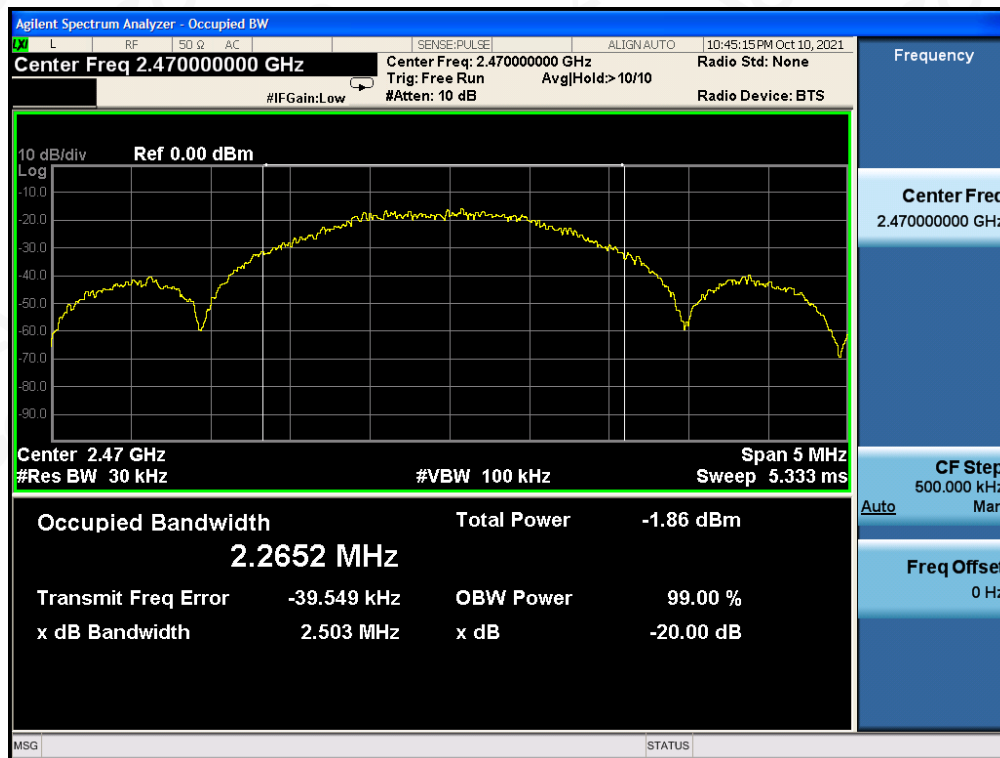
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TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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10. FCC LINE CONDUCTED EMISSION TEST

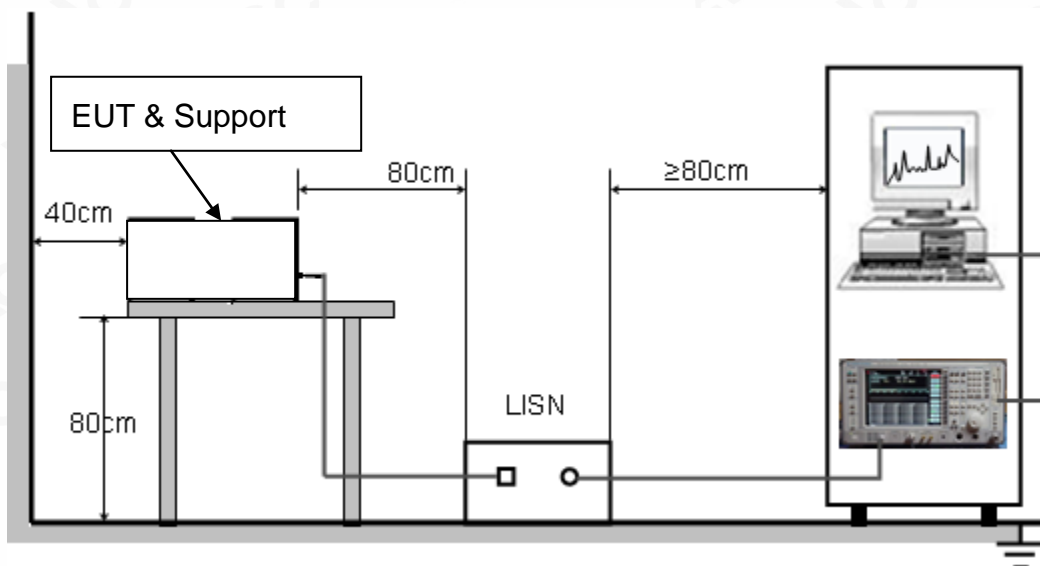
10.1. LIMITS OF LINE CONDUCTED EMISSION TEST

| Frequency | Maximum RF Line Voltage | |
|---------------|-------------------------|----------------|
| | Q.P.(dBuV) | Average(dBuV) |
| 150kHz~500kHz | 66-56 | 56-46 |
| 500kHz~5MHz | 56 | 46 |
| 5MHz~30MHz | 60 | 50 |

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

10.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



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10.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipment received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 3V power from PC which received AC120V/60Hz power from a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

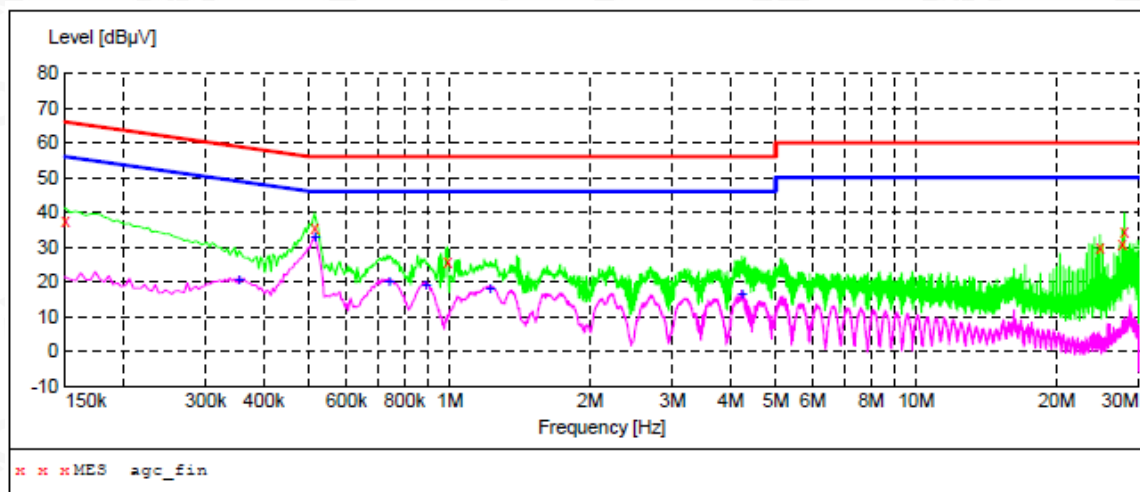
12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.



12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



MEASUREMENT RESULT: "agc_fin"

2021/9/9 14:00

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Detector | Line |
|------------------|---------------|--------------|---------------|--------------|----------|------|
| 0.150000 | 37.30 | 7.6 | 66 | 28.7 | QP | L1 |
| 0.514000 | 35.60 | 8.0 | 56 | 20.4 | QP | L1 |
| 0.990000 | 25.80 | 8.2 | 56 | 30.2 | QP | L1 |
| 24.766000 | 30.00 | 10.3 | 60 | 30.0 | QP | L1 |
| 27.654000 | 30.80 | 10.2 | 60 | 29.2 | QP | L1 |
| 27.970000 | 34.60 | 10.1 | 60 | 25.4 | QP | L1 |

MEASUREMENT RESULT: "agc_fin2"

2021/9/9 13:59

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Detector | Line |
|------------------|---------------|--------------|---------------|--------------|----------|------|
| 0.354000 | 20.60 | 7.9 | 49 | 28.3 | AV | L1 |
| 0.514000 | 32.70 | 8.0 | 46 | 13.3 | AV | L1 |
| 0.742000 | 20.10 | 8.1 | 46 | 25.9 | AV | L1 |
| 0.890000 | 19.20 | 8.1 | 46 | 26.8 | AV | L1 |
| 1.222000 | 18.20 | 8.2 | 46 | 27.8 | AV | L1 |
| 4.234000 | 16.60 | 8.6 | 46 | 29.4 | AV | L1 |

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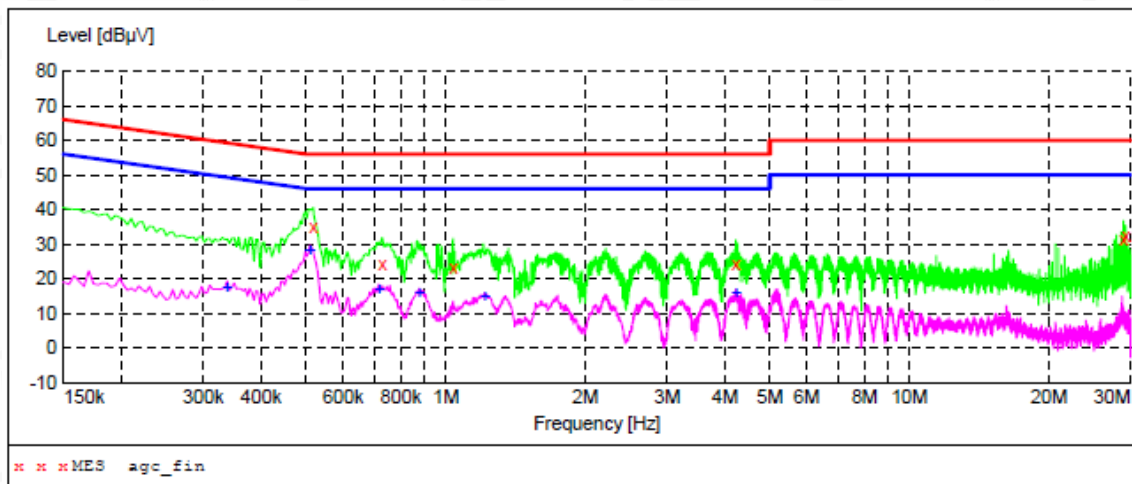
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Line Conducted Emission Test Line 2-N



MEASUREMENT RESULT: "agc_fin"

2021/9/9 14:03

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Detector | Line |
|------------------|---------------|--------------|---------------|--------------|----------|------|
| 0.518000 | 34.80 | 8.0 | 56 | 21.2 | QP | N |
| 0.730000 | 24.30 | 8.1 | 56 | 31.7 | QP | N |
| 1.038000 | 23.10 | 8.2 | 56 | 32.9 | QP | N |
| 4.230000 | 23.90 | 8.6 | 56 | 32.1 | QP | N |
| 28.942000 | 31.30 | 10.1 | 60 | 28.7 | QP | N |
| 29.258000 | 32.40 | 10.1 | 60 | 27.6 | QP | N |

MEASUREMENT RESULT: "agc_fin2"

2021/9/9 14:03

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Detector | Line |
|------------------|---------------|--------------|---------------|--------------|----------|------|
| 0.338000 | 17.50 | 7.8 | 49 | 31.8 | AV | N |
| 0.510000 | 28.00 | 8.0 | 46 | 18.0 | AV | N |
| 0.718000 | 16.90 | 8.1 | 46 | 29.1 | AV | N |
| 0.878000 | 16.00 | 8.1 | 46 | 30.0 | AV | N |
| 1.214000 | 14.90 | 8.2 | 46 | 31.1 | AV | N |
| 4.234000 | 16.00 | 8.6 | 46 | 30.0 | AV | N |

RESULT: PASS

Note: All the test modes had been tested, the mode 1 was the worst case. Only the data of the worst case would be record in this test report.

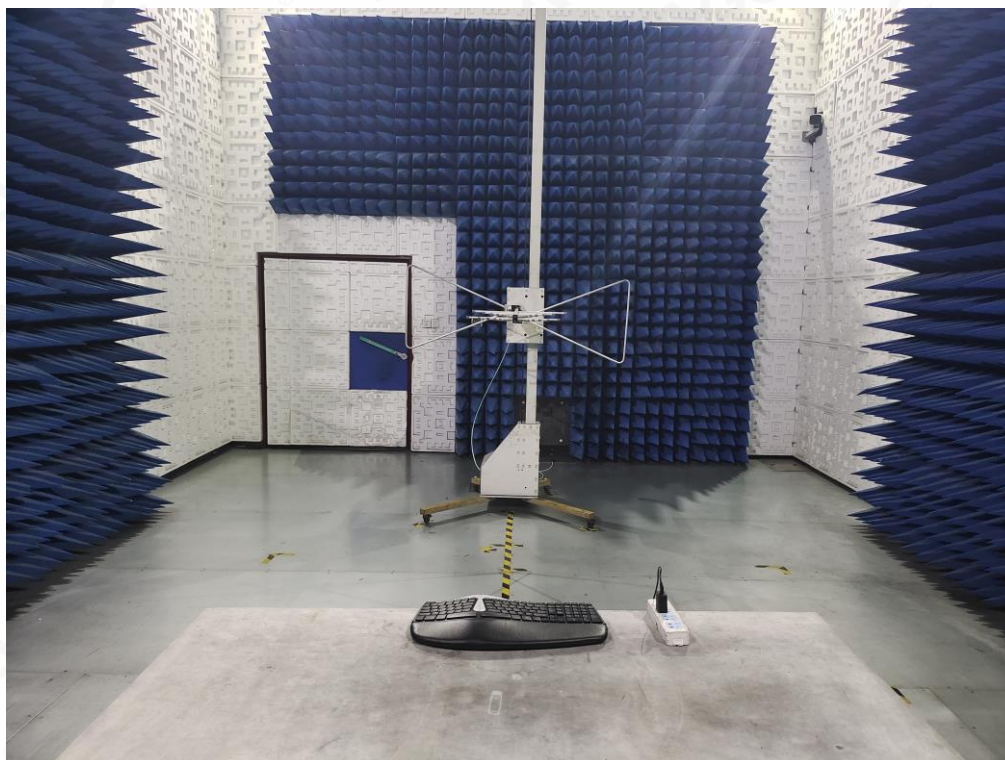
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APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC RADIATED EMISSION TEST SETUP BELOW 1GHZ



FCC RADIATED EMISSION TEST SETUP ABOVE 1GHZ



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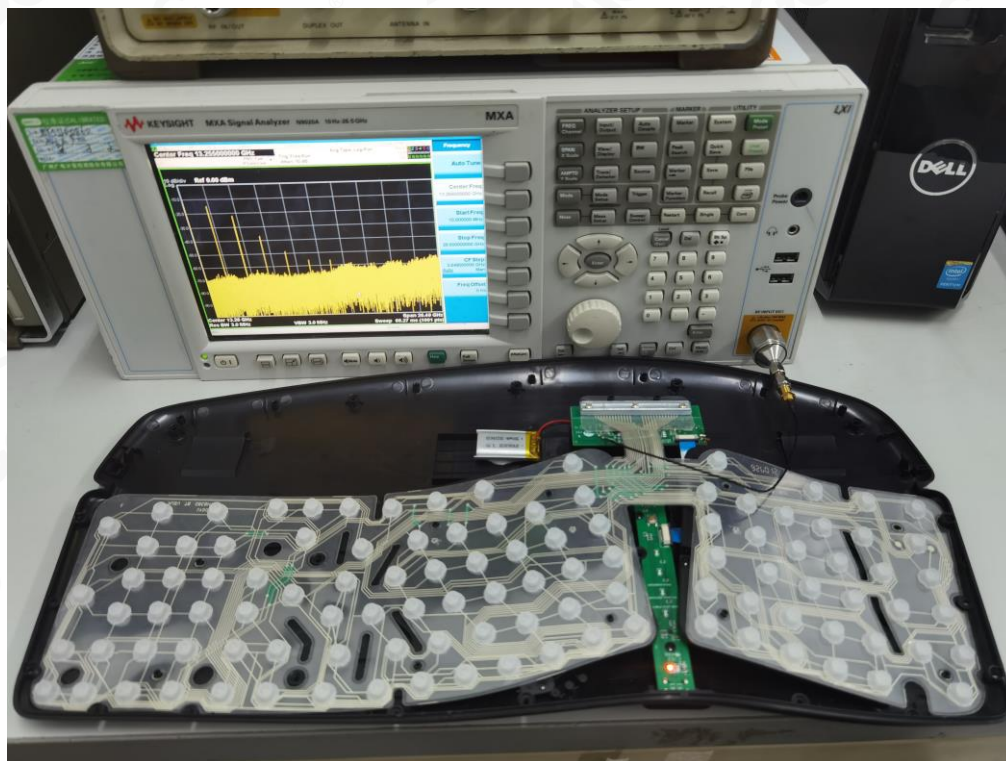
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CONDUCTED EMISSION TEST SETUP



CONDUCTED TEST SETUP



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APPENDIX B: PHOTOGRAPHS OF THE EUT

ALL VIEW OF EUT



OUTSIDE VIEW-1 OF EUT

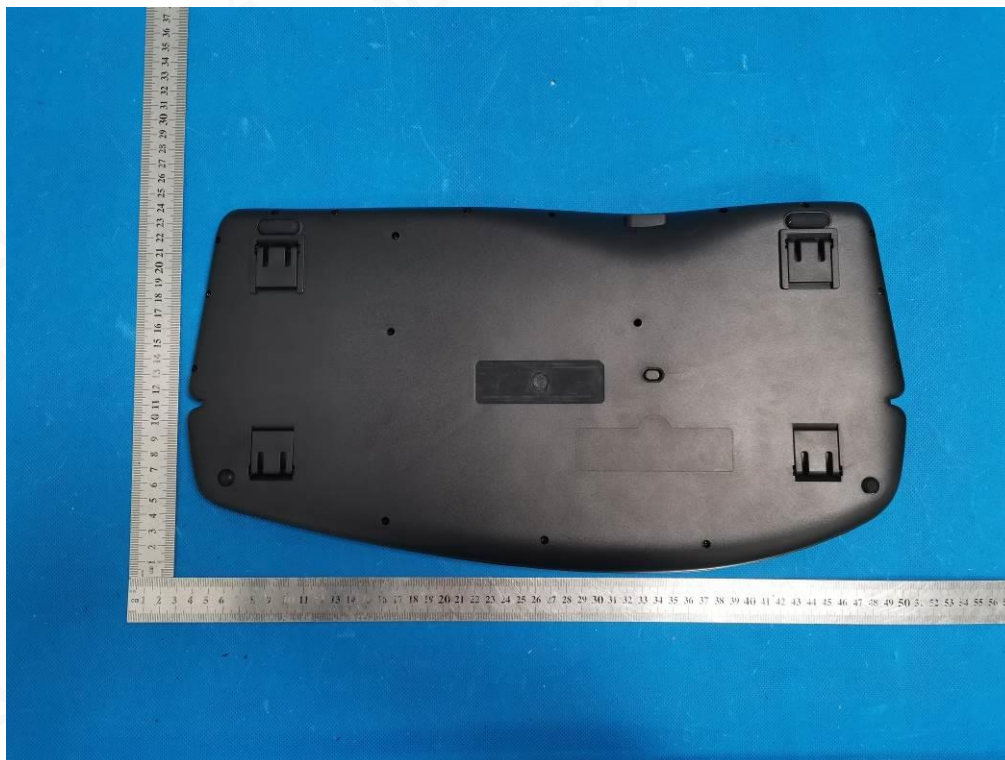


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OUTSIDE VIEW-2 OF EUT



OUTSIDE VIEW-3 OF EUT



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OUTSIDE VIEW-4 OF EUT



OUTSIDE VIEW-5 OF EUT



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OUTSIDE VIEW-6 OF EUT



PORT VIEW OF EUT



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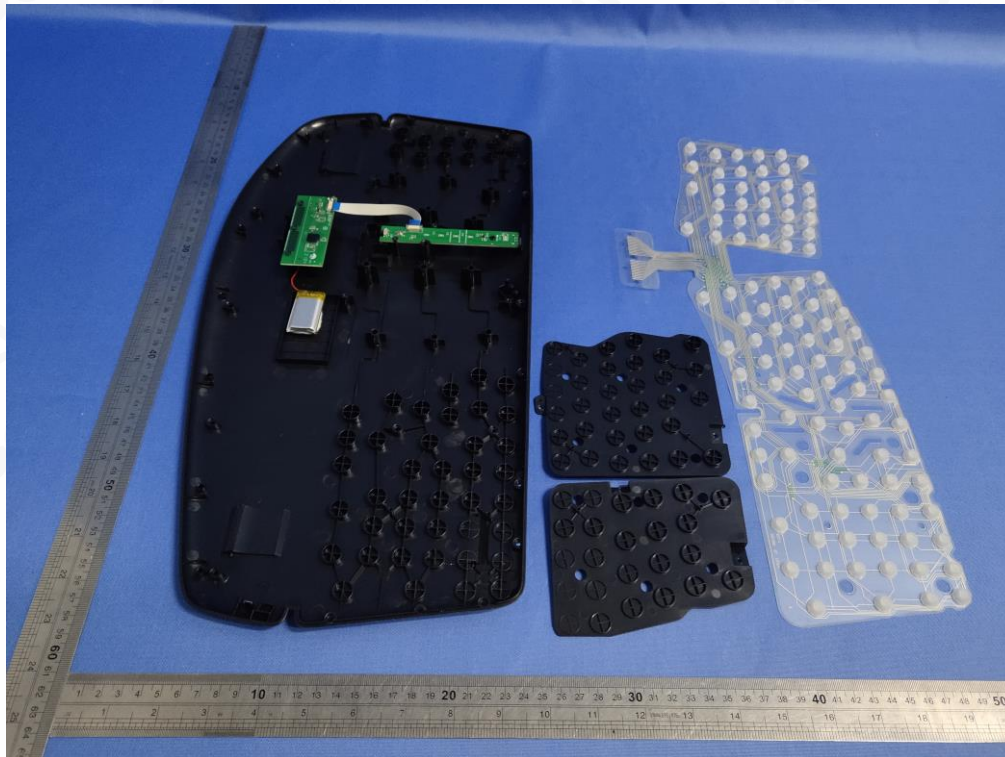
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OPEN VIEW-1 OF EUT



OPEN VIEW-2 OF EUT



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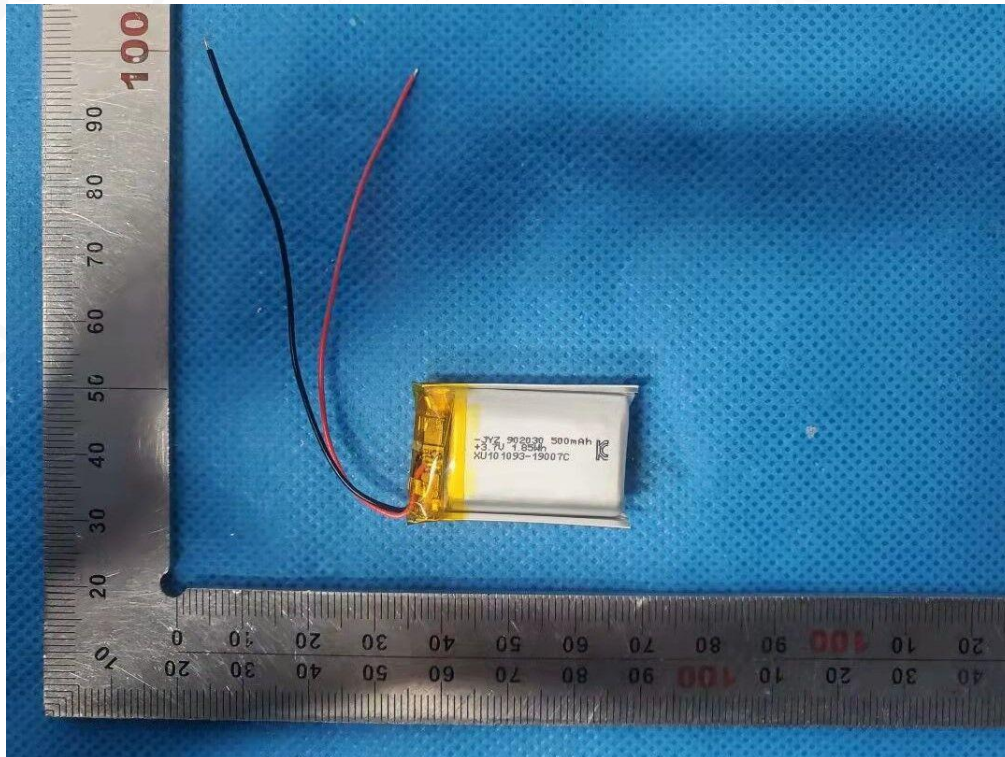
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OPEN VIEW-3 OF EUT



VIEW OF BATTERY

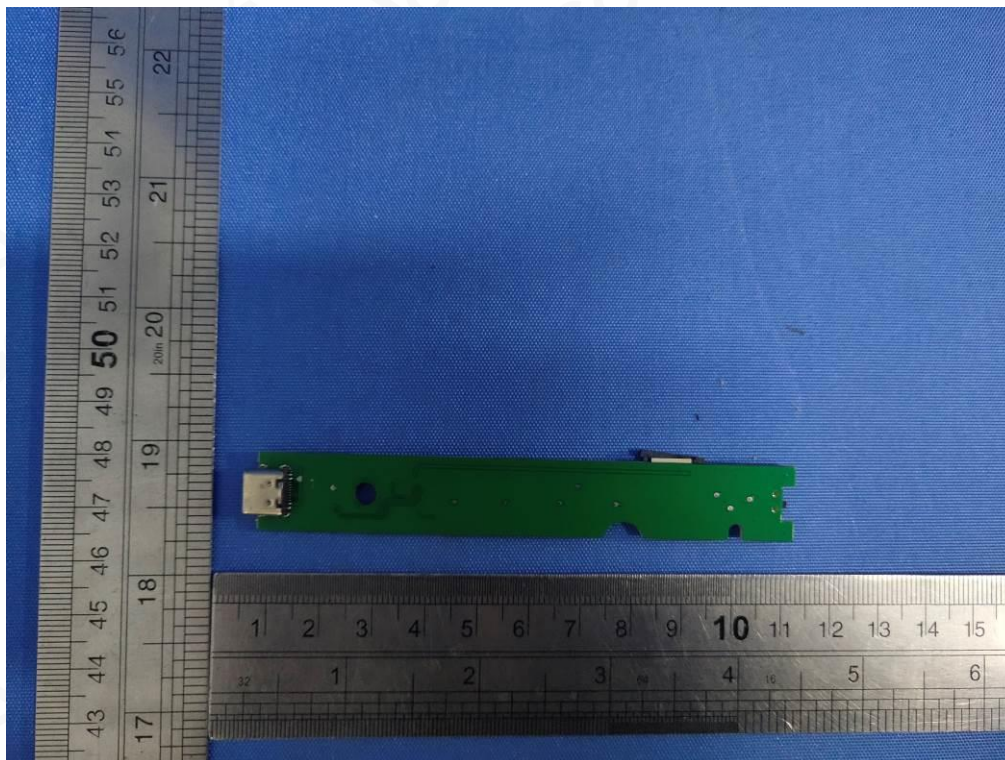


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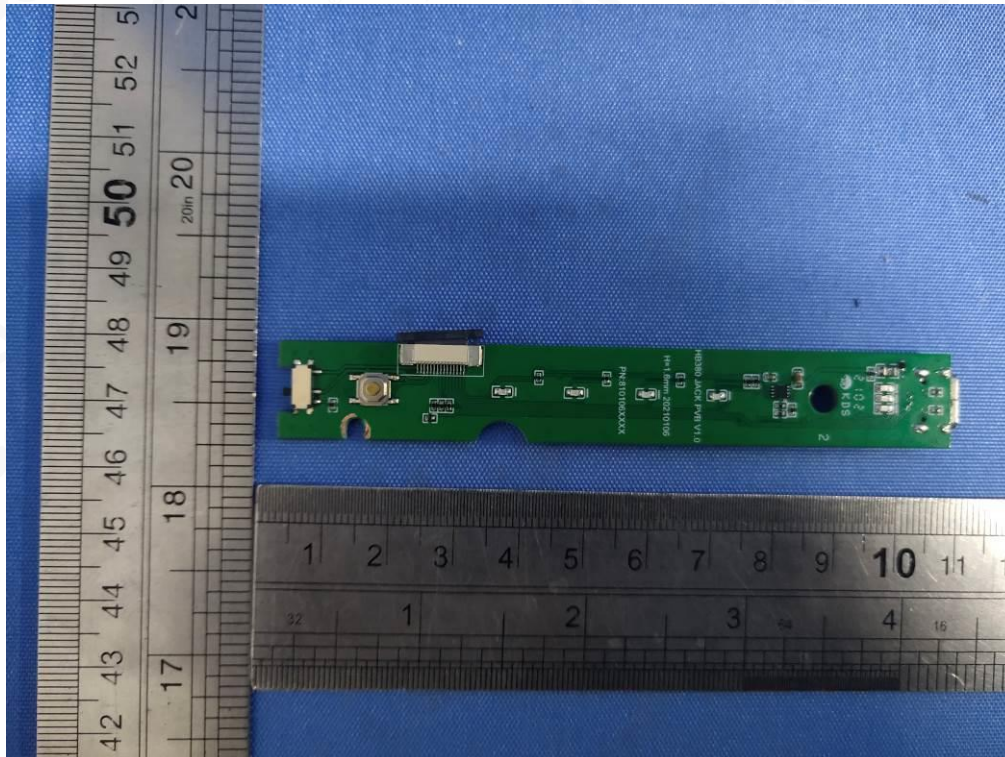
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INTERNAL VIEW-1 OF EUT



INTERNAL VIEW-2 OF EUT

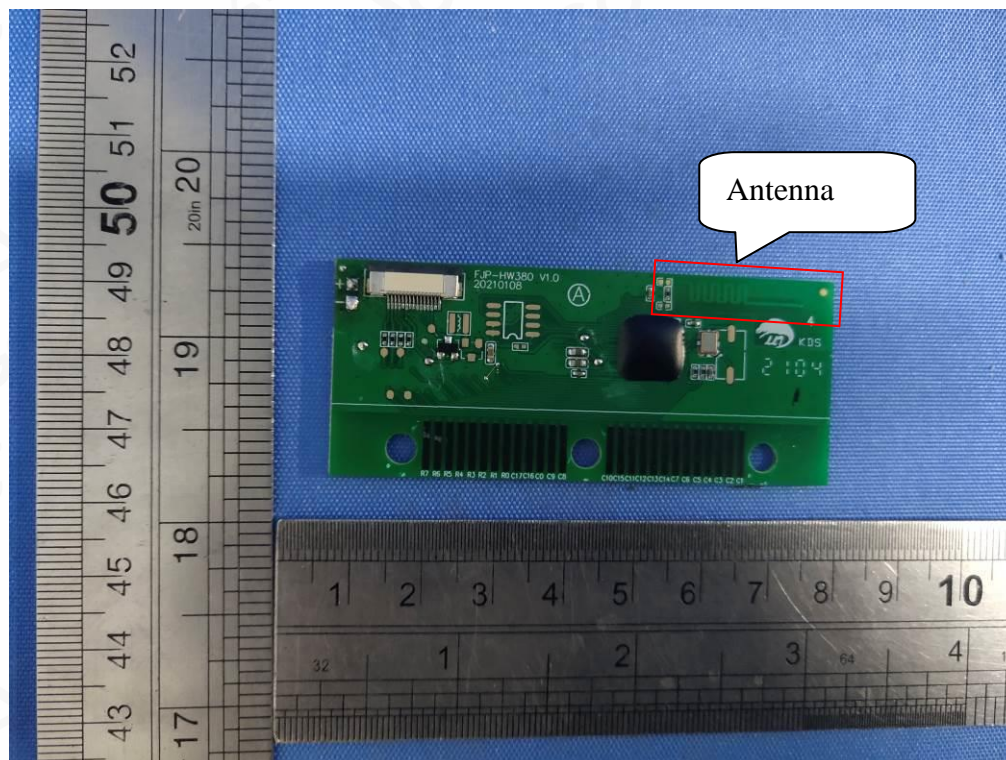


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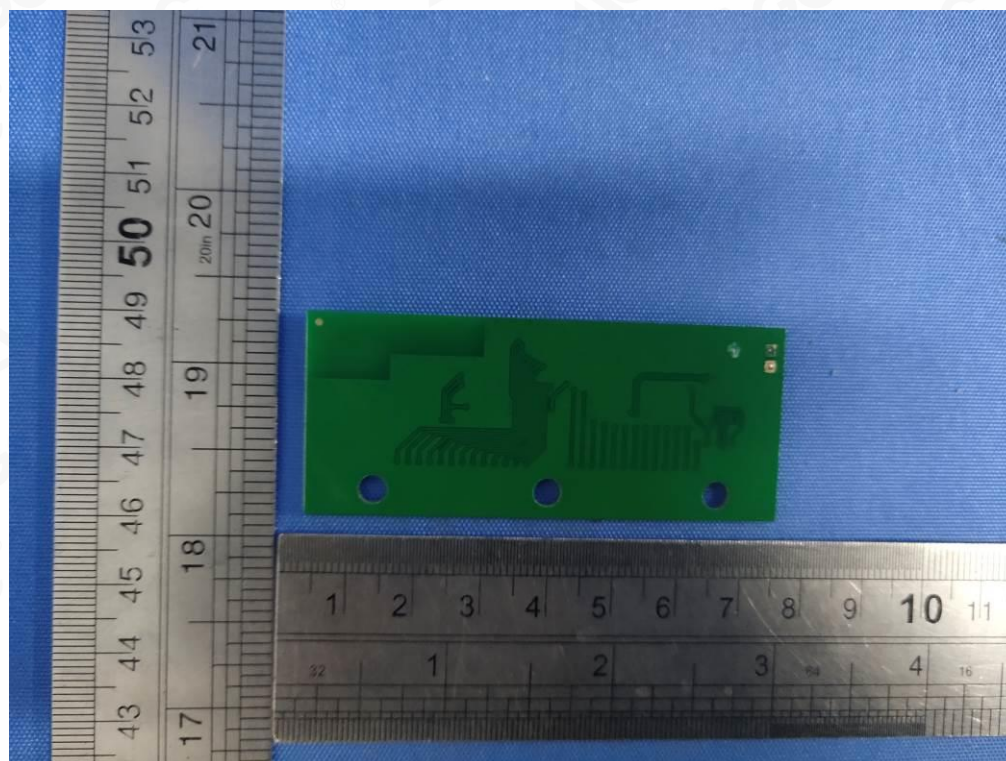
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INTERNAL VIEW-3 OF EUT



INTERNAL VIEW-4 OF EUT



----END OF REPORT----

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2. Any report issued by Company as a result of this application for testing services (the “Report”) shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.
3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.
4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
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9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.

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