# FCC PART 15C TEST REPORT FOR CERTIFICATION
On Behalf of

Mitek Corp

4 Channels amplifier, 2 Channels amplifier

Model Number: Z4-B, Z2-B

FCC ID:2AAOY-Z24

| | |
|---|---|
| Prepared for: | Mitek Corp |
| | 1 Mitek Plaza, Winslow, Illinois 61089, United States |
| | |
| Prepared By: | EST Technology Co., Ltd. |
| | Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China |
| Tel: 86-769-83081888-808 | |

| | |
|---|---|
| Report Number: | ESTE-R1905132 |
| Date of Test: | Jan. 18 ~ Mar. 22, 2019 |
| Date of Report: | Mar. 26, 2019 |

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# EST Technology Co., Ltd.

| | |
|---|---|
| **Applicant:**<br>**Address:** | Mitek Corp<br>1 Mitek Plaza, Winslow, Illinois 61089, United States |
| **Manufacturer:**<br>**Address:** | Integrity Electronic Co., Ltd<br>No. 68, Huanghe Road, Fenghuanggang, Tangxia Town, Dongguan City, Guangdong Province, China |
| **E.U.T:** | 4 Channels amplifier, 2 Channels amplifier |
| **Model Number:** | Z4-B, Z2-B<br>(The two models differ in power amplifier circuits, but the RF circuitry is identical.) |
| **Power Supply:** | DC 24V From Adapter Input AC 100-240V ~50/60Hz |
| **Test Voltage:** | DC 24V From Adapter Input AC 120V/60Hz<br>DC 24V From Adapter Input AC 240V/60Hz |
| **Trade Name:** | ATLAS SOUND Serial No.: ------ |
| **Date of Receipt:** | Jan. 18, 2019 Date of Test: Jan. 18 ~ Mar. 22, 2019 |
| **Test Specification:** | FCC Rules and Regulations Part 15 Subpart C:2018<br>ANSI C63.10:2013 |
| **Test Result:** | The device described above is tested by EST Technology Co., Ltd. The measurement results were contained in this test report and EST Technology Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the FCC Rules and Regulations Part 15 Subpart C requirements.<br><br>This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd.<br><br>**Date:** Mar. 26, 2019 |

| Prepared by: | Reviewed by: | Approved by: |
|---|---|---|
| Ring / Assistant | Tony / Engineer | Iceman Hu / Manager |

**Other Aspects:**
None.

*Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested*

*This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of EST Technology Co., Ltd.*

# 1. GENERAL INFORMATION

## 1.1. Description of Device (EUT)

| | | | |
|---|---|---|---|
| Product Name | : | 4 Channels amplifier, 2 Channels amplifier | |
| | | | |
| FCC ID | : | 2AAOY-Z24 | |
| | | | |
| Model Number | : | Z4-B, Z2-B | |
| | | | |
| Operation frequency | : | 2402MHz~2480MHz | |
| | | | |
| Number of channel | : | 79 | 40 |
| | | | |
| Antenna | : | Internal antenna,-0.61dBi Gain | |
| | | | |
| Modulation | : | Dual-mode Bluetooth 4.1<br>BT BDR: GFSK<br>BT EDR: π/4-DQPSK<br>BT EDR: 8-DPSK | Dual-mode Bluetooth 4.1<br>BLE: GFSK |
| | | | |
| Sample Type | : | Prototype production | |

# 2. SUMMARY OF TEST

## 2.1. Summary of test result

| Description of Test Item | Standard | Results |
|---|---|---|
| Maximum Peak Output Power | FCC Part 15: 15.247(b)(1)<br>KDB 558074 | PASS |
| 20dB Bandwidth | FCC Part 15: 15.247a1<br>KDB 558074 | PASS |
| Carrier Frequency Separation | FCC Part 15: 15.247(a)(1)<br>KDB 558074 | PASS |
| Number Of Hopping Channel | FCC Part 15: 15.247(a)(1)(iii)<br>KDB 558074 | PASS |
| Dwell Time | FCC Part 15: 15.247(a)(1)(iii)<br>KDB 558074 | PASS |
| Radiated Emissions | FCC Part 15: 15.209<br>FCC Part 15: 15.247(d)<br>ANSI C63.10:2013<br>KDB 558074 | PASS |
| Band Edge Compliance | FCC Part 15: 15.247(d)<br>KDB 558074 | PASS |
| Power Line Conducted Emissions | FCC Part 15: 15.207<br>ANSI C63.10:2013<br>KDB 558074 | PASS |
| Antenna requirement | FCC Part 15: 15.203 | PASS |
| Note: KDB 558074 D01 15.247 Meas Guidance v05<br>Z4-B and Z2-B both tested, and The report shows only the worst models. | | |

## 2.2. Test Facilities

EMC Lab : Certificated by CNAS, CHINA
Registration No.: L5288
Date of registration: November 13, 2017

Certificated by FCC, USA
Designation Number: CN1215
Test Firm Registration Number: 722932
Date of registration: November 21, 2017

Certificated by A2LA, USA
Registration No.: 4366.01
Date of registration: November 07, 2017

Certificated by Industry Canada
CAB identifier No.: CN0035
Date of registration: January 04, 2019

Certificated by VCCI, Japan
Registration No.: R-13663; C-14103
Date of registration: July 25, 2017
This Certificate is valid until: July 24, 2020

Certificated by TUV Rheinland, Germany
Registration No.: UA 50413872 0001
Date of registration: July 31, 2018

Certificated by TUV/PS, Shenzhen
Registration No.: SCN1017
Date of registration: January 27, 2011

Certificated by Intertek ETL SEMKO
Registration No.: 2011-RTL-L2-64
Date of registration: April 28, 2011

Certificated by Nemko, Hong Kong
Registration No.: 175193
Date of registration: May 4, 2011

Name of Firm : EST Technology Co., Ltd.

Site Location : Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China

## 2.3. Measurement uncertainty

| Test Item | Uncertainty |
|---|---|
| Uncertainty for Conduction emission test | ±3.48dB |
| Uncertainty for spurious emissions test (30MHz-1GHz) | ±4.60 dB(Polarize: H) |
| | ±4.68 dB(Polarize: V) |
| Uncertainty for spurious emissions test (1GHz to 18GHz) | ±4.96dB |
| Uncertainty for radio frequency | $7\times10^{-8}$ |
| Uncertainty for conducted RF Power | 0.20dB |
| Uncertainty for Power density test | 0.26dB |

Note：This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 2.4. Assistant equipment used for test

### 2.4.1. Adapter(For Z4-B)

| | | |
|---|---|---|
| M/N | : | GM130-2400500-D |
| Input | : | AC 100-240V, 50/60Hz, 2.5A |
| Output | : | DC 24V/5A |

### 2.4.2. Adapter(For Z2-B)

| | | |
|---|---|---|
| M/N | : | GM60-240250-D |
| Input | : | AC 100-240V, 50/60Hz, 2.0A |
| Output | : | DC 24V/2.5A |

## 2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 (or 1.5) meter high above ground. EUT was beset into Bluetooth test mode by software before test.


(EUT: 4 Channels amplifier, 2 Channels amplifier)

## 2.6. Test mode

The test software was used to control EUT work in Continuous TX mode, and select test channel, wireless mode

| Mode | Channel | Frequency |
|---|---|---|
| GFSK | Low | 2402MHz |
| | Middle | 2441MHz |
| | High | 2480MHz |
| 8-DPSK | Low | 2402MHz |
| | Middle | 2441MHz |
| | High | 2480MHz |
| Remark: The “GFSK” and “8-DPSK” is worst case, Will be recorded in the report. | | |

## 2.7. Channel List

| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|---|---|---|---|---|---|---|---|
| 1 | 2402 | 2 | 2403 | 3 | 2404 | 4 | 2405 |
| 5 | 2406 | 6 | 2407 | 7 | 2408 | 8 | 2409 |
| 9 | 2410 | 10 | 2411 | 11 | 2412 | 12 | 2413 |
| 13 | 2414 | 14 | 2415 | 15 | 2416 | 16 | 2417 |
| 17 | 2418 | 18 | 2419 | 19 | 2420 | 20 | 2421 |
| 21 | 2422 | 22 | 2423 | 23 | 2424 | 24 | 2425 |
| 25 | 2426 | 26 | 2427 | 27 | 2428 | 28 | 2429 |
| 29 | 2430 | 30 | 2431 | 31 | 2432 | 32 | 2433 |
| 33 | 2434 | 34 | 2435 | 35 | 2436 | 36 | 2437 |
| 37 | 2438 | 38 | 2439 | 39 | 2440 | 40 | 2441 |
| 41 | 2442 | 42 | 2443 | 43 | 2444 | 44 | 2445 |
| 45 | 2446 | 46 | 2447 | 47 | 2448 | 48 | 2449 |
| 49 | 2450 | 50 | 2451 | 51 | 2452 | 52 | 2453 |
| 53 | 2454 | 54 | 2455 | 55 | 2456 | 56 | 2457 |
| 57 | 2458 | 58 | 2459 | 59 | 2460 | 60 | 2461 |
| 61 | 2462 | 62 | 2463 | 63 | 2464 | 64 | 2465 |
| 65 | 2466 | 66 | 2467 | 67 | 2468 | 68 | 2469 |
| 69 | 2470 | 70 | 2471 | 71 | 2472 | 72 | 2473 |
| 73 | 2474 | 74 | 2475 | 75 | 2476 | 76 | 2477 |
| 77 | 2478 | 78 | 2479 | 79 | 2480 | - | - |

## 2.8. Test Equipment

### 2.8.1. For conducted emission test

| Equipment | Manufacturer | Model No. | Serial No. | Calibration Body | Last Cal. | Next Cal. |
|---|---|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESHS30 | 832354 | CEPREI | June 15,18 | 1 Year |
| Artificial Mains Network | Rohde & Schwarz | ENV216 | 101260 | CEPREI | June 15,18 | 1 Year |
| Pulse Limiter | Rohde & Schwarz | ESH3-Z2 | 101100 | CEPREI | June 15,18 | 1 Year |
| Test Software | Audix | e3-6.111221a | N/A | N/A | N/A | N/A |

### 2.8.2. For radiated emission test(9 kHz-30MHz)

| Equipment | Manufacturer | Model No. | Serial No. | Calibration Body | Last Cal. | Next Cal. |
|---|---|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESR7 | 101780 | CEPREI | June 15,18 | 1 Year |
| Active Loop Antenna | SCHWAREBECK | FMZB 1519B | 1519B-088 | N/A | Aug. 01,18 | 1 Year |
| Test Software | Audix | e3-6.111221a | N/A | N/A | N/A | N/A |

### 2.8.3. For radiated emissions test (30-1000MHz)

| Equipment | Manufacturer | Model No. | Serial No. | Calibration Body | Last Cal. | Next Cal. |
|---|---|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESR7 | 101780 | CEPREI | June 15,18 | 1 Year |
| Bilog Antenna | Teseq | CBL 6111D | 27090 | CEPREI | June 15,18 | 1 Year |
| Test Software | Audix | e3-6.111221a | N/A | N/A | N/A | N/A |

### 2.8.4. For radiated emission test(above 1GHz)

| Equipment | Manufacturer | Model No. | Serial No. | Calibration Body | Last Cal. | Next Cal. |
|---|---|---|---|---|---|---|
| Horn Antenna | SCHWARZBECK | BBHA 9120 D | BBHA9120D1002 | CEPREI | June 18,18 | 1 Year |
| Horn Antenna | SCHWARZBECK | BBHA9170 | BBHA9170242 | CEPREI | June 18,18 | 1Year |
| Signal Amplifier | SCHWARZBECK | BBV9718 | 9718-212 | CEPREI | June 15,18 | 1 Year |
| Spectrum Analyzer | Rohde &Schwarz | FSV | 103173 | CEPREI | June 15,18 | 1 Year |
| PSA Series Spertrum Analyzer | Agilent | E4447A | MY50180031 | CEPREI | June 15,18 | 1Year |
| Test Software | Audix | e3-6.111221a | N/A | N/A | N/A | N/A |

2.8.5. For connect EUT antenna terminal test

| Equipment | Manufacturer | Model No. | Serial No. | Calibration Body | Last Cal. | Next Cal. |
|---|---|---|---|---|---|---|
| Spectrum Analyzer | Rohde &Schwarz | FSV | 103173 | CEPREI | June 15,18 | 1 Year |
| Spectrum Analyzer | Agilent | E4408B | MY44211139 | CEPREI | June 15,18 | 1 Year |

# 3. MAXIMUM PEAK OUTPUT POWER

## 3.1. Limit

For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset employing at least 75 non-overlapping hopping channels; shall not exceed 0.125 W if the hopset employing at greater than or equal to 15 and less than 75 non-overlapping hopping channels.

## 3.2. Test Procedure

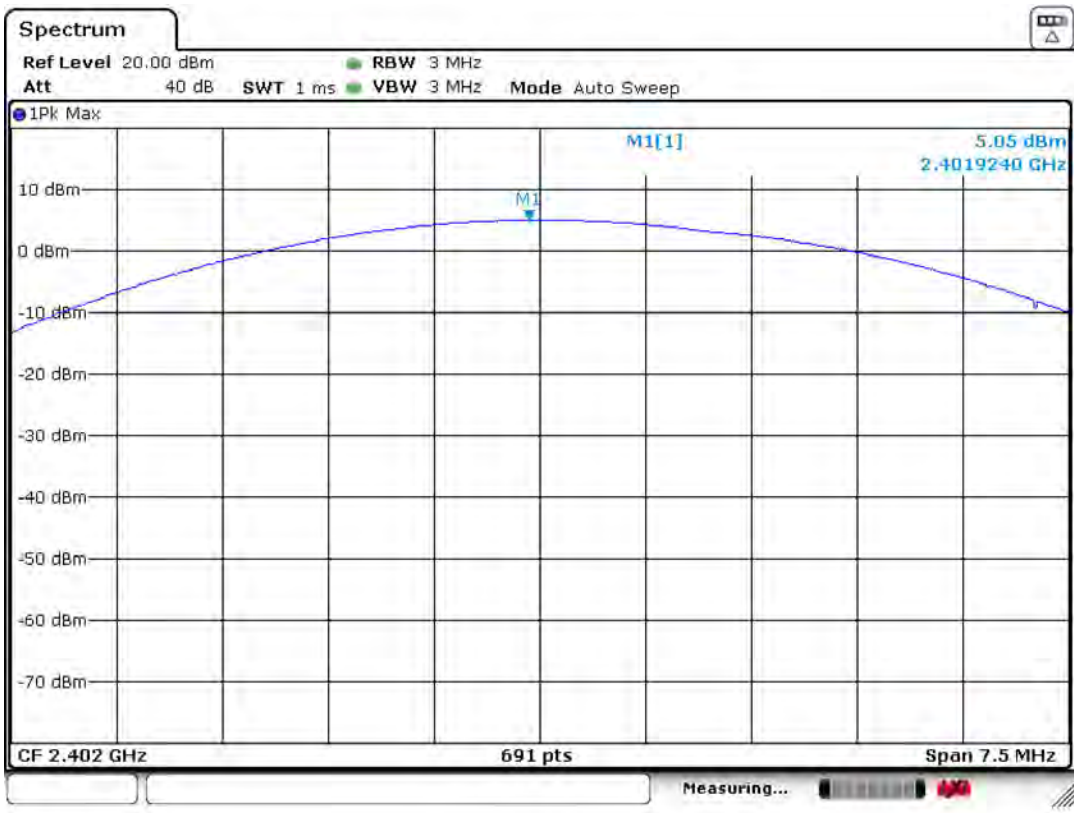
The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.

## 3.3. Test Result

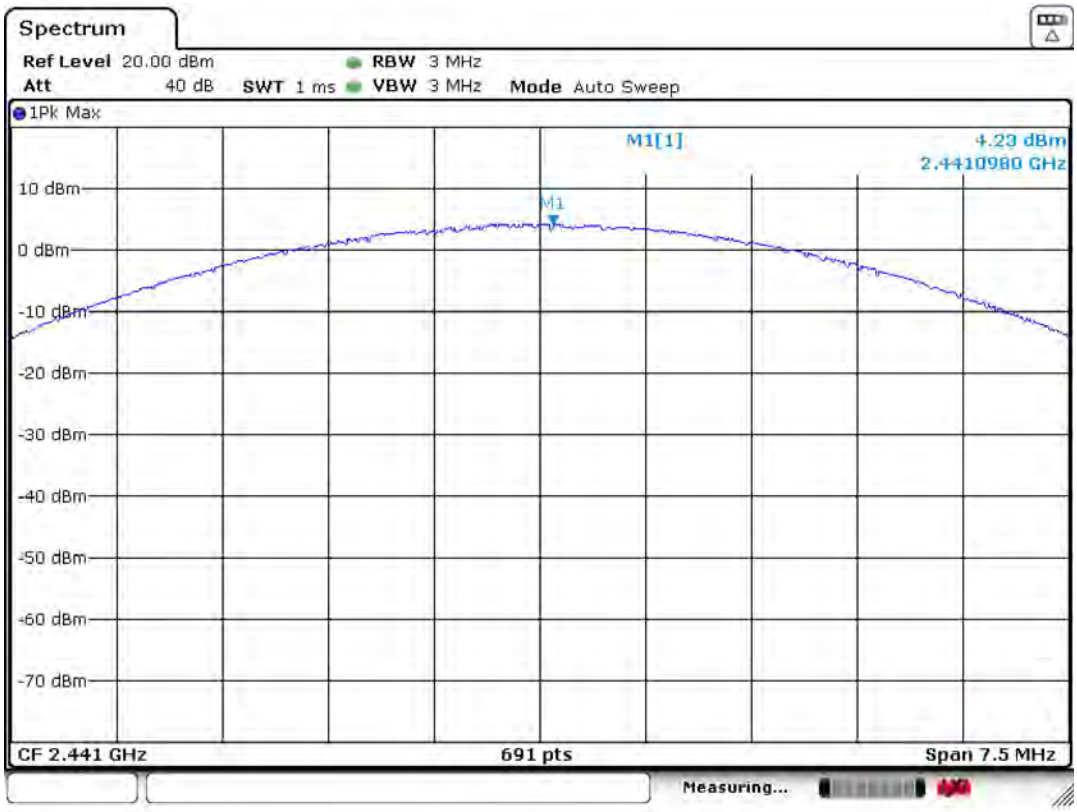
| EUT: 4 Channels amplifier | | | | | |
|---|---|---|---|---|---|
| M/N: Z4-B | | | | | |
| Test date: 2019-03-12 | | Test site: RF site | Tested by: Viking | | |
| Mode | Freq (MHz) | Result (dBm) | Limit | | Conclusion |
| | | | dBm | W | |
| GFSK | 2402 | 5.05 | 21.00 | 0.125 | Pass |
| | 2441 | 4.23 | 21.00 | 0.125 | Pass |
| | 2480 | 4.00 | 21.00 | 0.125 | Pass |
| 8-DPSK | 2402 | 5.58 | 21.00 | 0.125 | Pass |
| | 2441 | 5.47 | 21.00 | 0.125 | Pass |
| | 2480 | 5.35 | 21.00 | 0.125 | Pass |

## 3.4. Test Data

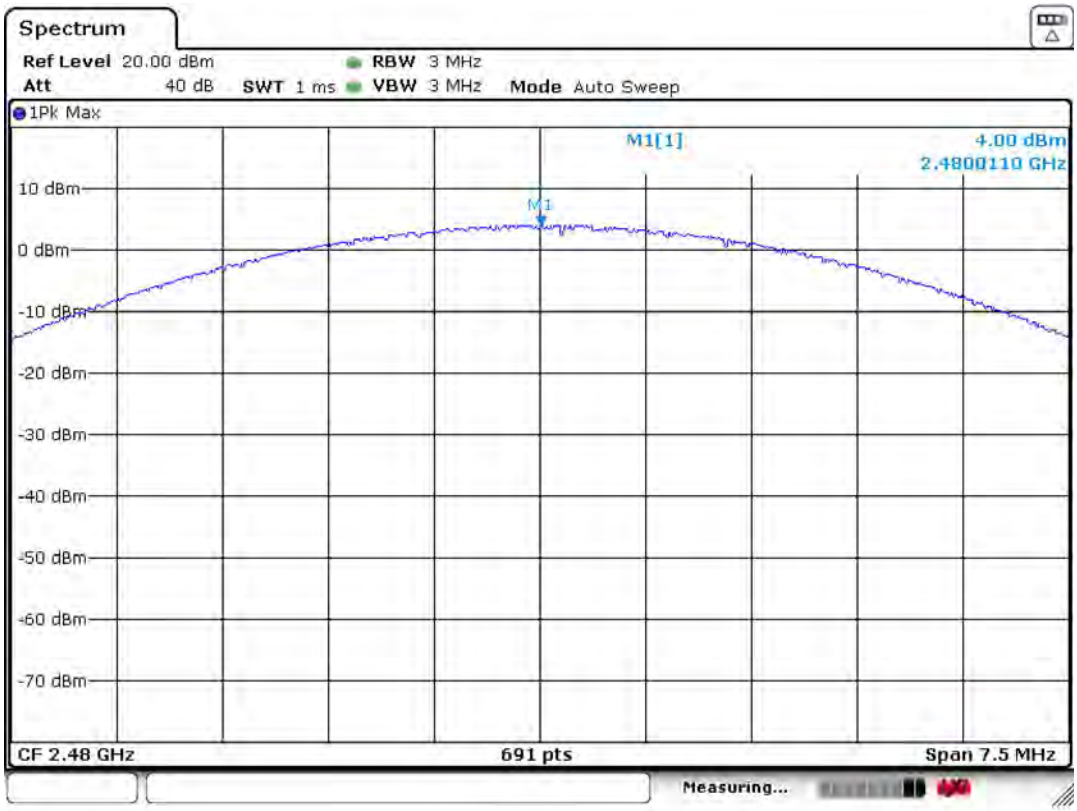
**GFSK 2402 MHz**



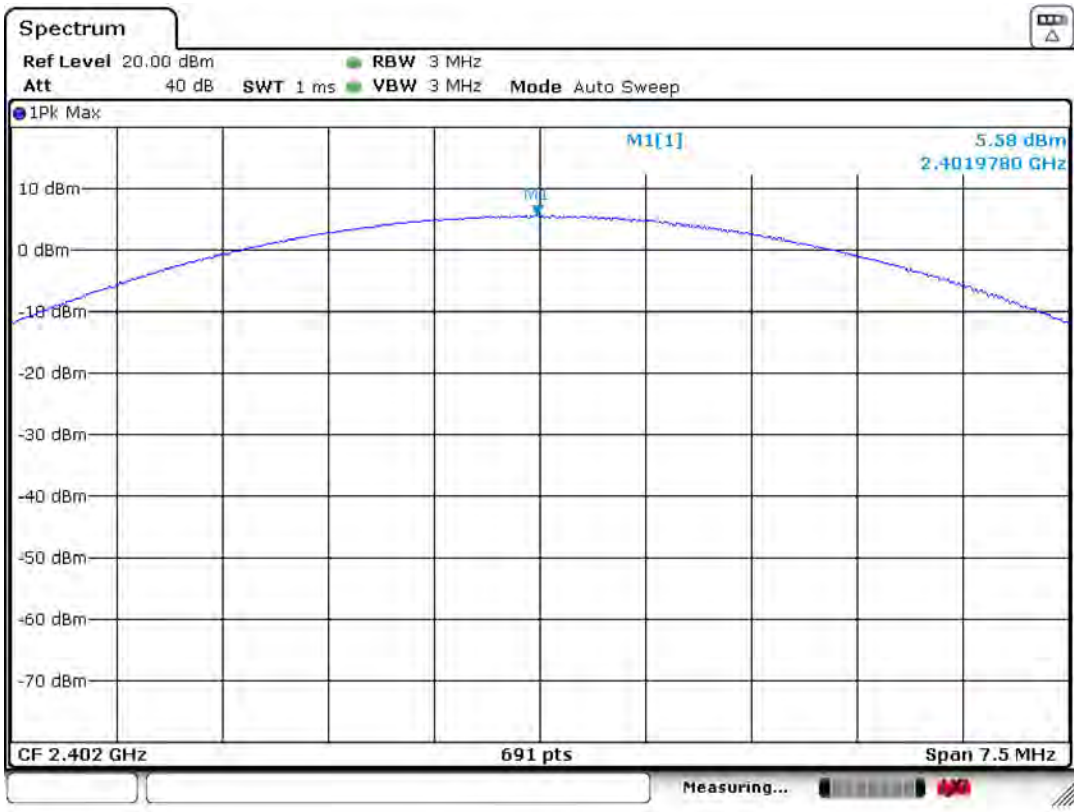

**GFSK 2441 MHz**



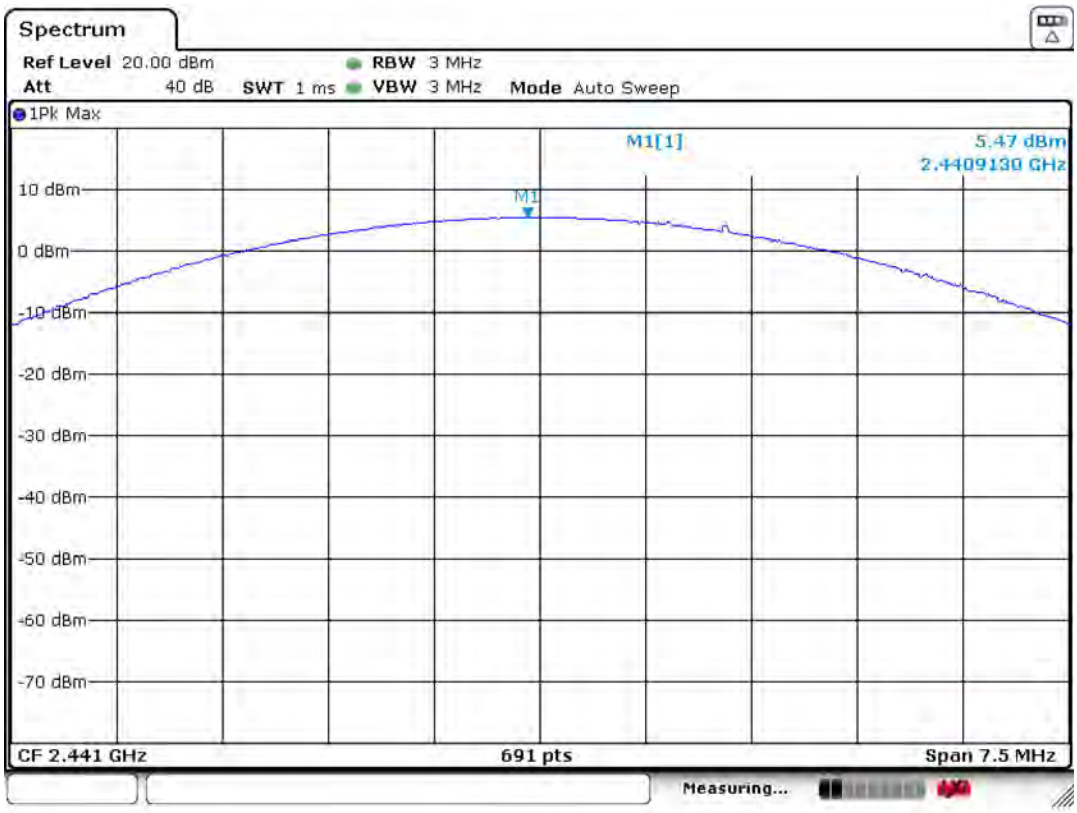
**GFSK 2480 MHz**



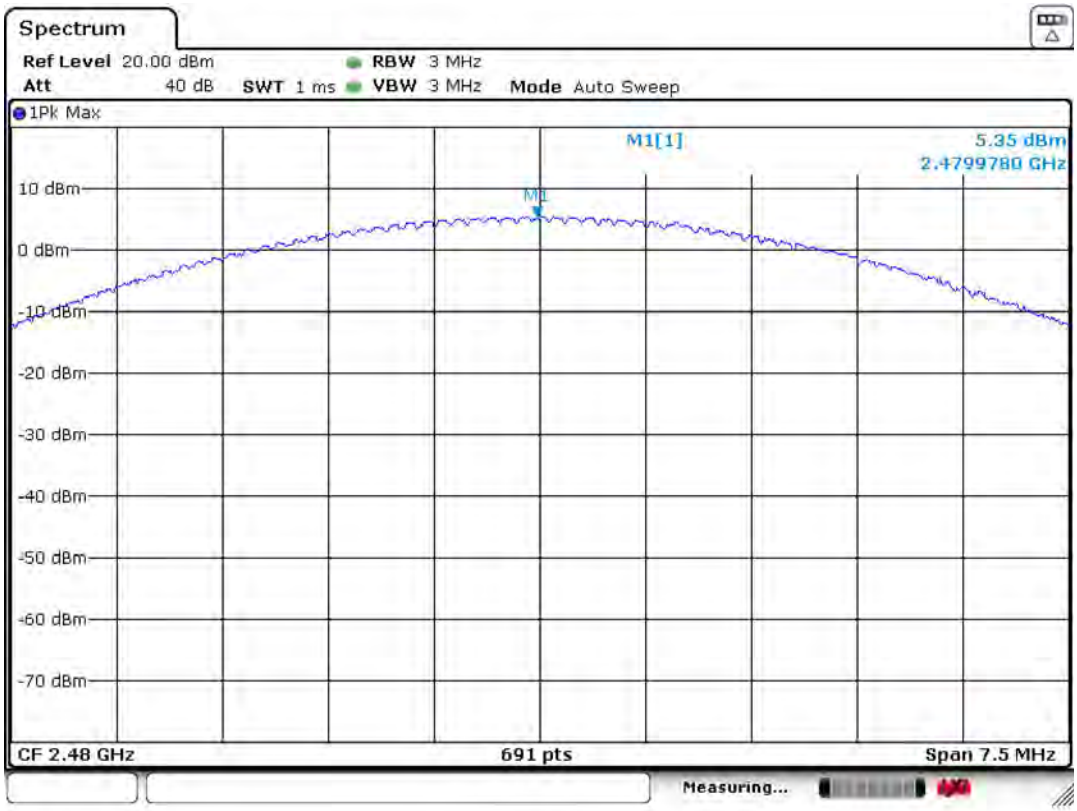
## 8-DPSK 2402 MHz




## 8-DPSK 2441 MHz



**8-DPSK 2480 MHz**



# 4. 20 DB BANDWIDTH

## 4.1. Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

## 4.2. Test Procedure

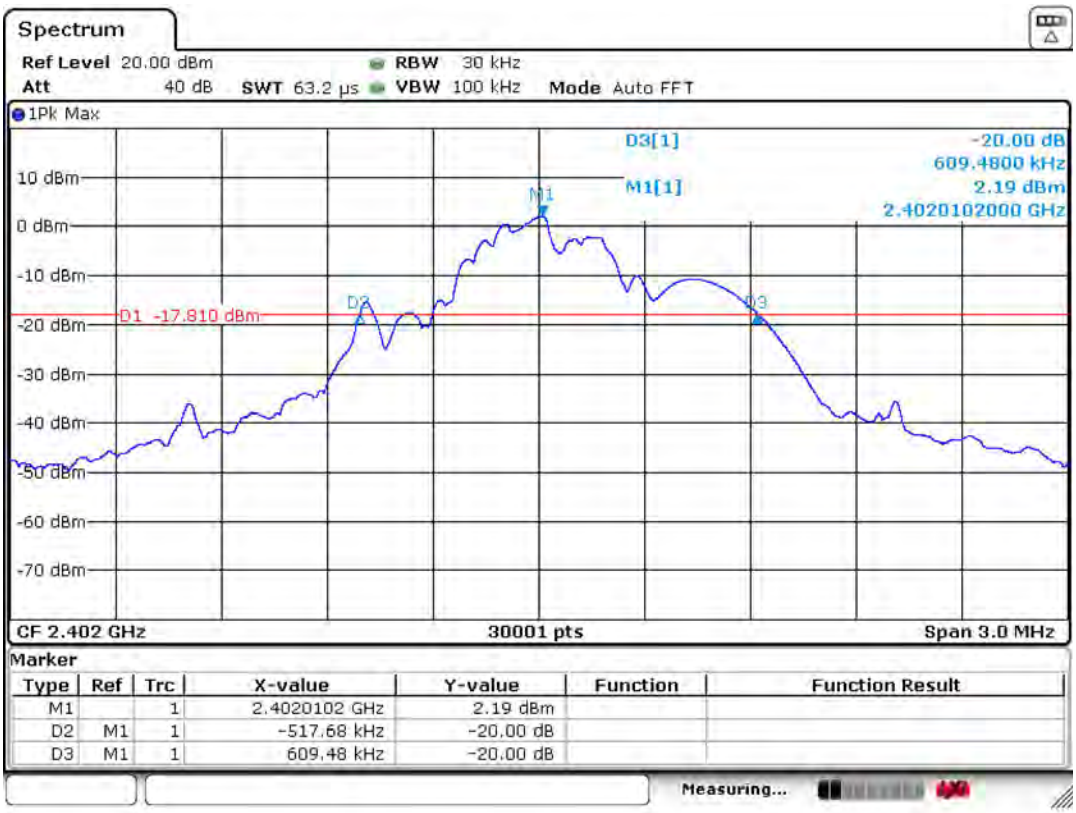
The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

## 4.3. Test Result

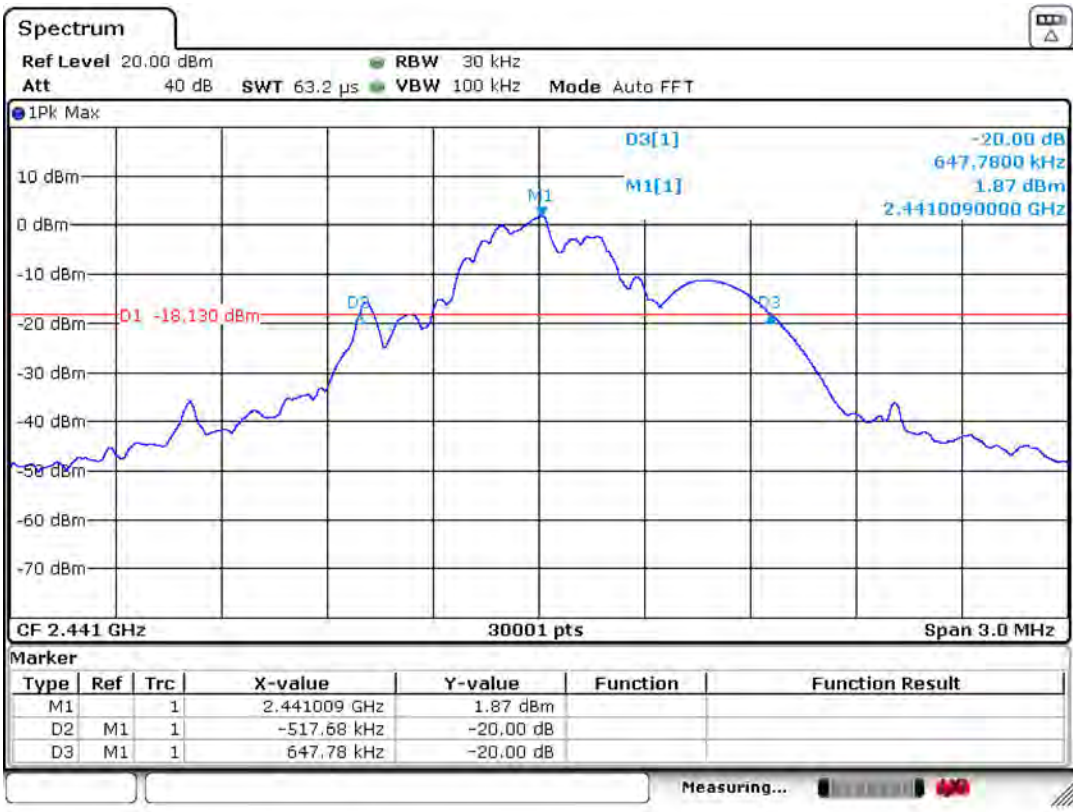
| EUT: 4 Channels amplifier | | | | |
|---|---|---|---|---|
| M/N: Z4-B | | | | |
| Test date: 2019-03-12 | | Test site: RF site | Tested by: Viking | |
| Mode | Freq (MHz) | 20dB Bandwidth (MHz) | Limit (kHz) | Conclusion |
| GFSK | 2402 | 1.127 | / | PASS |
| | 2441 | 1.165 | / | PASS |
| | 2480 | 1.150 | / | PASS |
| 8-DPSK | 2402 | 1.180 | / | PASS |
| | 2441 | 1.218 | / | PASS |
| | 2480 | 1.208 | / | PASS |

## 4.4. Test Data

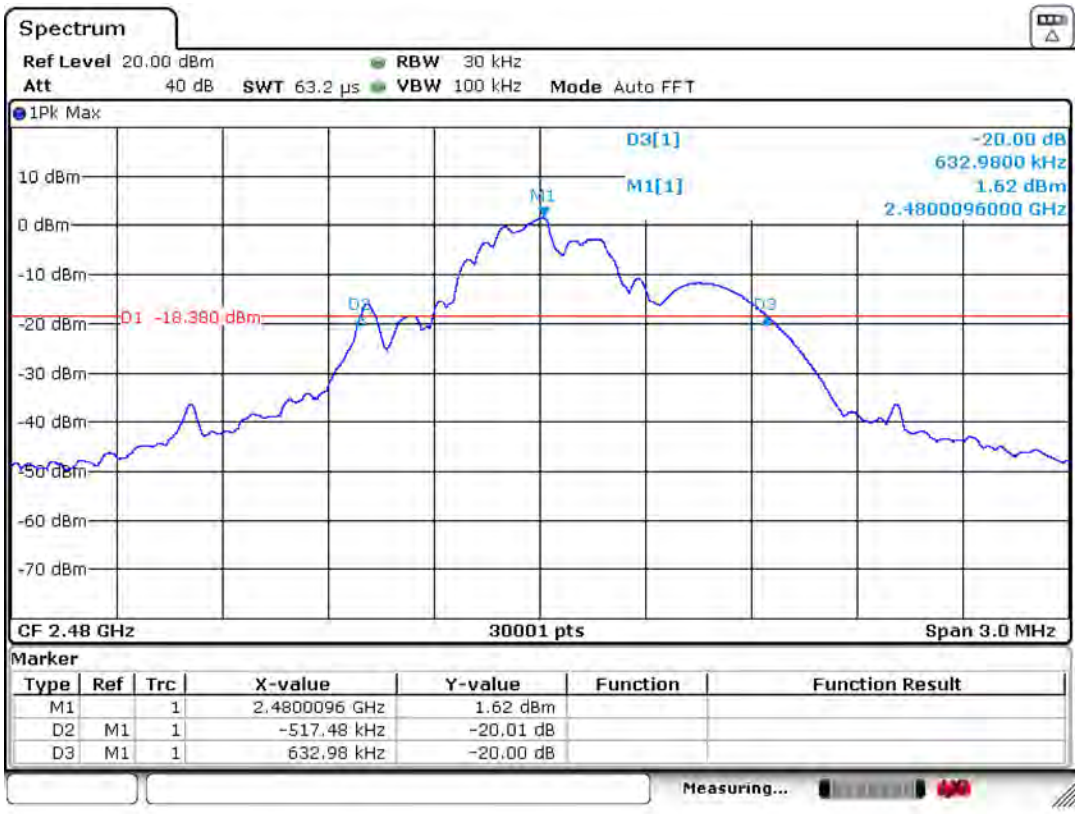
**GFSK 2402MHz**



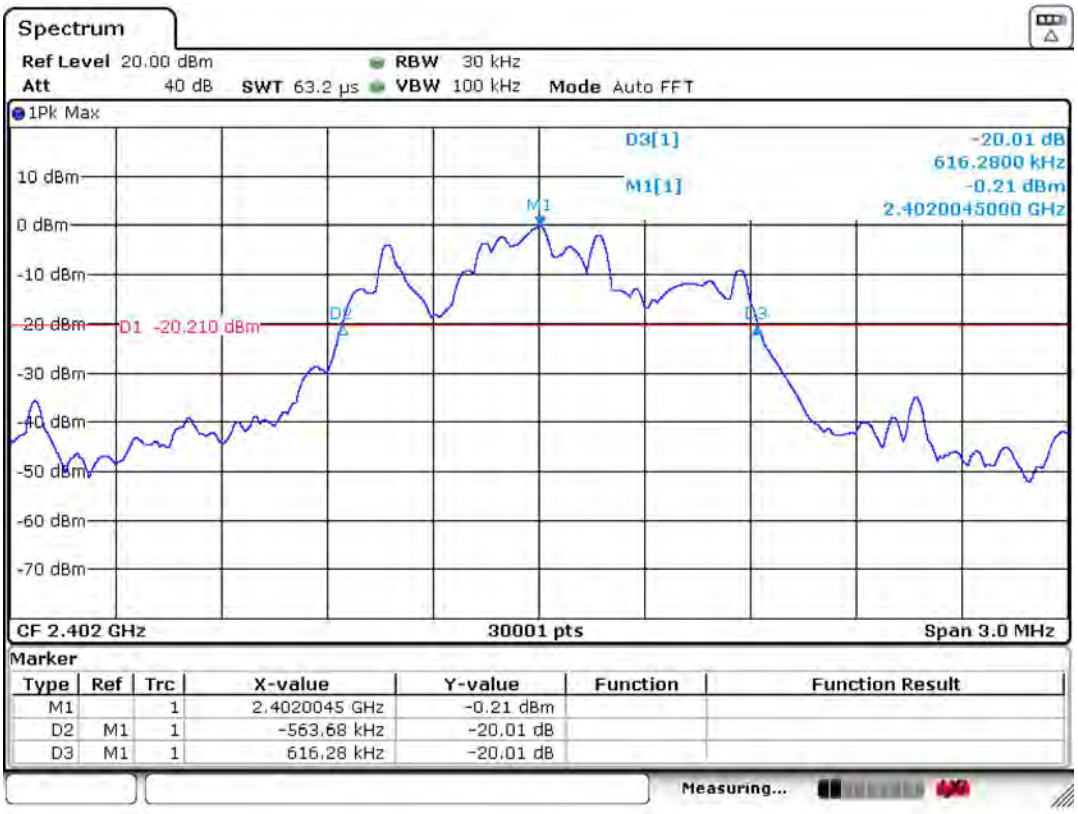

**GFSK 2441MHz**



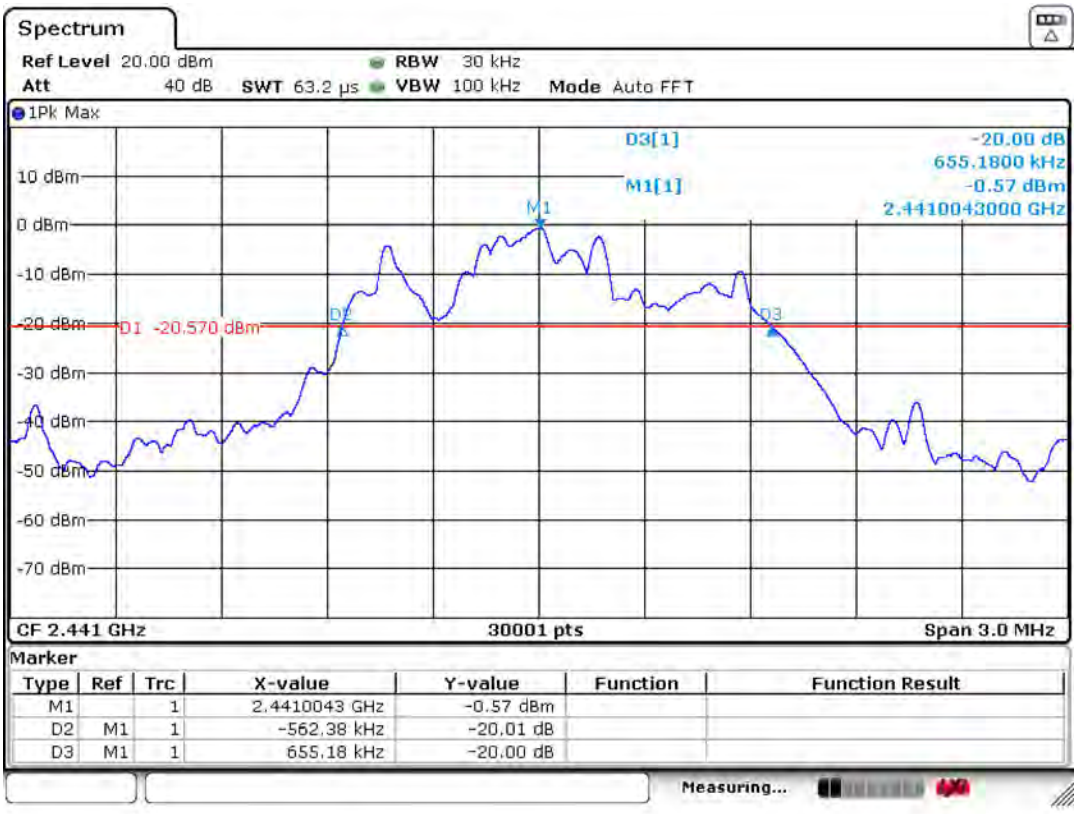
## GFSK 2480MHz



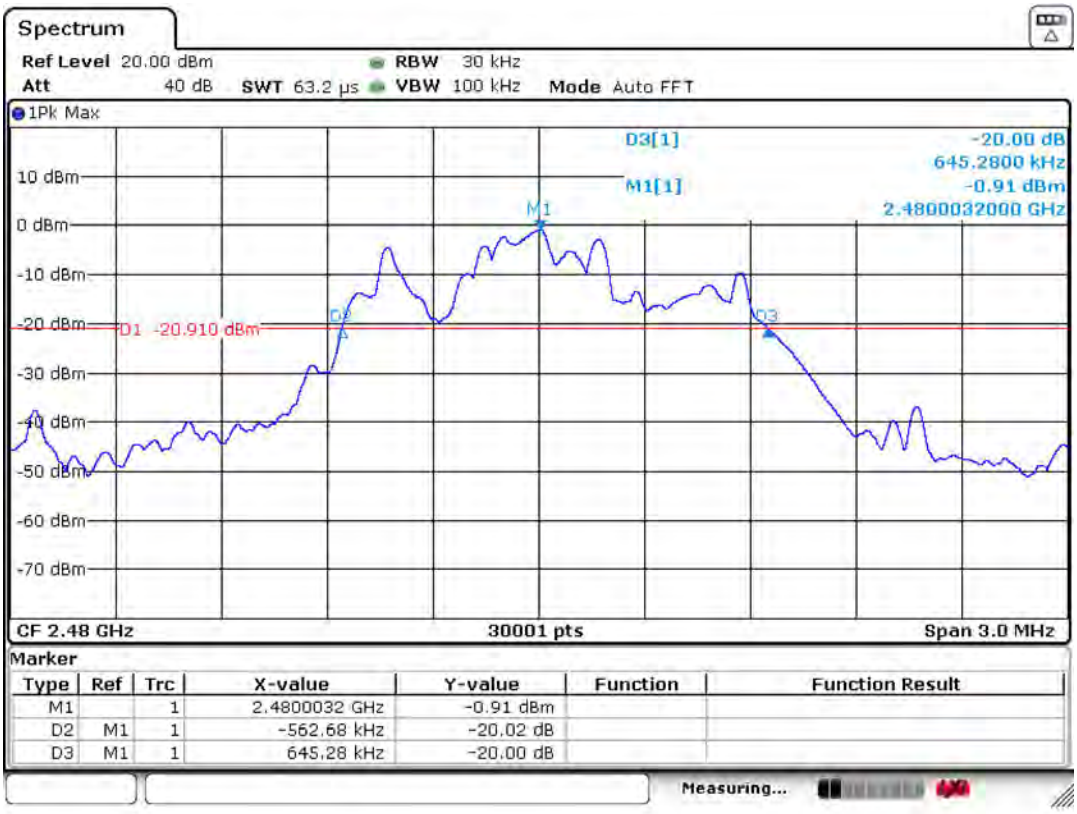
## 8-DPSK 2402MHz




## 8-DPSK 2441MHz



## 8-DPSK 2480MHz



# 5. CARRIER FREQUENCY SEPARATION

## 5.1. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping 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.

## 5.2. Test Procedure

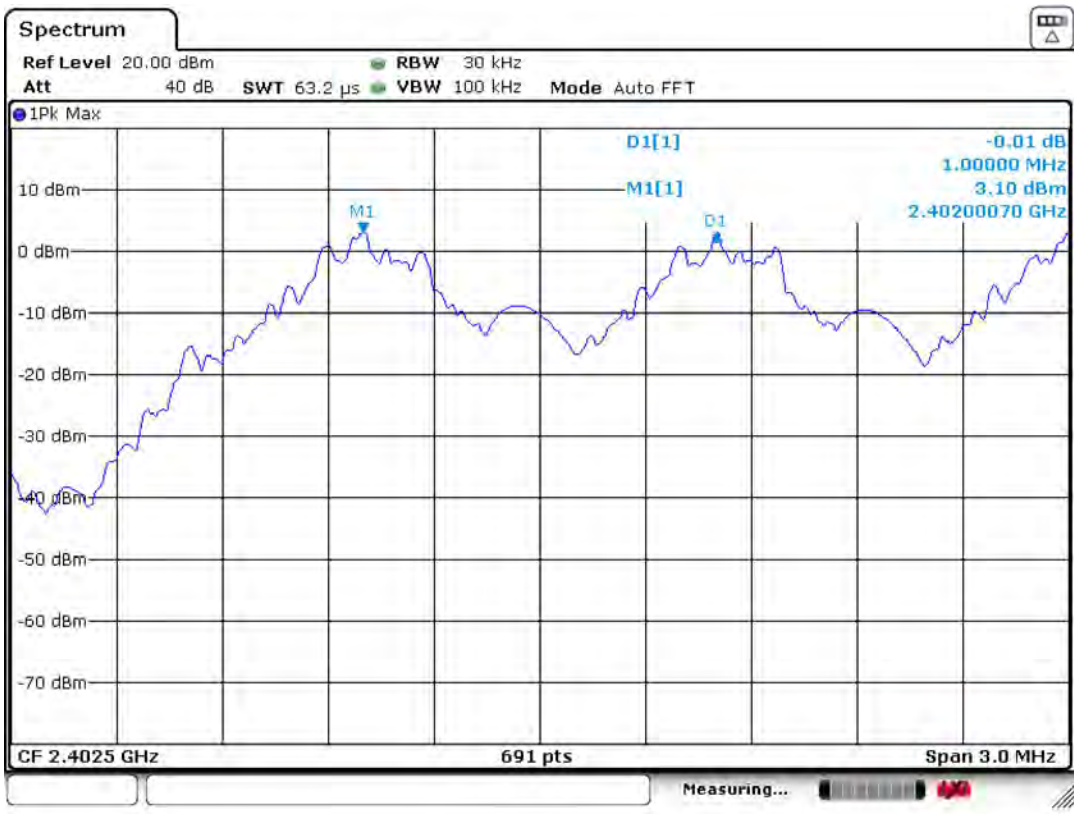
The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable. The carrier frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW.

## 5.3. Test Result

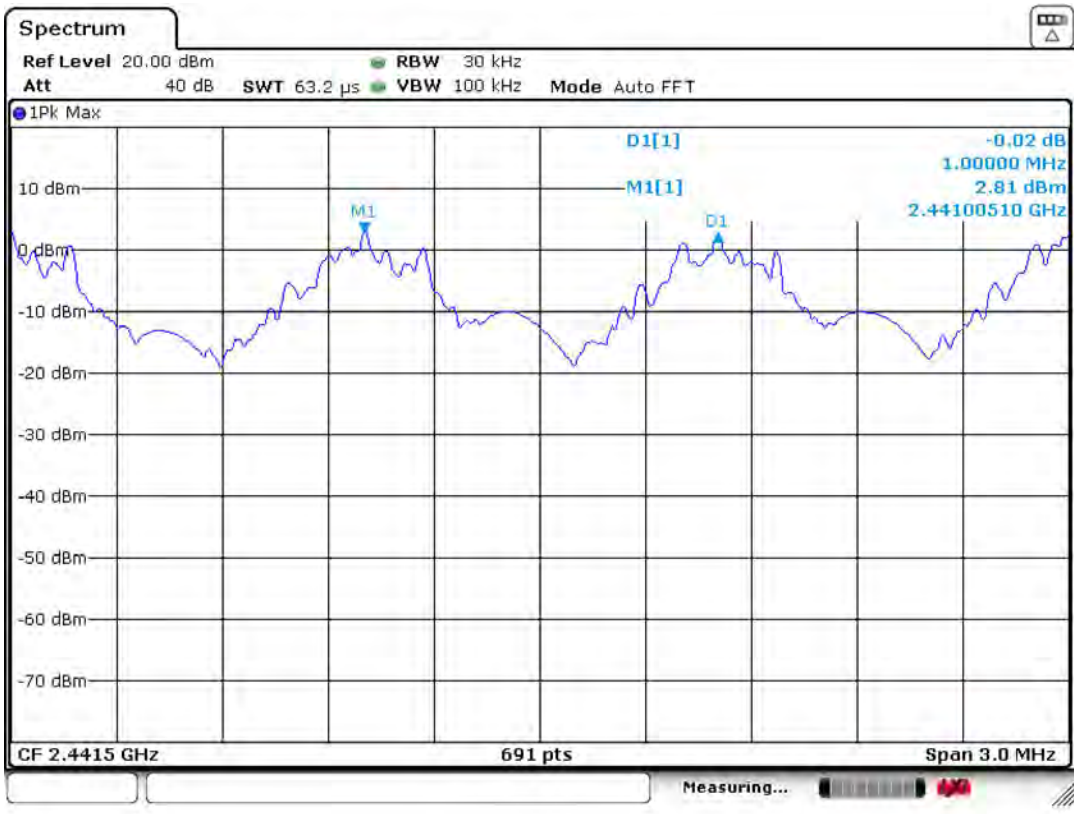
| EUT: 4 Channels amplifier | | | | |
|---|---|---|---|---|
| M/N: Z4-B | | | | |
| Test date: 2019-03-12 | | | Test site: RF site Tested by: Viking | |
| Mode | Channel | Channel separation (MHz) | Limit | Conclusion |
| GFSK | Low CH | 1.000 | > 2/3 of the 20dB Bandwidth or 25[kHz]( whichever is greater) | PASS |
| | Mid CH | 1.000 | | PASS |
| | High CH | 1.000 | | PASS |
| 8-DPSK | Low CH | 1.000 | | PASS |
| | Mid CH | 1.000 | | PASS |
| | High CH | 1.000 | | PASS |

## 5.4. Test Data

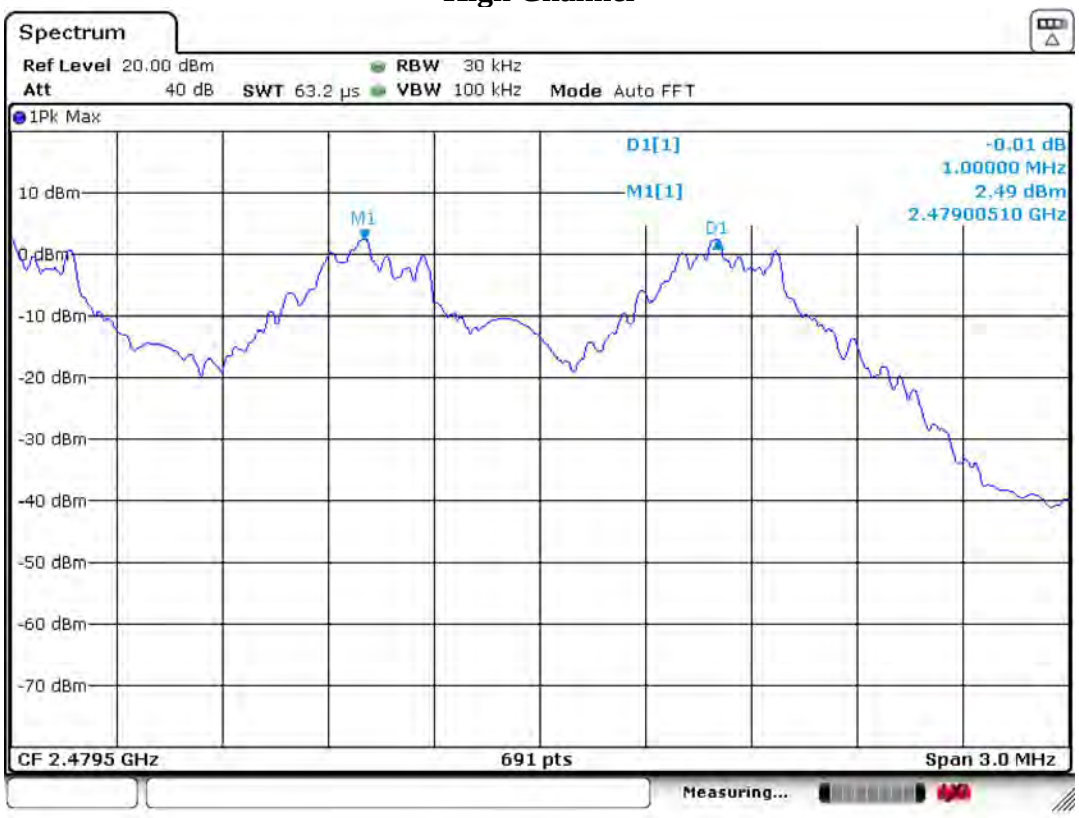
**GFSK**
**Low Channel**



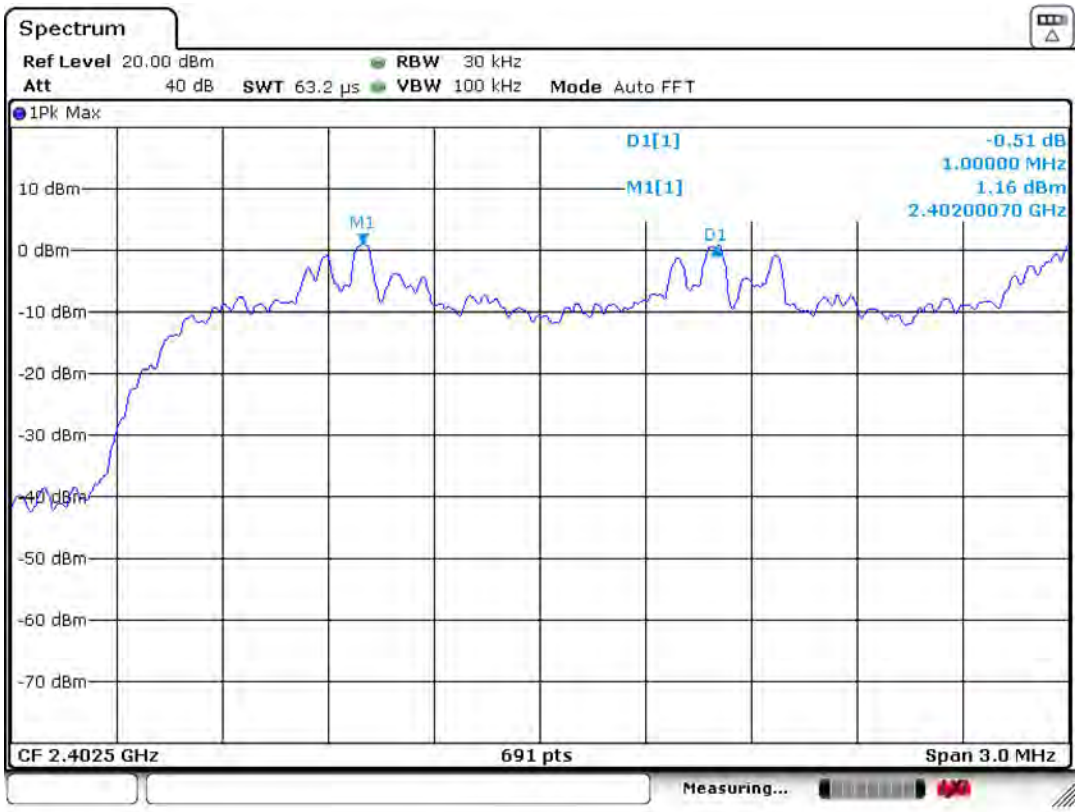

**Mid Channel**



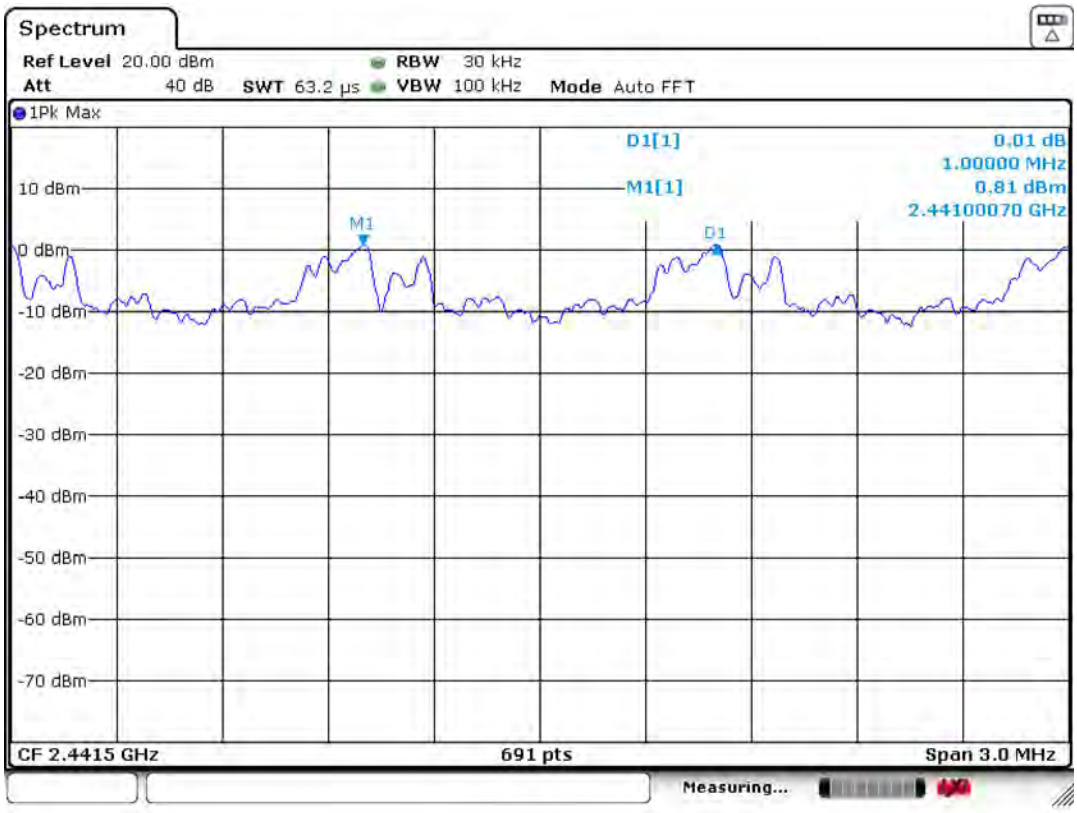
**High Channel**



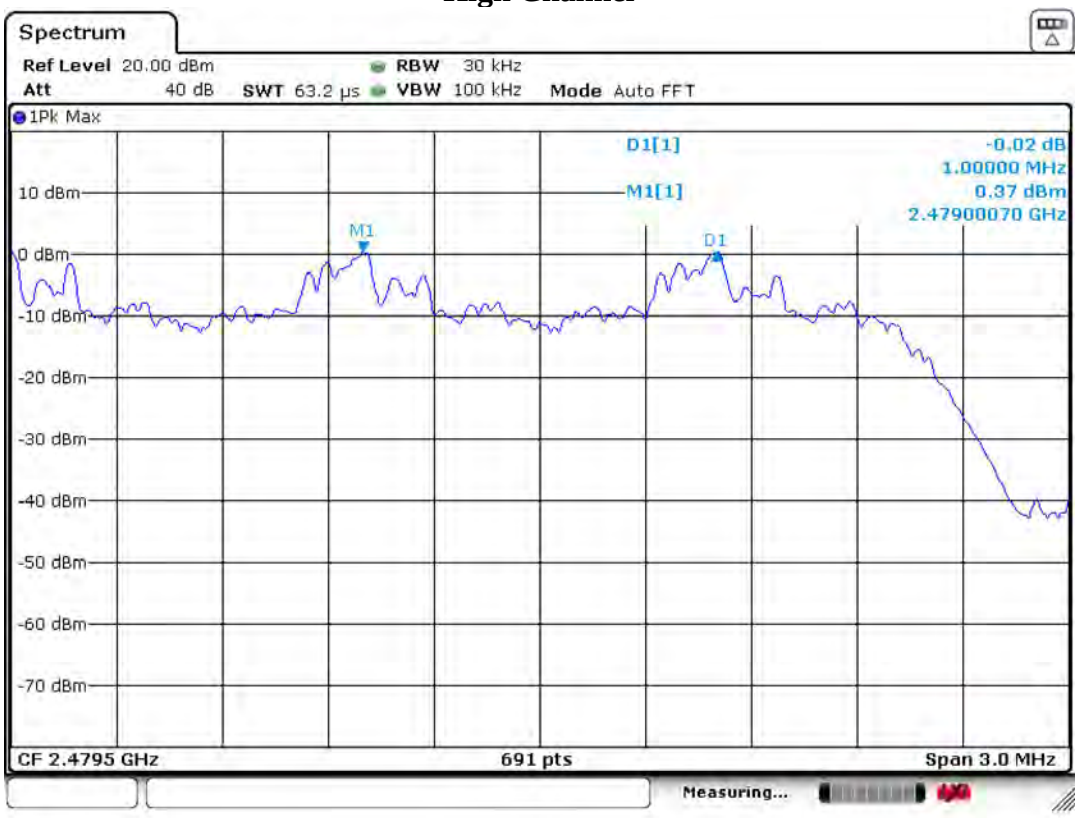
**8-DPSK**
**Low Channel**




**Mid Channel**



**High Channel**



# 6. NUMBER OF HOPPING CHANNEL

## 6.1. Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels

## 6.2. Test Procedure

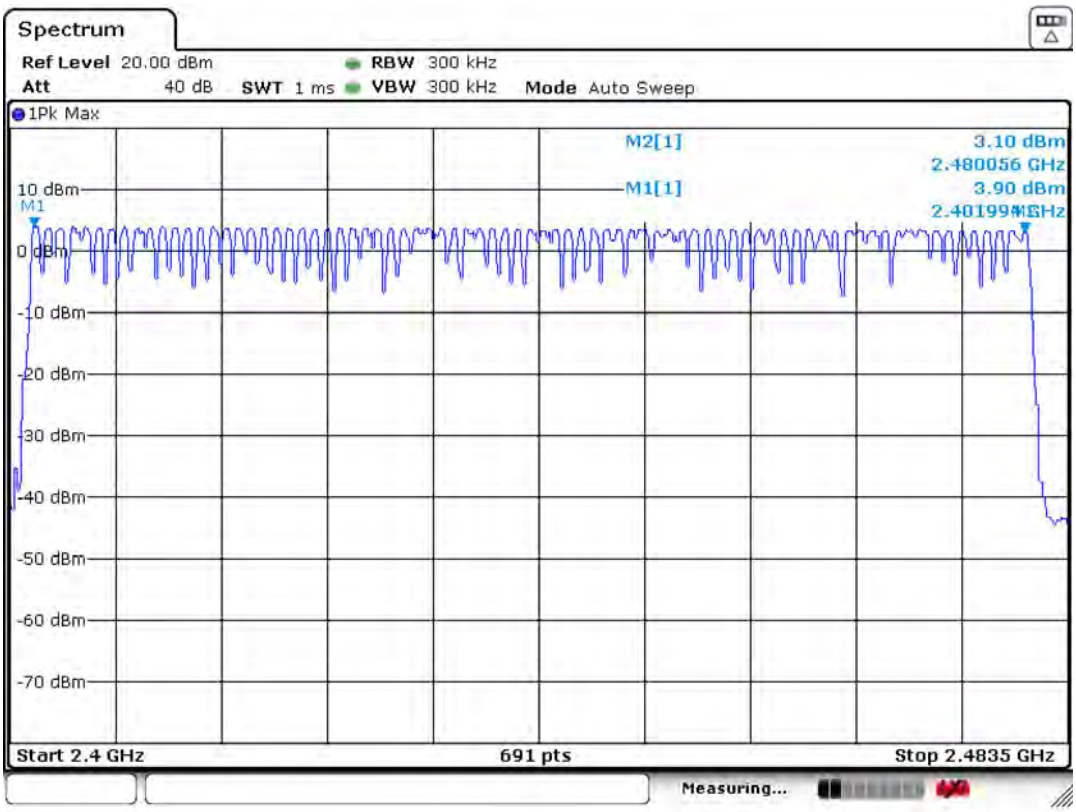
The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable. The number of hopping channel was measured by spectrum analyzer with 300kHz RBW and 300kHz VBW.

## 6.3. Test Result

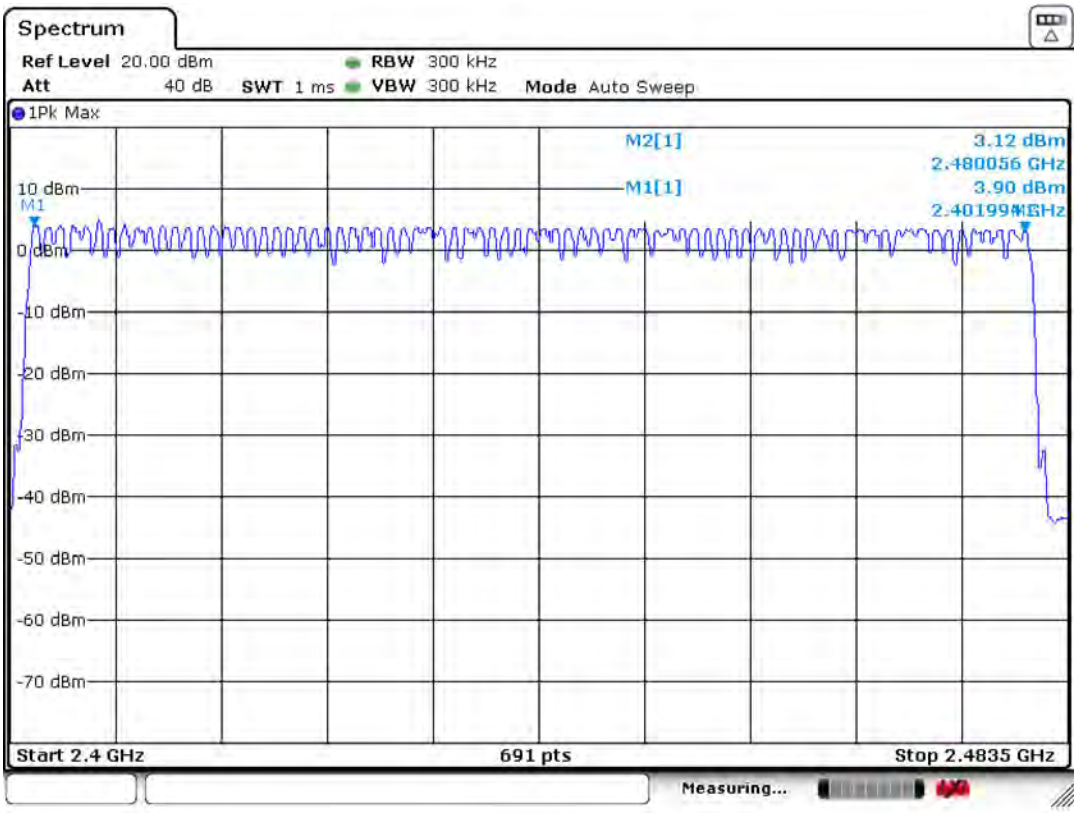
| EUT: 4 Channels amplifier | | | |
|---|---|---|---|
| M/N: Z4-B | | | |
| Test date: 2019-03-12 | Test site: RF site | Tested by: Viking | |
| Mode | Number of hopping channel | Limit | Conclusion |
| GFSK | 79 | >15 | PASS |
| 8-DPSK | 79 | >15 | PASS |

## 6.4. Test Data

**GFSK**




**8-DPSK**



# 7. DWELL TIME

## 7.1. 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.

## 7.2. Test Procedure

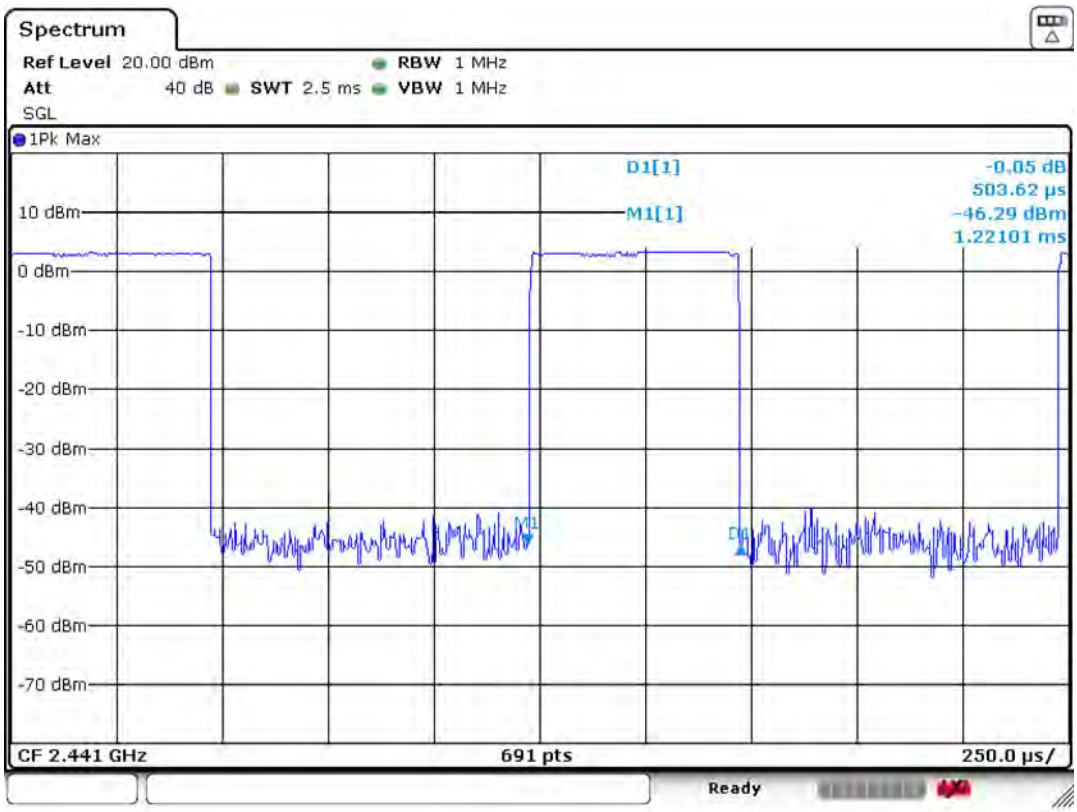
1. The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.
2. Set the EUT to proper test mode with relative test software and hardware.
3. Spectrum analyzer setting: Centered Frequency = measured channel, RBW = 1MHz, VBW= 1MHz, Frequency Span = 0 Hz.
4. Set sweep time properly to capture the entire dwell time per hopping channel.
5. Set detector type to Peak and trace mode to Max Hold and make the measurement.
6. Repeat step 3-5 until all channels measured were complete.

## 7.3. Test Result

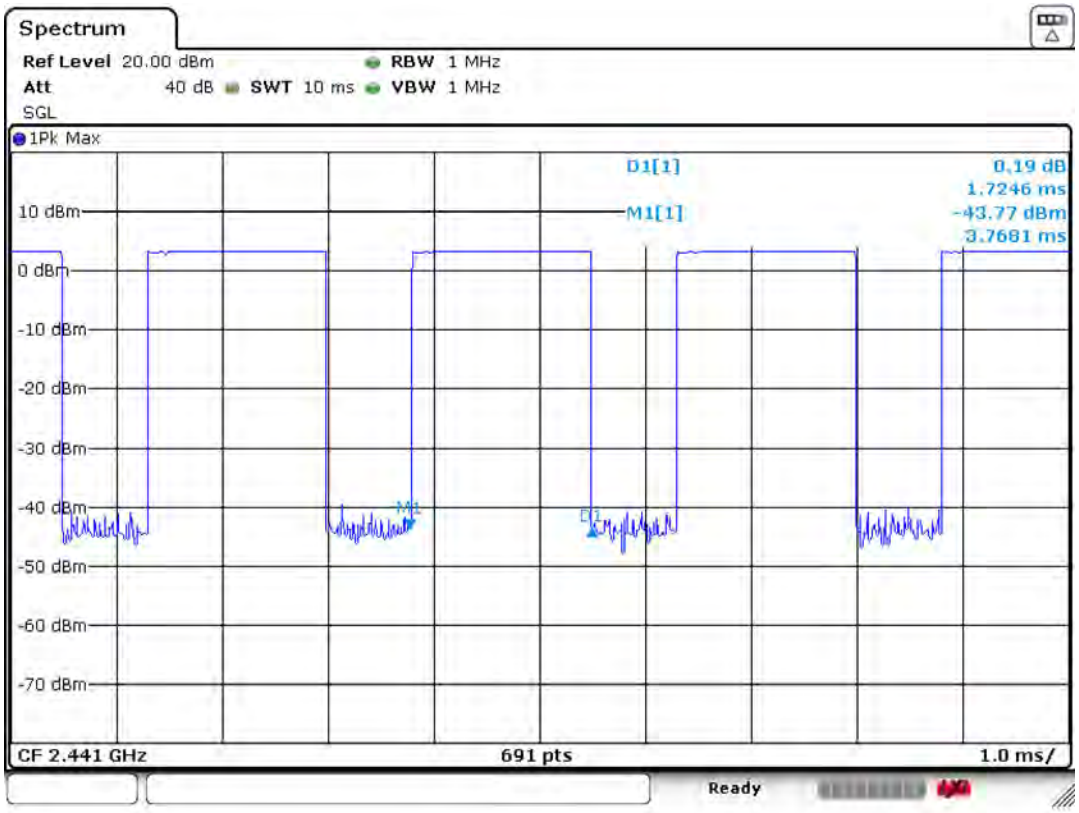
| EUT: 4 Channels amplifier | | | | | | |
|---|---|---|---|---|---|---|
| M/N: Z4-B | | | | | | |
| Test date: 2019-03-12 | Test site: RF site | | Tested by: Viking | | | |
| Mode | Freq (MHz) | Hops in Observation Period(hops) | Pulse Duration (ms) | Dwell time (ms) | Limit | Conclusion |
| GFSK DH1 | 2441 | 320 | 0.5036 | 161.16 | <400ms | PASS |
| GFSK DH3 | 2441 | 160 | 1.7246 | 275.94 | <400ms | PASS |
| GFSK DH5 | 2441 | 106.67 | 3.0725 | 327.73 | <400ms | PASS |
| 8-DPSK 3DH1 | 2441 | 320 | 0.3044 | 97.39 | <400ms | PASS |
| 8-DPSK 3DH3 | 2441 | 160 | 1.7971 | 287.54 | <400ms | PASS |
| 8-DPSK 3DH5 | 2441 | 106.67 | 3.1014 | 330.82 | <400ms | PASS |
| 1. DH1 Packet permit maximum 1600 hops/s with 2 timeslot in 79 channels (1 timeslot TX, 1 timeslot RX),So the hops in Observation Period(0.4s×79 channel)=(1600/79/2)hops/s×0.4s×79=320 hops.<br>2. DH3 Packet permit maximum 1600 hops/s with 4 timeslot in 79 channels (3 timeslot TX, 1 timeslot RX),So the hops in Observation Period(0.4s×79 channel)=(1600/79/4)hops/s×0.4s×79=160 hops.<br>3. DH5 Packet permit maximum 1600 hops/s with 6 timeslot in 79 channels (5 timeslot TX, 1 timeslot RX),So the hops in Observation Period(0.4s×79 channel)=(1600/79/5)hops/s×0.4s×79=106.67 hops.<br>4.Dwell Time= Hops in Observation Period×Pulse Duration. | | | | | | |

## 7.4. Test Data

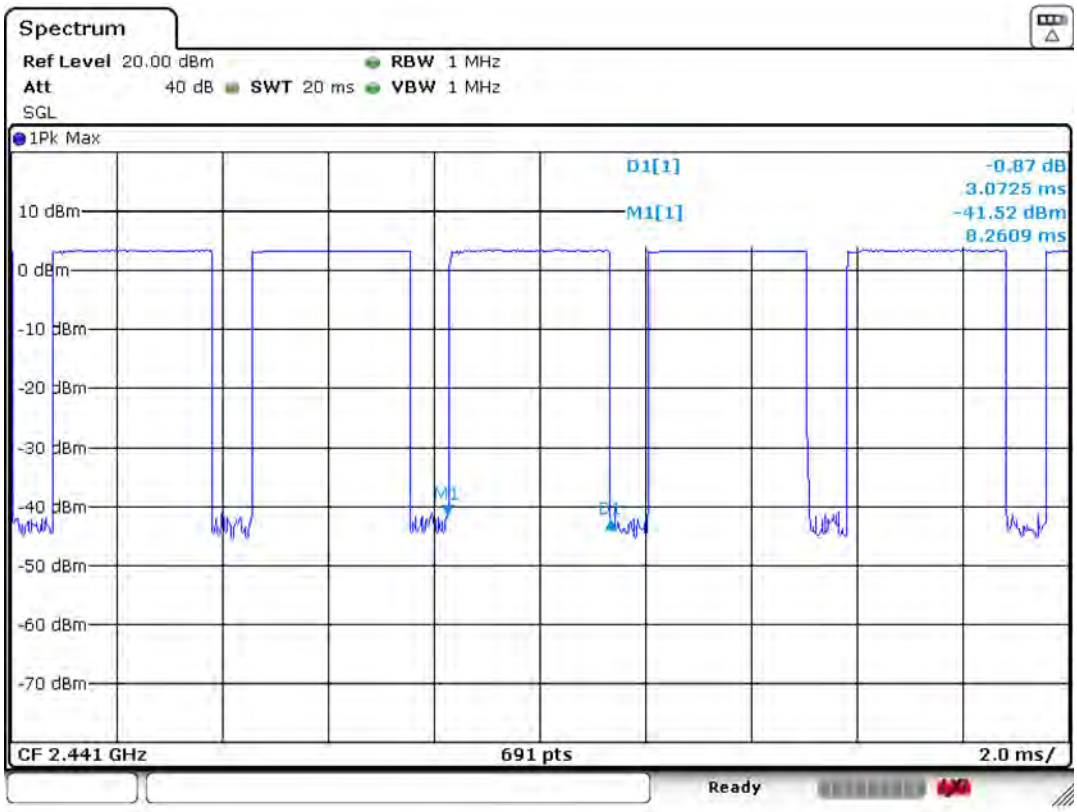
**GFSK DH1**



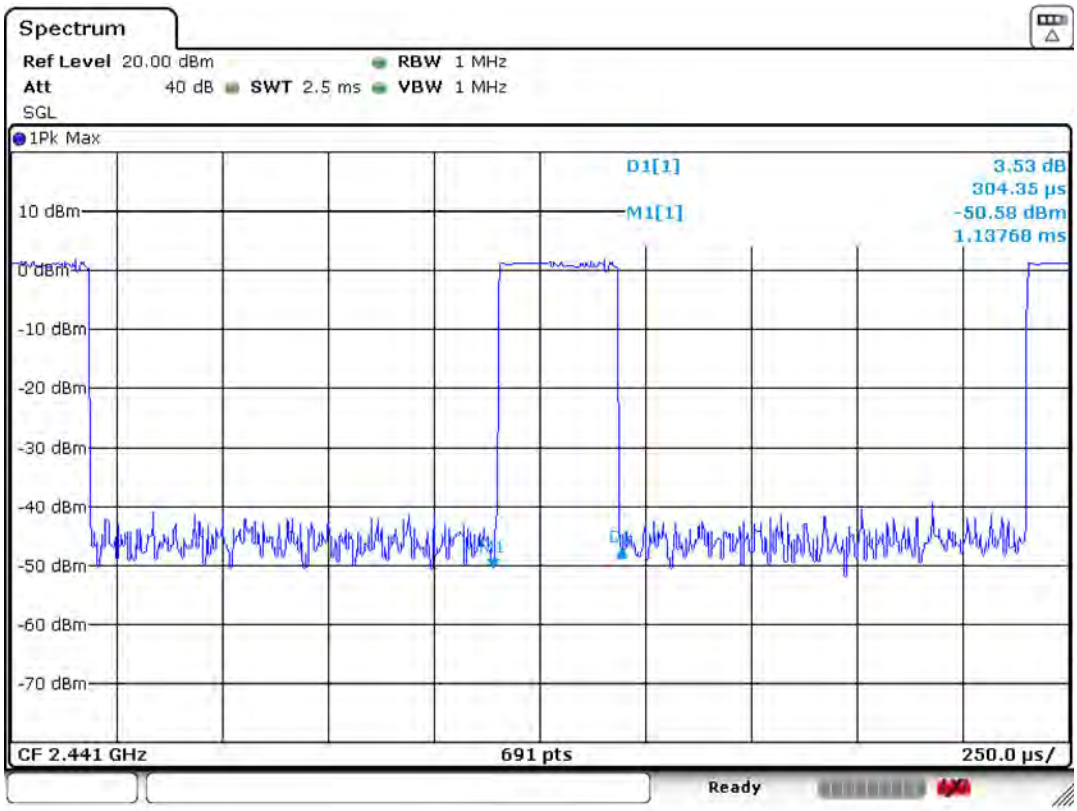

**GFSK DH3**



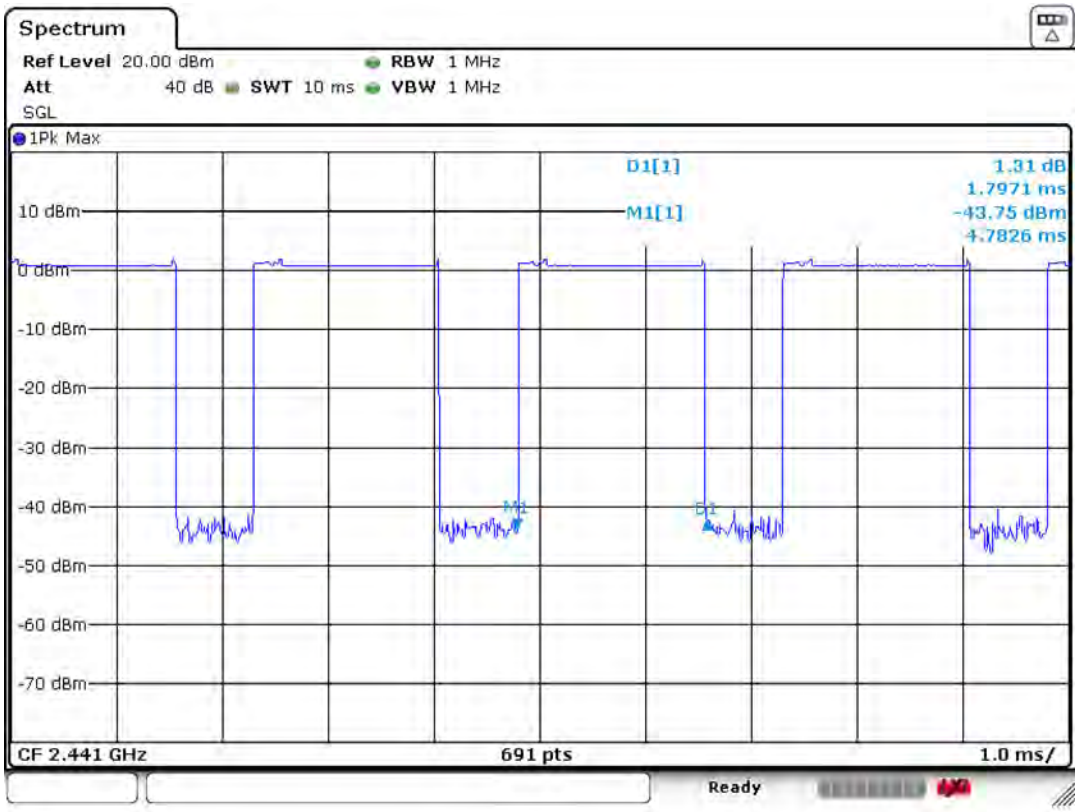
## GSFK DH5


Spectrum
Ref Level 20.00 dBm
RBW 1 MHz
Att 40 dB SWT 20 ms VBW 1 MHz
SGL
1Pk Max
D1[1] -0.87 dB
3.0725 ms
M1[1] -41.52 dBm
8.2609 ms
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.441 GHz
691 pts
2.0 ms/
Ready

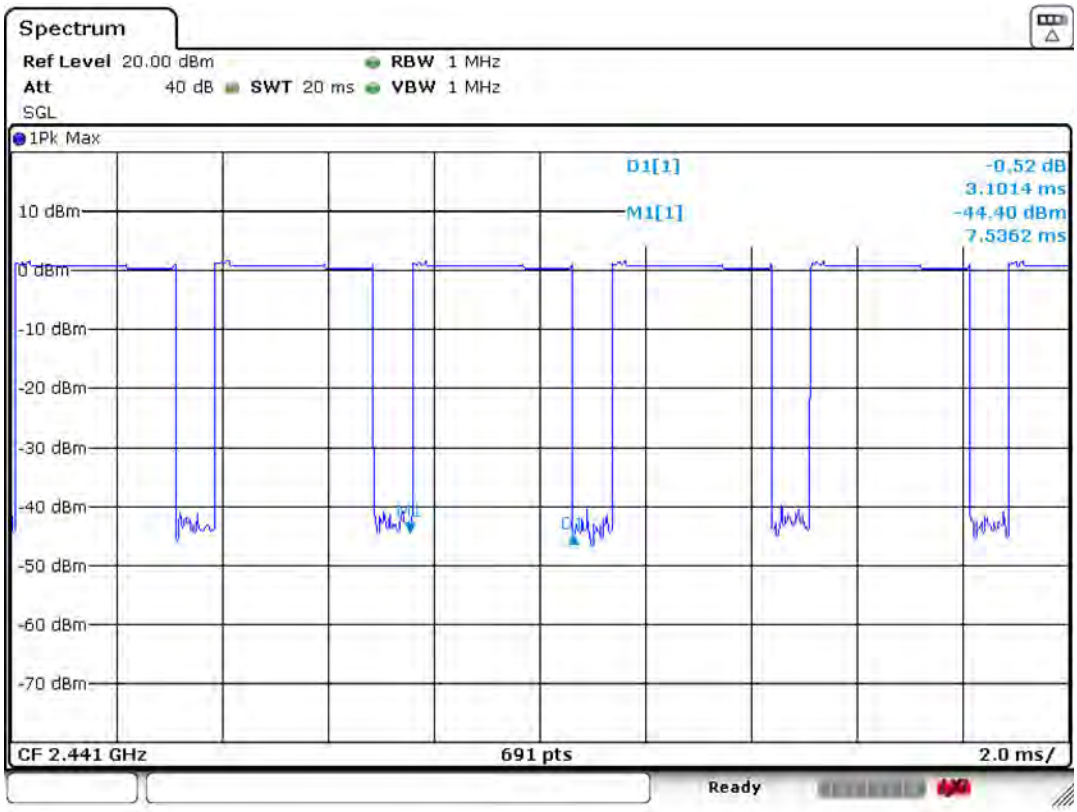
## 8-DPSK 3DH1




## 8-DPSK 3DH3



## 8-DPSK 3DH5


Spectrum
Ref Level 20.00 dBm
RBW 1 MHz
Att 40 dB SWT 20 ms VBW 1 MHz
SGL
1Pk Max
D1[1] -0.52 dB
3.1014 ms
M1[1] -44.40 dBm
7.5362 ms
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.441 GHz
691 pts
2.0 ms/
Ready

# 8. RADIATED EMISSIONS

## 8.1. Limit

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

15.205 Restricted frequency band

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| [1]0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2690 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | ([2]) |

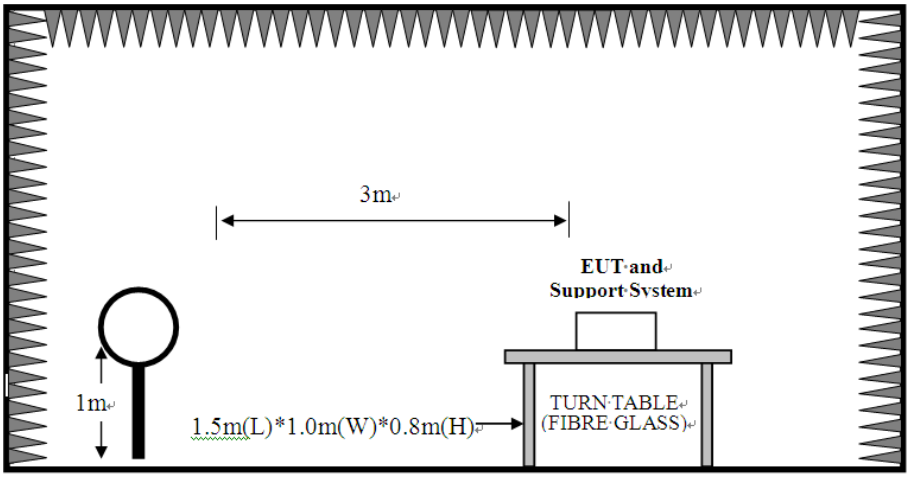
15.209 Limit

| Frequency (MHz) | Field Strength(μV/m) | Distance(m) |
|---|---|---|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

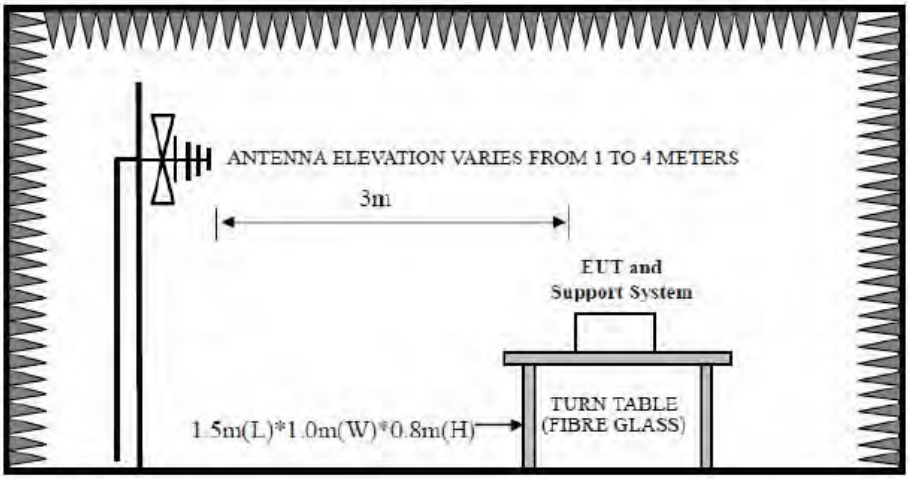
Remark：(1) Emission level dBμV = 20 log Emission level μV/m
(2) The smaller limit shall apply at the cross point between two frequency bands.
(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

## 8.2. Block Diagram of Test setup

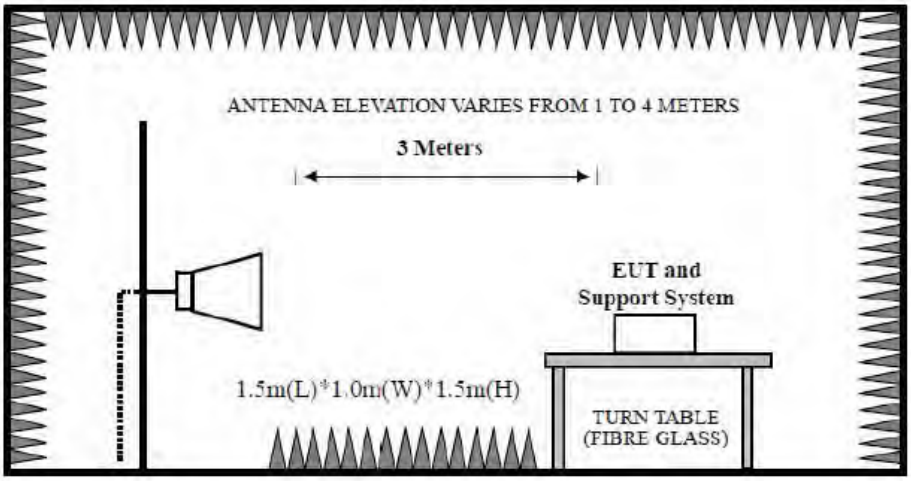
9kHz~30MHz




30~1000MHz




Above 1GHz



## 8.3. Test Procedure

EUT was placed on a turn table, which is 0.8 meter high above ground for 9kHz~1000MHz test, and which is 1.5 meter high above ground for above 1GHz test. The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it working in test mode, then test it. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

The test frequency analyzer system was set to Peak Detect (300Hz RBW in 9kHz to 150kHz and 10kHz RBW in 150kHz to 30MHz) Function and Specified Bandwidth with Maximum Hold Mode.

The bandwidth of the EMI test receiver (R&S ESVS10) is set at 120kHz for frequency range from 30MHz to 1000 MHz.

The bandwidth of the Spectrum's VBW is set at 1MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz

PEAK detector, 1MHz/1MHz for PAEK measurement,

PEAK detector, 1MHz/10Hz for Average measurement

The frequency range from 30MHz to 10th harmonic (25GHz) are checked.

## 8.4. Test Result

Pass

Note: 1、For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

2、The frequency 2402MHz 、2441MHz and 2480MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.

3、all modes have been tested , only worse case is reported.

## 8.5. Test Data

9 kHz – 30 MHz
Pass
Note: The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

30 MHz – 1000 MHz

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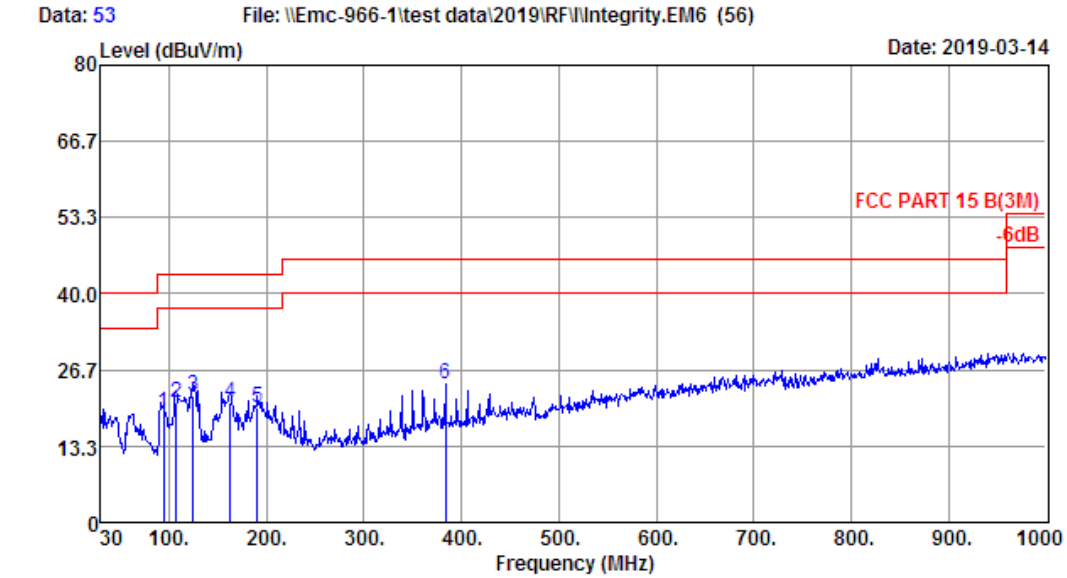


```
Site no.      : 1# 966 Chamber              Data no.  : 53
Dis. / Ant.   : 3m   37062                  Ant. pol. : VERTICAL
Limit         : FCC PART 15 B(3M)
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : TX Mode
```

| | Freq. (MHz) | ANT Factor (dB/m) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 94.02 | 9.46 | 0.81 | 8.81 | 19.08 | 43.50 | 24.42 | QP |
| 2 | 107.60 | 10.50 | 0.93 | 9.66 | 21.09 | 43.50 | 22.41 | QP |
| 3 | 125.06 | 11.60 | 0.95 | 9.61 | 22.16 | 43.50 | 21.34 | QP |
| 4 | 162.89 | 10.72 | 1.16 | 8.98 | 20.86 | 43.50 | 22.64 | QP |
| 5 | 191.02 | 8.84 | 1.25 | 9.91 | 20.00 | 43.50 | 23.50 | QP |
| 6 | 384.05 | 15.84 | 2.13 | 6.19 | 24.16 | 46.00 | 21.84 | QP |

```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
         2. Margin= Limit - Emission Level.
         3. The emission levels that are 20dB below the official limit are not reported.
```

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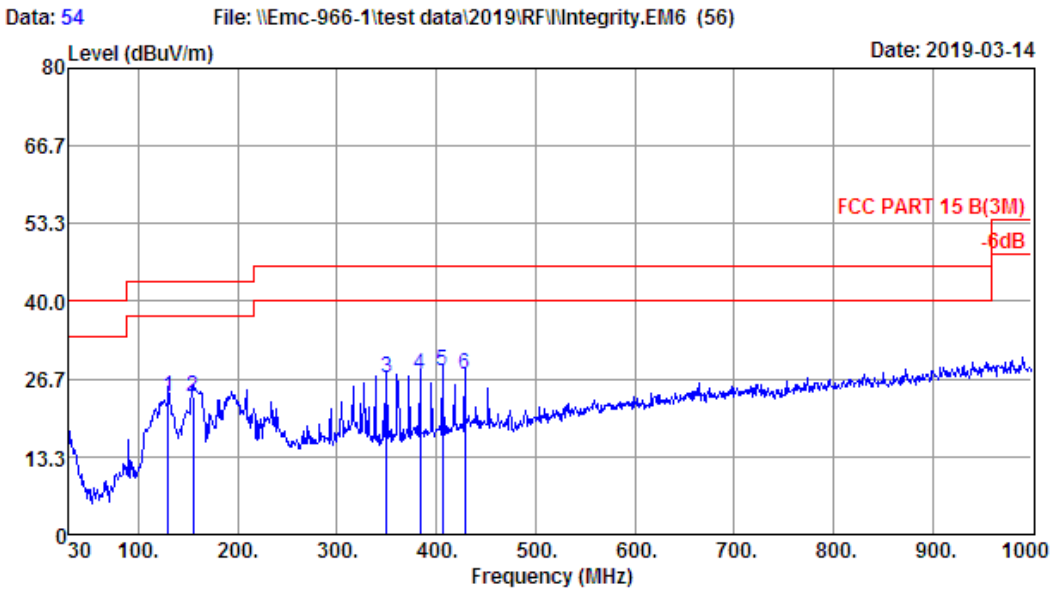


```
Site no.      : 1# 966 Chamber              Data no.  : 54
Dis. / Ant.   : 3m   37062                  Ant. pol. : HORIZONTAL
Limit         : FCC PART 15 B(3M)
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : TX Mode
```

| | Freq. (MHz) | ANT Factor (dB/m) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 129.91 | 11.80 | 0.98 | 10.75 | 23.53 | 43.50 | 19.97 | QP |
| 2 | 155.13 | 11.30 | 1.12 | 11.22 | 23.64 | 43.50 | 19.86 | QP |
| 3 | 350.10 | 15.30 | 2.11 | 9.57 | 26.98 | 46.00 | 19.02 | QP |
| 4 | 384.05 | 15.84 | 2.13 | 9.41 | 27.38 | 46.00 | 18.62 | QP |
| 5 | 406.36 | 16.23 | 2.14 | 9.65 | 28.02 | 46.00 | 17.98 | QP |
| 6 | 428.67 | 16.78 | 2.32 | 8.33 | 27.43 | 46.00 | 18.57 | QP |

```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
         2. Margin= Limit - Emission Level.
         3. The emission levels that are 20dB below the official limit are not reported.
```

**1000-18000MHz**

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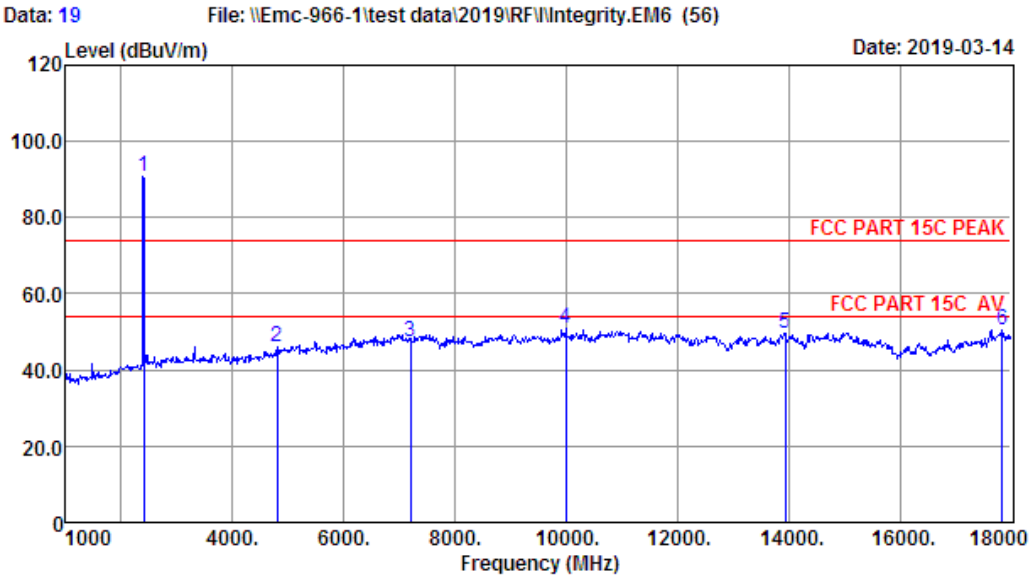


```
Site no.      : 1# 966 Chamber              Data no.  : 19
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : 8-DPSK TX 2402MHz
```

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Amp Factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2402.00 | 27.26 | 2.89 | 34.68 | 95.20 | 90.67 | 74.00 | -16.67 | Peak |
| 2 | 4804.00 | 31.16 | 4.51 | 34.68 | 44.98 | 45.97 | 74.00 | 28.03 | Peak |
| 3 | 7206.00 | 36.05 | 5.84 | 34.58 | 40.26 | 47.57 | 74.00 | 26.43 | Peak |
| 4 | 9993.00 | 38.50 | 6.76 | 34.60 | 40.28 | 50.94 | 74.00 | 23.06 | Peak |
| 5 | 13937.00 | 40.98 | 8.15 | 34.21 | 34.80 | 49.72 | 74.00 | 24.28 | Peak |
| 6 | 17847.00 | 47.06 | 9.67 | 34.28 | 27.98 | 50.43 | 74.00 | 23.57 | Peak |

```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
         2. Margin= Limit - Emission Level.
         3. The emission levels that are 20dB below the official
            limit are not reported.
```

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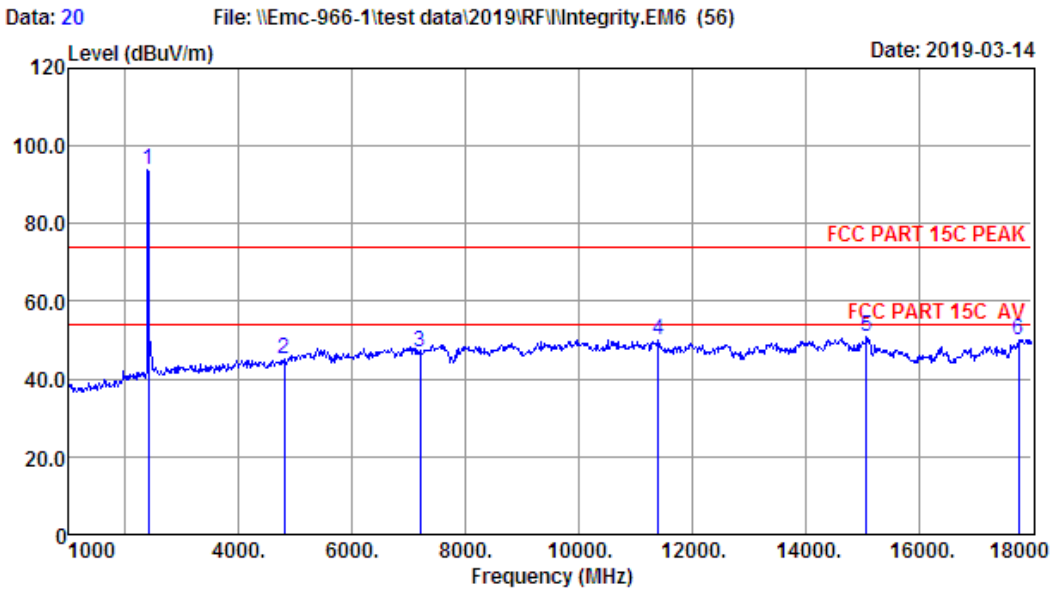


```
Site no.      : 1# 966 Chamber              Data no.  : 20
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : 8-DPSK TX 2402MHz
```

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Amp Factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2402.00 | 27.26 | 2.89 | 34.68 | 98.24 | 93.71 | 74.00 | -19.71 | Peak |
| 2 | 4804.00 | 31.16 | 4.51 | 34.68 | 44.15 | 45.14 | 74.00 | 28.86 | Peak |
| 3 | 7206.00 | 36.05 | 5.84 | 34.58 | 39.82 | 47.13 | 74.00 | 26.87 | Peak |
| 4 | 11404.00 | 39.72 | 7.38 | 34.42 | 37.33 | 50.01 | 74.00 | 23.99 | Peak |
| 5 | 15076.00 | 40.77 | 8.44 | 34.29 | 35.80 | 50.72 | 74.00 | 23.28 | Peak |
| 6 | 17762.00 | 46.49 | 9.62 | 34.28 | 28.31 | 50.14 | 74.00 | 23.86 | Peak |

```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
         2. Margin= Limit - Emission Level.
         3. The emission levels that are 20dB below the official
            limit are not reported.
```

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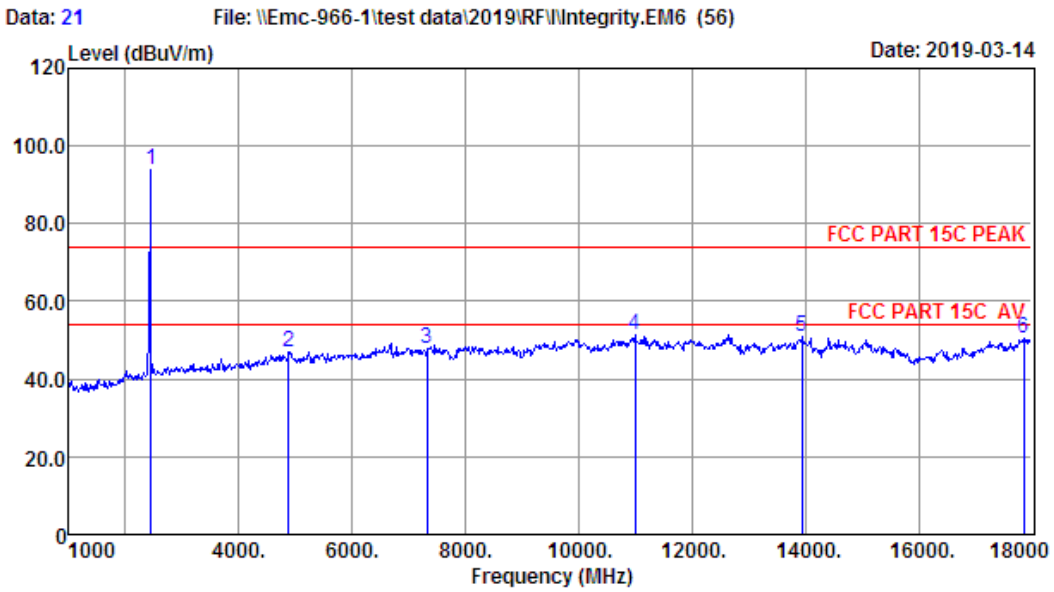


```
Site no.      : 1# 966 Chamber              Data no.  : 21
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : 8-DPSK TX 2441MHz
```

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Amp Factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2441.00 | 27.33 | 2.90 | 34.67 | 98.44 | 94.00 | 74.00 | -20.00 | Peak |
| 2 | 4882.00 | 31.39 | 4.71 | 34.69 | 45.34 | 46.75 | 74.00 | 27.25 | Peak |
| 3 | 7323.00 | 36.19 | 5.88 | 34.57 | 40.17 | 47.67 | 74.00 | 26.33 | Peak |
| 4 | 10996.00 | 40.00 | 7.11 | 34.30 | 38.44 | 51.25 | 74.00 | 22.75 | Peak |
| 5 | 13937.00 | 40.98 | 8.15 | 34.21 | 36.19 | 51.11 | 74.00 | 22.89 | Peak |
| 6 | 17864.00 | 47.18 | 9.69 | 34.29 | 27.82 | 50.40 | 74.00 | 23.60 | Peak |

```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
         2. Margin= Limit - Emission Level.
         3. The emission levels that are 20dB below the official
            limit are not reported.
```

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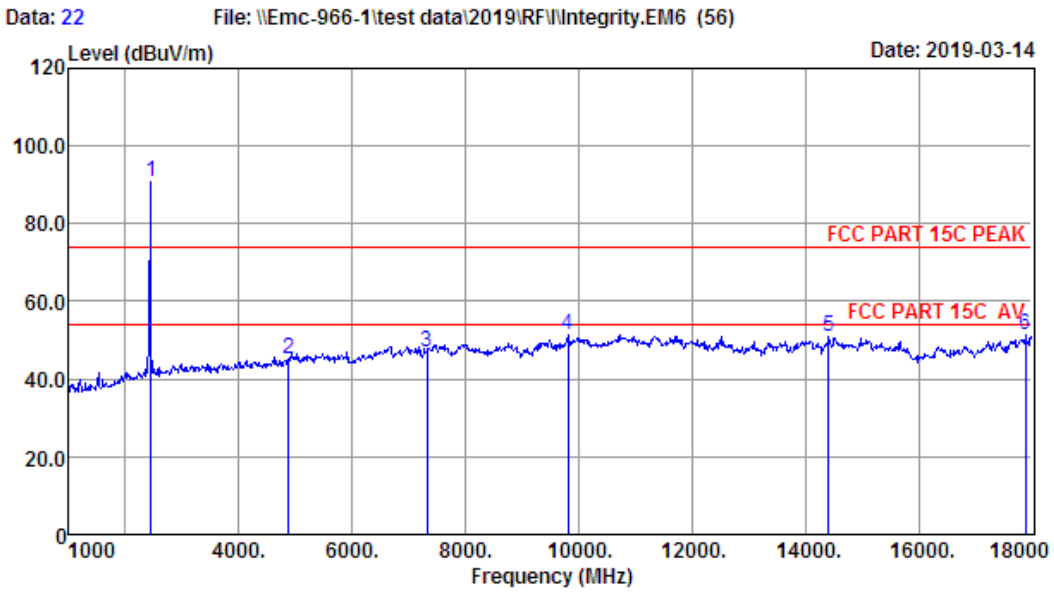


```
Site no.      : 1# 966 Chamber              Data no.  : 22
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : 8-DPSK TX 2441MHz
```

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Amp Factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2441.00 | 27.33 | 2.90 | 34.67 | 95.17 | 90.73 | 74.00 | -16.73 | Peak |
| 2 | 4882.00 | 31.39 | 4.71 | 34.69 | 43.92 | 45.33 | 74.00 | 28.67 | Peak |
| 3 | 7323.00 | 36.19 | 5.88 | 34.57 | 39.45 | 46.95 | 74.00 | 27.05 | Peak |
| 4 | 9806.00 | 38.12 | 6.65 | 34.60 | 41.23 | 51.40 | 74.00 | 22.60 | Peak |
| 5 | 14413.00 | 41.06 | 8.33 | 34.24 | 35.62 | 50.77 | 74.00 | 23.23 | Peak |
| 6 | 17881.00 | 47.29 | 9.70 | 34.29 | 28.51 | 51.21 | 74.00 | 22.79 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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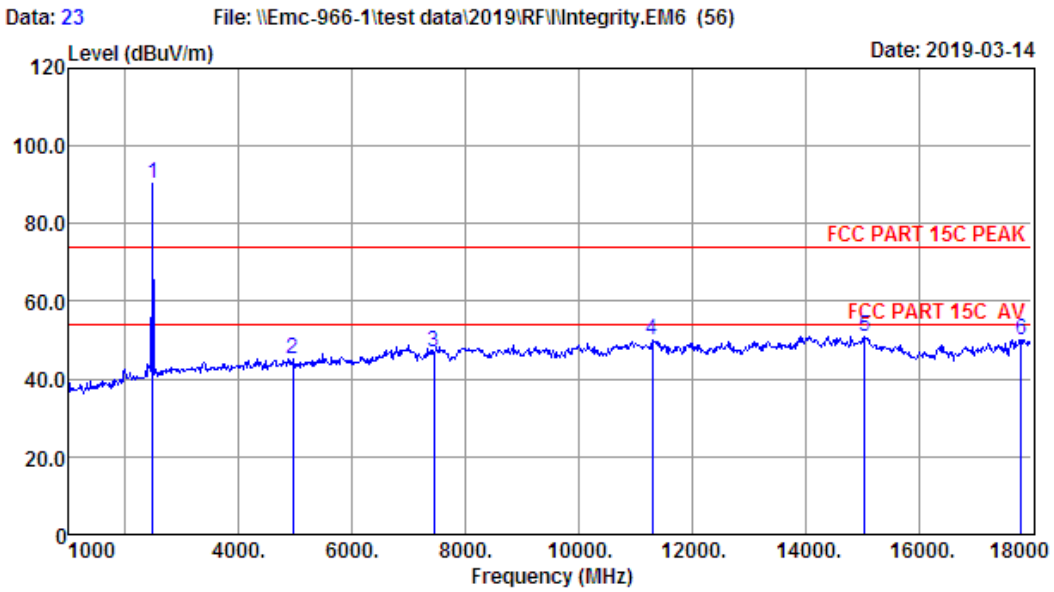


```
Site no.      : 1# 966 Chamber              Data no.  : 23
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : 8-DPSK TX 2480MHz
```

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Amp Factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2480.00 | 27.38 | 2.93 | 34.66 | 94.77 | 90.42 | 74.00 | -16.42 | Peak |
| 2 | 4960.00 | 31.68 | 4.60 | 34.70 | 43.69 | 45.27 | 74.00 | 28.73 | Peak |
| 3 | 7440.00 | 36.34 | 6.02 | 34.56 | 39.32 | 47.12 | 74.00 | 26.88 | Peak |
| 4 | 11302.00 | 39.79 | 7.35 | 34.39 | 37.14 | 49.89 | 74.00 | 24.11 | Peak |
| 5 | 15042.00 | 40.88 | 8.42 | 34.29 | 35.97 | 50.98 | 74.00 | 23.02 | Peak |
| 6 | 17813.00 | 46.83 | 9.65 | 34.28 | 28.03 | 50.23 | 74.00 | 23.77 | Peak |

```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
         2. Margin= Limit - Emission Level.
         3. The emission levels that are 20dB below the official
            limit are not reported.
```

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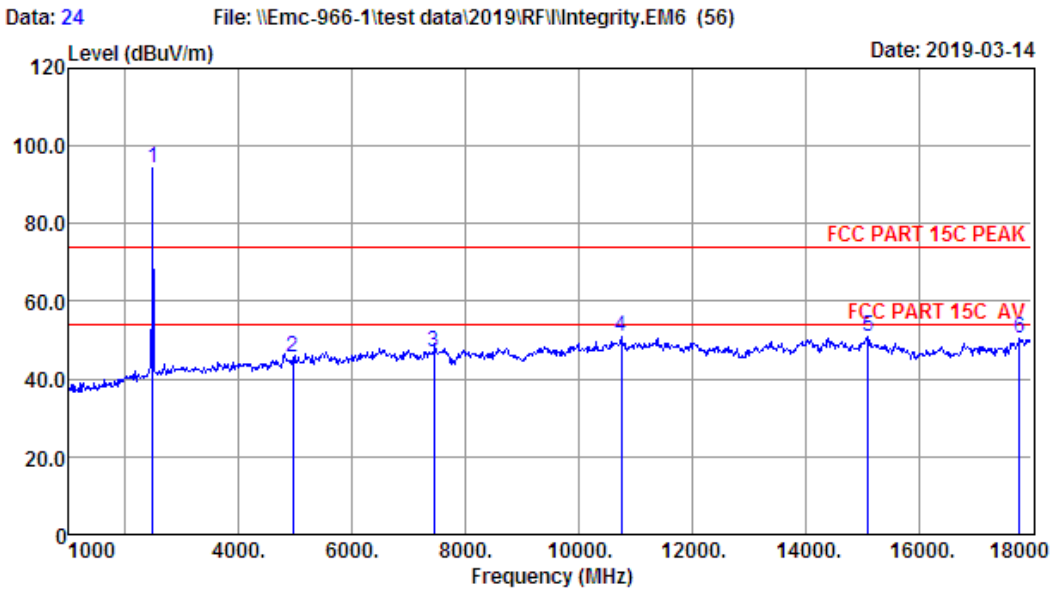



```
Site no.      : 1# 966 Chamber              Data no.  : 24
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : 8-DPSK TX 2480MHz
```

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Amp Factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2480.00 | 27.38 | 2.93 | 34.66 | 98.79 | 94.44 | 74.00 | -20.44 | Peak |
| 2 | 4960.00 | 31.68 | 4.60 | 34.70 | 43.90 | 45.48 | 74.00 | 28.52 | Peak |
| 3 | 7440.00 | 36.34 | 6.02 | 34.56 | 39.26 | 47.06 | 74.00 | 26.94 | Peak |
| 4 | 10758.00 | 39.64 | 7.01 | 34.37 | 38.59 | 50.87 | 74.00 | 23.13 | Peak |
| 5 | 15110.00 | 40.65 | 8.47 | 34.28 | 36.09 | 50.93 | 74.00 | 23.07 | Peak |
| 6 | 17779.00 | 46.60 | 9.63 | 34.28 | 28.53 | 50.48 | 74.00 | 23.52 | Peak |

```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
         2. Margin= Limit - Emission Level.
         3. The emission levels that are 20dB below the official
            limit are not reported.
```

**18000MHz – 25000MHz**

Pass

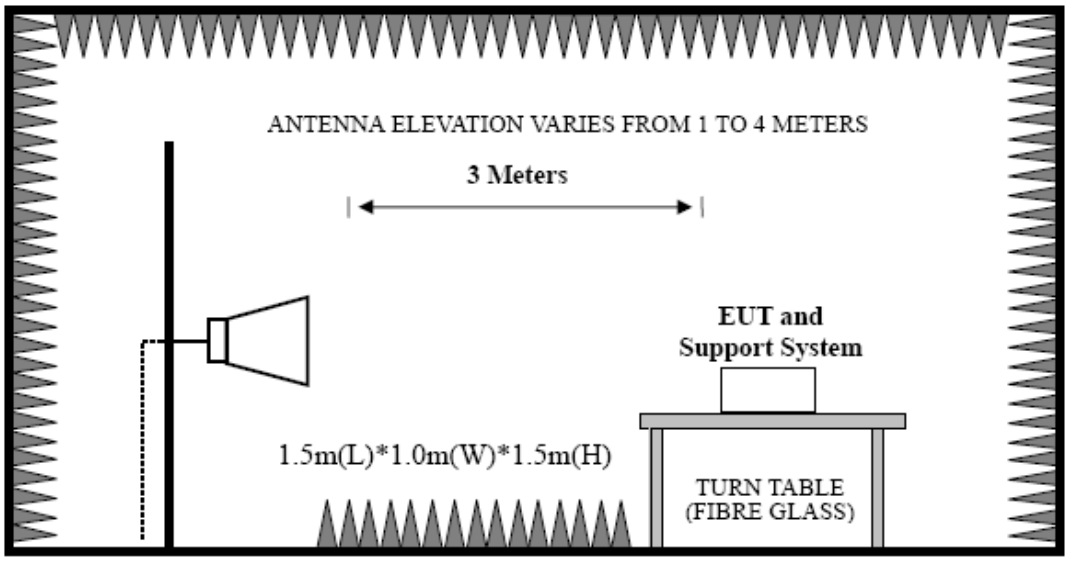
Note: The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

# 9. BAND EDGE COMPLIANCE

## 9.1. Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

## 9.2. Block Diagram of Test setup




## 9.3. Test Procedure

EUT was placed on a turn table, which is 1.5 m high above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. Power on the EUT and let it working in test mode, then test it. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.

Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of emissions

Peak : RBW = 1MHz, VBW = 1MHz, Detector=PEAK detector, Sweep time = auto.

AV : RBW = 1MHz, VBW = 10Hz, Detector=PEAK detector, Sweep time = auto.

## 9.4. Test Result

Pass (The testing data was attached in the next pages.)

Note: 1、For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

2、The frequency 2402MHz and 2480MHz is fundamental frequency which no limit, the limit on plots is automatically generated by the software, it's not fundamental limit, we can't remove it.

3、all modes have been tested , only worse case is reported.

## 9.5. Test Data

EST Technology

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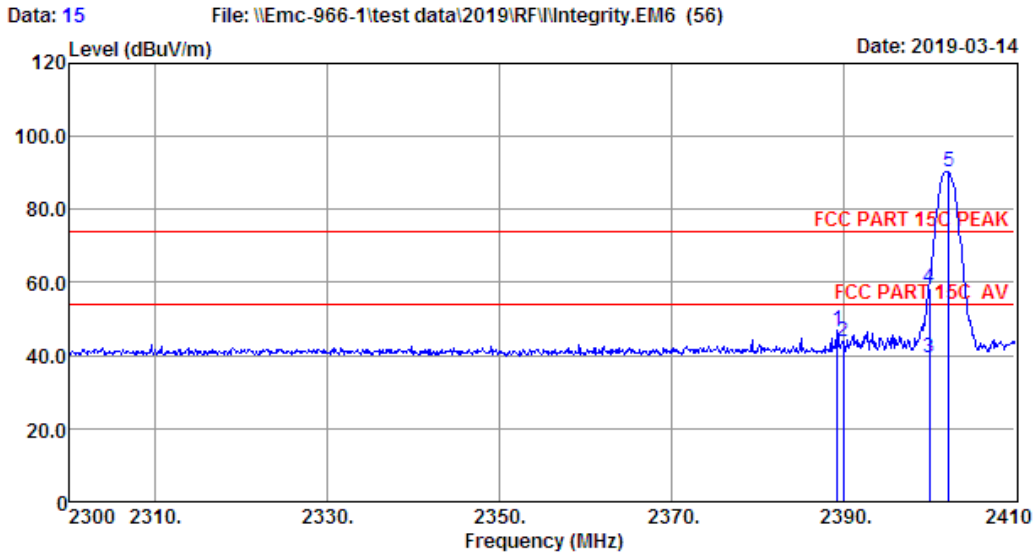


```
Site no.      : 1# 966 Chamber              Data no.  : 15
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : 8-DPSK TX 2402MHz
```

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Amp Factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2389.32 | 27.26 | 2.89 | 34.68 | 51.54 | 47.01 | 74.00 | 26.99 | Peak |
| 2 | 2390.00 | 27.26 | 2.89 | 34.68 | 48.44 | 43.91 | 74.00 | 30.09 | Peak |
| 3 | 2400.00 | 27.26 | 2.89 | 34.68 | 44.00 | 39.47 | 54.00 | 14.53 | Average |
| 4 | 2400.00 | 27.26 | 2.89 | 34.68 | 63.20 | 58.67 | 74.00 | 15.33 | Peak |
| 5 | 2402.30 | 27.26 | 2.89 | 34.68 | 94.82 | 90.29 | 74.00 | -16.29 | Peak |

```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
         2. Margin= Limit - Emission Level.
         3. The emission levels that are 20dB below the official
            limit are not reported.
```

EST Technology

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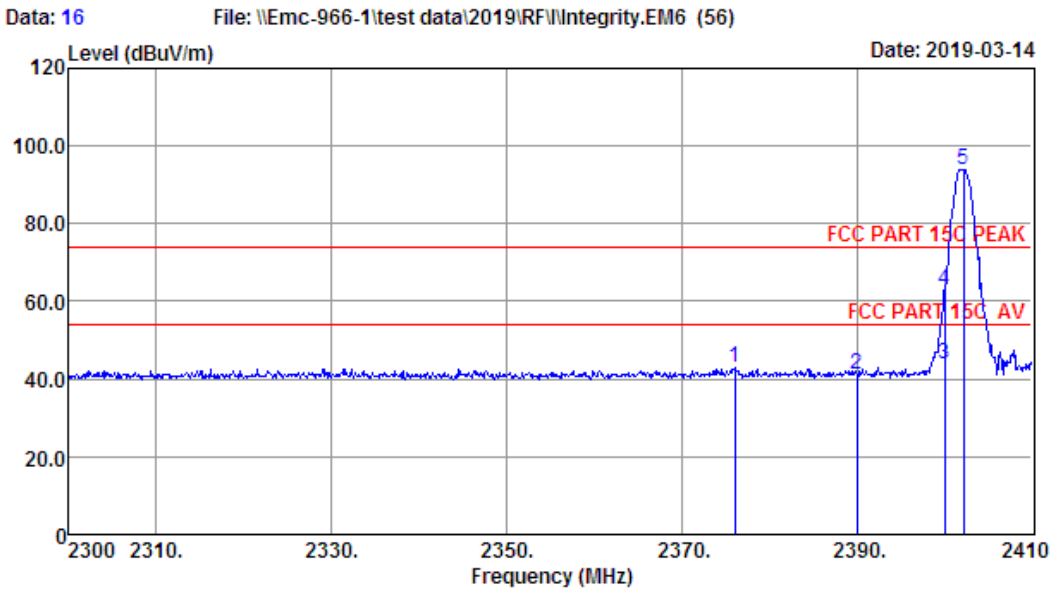


Site no. : 1# 966 Chamber Data no. : 16
Dis. / Ant. : 3m ANT9120D 1-18G Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer : Viking
EUT : 4 Channels amplifier
Power : DC 24V From Adapter Input AC 120V/60Hz
M/N : Z4-B
Test Mode : 8-DPSK TX 2402MHz

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Amp Factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2376.12 | 27.23 | 2.88 | 34.69 | 47.42 | 42.84 | 74.00 | 31.16 | Peak |
| 2 | 2390.00 | 27.26 | 2.89 | 34.68 | 45.80 | 41.27 | 74.00 | 32.73 | Peak |
| 3 | 2400.00 | 27.26 | 2.89 | 34.68 | 48.55 | 44.02 | 54.00 | 9.98 | Average |
| 4 | 2400.00 | 27.26 | 2.89 | 34.68 | 67.44 | 62.91 | 74.00 | 11.09 | Peak |
| 5 | 2402.19 | 27.26 | 2.89 | 34.68 | 98.56 | 94.03 | 74.00 | -20.03 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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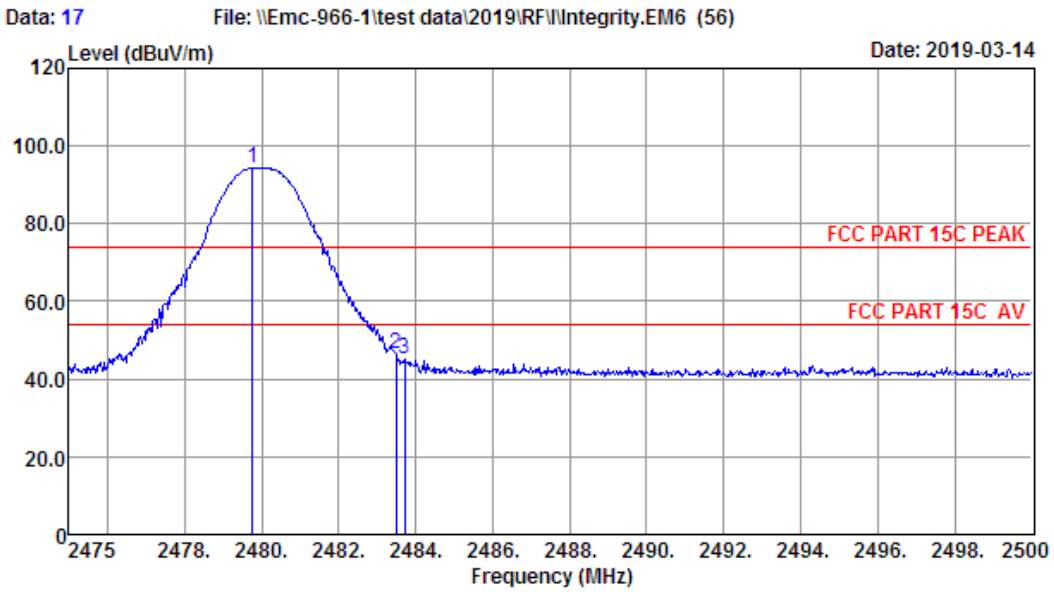


```
Site no.      : 1# 966 Chamber              Data no.  : 17
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : HORIZONTAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : 8-DPSK TX 2480MHz
```

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Amp Factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2479.78 | 27.38 | 2.93 | 34.66 | 98.71 | 94.36 | 74.00 | -20.36 | Peak |
| 2 | 2483.50 | 27.38 | 2.93 | 34.66 | 50.89 | 46.54 | 74.00 | 27.46 | Peak |
| 3 | 2483.73 | 27.38 | 2.93 | 34.66 | 49.59 | 45.24 | 74.00 | 28.76 | Peak |

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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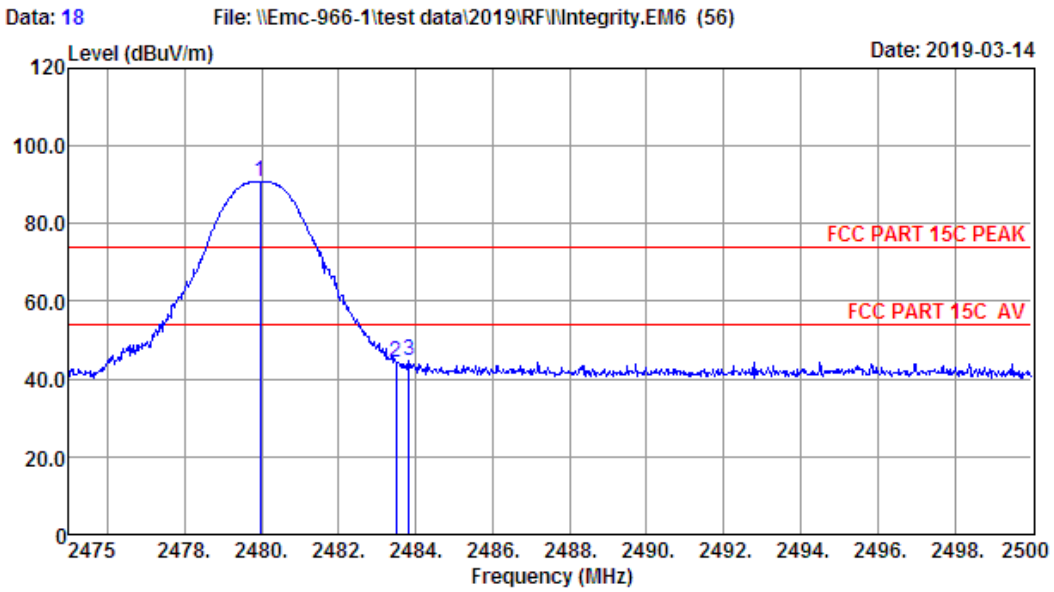



```
Site no.      : 1# 966 Chamber              Data no.  : 18
Dis. / Ant.   : 3m   ANT9120D 1-18G         Ant. pol. : VERTICAL
Limit         : FCC PART 15C PEAK
Env. / Ins.   : Temp:23.5';Humi:52.4%;Press:101.52kPa
Engineer      : Viking
EUT           : 4 Channels amplifier
Power         : DC 24V From Adapter Input AC 120V/60Hz
M/N           : Z4-B
Test Mode     : 8-DPSK TX 2480MHz
```

| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Amp Factor (dB) | Reading (dBuV) | Emission Level (dBuV/m) | Limits (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2479.98 | 27.38 | 2.93 | 34.66 | 95.14 | 90.79 | 74.00 | -16.79 | Peak |
| 2 | 2483.50 | 27.38 | 2.93 | 34.66 | 48.62 | 44.27 | 74.00 | 29.73 | Peak |
| 3 | 2483.83 | 27.38 | 2.93 | 34.66 | 49.11 | 44.76 | 74.00 | 29.24 | Peak |

```
Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
         2. Margin= Limit - Emission Level.
         3. The emission levels that are 20dB below the official
            limit are not reported.
```

# 10. CONDUCTED SPURIOUS EMISSIONS AND BAND EDGES TEST

## 10.1. Limit

According to §15.247 (d): 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 conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies 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 addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

## 10.2. Test Procedure

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

The spectrum from 9 KHz to 26.5GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

## 10.3. Test Result

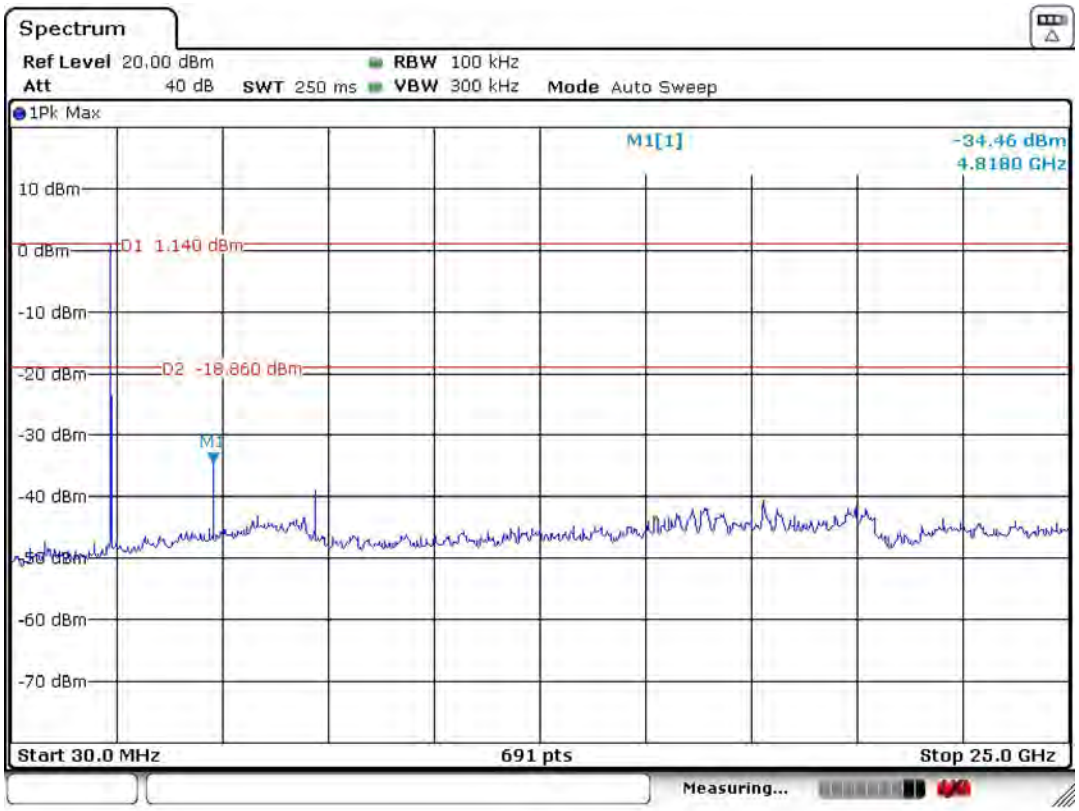
Pass (The testing data was attached in the next pages.)

Note: 1、all modes have been tested , only worse case is reported.

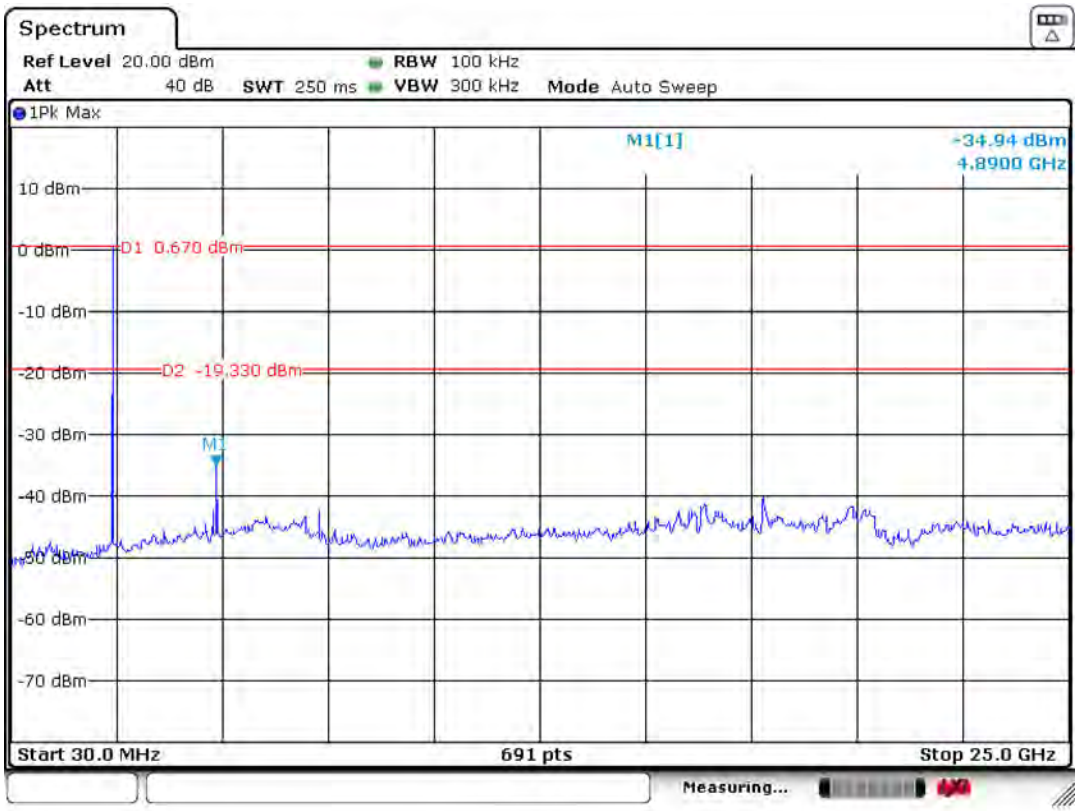
Test Data

Conducted Spurious Emissions

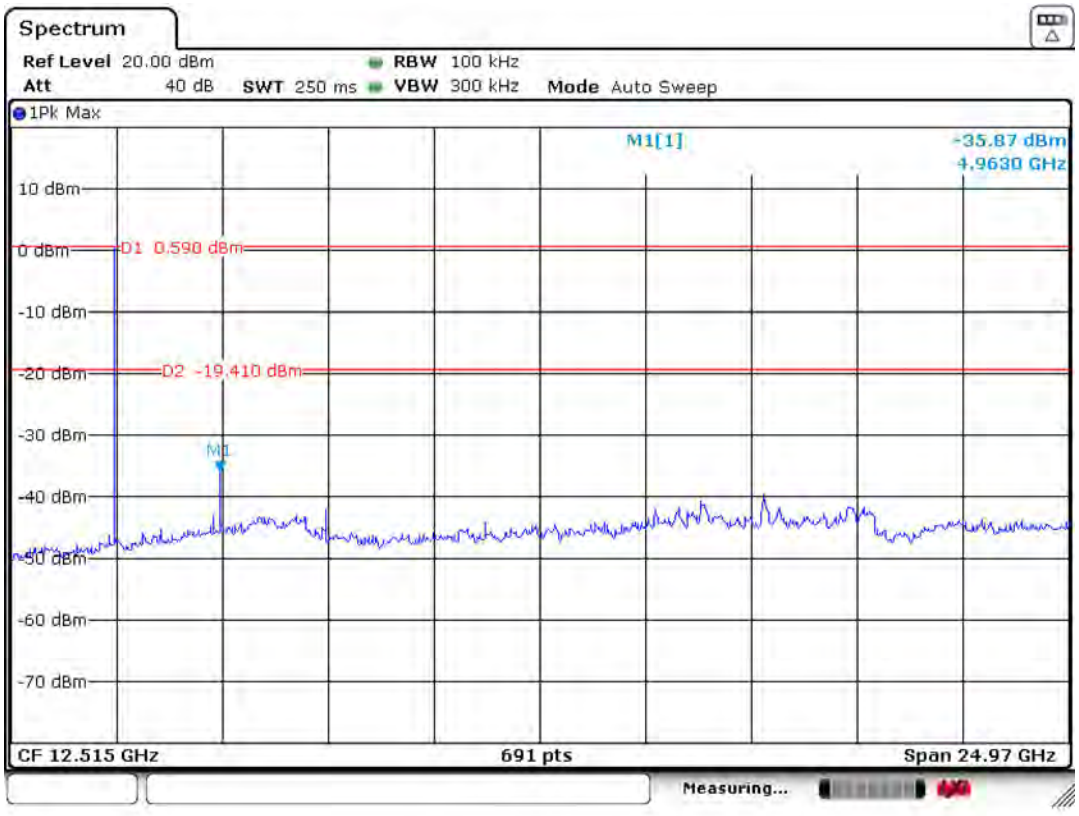
Test Mode: 8-DPSK 2402MHz




Test Mode: 8-DPSK 2441MHz

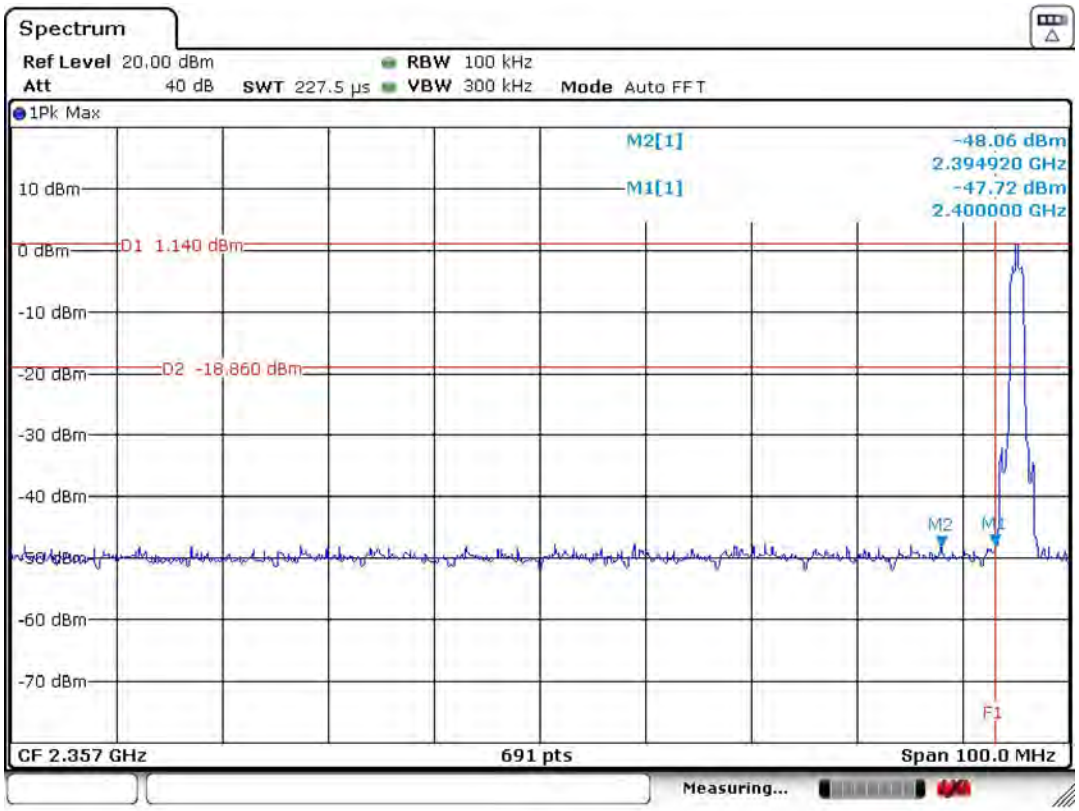


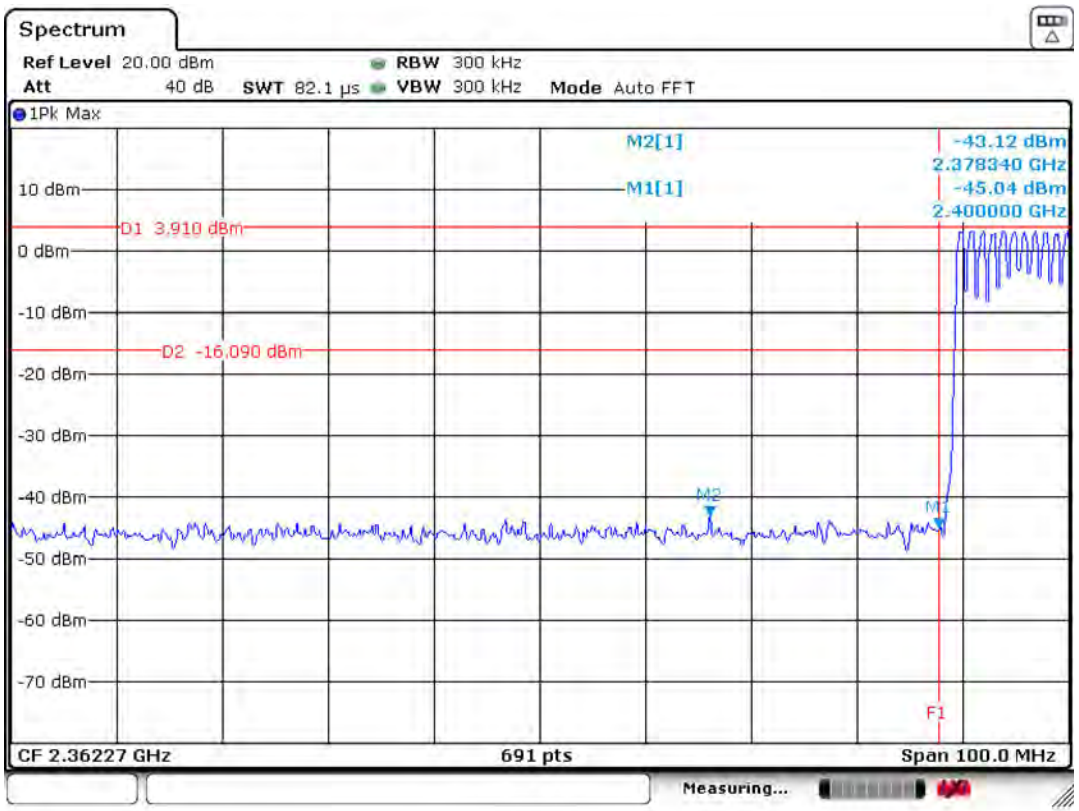
Test Mode: 8-DPSK 2480MHz



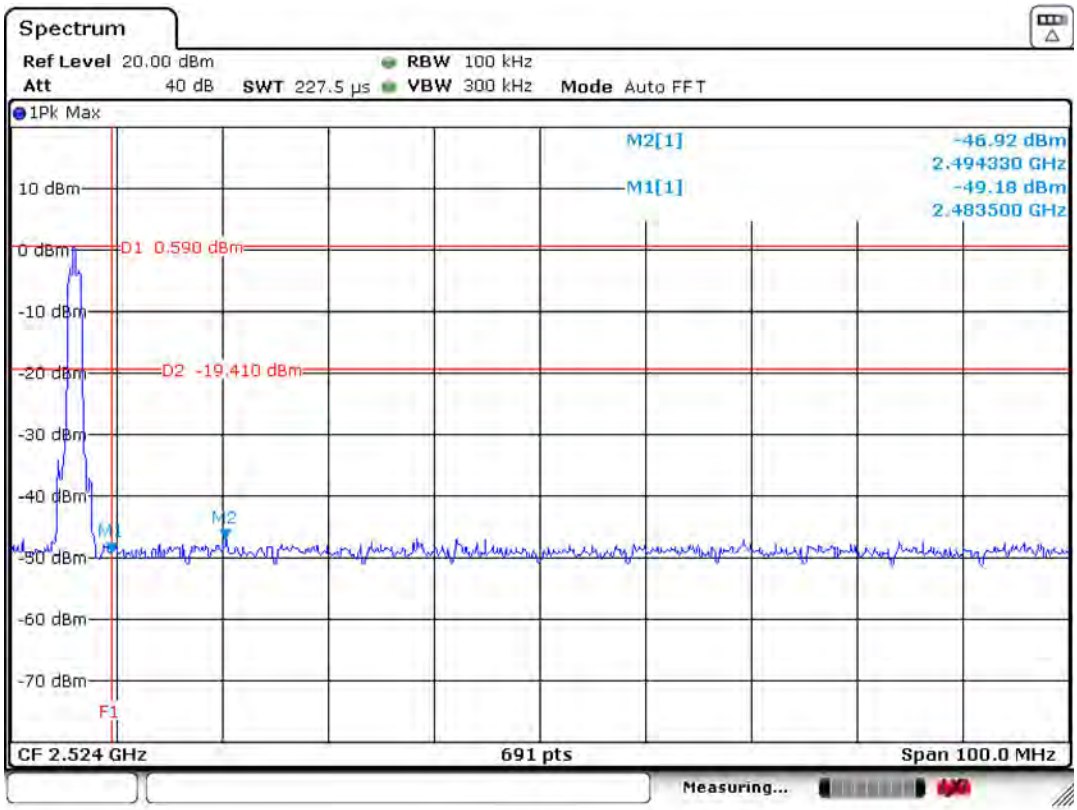
Band-edge measurements for conducted emissions

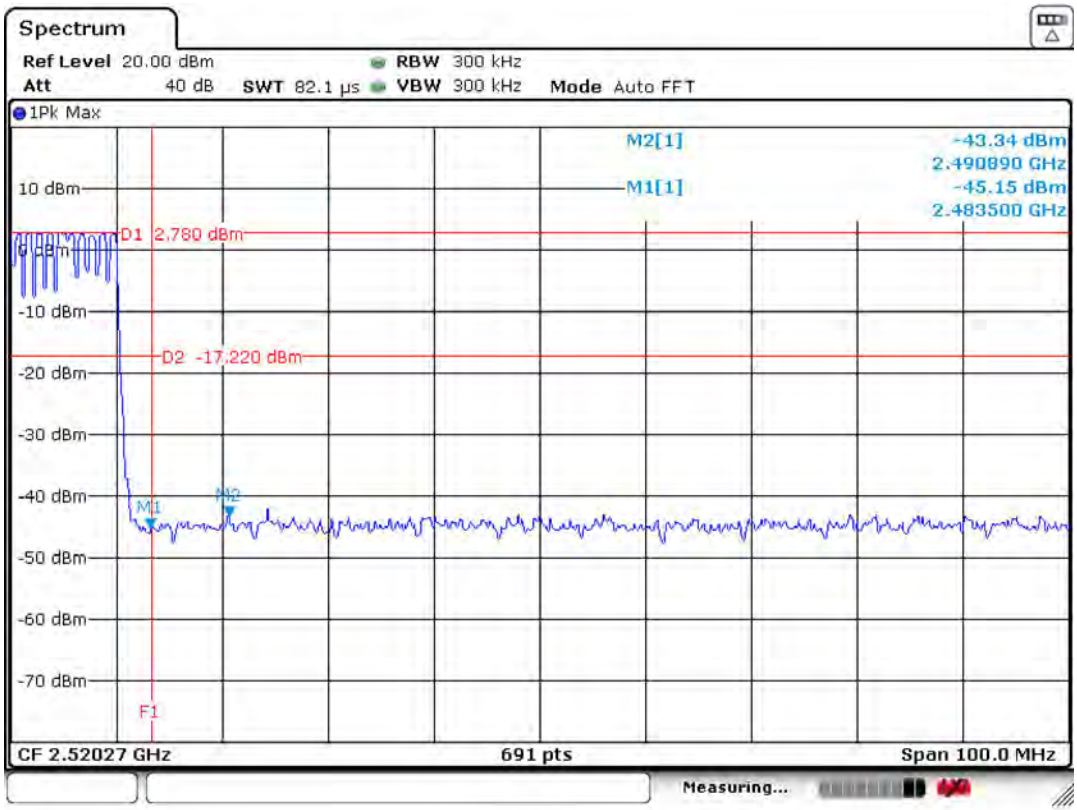
Test Mode: 8-DPSK 2402MHz



Test Mode: 8-DPSK 2480MHz



# 11. POWER LINE CONDUCTED EMISSIONS

## 11.1.Limit

| Frequency | Maximum RF Line Voltage | |
|---|---|---|
| | Quasi-Peak Level dB(μV) | Average Level dB(μV) |
| 150kHz ~ 500kHz | 66 ~ 56* | 56 ~ 46* |
| 500kHz ~ 5MHz | 56 | 46 |
| 5MHz ~ 30MHz | 60 | 50 |

Notes: 1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

## 11.2.Test Procedure

The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT was charged form PC's USB port which connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#).. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Test.

The bandwidth of test receiver (R & S ESHS30) is set at 10kHz.

The frequency range from 150kHz to 30MHz is checked.

## 11.3.Test Result

**PASS.** **(**All emissions not reported below are too low against the prescribed limits.)

## 11.4.Test data

EST Technology

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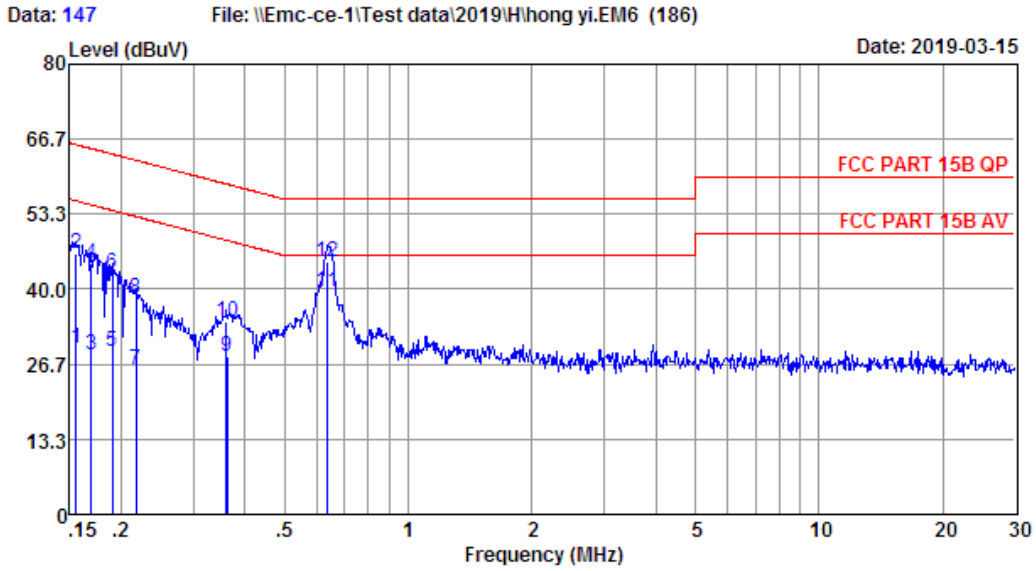


Site no : 844 Shield Room Data no. : 147
Env. / Ins. : Temp:23.5'C Humi:52.3% Press:101.50kPaINE Phase : LINE
Limit : FCC PART 15B QP
Engineer : Viking
EUT : 4 Channels amplifier
Power : DC 24V From Adapter Input AC 120V/60Hz
M/N : Z4-B
Test Mode : TX Mode

| | Freq. (MHz) | LISN Factor (dB) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuv) | Limits (dBuv) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.16 | 9.59 | 9.69 | 10.20 | 29.48 | 55.69 | 26.21 | Average |
| 2 | 0.16 | 9.59 | 9.69 | 27.17 | 46.45 | 65.69 | 19.24 | QP |
| 3 | 0.17 | 9.59 | 9.69 | 8.92 | 28.20 | 54.99 | 26.79 | Average |
| 4 | 0.17 | 9.59 | 9.69 | 25.29 | 44.57 | 64.99 | 20.42 | QP |
| 5 | 0.19 | 9.60 | 9.77 | 9.43 | 28.80 | 54.02 | 25.22 | Average |
| 6 | 0.19 | 9.60 | 9.77 | 23.32 | 42.69 | 64.02 | 21.33 | QP |
| 7 | 0.22 | 9.61 | 9.84 | 6.17 | 25.62 | 52.92 | 27.30 | Average |
| 8 | 0.22 | 9.61 | 9.84 | 18.82 | 38.27 | 62.92 | 24.65 | QP |
| 9 | 0.36 | 9.63 | 9.92 | 8.43 | 27.98 | 48.69 | 20.71 | Average |
| 10 | 0.36 | 9.63 | 9.92 | 14.65 | 34.20 | 58.69 | 24.49 | QP |
| 11 | 0.64 | 9.63 | 9.92 | 19.95 | 39.50 | 46.00 | 6.50 | Average |
| 12 | 0.64 | 9.63 | 9.92 | 25.24 | 44.79 | 56.00 | 11.21 | QP |

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
2. Margin= Limit - Emission Level.
3. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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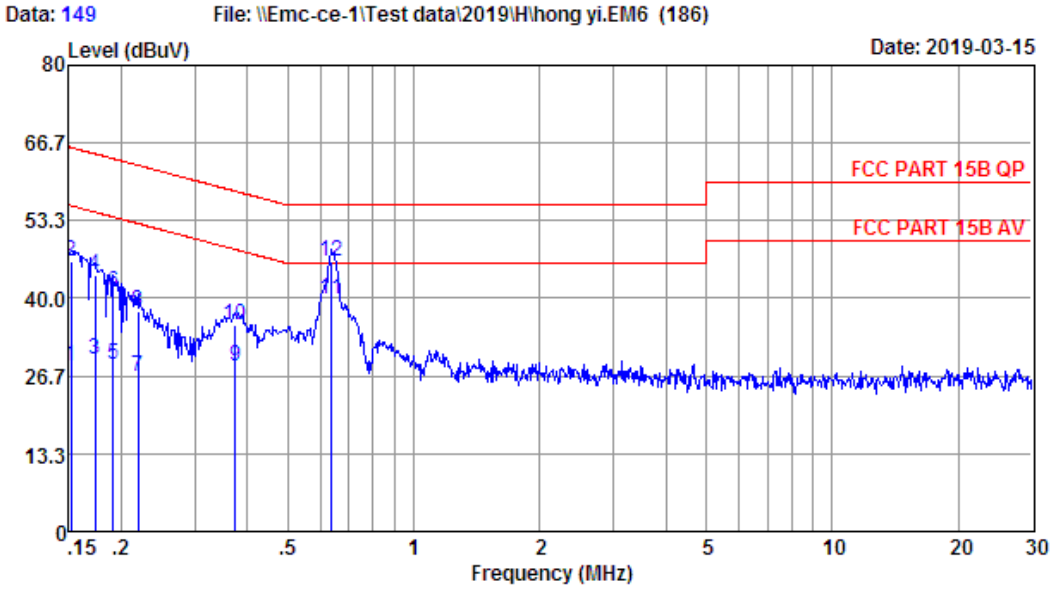


Site no : 844 Shield Room Data no. : 149
Env. / Ins. : Temp:23.5'C Humi:52.3% Press:101.50kPaINE Phase : NEUTRAL
Limit : FCC PART 15B QP
Engineer : Viking
EUT : 4 Channels amplifier
Power : DC 24V From Adapter Input AC 120V/60Hz
M/N : Z4-B
Test Mode : TX Mode

| | Freq. (MHz) | LISN Factor (dB) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuv) | Limits (dBuv) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.15 | 9.50 | 9.69 | 9.20 | 28.39 | 55.91 | 27.52 | Average |
| 2 | 0.15 | 9.50 | 9.69 | 27.06 | 46.25 | 65.91 | 19.66 | QP |
| 3 | 0.17 | 9.50 | 9.69 | 10.20 | 29.39 | 54.81 | 25.42 | Average |
| 4 | 0.17 | 9.50 | 9.69 | 24.84 | 44.03 | 64.81 | 20.78 | QP |
| 5 | 0.19 | 9.53 | 9.77 | 9.43 | 28.73 | 53.98 | 25.25 | Average |
| 6 | 0.19 | 9.53 | 9.77 | 21.77 | 41.07 | 63.98 | 22.91 | QP |
| 7 | 0.22 | 9.53 | 9.84 | 7.18 | 26.55 | 52.83 | 26.28 | Average |
| 8 | 0.22 | 9.53 | 9.84 | 18.46 | 37.83 | 62.83 | 25.00 | QP |
| 9 | 0.38 | 9.55 | 9.92 | 8.77 | 28.24 | 48.39 | 20.15 | Average |
| 10 | 0.38 | 9.55 | 9.92 | 15.99 | 35.46 | 58.39 | 22.93 | QP |
| 11 | 0.64 | 9.56 | 9.92 | 20.23 | 39.71 | 46.00 | 6.29 | Average |
| 12 | 0.64 | 9.56 | 9.92 | 26.79 | 46.27 | 56.00 | 9.73 | QP |

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
2. Margin= Limit - Emission Level.
3. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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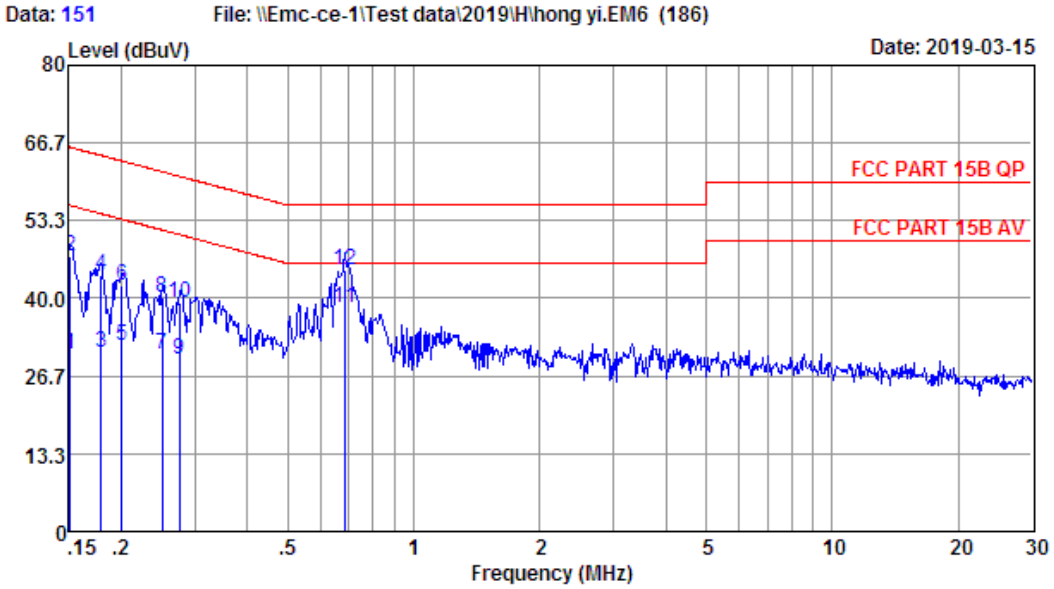
Tel:+86-769-83081888
Fax:+86-769-83081878




Site no : 844 Shield Room Data no. : 151
Env. / Ins. : Temp:23.5'C Humi:52.3% Press:101.50kPaINE Phase : LINE
Limit : FCC PART 15B QP
Engineer : Viking
EUT : 4 Channels amplifier
Power : DC 24V From Adapter Input AC 240V/60Hz
M/N : Z4-B
Test Mode : TX Mode

| | Freq. (MHz) | LISN Factor (dB) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuv) | Limits (dBuv) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.15 | 9.59 | 9.69 | 11.20 | 30.48 | 55.96 | 25.48 | Average |
| 2 | 0.15 | 9.59 | 9.69 | 27.99 | 47.27 | 65.96 | 18.69 | QP |
| 3 | 0.18 | 9.60 | 9.77 | 11.43 | 30.80 | 54.55 | 23.75 | Average |
| 4 | 0.18 | 9.60 | 9.77 | 24.70 | 44.07 | 64.55 | 20.48 | QP |
| 5 | 0.20 | 9.60 | 9.77 | 12.43 | 31.80 | 53.58 | 21.78 | Average |
| 6 | 0.20 | 9.60 | 9.77 | 22.96 | 42.33 | 63.58 | 21.25 | QP |
| 7 | 0.25 | 9.61 | 9.92 | 10.90 | 30.43 | 51.73 | 21.30 | Average |
| 8 | 0.25 | 9.61 | 9.92 | 20.72 | 40.25 | 61.73 | 21.48 | QP |
| 9 | 0.28 | 9.61 | 9.92 | 10.01 | 29.54 | 50.94 | 21.40 | Average |
| 10 | 0.28 | 9.61 | 9.92 | 19.68 | 39.21 | 60.94 | 21.73 | QP |
| 11 | 0.69 | 9.63 | 9.93 | 18.93 | 38.49 | 46.00 | 7.51 | Average |
| 12 | 0.69 | 9.63 | 9.93 | 25.39 | 44.95 | 56.00 | 11.05 | QP |

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
2. Margin= Limit - Emission Level.
3. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

EST Technology

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Houjie, Dongguan,Guangdong,China
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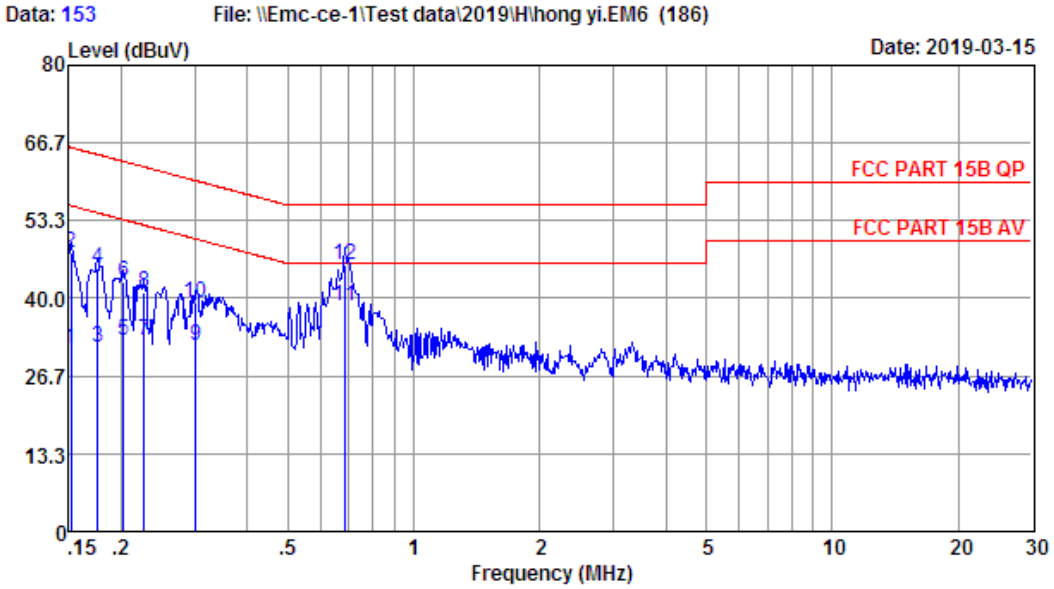



Site no : 844 Shield Room Data no. : 153
Env. / Ins. : Temp:23.5'C Humi:52.3% Press:101.50kPaINE Phase : NEUTRAL
Limit : FCC PART 15B QP
Engineer : Viking
EUT : 4 Channels amplifier
Power : DC 24V From Adapter Input AC 240V/60Hz
M/N : Z4-B
Test Mode : TX Mode

| | Freq. (MHz) | LISN Factor (dB) | Cable Loss (dB) | Reading (dBuV) | Emission Level (dBuv) | Limits (dBuv) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.15 | 9.50 | 9.69 | 12.20 | 31.39 | 55.91 | 24.52 | Average |
| 2 | 0.15 | 9.50 | 9.69 | 28.54 | 47.73 | 65.91 | 18.18 | QP |
| 3 | 0.18 | 9.53 | 9.77 | 12.43 | 31.73 | 54.68 | 22.95 | Average |
| 4 | 0.18 | 9.53 | 9.77 | 25.75 | 45.05 | 64.68 | 19.63 | QP |
| 5 | 0.20 | 9.53 | 9.77 | 13.43 | 32.73 | 53.49 | 20.76 | Average |
| 6 | 0.20 | 9.53 | 9.77 | 23.61 | 42.91 | 63.49 | 20.58 | QP |
| 7 | 0.23 | 9.53 | 9.84 | 13.42 | 32.79 | 52.57 | 19.78 | Average |
| 8 | 0.23 | 9.53 | 9.84 | 21.72 | 41.09 | 62.57 | 21.48 | QP |
| 9 | 0.30 | 9.54 | 9.92 | 12.30 | 31.76 | 50.19 | 18.43 | Average |
| 10 | 0.30 | 9.54 | 9.92 | 19.79 | 39.25 | 60.19 | 20.94 | QP |
| 11 | 0.69 | 9.56 | 9.93 | 19.33 | 38.82 | 46.00 | 7.18 | Average |
| 12 | 0.69 | 9.56 | 9.93 | 26.20 | 45.69 | 56.00 | 10.31 | QP |

Remarks: 1. Emission Level= LISN Factor + Cable Loss + Reading.
2. Margin= Limit - Emission Level.
3. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

# 12. ANTENNA REQUIREMENTS

## 12.1.Limit

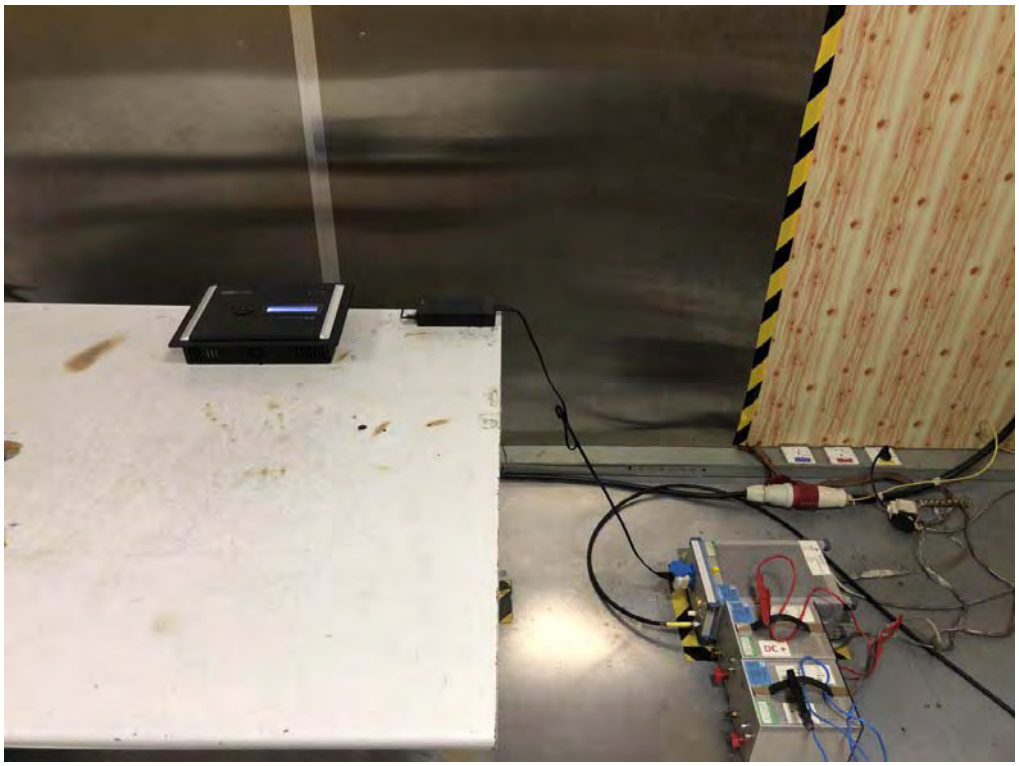
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional 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.

## 12.2.Result

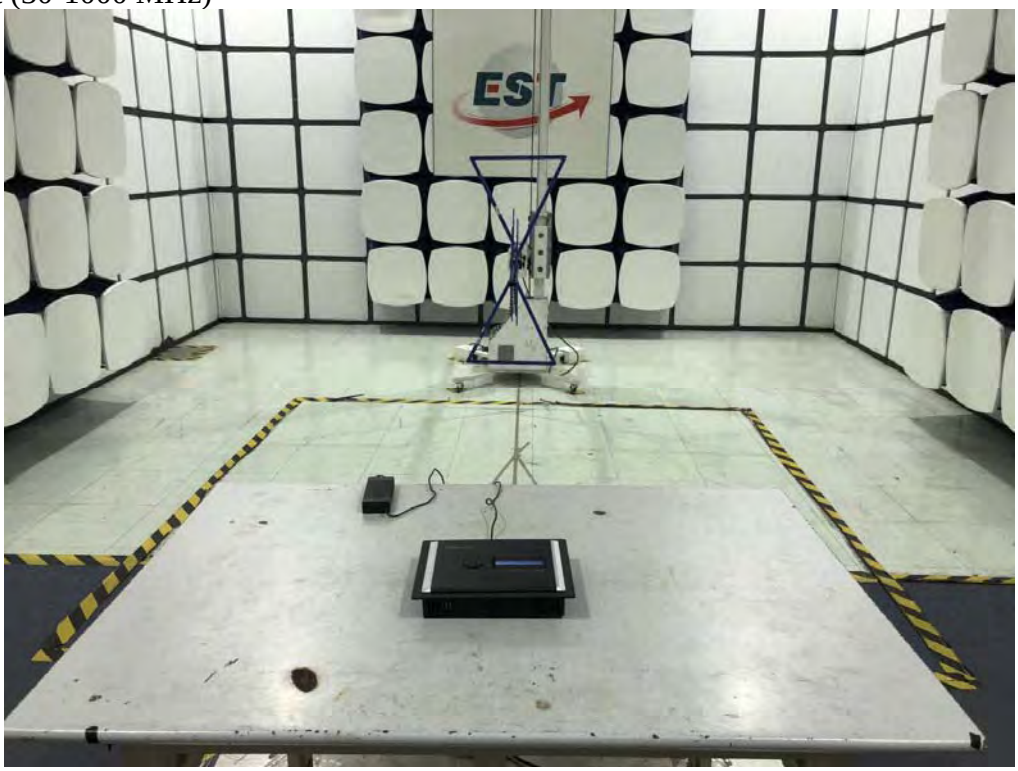
The antennas used for this product are Internal antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only -0.61dBi.

# 13. TEST SETUP PHOTO

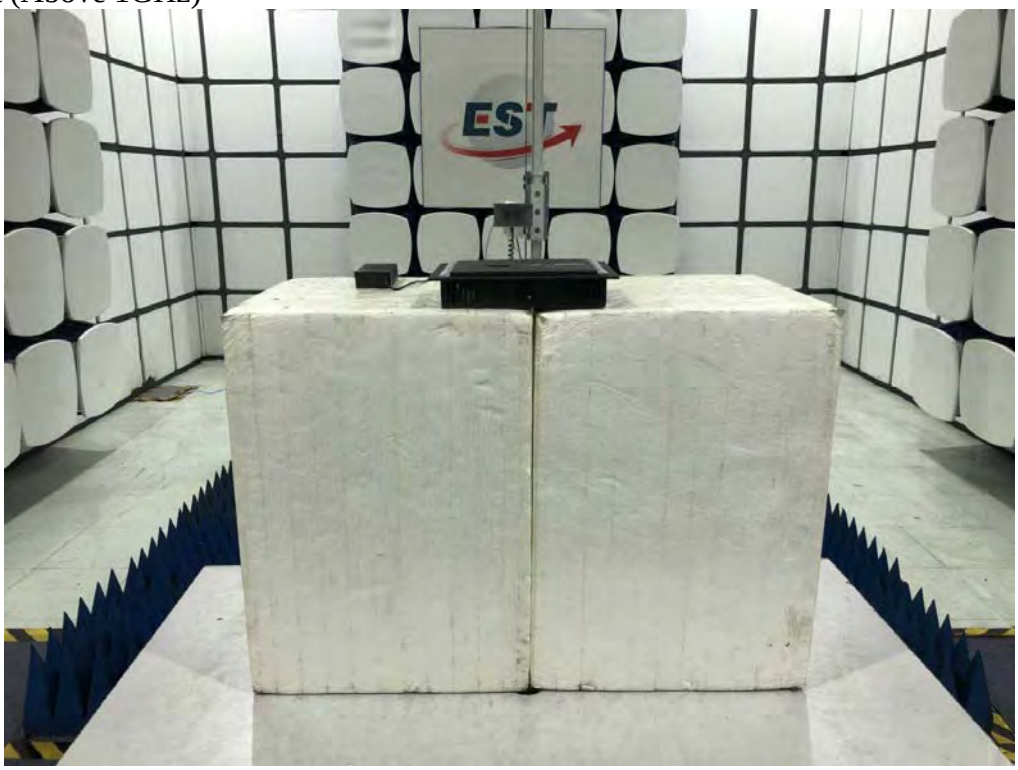
Conducted Test



Radiated Test (30-1000 MHz)



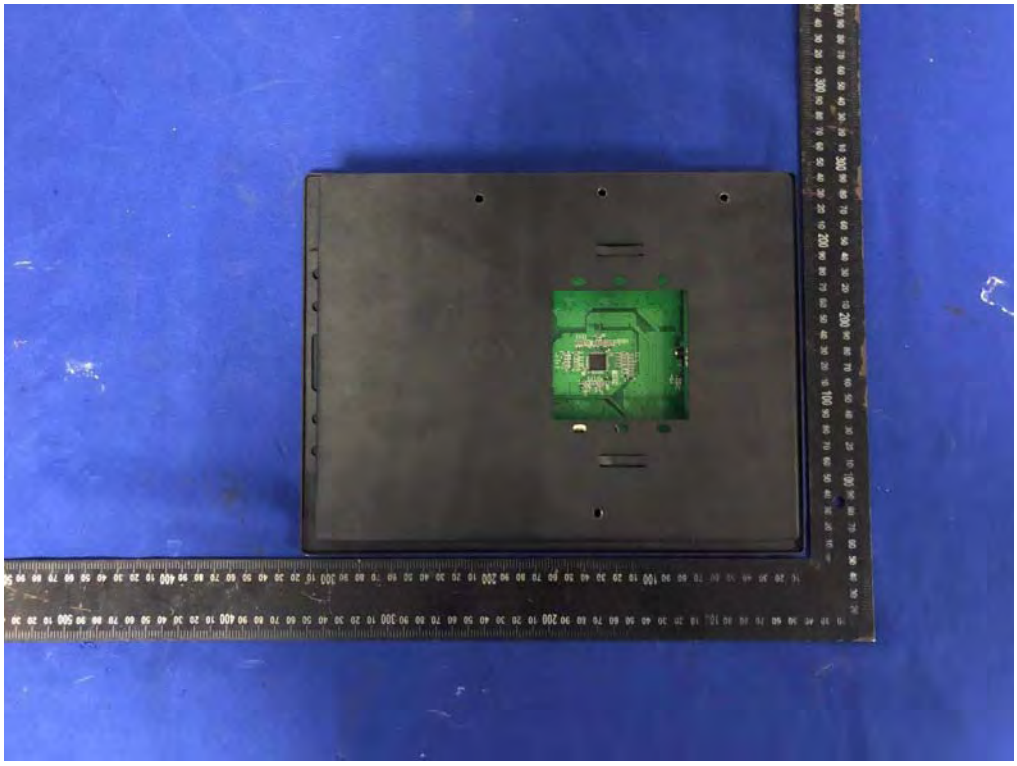
Radiated Test (Above 1GHz)



# 14. PHOTO EUT

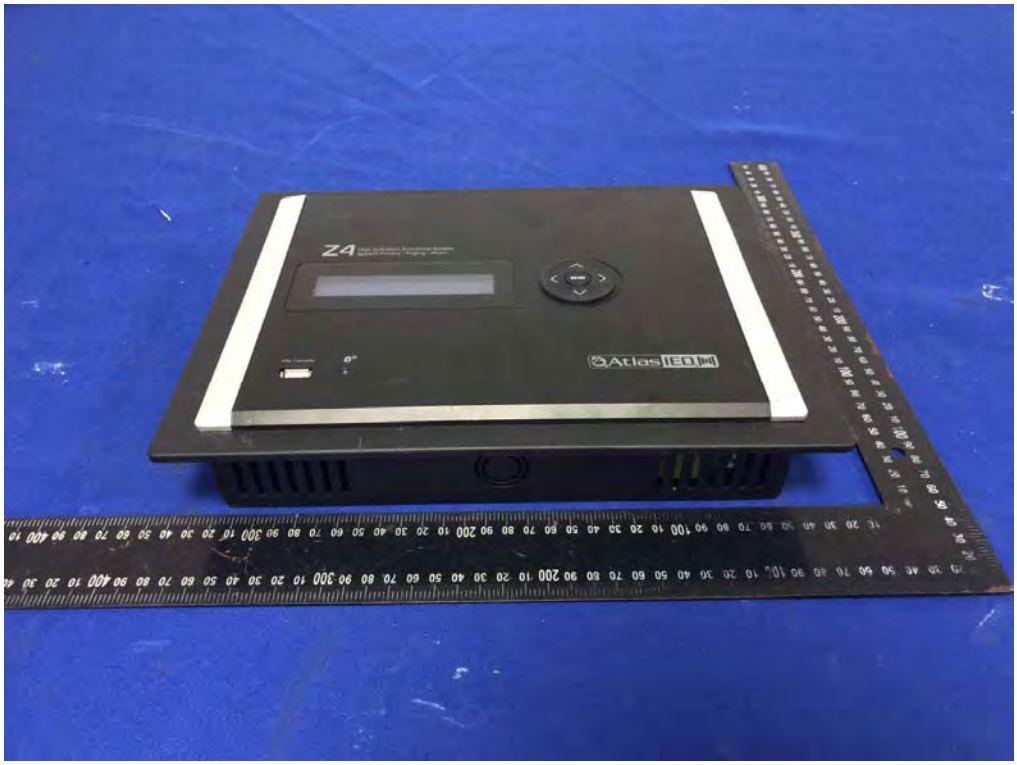
**External Photos**

M/N: Z4-B

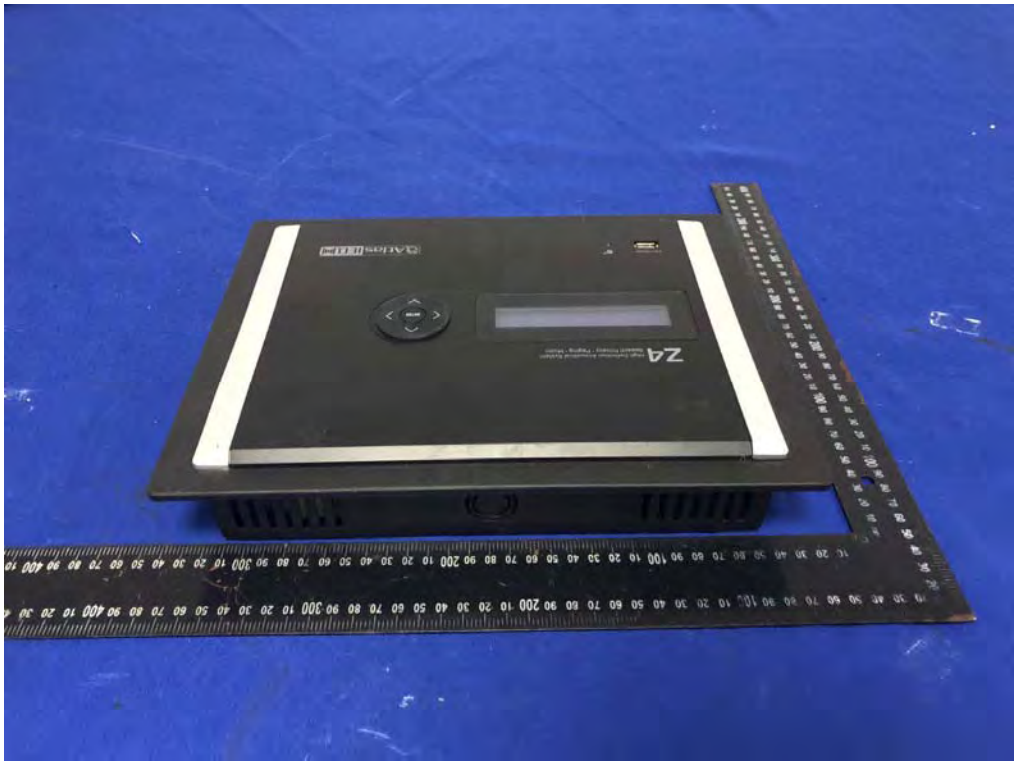
**External Photos**

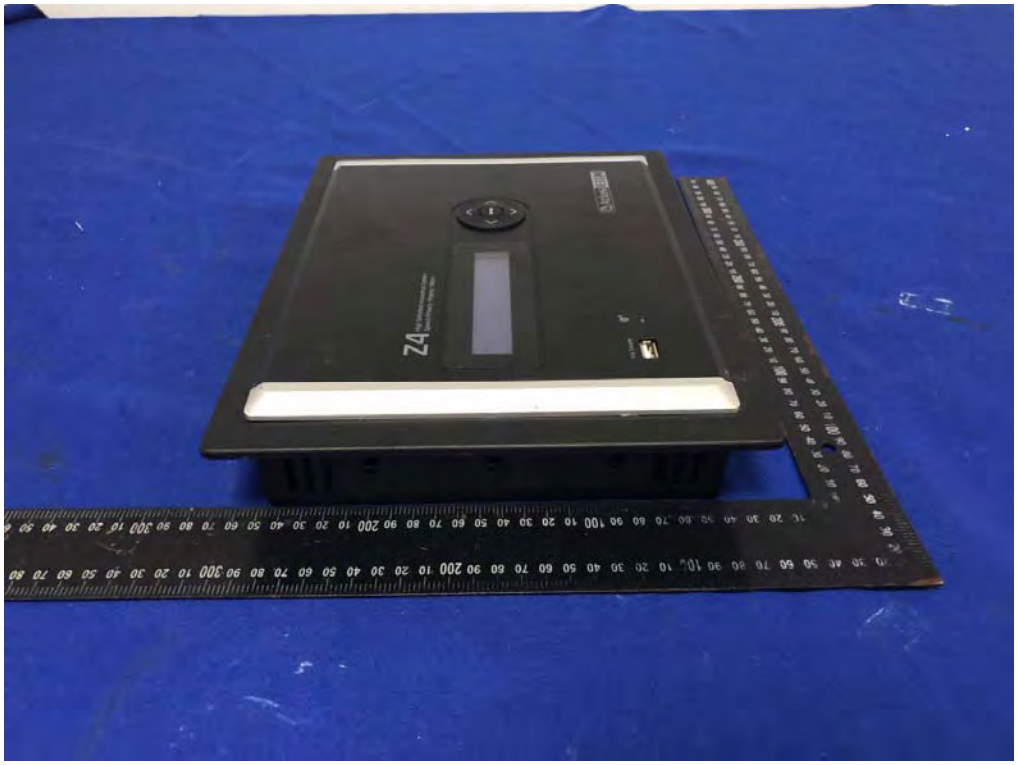
M/N: Z4-B




**External Photos**

M/N: Z4-B



**External Photos**

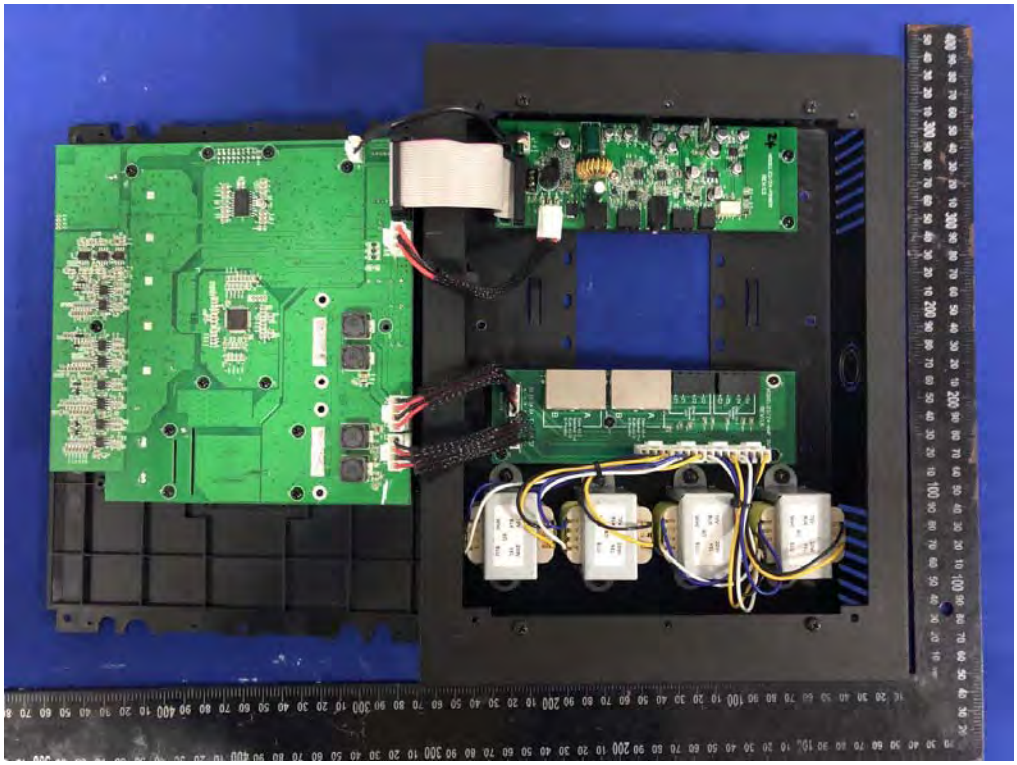
M/N: Z4-B

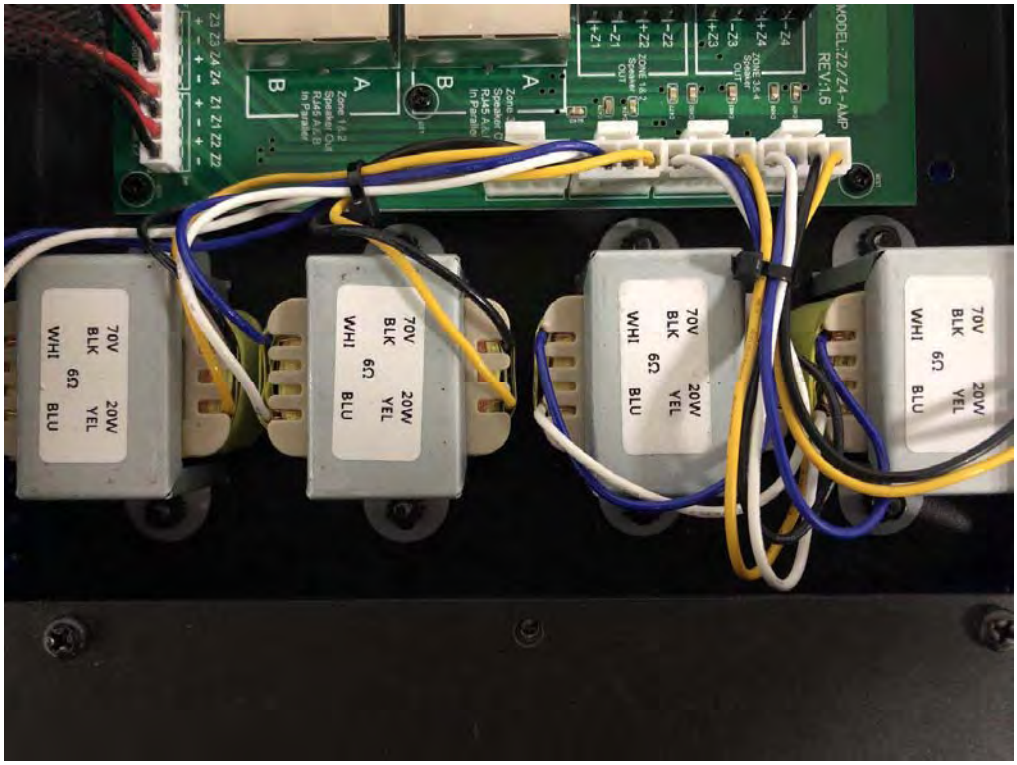
**External Photos**

M/N: Z4-B

**Internal Photos**

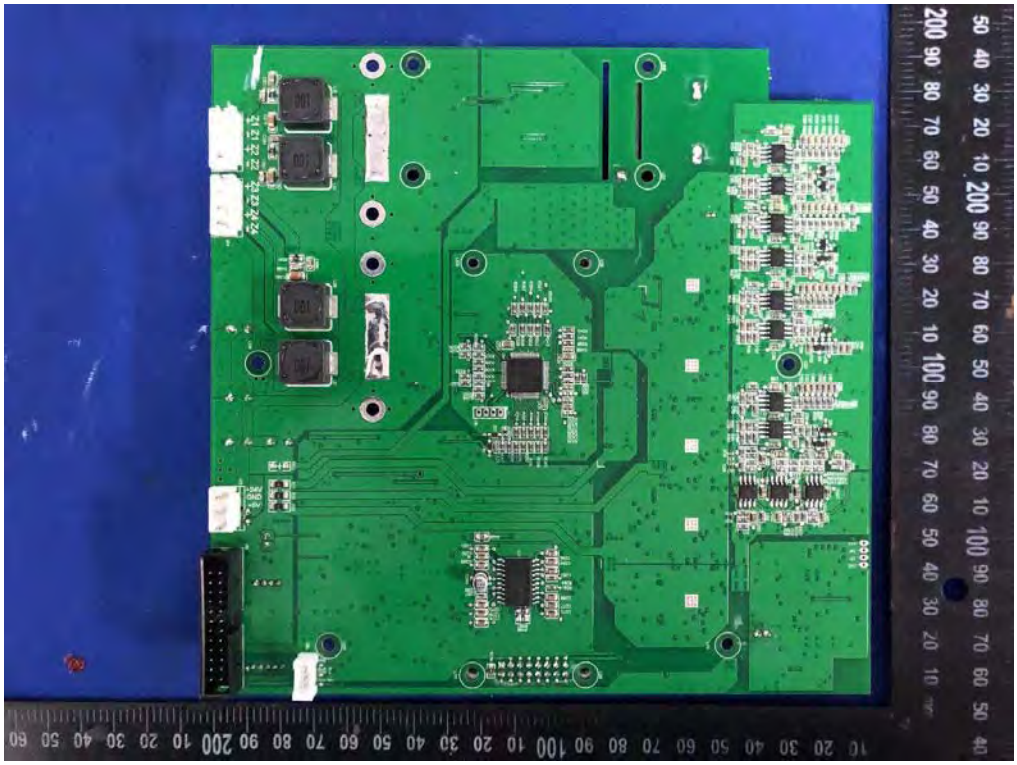
M/N: Z4-B





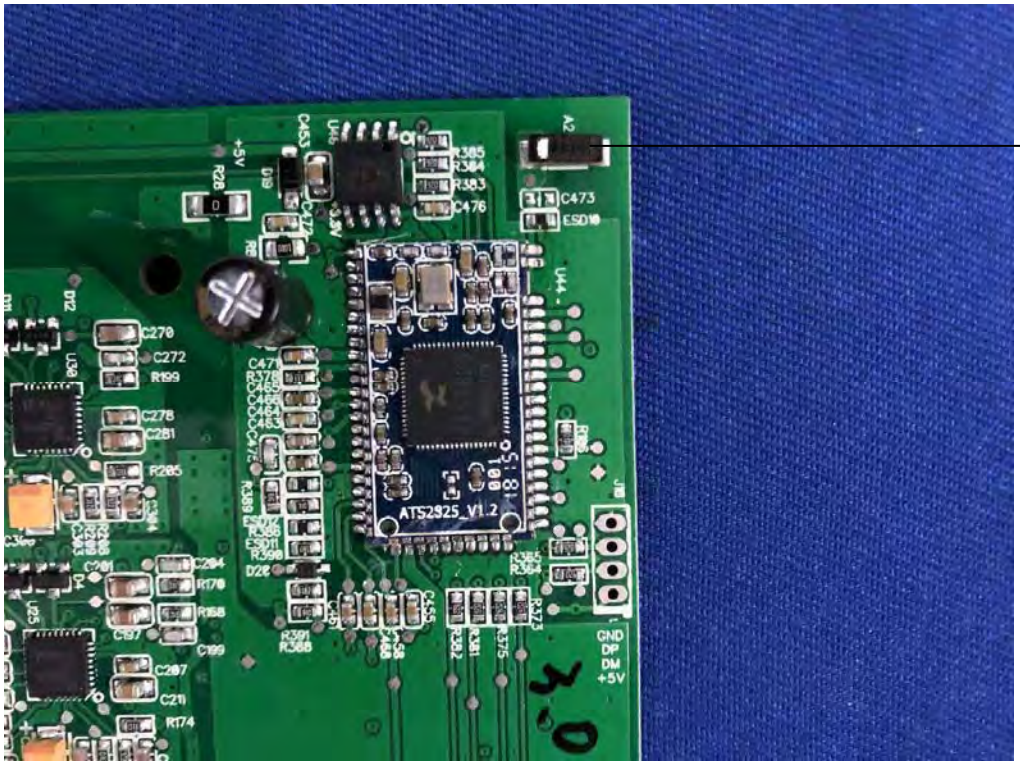
**Internal Photos**

M/N: Z4-B



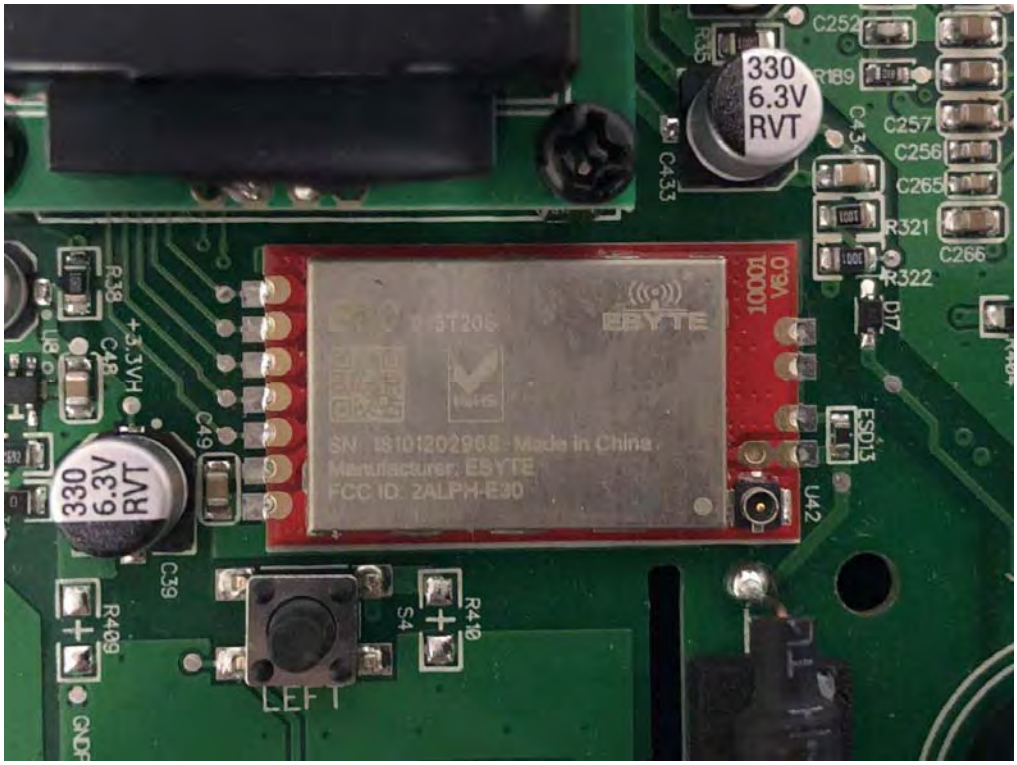
**Internal Photos**

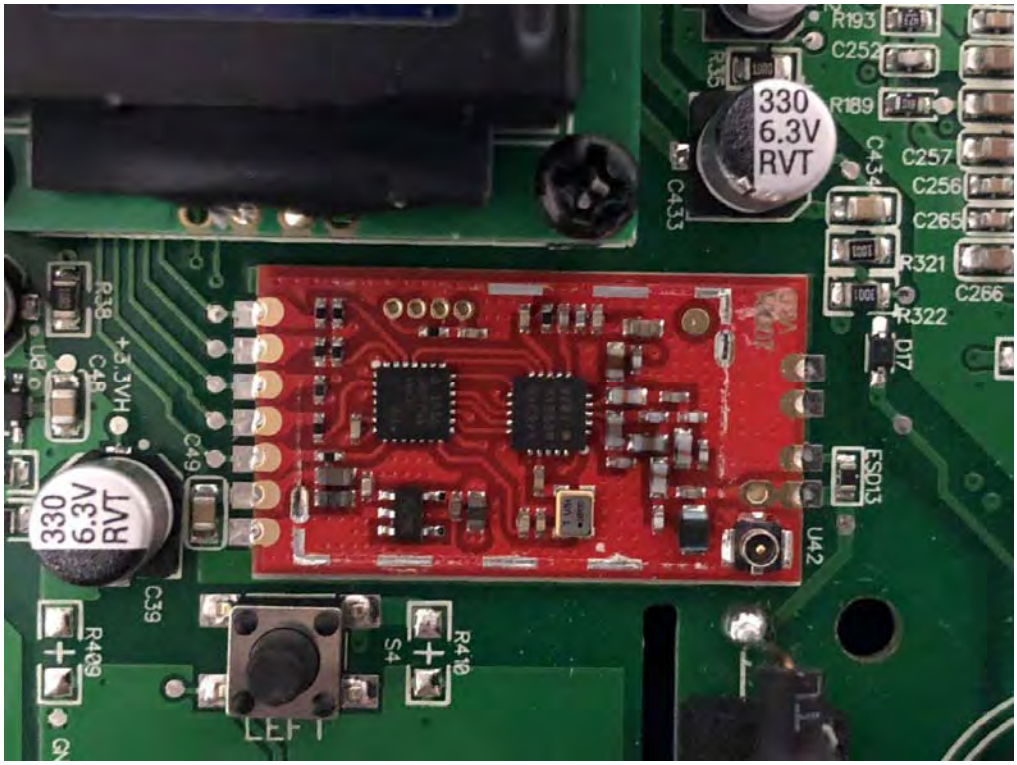
M/N: Z4-B

**Internal Photos**

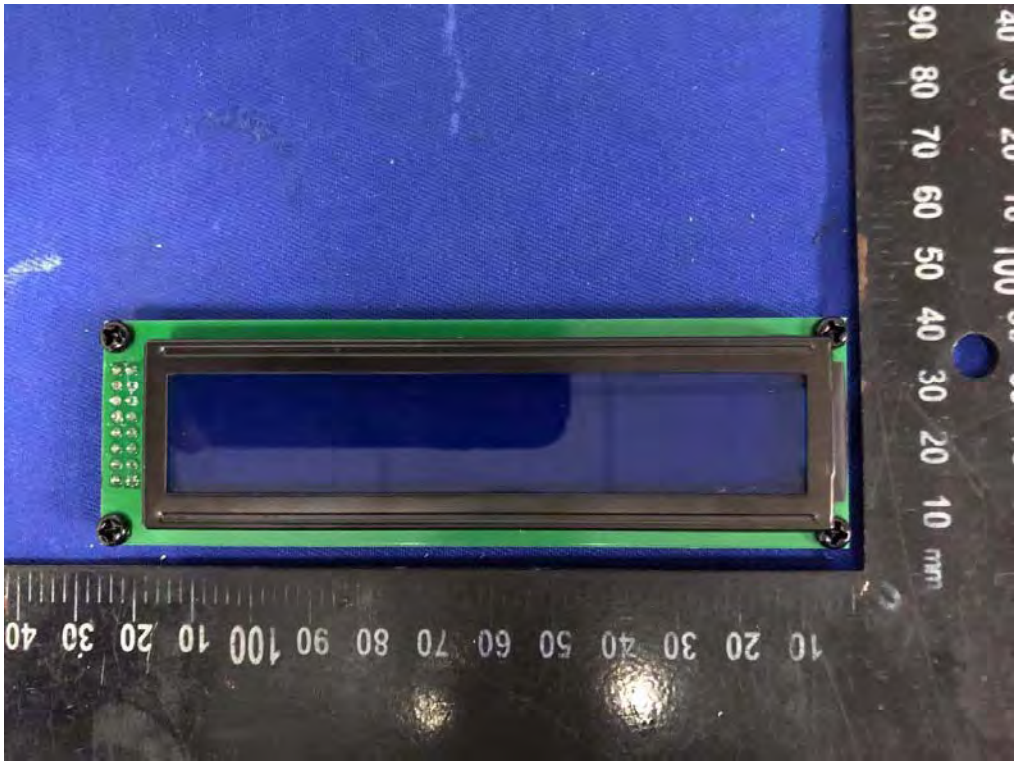
M/N: Z4-B

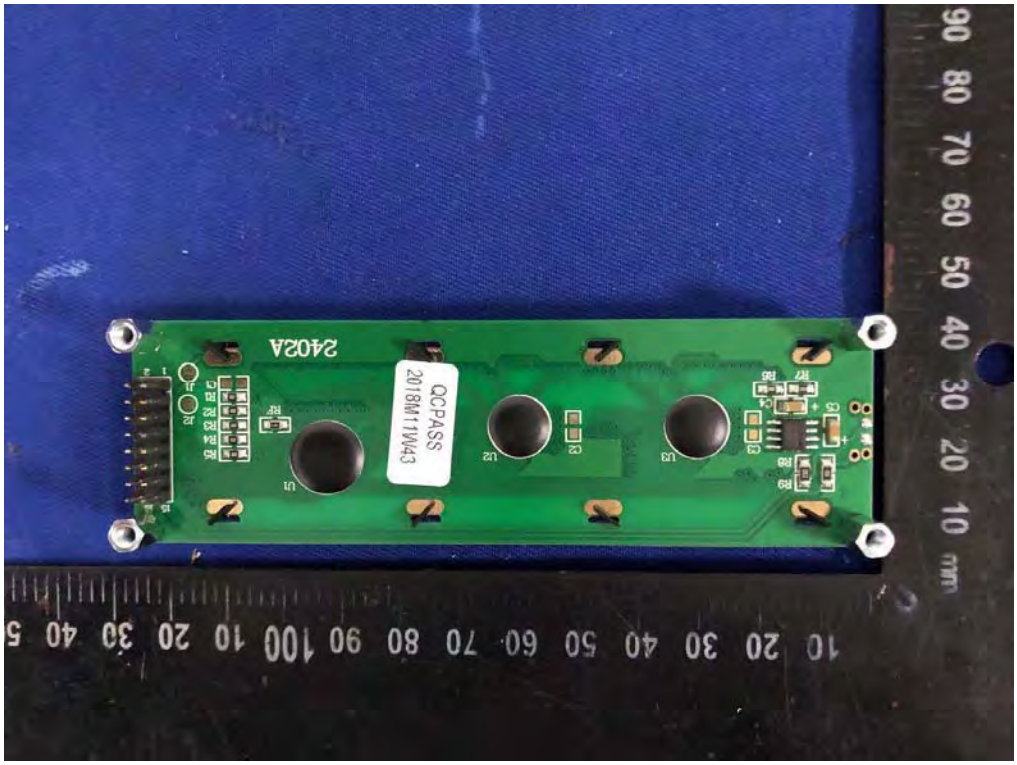


**Internal Photos**

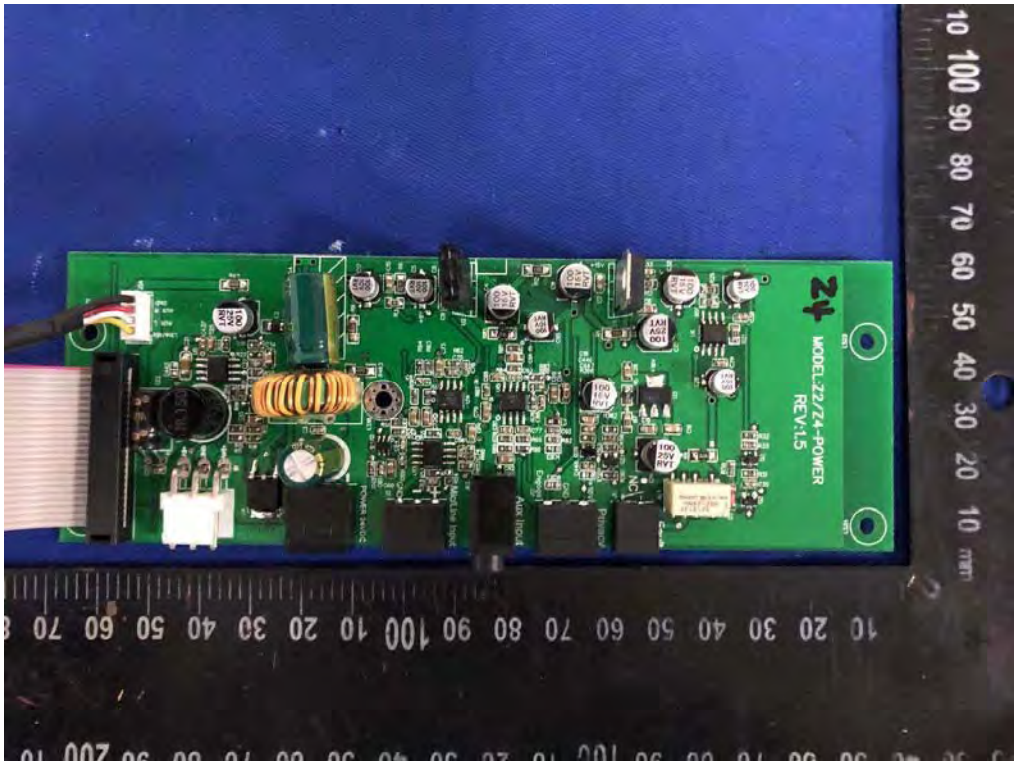
M/N: Z4-B

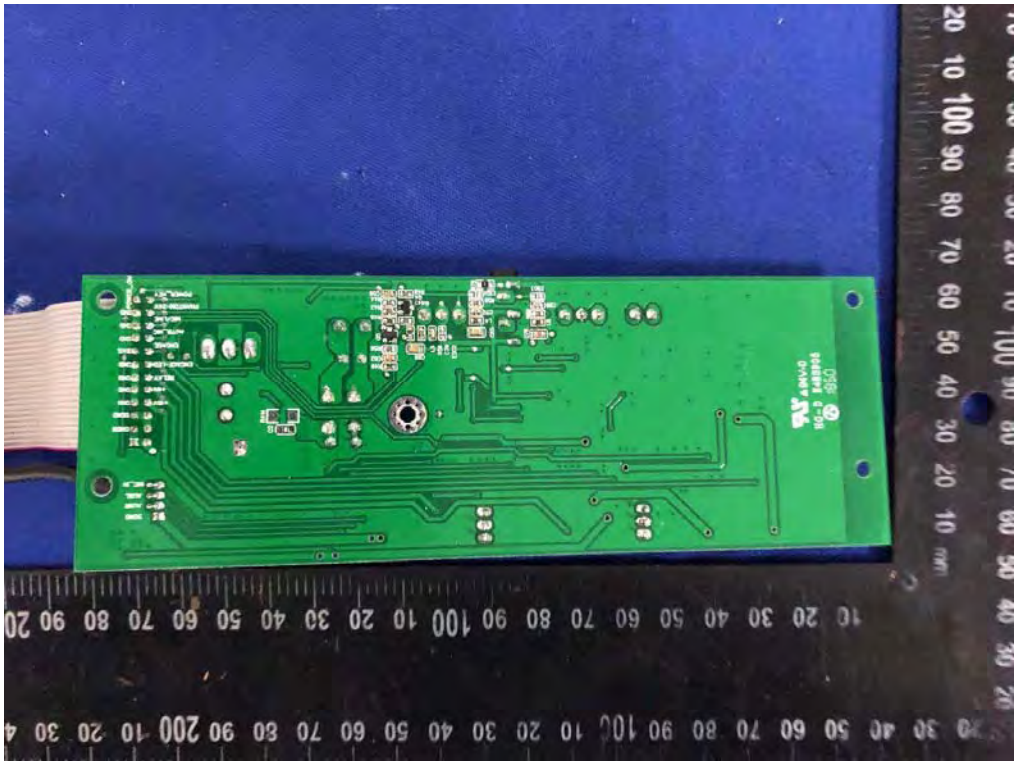




**Internal Photos**

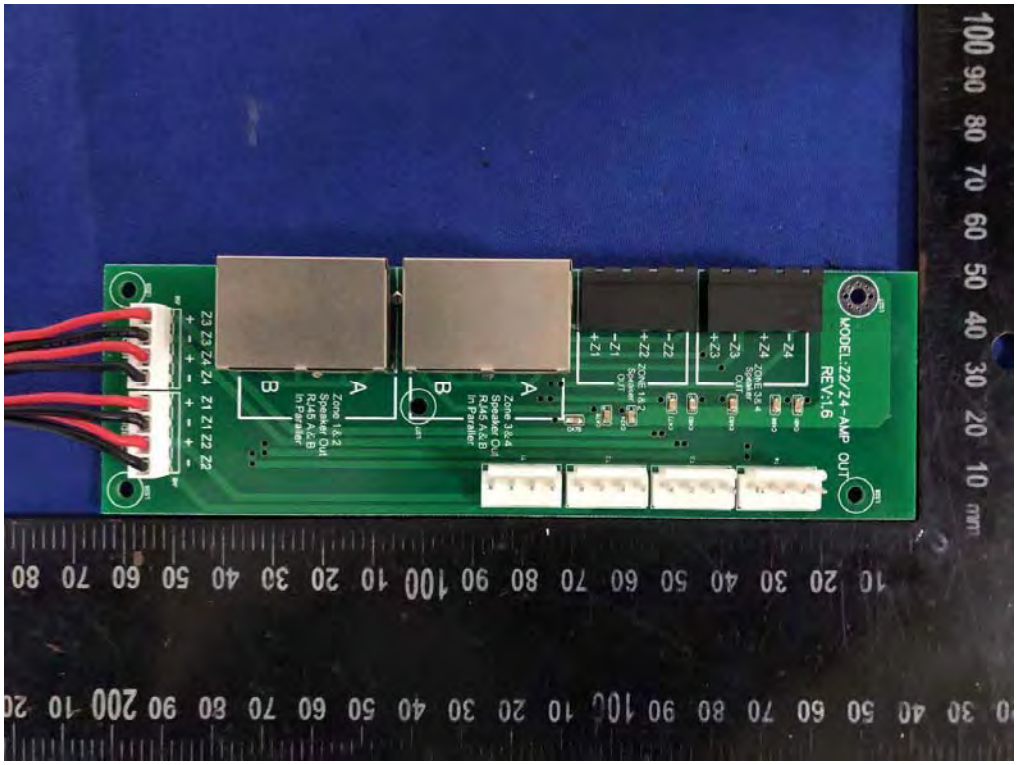
M/N: Z4-B

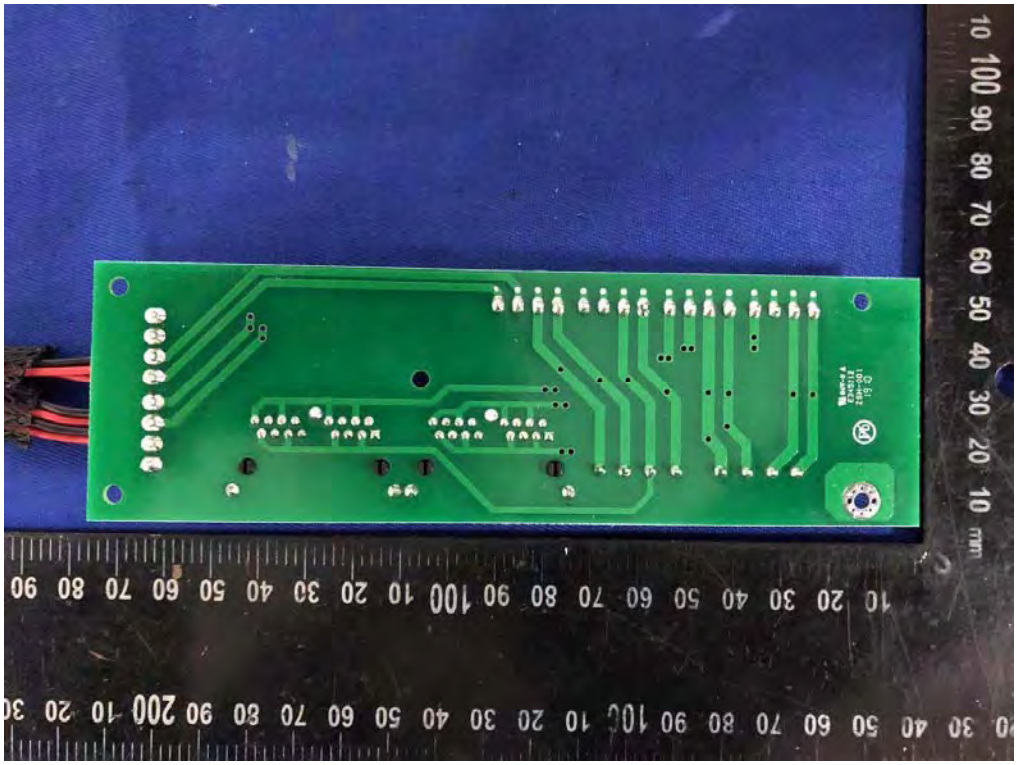


**Internal Photos**

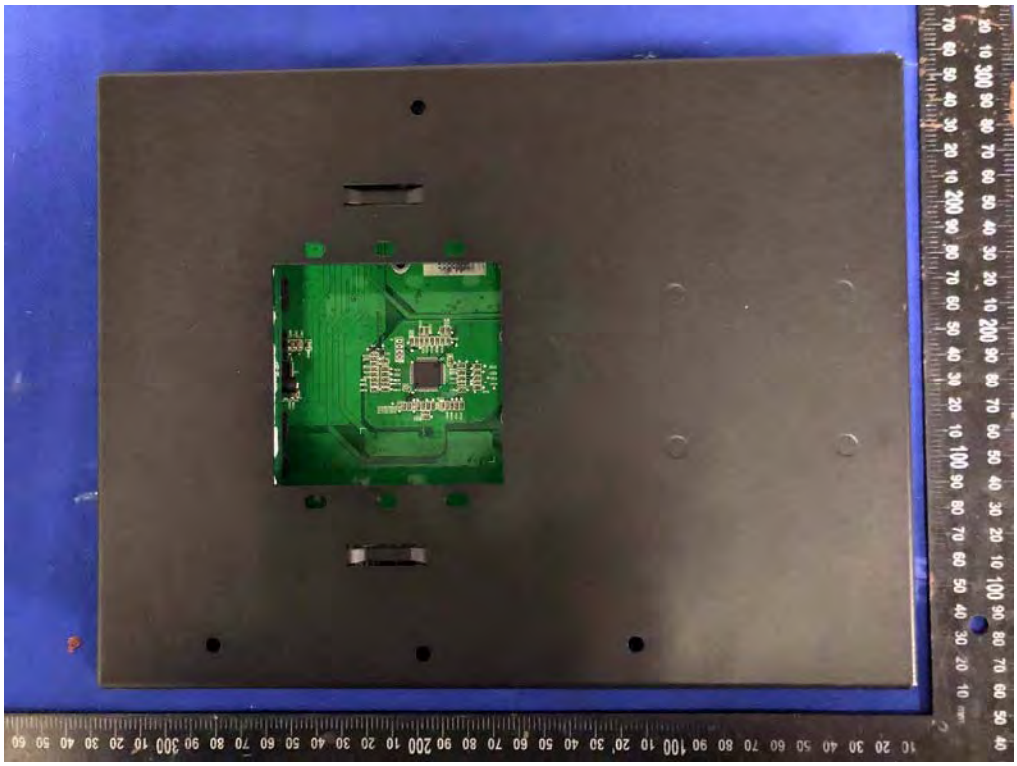
M/N: Z4-B



**External Photos**

M/N: Z2-B

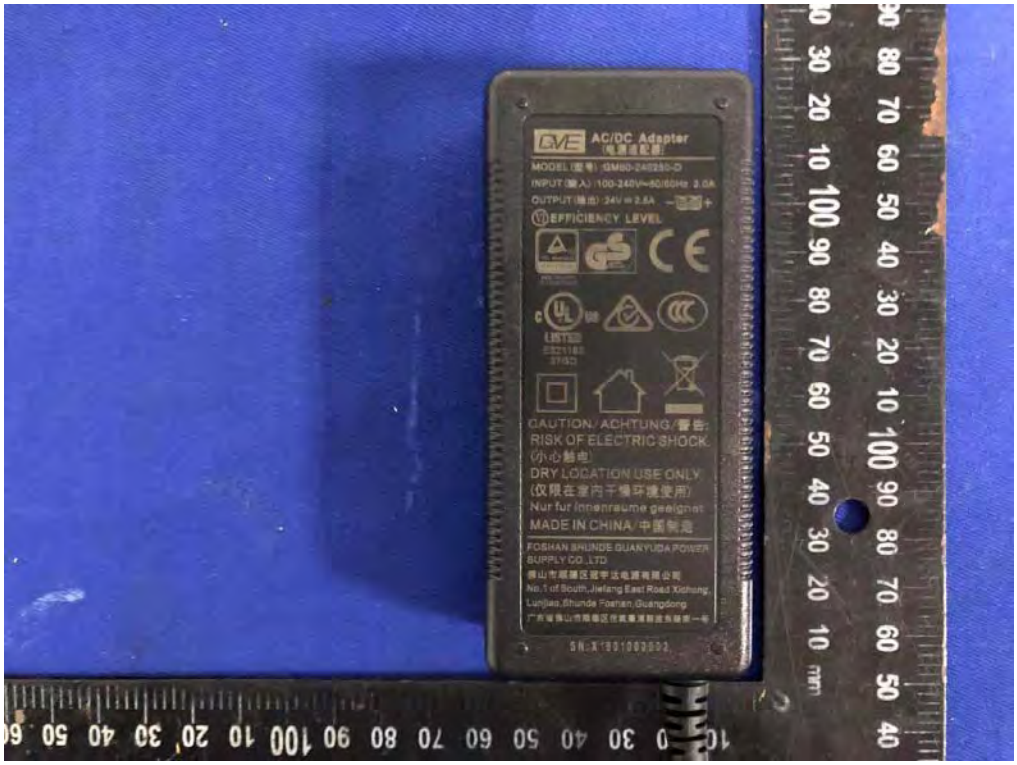



**External Photos**

M/N: Z2-B

**External Photos**

M/N: Z2-B



**Internal Photos**

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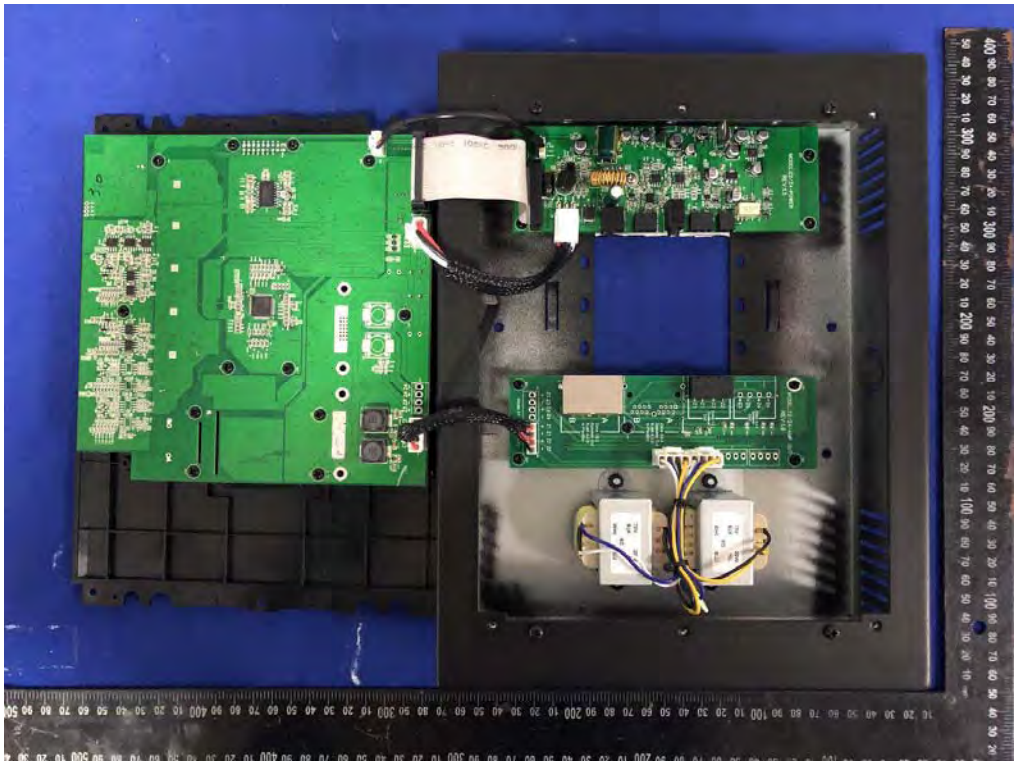

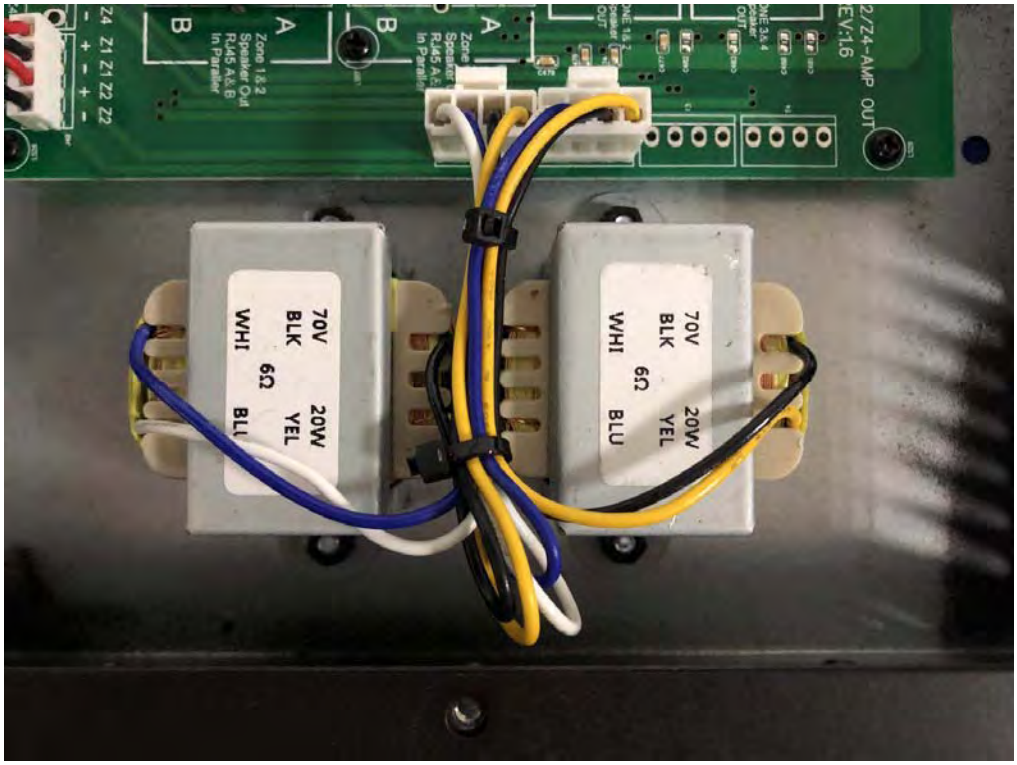

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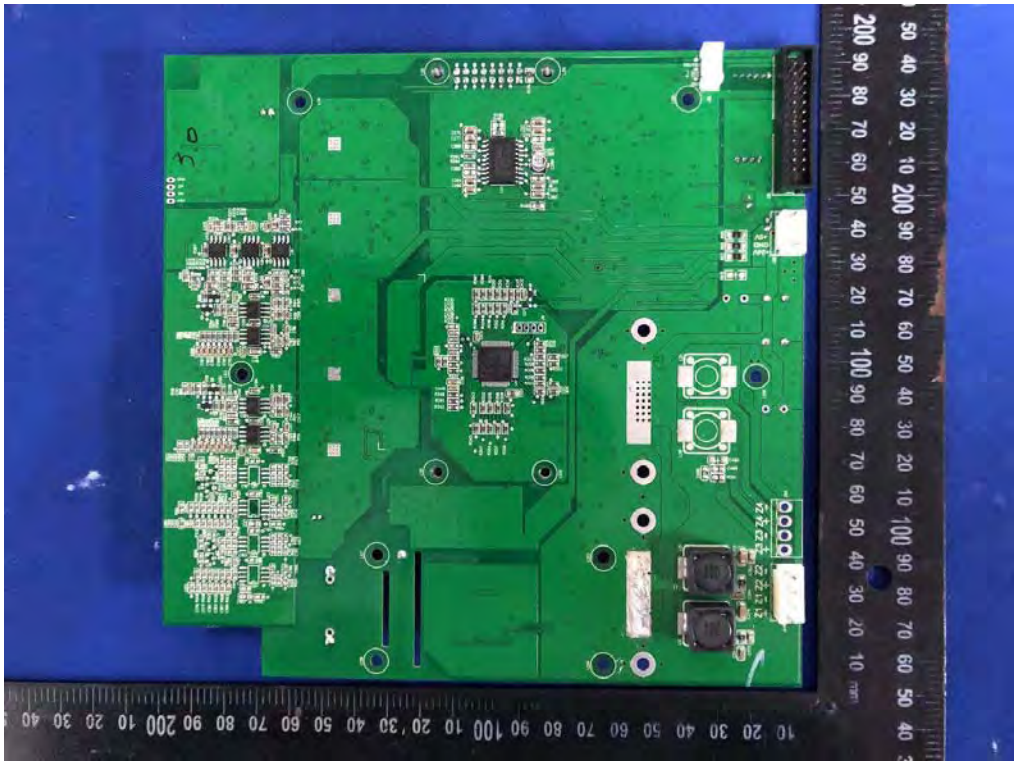
M/N: Z2-B



**Internal Photos**

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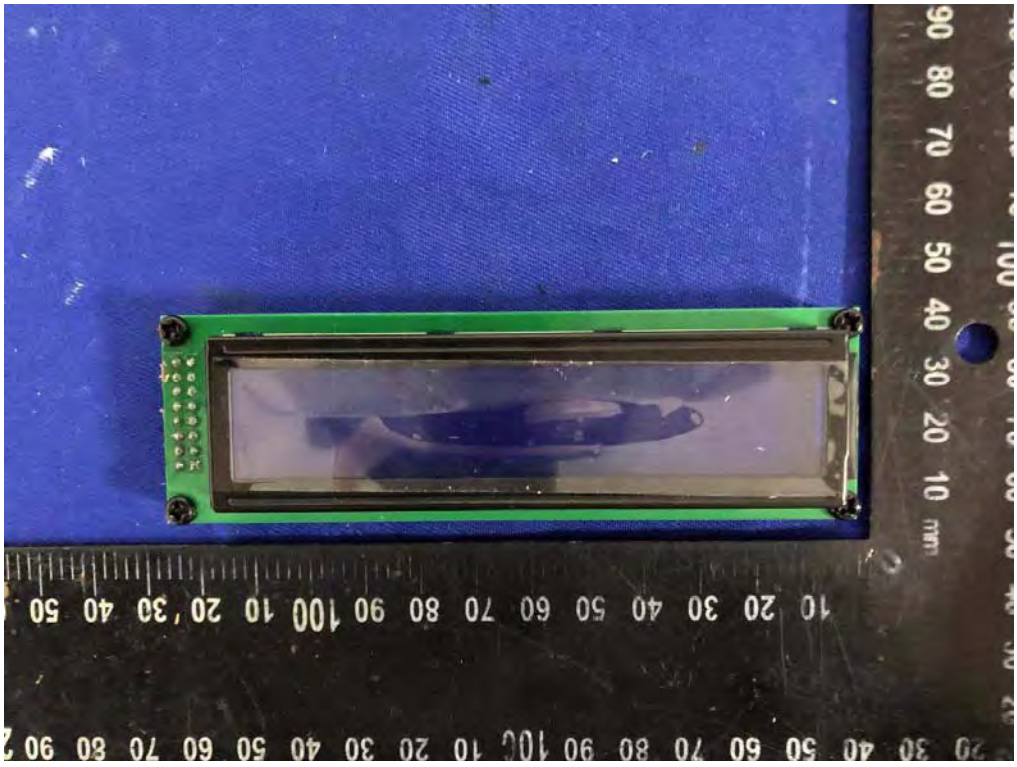

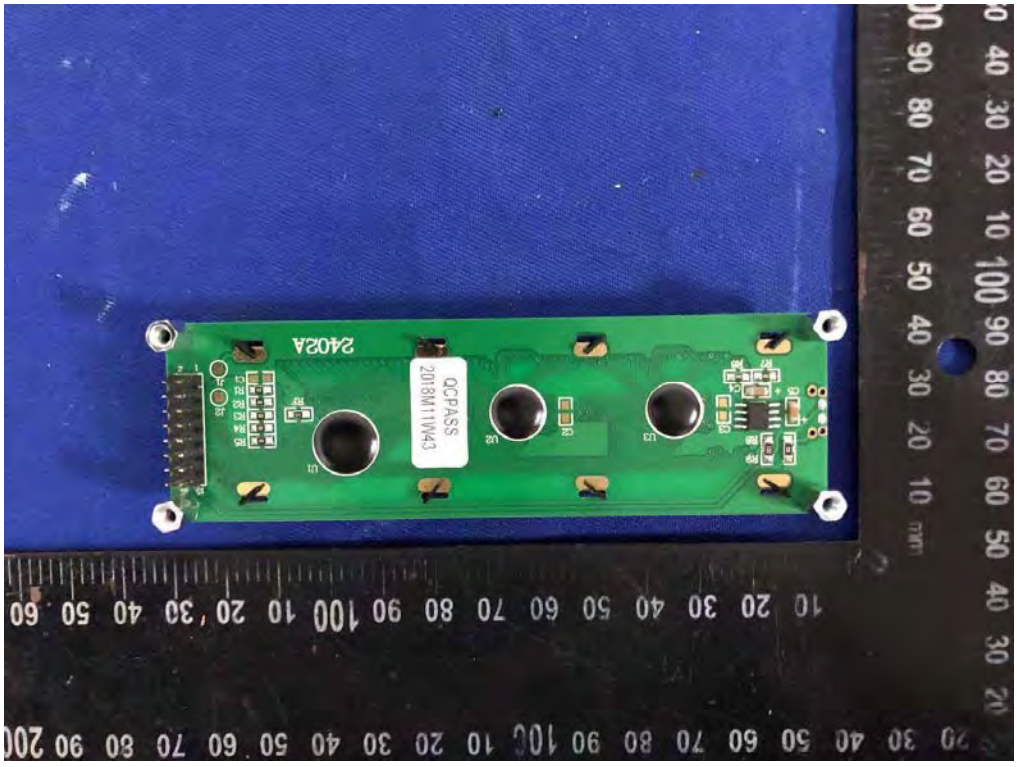

**Internal Photos**

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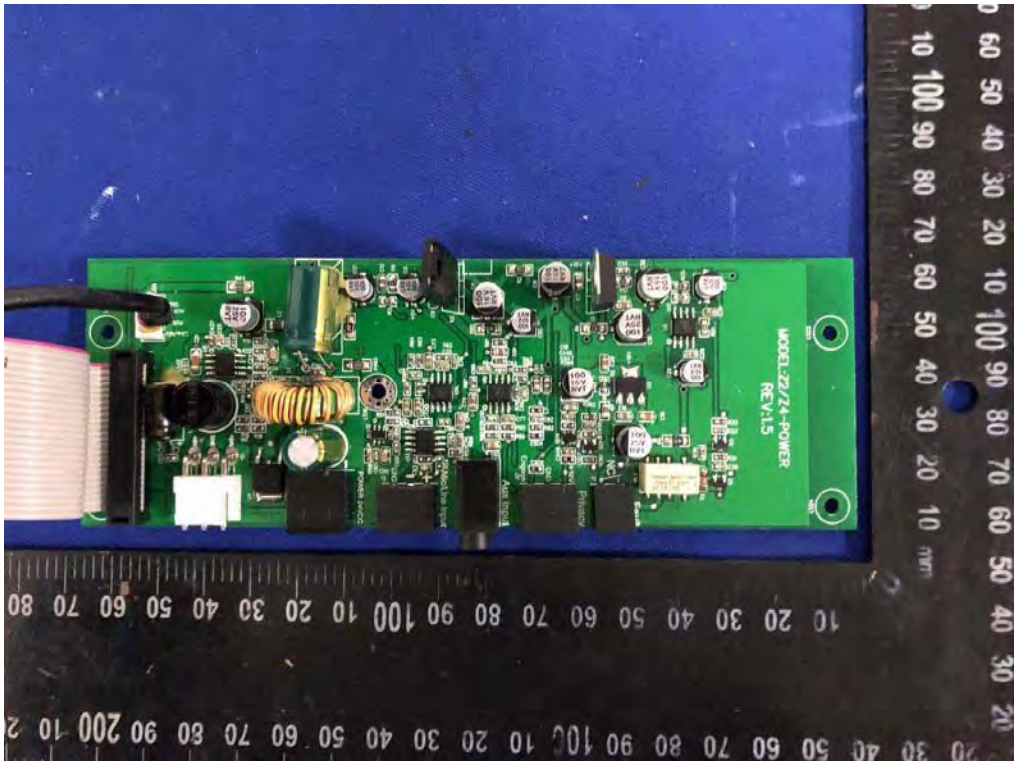


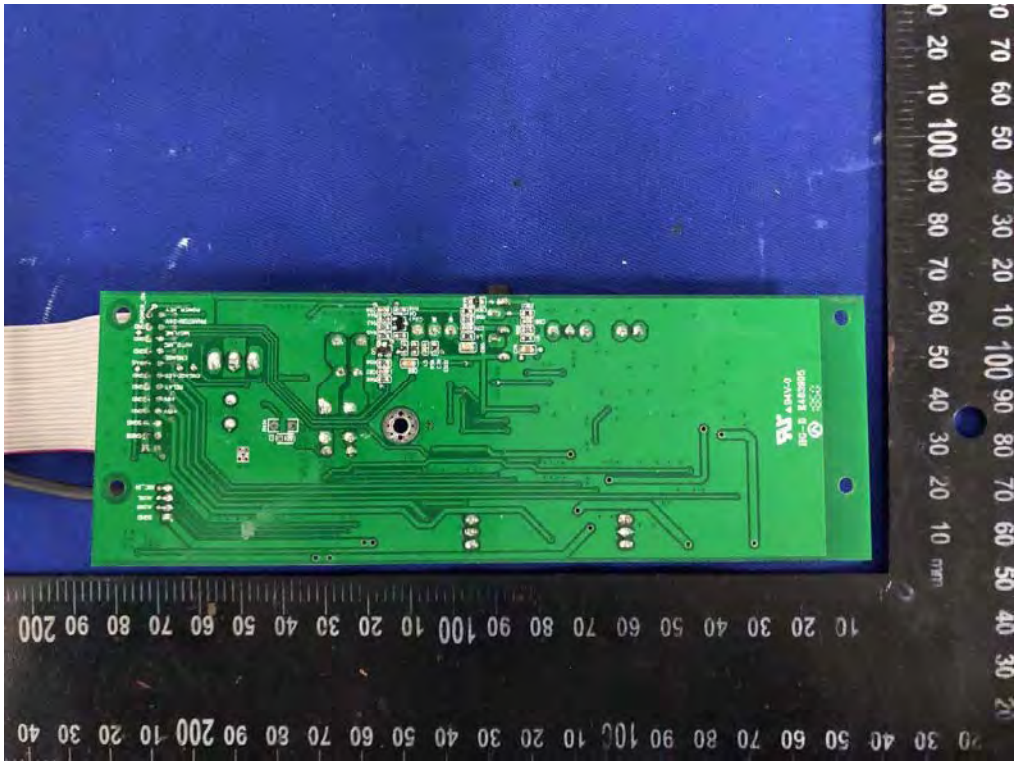

**Internal Photos**

M/N: Z2-B