

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               |
|               |                                                                     |
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|                 |                         |
|-----------------|-------------------------|
| Report Number:  | ESTE-R1905133           |
| Date of Test:   | Jan. 18 ~ Mar. 22, 2019 |
| Date of Report: | Mar. 26, 2019           |

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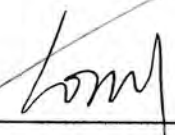
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## EST Technology Co., Ltd.

|                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                       |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------|
| <b>Applicant:</b>                                                                                                                                                                                 | Mitek Corp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |                         |
| <b>Address:</b>                                                                                                                                                                                   | 1 Mitek Plaza, Winslow, Illinois 61089, United States                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                       |                         |
| <b>Manufacturer:</b>                                                                                                                                                                              | Integrity Electronic Co., Ltd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                       |                         |
| <b>Address:</b>                                                                                                                                                                                   | No. 68, Huanghe Road, Fenghuanggang, Tangxia Town, Dongguan City, Guangdong Province, China                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                       |                         |
| <b>E.U.T:</b>                                                                                                                                                                                     | 4 Channels amplifier, 2 Channels amplifier                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |                         |
| <b>Model Number:</b>                                                                                                                                                                              | Z4-B, Z2-B<br>(The two models differ in power amplifier circuits, but the RF circuitry is identical.)                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                       |                         |
| <b>Power Supply:</b>                                                                                                                                                                              | DC 24V From Adapter Input AC 100-240V ~50/60Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                       |                         |
| <b>Test Voltage:</b>                                                                                                                                                                              | DC 24V From Adapter Input AC 120V/60Hz<br>DC 24V From Adapter Input AC 240V/60Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                       |                         |
| <b>Trade Name:</b>                                                                                                                                                                                | ATLAS SOUND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Serial No.:</b>                                                                                                    | -----                   |
| <b>Date of Receipt:</b>                                                                                                                                                                           | Jan. 18, 2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Date of Test:</b>                                                                                                  | Jan. 18 ~ Mar. 22, 2019 |
| <b>Test Specification:</b>                                                                                                                                                                        | FCC Rules and Regulations Part 15 Subpart C:2018<br>ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                       |                         |
| <b>Test Result:</b>                                                                                                                                                                               | <p>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.</p> <p>This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd.</p> |                                                                                                                       |                         |
|                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Date:</b> Mar. 26, 2019                                                                                            |                         |
| <b>Prepared by:</b>                                                                                                                                                                               | <b>Reviewed by:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Approved by:</b>                                                                                                   |                         |
| <br>_____<br>Ring / Assistant                                                                                  | <br>_____<br>Tony / Engineer                                                                                                                                                                                                                                                                                                                                                                                                                               | <br>_____<br>Iceman Hu / Manager |                         |
| <b>Other Aspects:</b>                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                       |                         |
| 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: $\pi/4$ -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 |
|-----------------------------------------------|-------------------------------------------------------|---------|
| Power Line Conducted Emission                 | FCC Part 15: 15.207<br>ANSI C63.10:2013               | PASS    |
| Radiated Emission                             | FCC Part 15: 15.209<br>ANSI C63.10:2013<br>KDB 558074 | PASS    |
| Band Edge Compliance                          | FCC Part 15: 15.247<br>ANSI C63.10:2013<br>KDB 558074 | PASS    |
| 6dB Bandwidth                                 | FCC Part 15: 15.247<br>ANSI C63.10:2013<br>KDB 558074 | PASS    |
| Peak Output Power                             | FCC Part 15: 15.247<br>ANSI C63.10:2013<br>KDB 558074 | PASS    |
| Power Spectral Density                        | FCC Part 15: 15.247<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 |                                                       |         |

## 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                   | $\pm 3.48\text{dB}$               |
| Uncertainty for spurious emissions test<br>(30MHz-1GHz)    | $\pm 4.60\text{ dB(Polarize: H)}$ |
|                                                            | $\pm 4.68\text{ dB(Polarize: V)}$ |
| Uncertainty for spurious emissions test<br>(1GHz to 18GHz) | $\pm 4.96\text{dB}$               |
| Uncertainty for radio frequency                            | $7 \times 10^{-8}$                |
| 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                  |

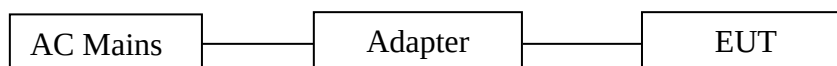
#### 2.4.2. Adapter(For Z2-B)

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

#### 2.4.3.

### 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

A special test software was used to control EUT work in Continuous TX mode(100% duty cycle), and select test channel, wireless mode and data rate.

| Mode            | Channel | Frequency |
|-----------------|---------|-----------|
| BT 4.1-BLE GFSK | Low     | 2402MHz   |
|                 | Middle  | 2440MHz   |
|                 | High    | 2480MHz   |

## 2.7. Channel List

| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|-------------|-----------------|-------------|-----------------|
| 1           | 2402            | 2           | 2404            |
| 3           | 2406            | 4           | 2408            |
| 5           | 2410            | 6           | 2412            |
| 7           | 2414            | 8           | 2416            |
| 9           | 2418            | 10          | 2420            |
| 11          | 2422            | 12          | 2424            |
| 13          | 2426            | 14          | 2428            |
| 15          | 2430            | 16          | 2432            |
| 17          | 2434            | 18          | 2436            |
| 19          | 2438            | 20          | 2440            |
| 21          | 2442            | 22          | 2444            |
| 23          | 2446            | 24          | 2448            |
| 25          | 2450            | 26          | 2452            |
| 27          | 2454            | 28          | 2456            |
| 29          | 2458            | 30          | 2460            |
| 31          | 2462            | 32          | 2464            |
| 33          | 2466            | 34          | 2468            |
| 35          | 2470            | 36          | 2472            |
| 37          | 2474            | 38          | 2476            |
| 39          | 2478            | 40          | 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 | SCHWARZB ECK    | 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                 | SCHWARZB ECK    | BBHA 9120 D  | BBHA912 0D1002 | CEPREI           | June 18,18 | 1 Year    |
| Horn Antenna                 | SCHWARZB ECK    | BBHA9170     | BBHA917 0242   | CEPREI           | June 18,18 | 1 Year    |
| Signal Amplifier             | SCHWARZB ECK    | BBV9718      | 9718-212       | CEPREI           | June 15,18 | 1 Year    |
| Spectrum Analyzer            | Rohde & Schwarz | FSV          | 103173         | CEPREI           | June 15,18 | 1 Year    |
| PSA Series Spectrum Analyzer | Agilent         | E4447A       | MY50180 031    | CEPREI           | June 15,18 | 1 Year    |
| 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    | MY44211<br>139 | CEPREI           | June 15,18 | 1 Year    |

### 3 POWER LINE CONDUCTED EMISSION TEST

#### 3.1 Limit

| Frequency       | Maximum RF Line Voltage          |                               |
|-----------------|----------------------------------|-------------------------------|
|                 | Quasi-Peak Level<br>dB( $\mu$ V) | Average Level<br>dB( $\mu$ V) |
| 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.

#### 3.2 Test Procedure

The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provides a 50 ohm coupling impedance for the EUT (Please refer the block diagram of the test setup and photographs). The 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.

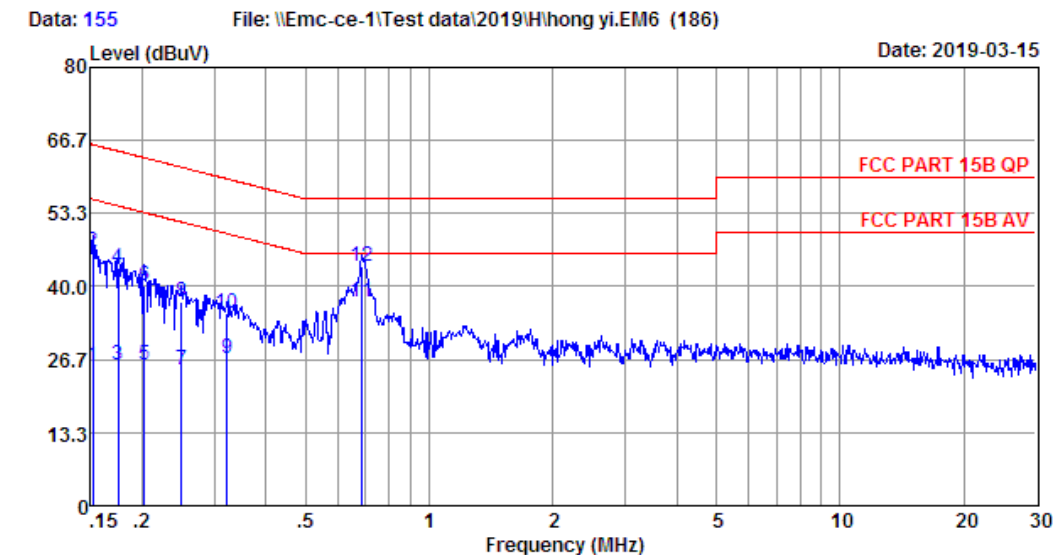
#### 3.3. Test Result

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

3.4. Test data

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Site no : 844 Shield Room Data no. : 155  
Env. / Ins. : Temp:23.5°C Humi:52.3% Press:101.50kPa INE 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.<br>(MHz) | LISN<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV) | Limits<br>(dBuV) | Margin<br>(dB) | Remark  |
|----|----------------|------------------------|-----------------------|-------------------|-----------------------------|------------------|----------------|---------|
| 1  | 0.15           | 9.50                   | 9.69                  | 6.20              | 25.39                       | 55.91            | 30.52          | Average |
| 2  | 0.15           | 9.50                   | 9.69                  | 27.02             | 46.21                       | 65.91            | 19.70          | QP      |
| 3  | 0.17           | 9.53                   | 9.77                  | 6.43              | 25.73                       | 54.72            | 28.99          | Average |
| 4  | 0.17           | 9.53                   | 9.77                  | 24.17             | 43.47                       | 64.72            | 21.25          | QP      |
| 5  | 0.20           | 9.53                   | 9.77                  | 6.43              | 25.73                       | 53.49            | 27.76          | Average |
| 6  | 0.20           | 9.53                   | 9.77                  | 20.71             | 40.01                       | 63.49            | 23.48          | QP      |
| 7  | 0.25           | 9.53                   | 9.92                  | 5.41              | 24.86                       | 51.78            | 26.92          | Average |
| 8  | 0.25           | 9.53                   | 9.92                  | 17.84             | 37.29                       | 61.78            | 24.49          | QP      |
| 9  | 0.32           | 9.54                   | 9.92                  | 7.30              | 26.76                       | 49.66            | 22.90          | Average |
| 10 | 0.32           | 9.54                   | 9.92                  | 15.81             | 35.27                       | 59.66            | 24.39          | QP      |
| 11 | 0.68           | 9.56                   | 9.92                  | 17.74             | 37.22                       | 46.00            | 8.78           | Average |
| 12 | 0.68           | 9.56                   | 9.92                  | 24.21             | 43.69                       | 56.00            | 12.31          | QP      |

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

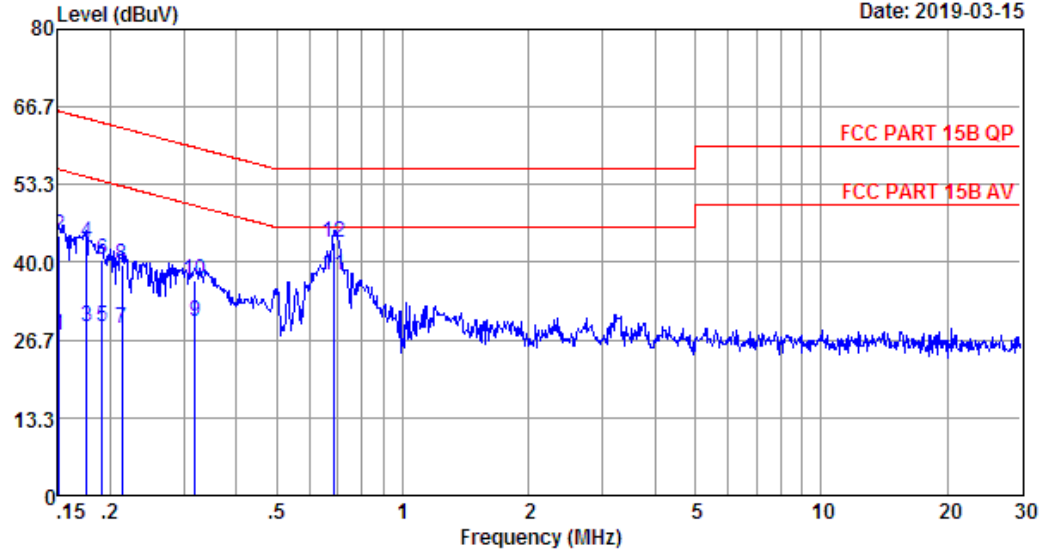
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Fax: +86-769-83081878

Data: 157

File: \\Emc-ce-1\Test data\2019\Hihong yi.EM6 (186)

Date: 2019-03-15



Site no : 844 Shield Room Data no. : 157  
 Env. / Ins. : Temp:23.5'C Humi:52.3% Press:101.50kPa INE 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.<br>(MHz) | LISN<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV) | Limits<br>(dBuV) | Margin<br>(dB) | Remark  |
|----|----------------|------------------------|-----------------------|-------------------|-----------------------------|------------------|----------------|---------|
| 1  | 0.15           | 9.59                   | 9.69                  | 8.20              | 27.48                       | 55.96            | 28.48          | Average |
| 2  | 0.15           | 9.59                   | 9.69                  | 25.19             | 44.47                       | 65.96            | 21.49          | QP      |
| 3  | 0.18           | 9.60                   | 9.77                  | 9.43              | 28.80                       | 54.68            | 25.88          | Average |
| 4  | 0.18           | 9.60                   | 9.77                  | 24.00             | 43.37                       | 64.68            | 21.31          | QP      |
| 5  | 0.19           | 9.60                   | 9.77                  | 9.43              | 28.80                       | 53.98            | 25.18          | Average |
| 6  | 0.19           | 9.60                   | 9.77                  | 21.10             | 40.47                       | 63.98            | 23.51          | QP      |
| 7  | 0.21           | 9.61                   | 9.84                  | 9.17              | 28.62                       | 53.10            | 24.48          | Average |
| 8  | 0.21           | 9.61                   | 9.84                  | 20.08             | 39.53                       | 63.10            | 23.57          | QP      |
| 9  | 0.32           | 9.62                   | 9.92                  | 10.30             | 29.84                       | 49.75            | 19.91          | Average |
| 10 | 0.32           | 9.62                   | 9.92                  | 17.33             | 36.87                       | 59.75            | 22.88          | QP      |
| 11 | 0.69           | 9.63                   | 9.93                  | 18.33             | 37.89                       | 46.00            | 8.11           | Average |
| 12 | 0.69           | 9.63                   | 9.93                  | 23.85             | 43.41                       | 56.00            | 12.59          | QP      |

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

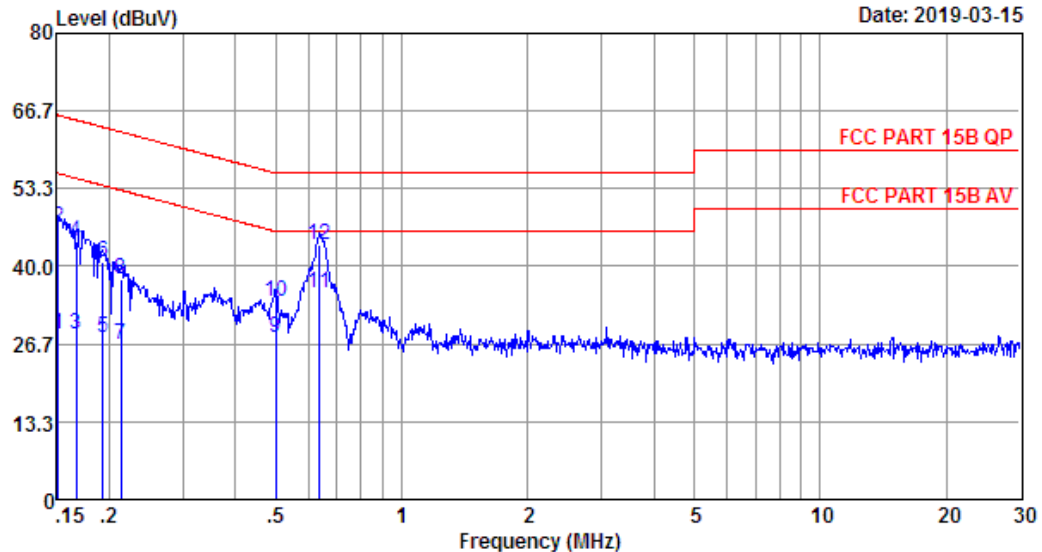
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Data: 159

File: \\Emc-ce-1\Test data\2019\Hihong yi.EM6 (186)

Date: 2019-03-15



Site no : 844 Shield Room Data no. : 159  
 Env. / Ins. : Temp:23.5'C Humi:52.3% Press:101.50kPa INE 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.<br>(MHz) | LISN<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV) | Limits<br>(dBuV) | Margin<br>(dB) | Remark  |
|----|----------------|------------------------|-----------------------|-------------------|-----------------------------|------------------|----------------|---------|
| 1  | 0.15           | 9.59                   | 9.69                  | 9.20              | 28.48                       | 55.96            | 27.48          | Average |
| 2  | 0.15           | 9.59                   | 9.69                  | 27.49             | 46.77                       | 65.96            | 19.19          | QP      |
| 3  | 0.17           | 9.59                   | 9.69                  | 9.20              | 28.48                       | 55.12            | 26.64          | Average |
| 4  | 0.17           | 9.59                   | 9.69                  | 25.09             | 44.37                       | 65.12            | 20.75          | QP      |
| 5  | 0.19           | 9.60                   | 9.77                  | 8.33              | 27.70                       | 53.89            | 26.19          | Average |
| 6  | 0.19           | 9.60                   | 9.77                  | 21.48             | 40.85                       | 63.89            | 23.04          | QP      |
| 7  | 0.21           | 9.61                   | 9.84                  | 7.17              | 26.62                       | 53.10            | 26.48          | Average |
| 8  | 0.21           | 9.61                   | 9.84                  | 18.32             | 37.77                       | 63.10            | 25.33          | QP      |
| 9  | 0.50           | 9.63                   | 9.92                  | 8.07              | 27.62                       | 46.01            | 18.39          | Average |
| 10 | 0.50           | 9.63                   | 9.92                  | 14.47             | 34.02                       | 56.01            | 21.99          | QP      |
| 11 | 0.64           | 9.63                   | 9.92                  | 15.95             | 35.50                       | 46.00            | 10.50          | Average |
| 12 | 0.64           | 9.63                   | 9.92                  | 24.12             | 43.67                       | 56.00            | 12.33          | QP      |

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

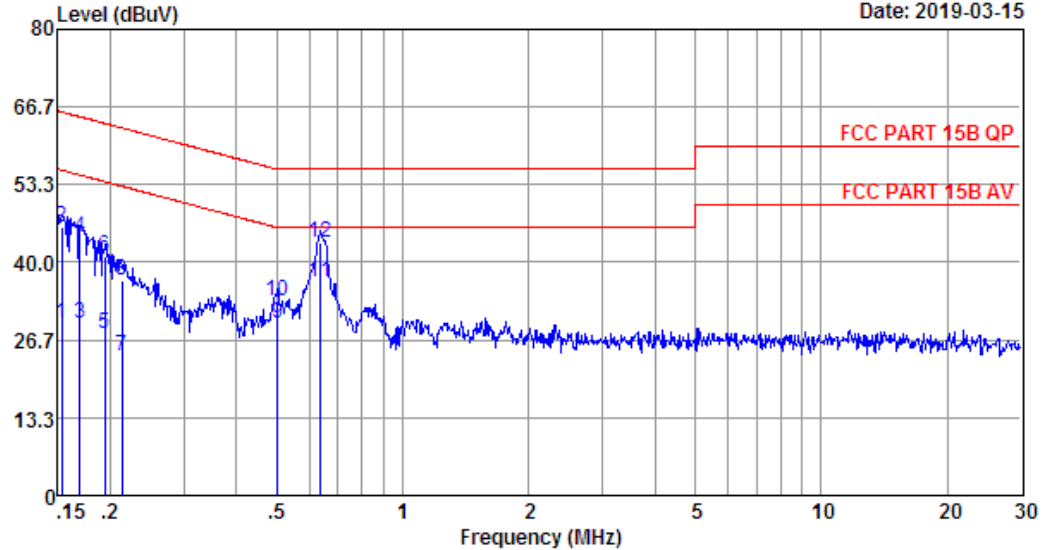
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Data: 161

File: \\Emc-ce-1\Test data\2019\Hihong yi.EM6 (186)

Date: 2019-03-15



Site no : 844 Shield Room Data no. : 161  
 Env. / Ins. : Temp:23.5'C Humi:52.3% Press:101.50kPa INE 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.<br>(MHz) | LISN<br>Factor<br>(dB) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV) | Limits<br>(dBuV) | Margin<br>(dB) | Remark  |
|----|----------------|------------------------|-----------------------|-------------------|-----------------------------|------------------|----------------|---------|
| 1  | 0.15           | 9.50                   | 9.69                  | 10.20             | 29.39                       | 55.82            | 26.43          | Average |
| 2  | 0.15           | 9.50                   | 9.69                  | 26.92             | 46.11                       | 65.82            | 19.71          | QP      |
| 3  | 0.17           | 9.50                   | 9.69                  | 10.20             | 29.39                       | 54.99            | 25.60          | Average |
| 4  | 0.17           | 9.50                   | 9.69                  | 25.16             | 44.35                       | 64.99            | 20.64          | QP      |
| 5  | 0.19           | 9.53                   | 9.77                  | 8.43              | 27.73                       | 53.84            | 26.11          | Average |
| 6  | 0.19           | 9.53                   | 9.77                  | 21.83             | 41.13                       | 63.84            | 22.71          | QP      |
| 7  | 0.21           | 9.53                   | 9.84                  | 4.42              | 23.79                       | 53.10            | 29.31          | Average |
| 8  | 0.21           | 9.53                   | 9.84                  | 17.62             | 36.99                       | 63.10            | 26.11          | QP      |
| 9  | 0.50           | 9.55                   | 9.92                  | 10.07             | 29.54                       | 46.00            | 16.46          | Average |
| 10 | 0.50           | 9.55                   | 9.92                  | 13.94             | 33.41                       | 56.00            | 22.59          | QP      |
| 11 | 0.63           | 9.56                   | 9.92                  | 17.23             | 36.71                       | 46.00            | 9.29           | Average |
| 12 | 0.63           | 9.56                   | 9.92                  | 23.85             | 43.33                       | 56.00            | 12.67          | QP      |

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

## 4 RADIATED EMISSION TEST

### 4.1 Limit

#### 4.1.1 15.209 limits

| Frequency (MHz) | Field Strength( $\mu\text{V}/\text{m}$ ) | 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           |

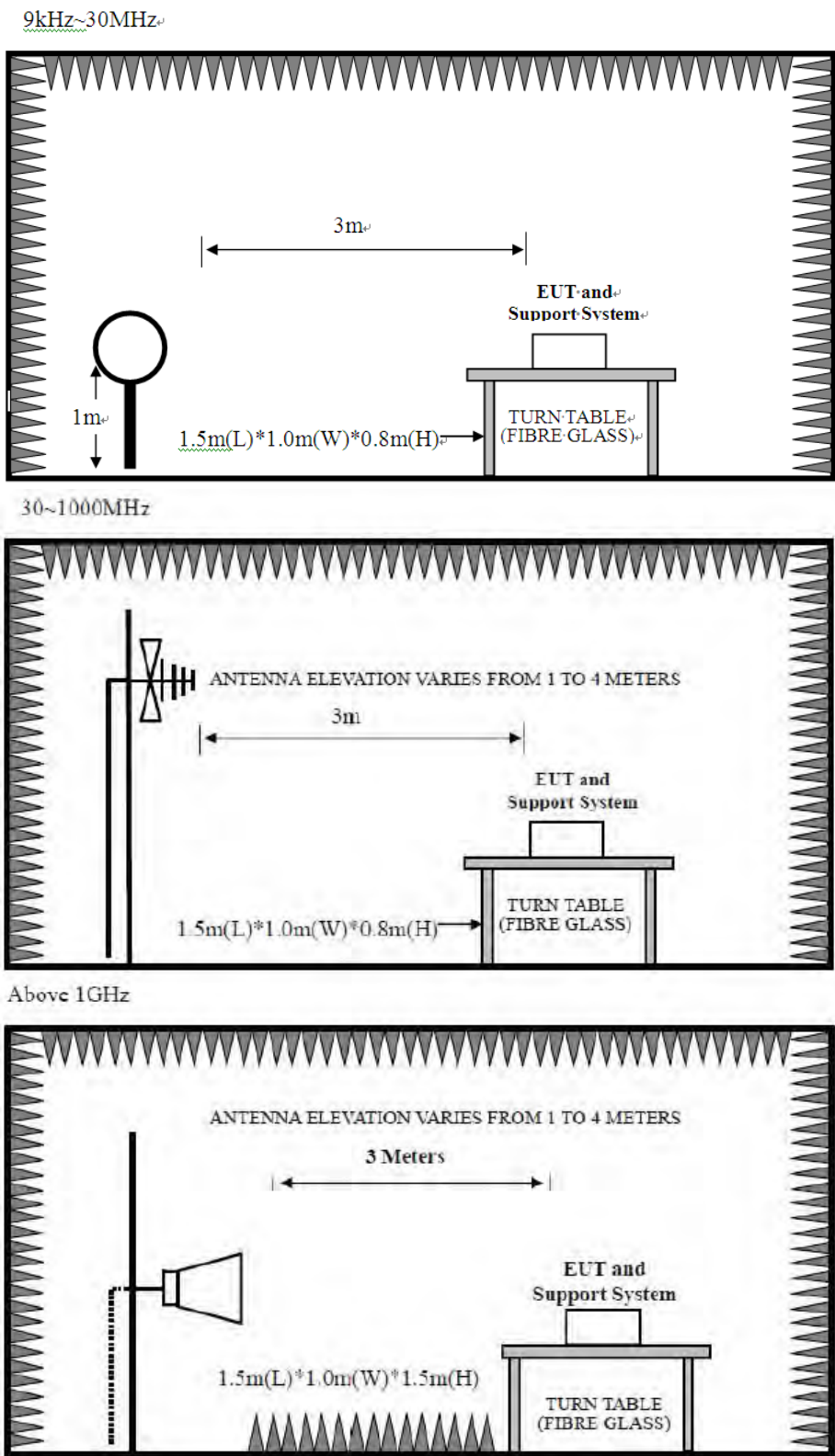
- Remark : (1) Emission level  $\text{dB}\mu\text{V} = 20 \log \text{Emission level } \mu\text{V}/\text{m}$   
 (2) The smaller limit shall apply at the cross point between two frequency bands.  
 (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of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

#### 4.1.2 15.205 Restricted bands of operation

| MHz                        | MHz                   | MHz             | GHz              |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110              | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |
| <sup>1</sup> 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     | ( <sup>2</sup> ) |

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.

4.2. Block Diagram of Test setup



### 4.3. 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.

### 4.4. Test Result

**PASS.**

All the emissions from 30MHz to 25 GHz were comply with 15.209 limits.

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 、 2440MHz and 2480 MHz 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.

#### 4.5. Test Data

9 kHz – 30 MHz

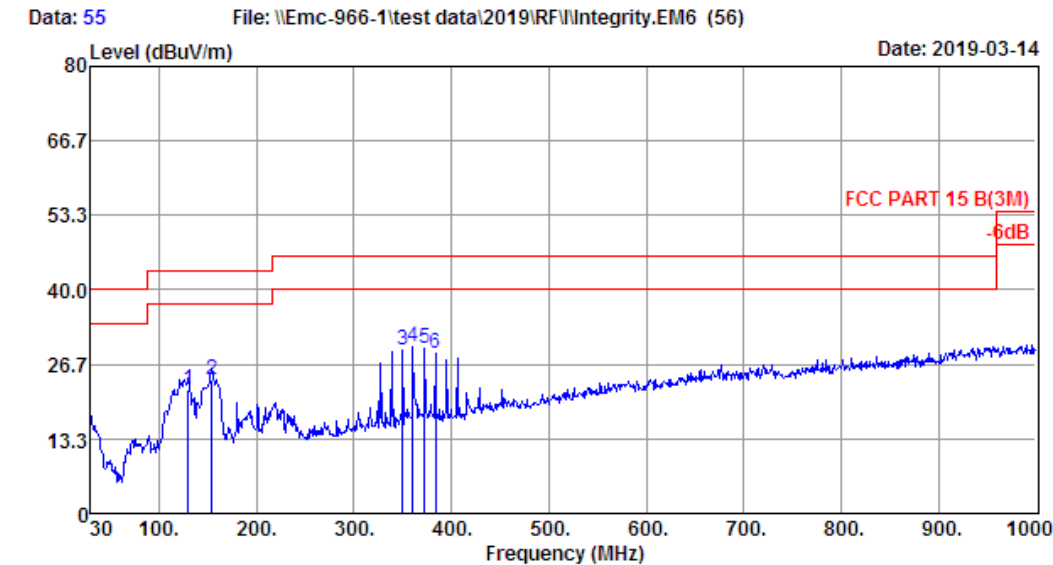
Pass

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

30-1000 MHz

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Site no. : 1# 966 Chamber Data no. : 55  
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.<br>(MHz) | ANT<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|-------------------------|-----------------------|-------------------|-------------------------------|-------------------|----------------|--------|
| 1 | 129.91         | 11.80                   | 0.98                  | 9.35              | 22.13                         | 43.50             | 21.37          | QP     |
| 2 | 154.16         | 11.34                   | 1.11                  | 11.54             | 23.99                         | 43.50             | 19.51          | QP     |
| 3 | 350.10         | 15.30                   | 2.11                  | 11.67             | 29.08                         | 46.00             | 16.92          | QP     |
| 4 | 360.77         | 15.42                   | 2.16                  | 12.25             | 29.83                         | 46.00             | 16.17          | QP     |
| 5 | 372.41         | 15.64                   | 2.17                  | 11.61             | 29.42                         | 46.00             | 16.58          | QP     |
| 6 | 384.05         | 15.84                   | 2.13                  | 10.75             | 28.72                         | 46.00             | 17.28          | 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.

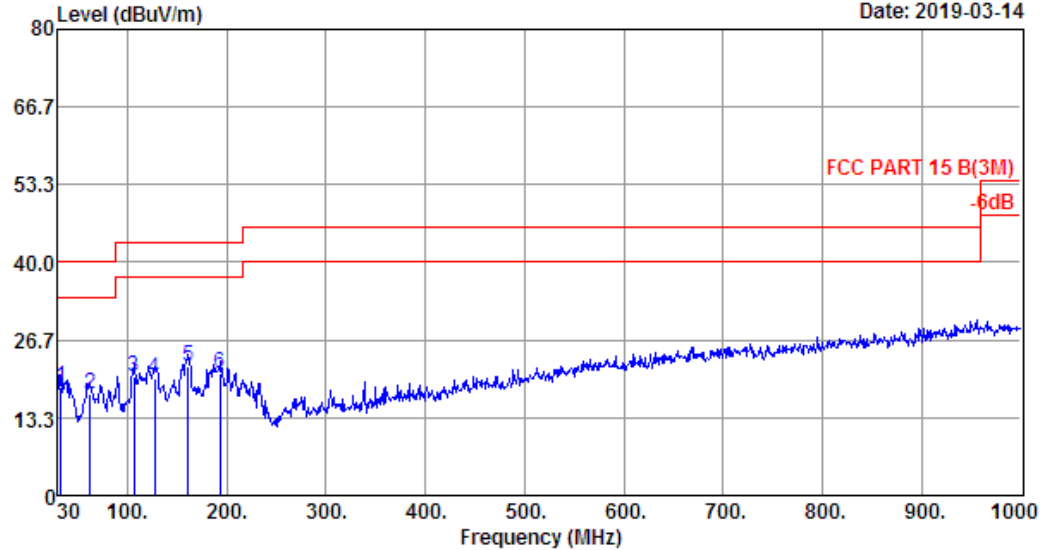
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Data: 56

File: \\Emc-966-1\\test data\\2019\\RF\\Integrity.EM6 (56)

Date: 2019-03-14



Site no. : 1# 966 Chamber Data no. : 56  
 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 : 24-B  
 Test Mode : TX Mode

|   | Freq.<br>(MHz) | ANT<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|-------------------------|-----------------------|-------------------|-------------------------------|-------------------|----------------|--------|
| 1 | 32.91          | 16.35                   | 0.16                  | 2.22              | 18.73                         | 40.00             | 21.27          | QP     |
| 2 | 62.01          | 5.02                    | 0.44                  | 11.86             | 17.32                         | 40.00             | 22.68          | QP     |
| 3 | 106.63         | 10.40                   | 0.92                  | 9.18              | 20.50                         | 43.50             | 23.00          | QP     |
| 4 | 127.00         | 11.68                   | 0.95                  | 7.59              | 20.22                         | 43.50             | 23.28          | QP     |
| 5 | 160.95         | 11.04                   | 1.15                  | 9.89              | 22.08                         | 43.50             | 21.42          | QP     |
| 6 | 192.96         | 8.72                    | 1.27                  | 10.96             | 20.95                         | 43.50             | 22.55          | 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

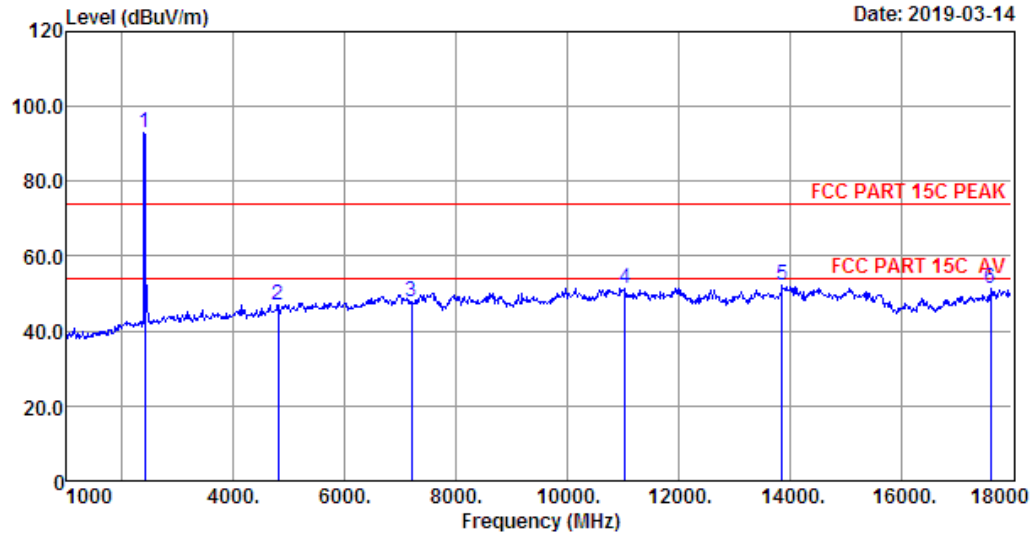
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Data: 29

File: \\Emc-966-1\test data\2019\RF\Integrity.EM6 (56)

Date: 2019-03-14



Site no. : 1# 966 Chamber Data no. : 29  
 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 : GFSK TX 2402MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2402.00        | 27.26                    | 2.89                  | 34.68                 | 97.56             | 93.03                         | 74.00              | -19.03         | Peak   |
| 2 | 4804.00        | 31.16                    | 4.51                  | 34.68                 | 45.81             | 46.80                         | 74.00              | 27.20          | Peak   |
| 3 | 7206.00        | 36.05                    | 5.84                  | 34.58                 | 40.30             | 47.61                         | 74.00              | 26.39          | Peak   |
| 4 | 11047.00       | 39.96                    | 7.15                  | 34.32                 | 38.68             | 51.47                         | 74.00              | 22.53          | Peak   |
| 5 | 13869.00       | 40.87                    | 8.16                  | 34.22                 | 37.36             | 52.17                         | 74.00              | 21.83          | Peak   |
| 6 | 17609.00       | 45.45                    | 9.50                  | 34.26                 | 30.59             | 51.28                         | 74.00              | 22.72          | 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.

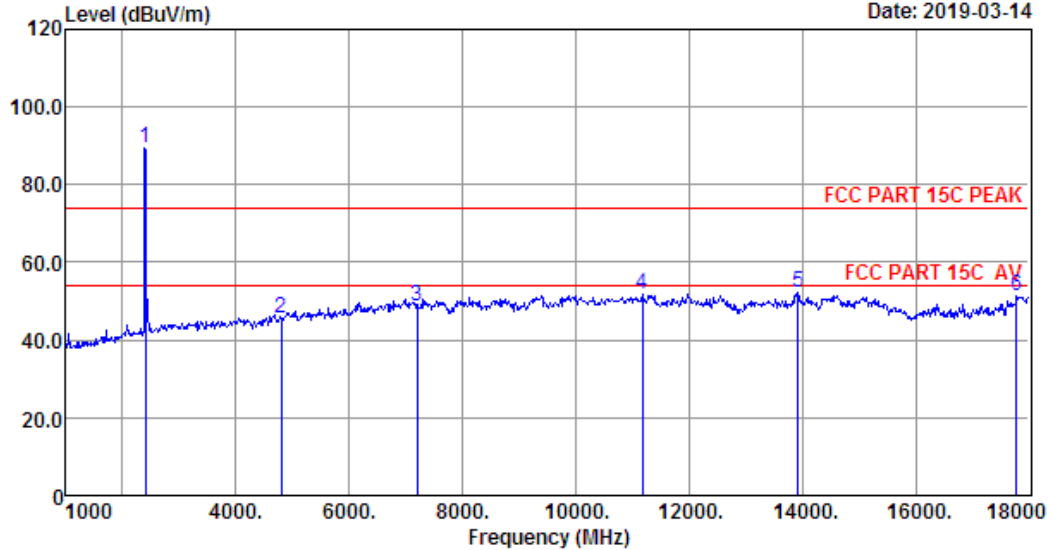
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Data: 30

File: \\Emc-966-1\\test data\\2019\\RF\\Integrity.EM6 (56)

Date: 2019-03-14



Site no. : 1# 966 Chamber Data no. : 30  
 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 : 24-B  
 Test Mode : GFSK TX 2402MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2402.00        | 27.26                    | 2.89                  | 34.68                 | 93.96             | 89.43                         | 74.00              | -15.43         | Peak   |
| 2 | 4804.00        | 31.16                    | 4.51                  | 34.68                 | 44.80             | 45.79                         | 74.00              | 28.21          | Peak   |
| 3 | 7206.00        | 36.05                    | 5.84                  | 34.58                 | 41.41             | 48.72                         | 74.00              | 25.28          | Peak   |
| 4 | 11183.00       | 39.87                    | 7.28                  | 34.35                 | 39.03             | 51.83                         | 74.00              | 22.17          | Peak   |
| 5 | 13920.00       | 40.96                    | 8.15                  | 34.21                 | 37.30             | 52.20                         | 74.00              | 21.80          | Peak   |
| 6 | 17779.00       | 46.60                    | 9.63                  | 34.28                 | 29.29             | 51.24                         | 74.00              | 22.76          | 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.

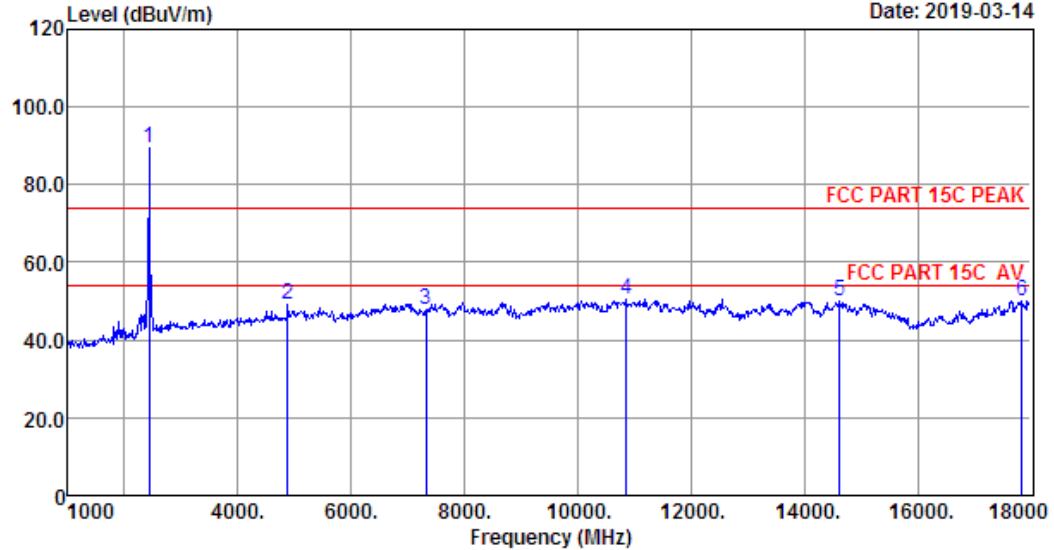
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Data: 31

File: \\Emc-966-1\\test data\\2019\\RF\\Integrity.EM6 (56)

Date: 2019-03-14



Site no. : 1# 966 Chamber Data no. : 31  
 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 : 24-B  
 Test Mode : GFSK TX 2440MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2440.00        | 27.33                    | 2.90                  | 34.67                 | 94.09             | 89.65                         | 74.00              | -15.65         | Peak   |
| 2 | 4880.00        | 31.39                    | 4.71                  | 34.69                 | 47.85             | 49.26                         | 74.00              | 24.74          | Peak   |
| 3 | 7320.00        | 36.19                    | 5.88                  | 34.57                 | 40.39             | 47.89                         | 74.00              | 26.11          | Peak   |
| 4 | 10860.00       | 39.80                    | 7.04                  | 34.34                 | 38.19             | 50.69                         | 74.00              | 23.31          | Peak   |
| 5 | 14617.00       | 41.04                    | 8.33                  | 34.26                 | 34.87             | 49.98                         | 74.00              | 24.02          | Peak   |
| 6 | 17847.00       | 47.06                    | 9.67                  | 34.28                 | 27.50             | 49.95                         | 74.00              | 24.05          | 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.

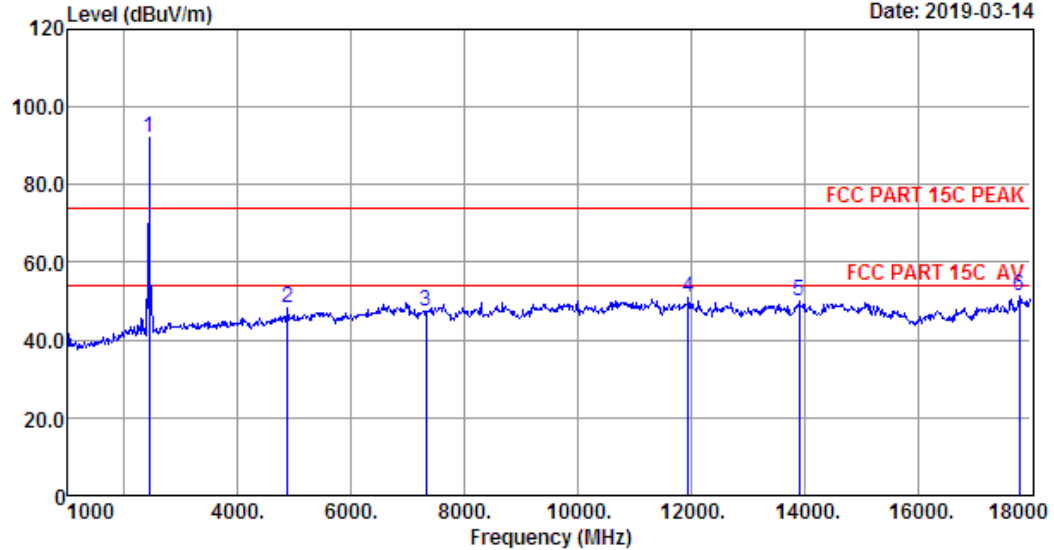
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Data: 32

File: \\Emc-966-1\\test data\\2019\\RF\\Integrity.EM6 (56)

Date: 2019-03-14



Site no. : 1# 966 Chamber Data no. : 32  
 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 : 24-B  
 Test Mode : GFSK TX 2440MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2440.00        | 27.33                    | 2.90                  | 34.67                 | 96.68             | 92.24                         | 74.00              | -18.24         | Peak   |
| 2 | 4880.00        | 31.39                    | 4.71                  | 34.69                 | 46.98             | 48.39                         | 74.00              | 25.61          | Peak   |
| 3 | 7320.00        | 36.19                    | 5.88                  | 34.57                 | 40.09             | 47.59                         | 74.00              | 26.41          | Peak   |
| 4 | 11948.00       | 39.34                    | 7.82                  | 34.58                 | 38.26             | 50.84                         | 74.00              | 23.16          | Peak   |
| 5 | 13903.00       | 40.93                    | 8.15                  | 34.22                 | 34.99             | 49.85                         | 74.00              | 24.15          | Peak   |
| 6 | 17796.00       | 46.72                    | 9.64                  | 34.28                 | 29.35             | 51.43                         | 74.00              | 22.57          | 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.

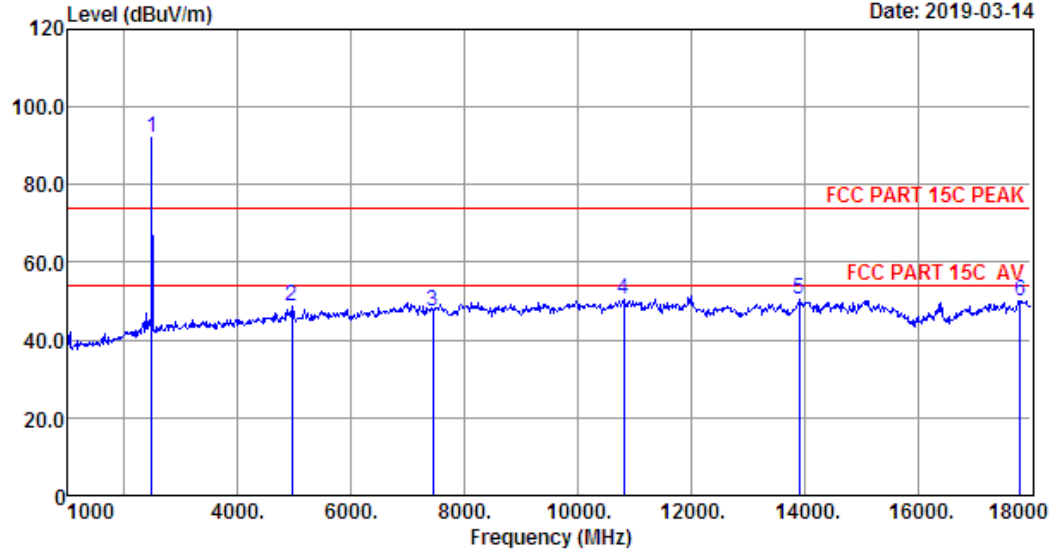
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Data: 33

File: \\Emc-966-1\\test data\\2019\\RF\\Integrity.EM6 (56)

Date: 2019-03-14



Site no. : 1# 966 Chamber Data no. : 33  
 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 : 24-B  
 Test Mode : GFSK TX 2480MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2480.00        | 27.38                    | 2.93                  | 34.66                 | 96.48             | 92.13                         | 74.00              | -18.13         | Peak   |
| 2 | 4960.00        | 31.68                    | 4.60                  | 34.70                 | 47.26             | 48.84                         | 74.00              | 25.16          | Peak   |
| 3 | 7440.00        | 36.34                    | 6.02                  | 34.56                 | 39.55             | 47.35                         | 74.00              | 26.65          | Peak   |
| 4 | 10809.00       | 39.72                    | 7.02                  | 34.36                 | 38.25             | 50.63                         | 74.00              | 23.37          | Peak   |
| 5 | 13903.00       | 40.93                    | 8.15                  | 34.22                 | 35.69             | 50.55                         | 74.00              | 23.45          | Peak   |
| 6 | 17813.00       | 46.83                    | 9.65                  | 34.28                 | 27.98             | 50.18                         | 74.00              | 23.82          | 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.

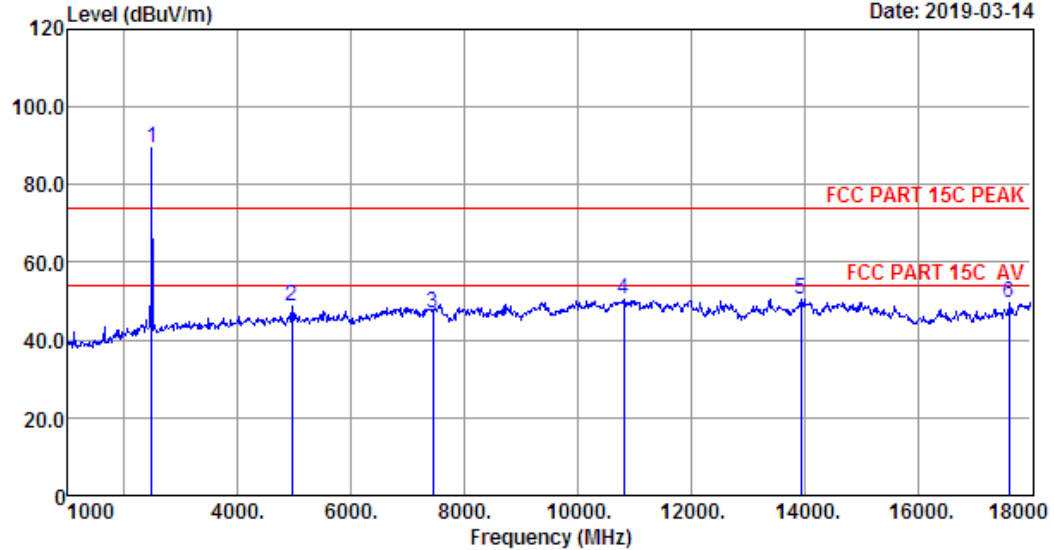
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Data: 34

File: \\Emc-966-1\\test data\\2019\\RF\\Integrity.EM6 (56)

Date: 2019-03-14



Site no. : 1# 966 Chamber Data no. : 34  
 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 : 24-B  
 Test Mode : GFSK TX 2480MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2480.00        | 27.38                    | 2.93                  | 34.66                 | 93.77             | 89.42                         | 74.00              | -15.42         | Peak   |
| 2 | 4960.00        | 31.68                    | 4.60                  | 34.70                 | 46.96             | 48.54                         | 74.00              | 25.46          | Peak   |
| 3 | 7440.00        | 36.34                    | 6.02                  | 34.56                 | 39.28             | 47.08                         | 74.00              | 26.92          | Peak   |
| 4 | 10809.00       | 39.72                    | 7.02                  | 34.36                 | 38.16             | 50.54                         | 74.00              | 23.46          | Peak   |
| 5 | 13937.00       | 40.98                    | 8.15                  | 34.21                 | 35.46             | 50.38                         | 74.00              | 23.62          | Peak   |
| 6 | 17609.00       | 45.45                    | 9.50                  | 34.26                 | 29.06             | 49.75                         | 74.00              | 24.25          | 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

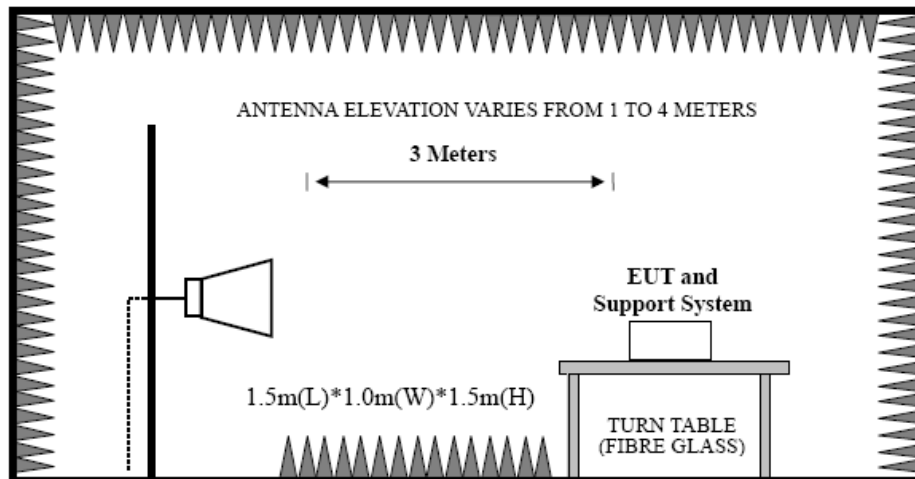
Note: The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

## 5 BAND EDGE COMPLIANCE TEST

### 5.1 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

### 5.2 Block Diagram of Test setup



### 5.3 Test Procedure

1. The EUT is placed on a turntable, which is 1.5m above the ground plane and worked at highest radiated power.
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

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

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

### 5.4 Test Result

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

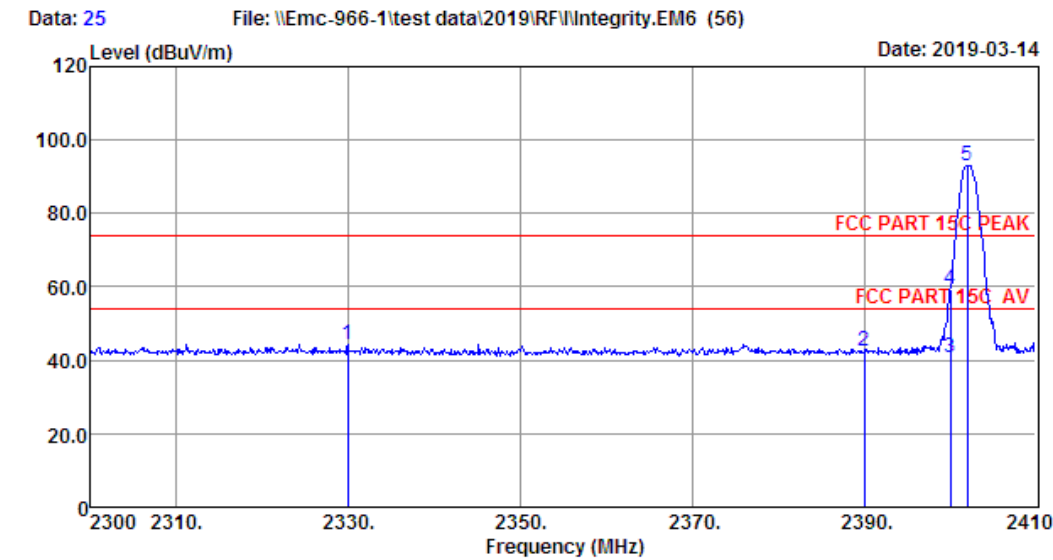
Note: 1、 For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.

- 2、 The frequency 2402MHz and 2480 MHz 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.

5.5 Test Data

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Site no. : 1# 966 Chamber Data no. : 25  
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 : GFSK TX 2402MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark  |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|---------|
| 1 | 2329.92        | 27.16                    | 2.84                  | 34.70                 | 49.08             | 44.38                         | 74.00              | 29.62          | Peak    |
| 2 | 2390.00        | 27.26                    | 2.89                  | 34.68                 | 47.03             | 42.50                         | 74.00              | 31.50          | Peak    |
| 3 | 2400.00        | 27.26                    | 2.89                  | 34.68                 | 45.32             | 40.79                         | 54.00              | 13.21          | Average |
| 4 | 2400.00        | 27.26                    | 2.89                  | 34.68                 | 63.68             | 59.15                         | 74.00              | 14.85          | Peak    |
| 5 | 2401.97        | 27.26                    | 2.89                  | 34.68                 | 97.51             | 92.98                         | 74.00              | -18.98         | 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.

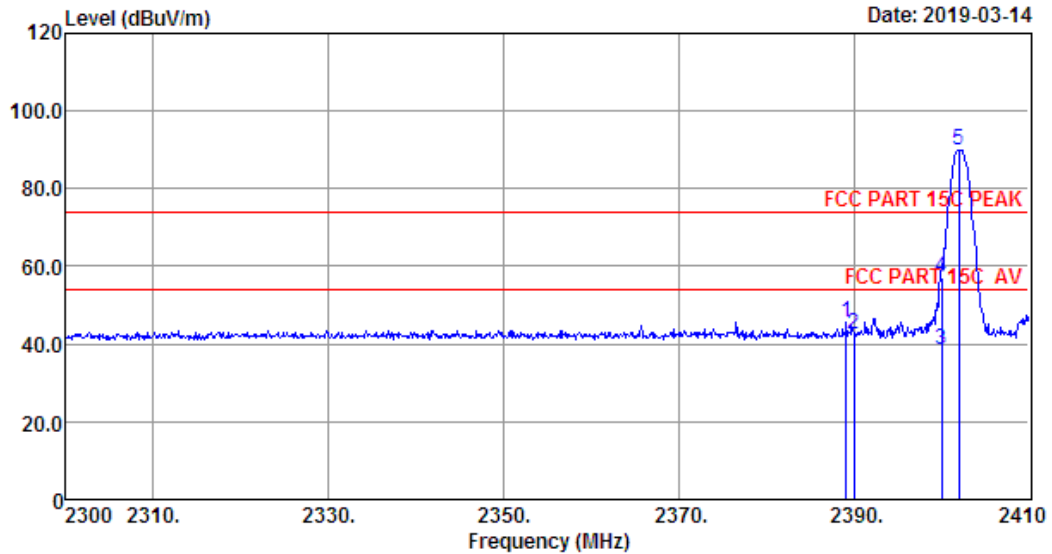
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Data: 26

File: \\Emc-966-1\\test data\\2019\\RF\\Integrity.EM6 (56)

Date: 2019-03-14



Site no. : 1# 966 Chamber Data no. : 26  
 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 : 24-B  
 Test Mode : GFSK TX 2402MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark  |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|---------|
| 1 | 2389.10        | 27.26                    | 2.89                  | 34.68                 | 50.23             | 45.70                         | 74.00              | 28.30          | Peak    |
| 2 | 2390.00        | 27.26                    | 2.89                  | 34.68                 | 47.08             | 42.55                         | 74.00              | 31.45          | Peak    |
| 3 | 2400.00        | 27.26                    | 2.89                  | 34.68                 | 42.93             | 38.40                         | 54.00              | 15.60          | Average |
| 4 | 2400.00        | 27.26                    | 2.89                  | 34.68                 | 61.80             | 57.27                         | 74.00              | 16.73          | Peak    |
| 5 | 2401.97        | 27.26                    | 2.89                  | 34.68                 | 94.47             | 89.94                         | 74.00              | -15.94         | 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.

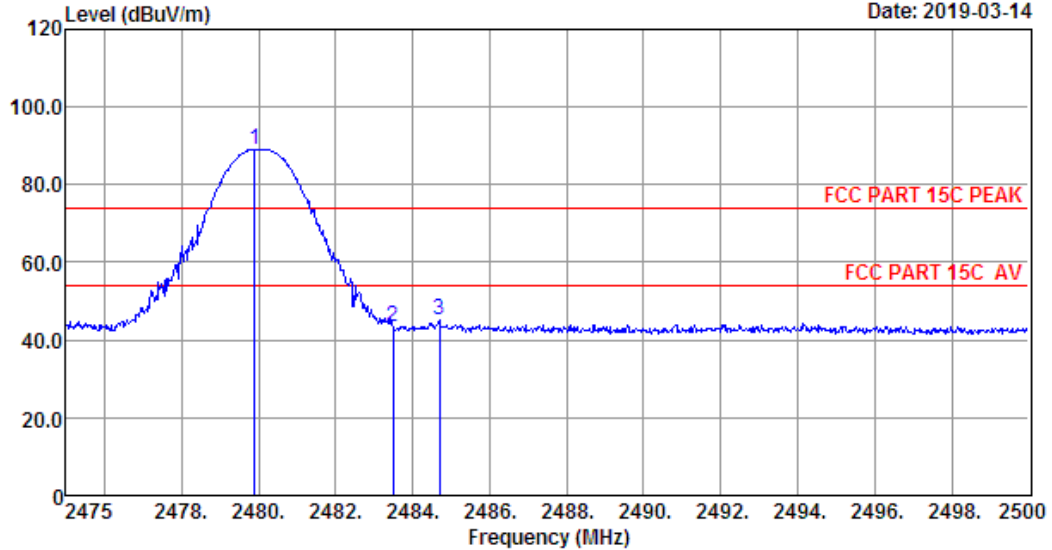
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Data: 27

File: \\Emc-966-1\\test data\\2019\\RF\\Integrity.EM6 (56)

Date: 2019-03-14



Site no. : 1# 966 Chamber Data no. : 27  
 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 : 24-B  
 Test Mode : GFSK TX 2480MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2479.90        | 27.38                    | 2.93                  | 34.66                 | 93.33             | 88.98                         | 74.00              | -14.98         | Peak   |
| 2 | 2483.50        | 27.38                    | 2.93                  | 34.66                 | 47.72             | 43.37                         | 74.00              | 30.63          | Peak   |
| 3 | 2484.70        | 27.38                    | 2.93                  | 34.66                 | 49.29             | 44.94                         | 74.00              | 29.06          | 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.

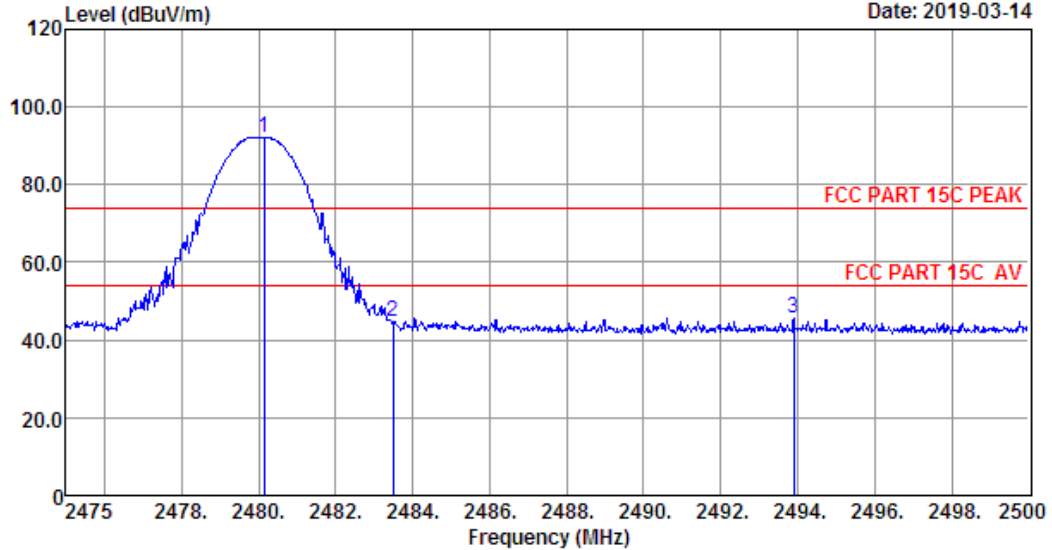
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Data: 28

File: \\Emc-966-1\\test data\\2019\\RF\\Integrity.EM6 (56)

Date: 2019-03-14



Site no. : 1# 966 Chamber Data no. : 28  
 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 : 24-B  
 Test Mode : GFSK TX 2480MHz

|   | Freq.<br>(MHz) | Ant.<br>Factor<br>(dB/m) | Cable<br>Loss<br>(dB) | Amp<br>Factor<br>(dB) | Reading<br>(dBuV) | Emission<br>Level<br>(dBuV/m) | Limits<br>(dBuV/m) | Margin<br>(dB) | Remark |
|---|----------------|--------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 1 | 2480.15        | 27.38                    | 2.93                  | 34.66                 | 96.57             | 92.22                         | 74.00              | -18.22         | Peak   |
| 2 | 2483.50        | 27.38                    | 2.93                  | 34.66                 | 49.16             | 44.81                         | 74.00              | 29.19          | Peak   |
| 3 | 2493.90        | 27.40                    | 2.95                  | 34.65                 | 49.93             | 45.63                         | 74.00              | 28.37          | 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.

## 6 Conducted Spurious Emissions and Band Edges Test

### 6.1 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)).

### 6.2 Test Procedure

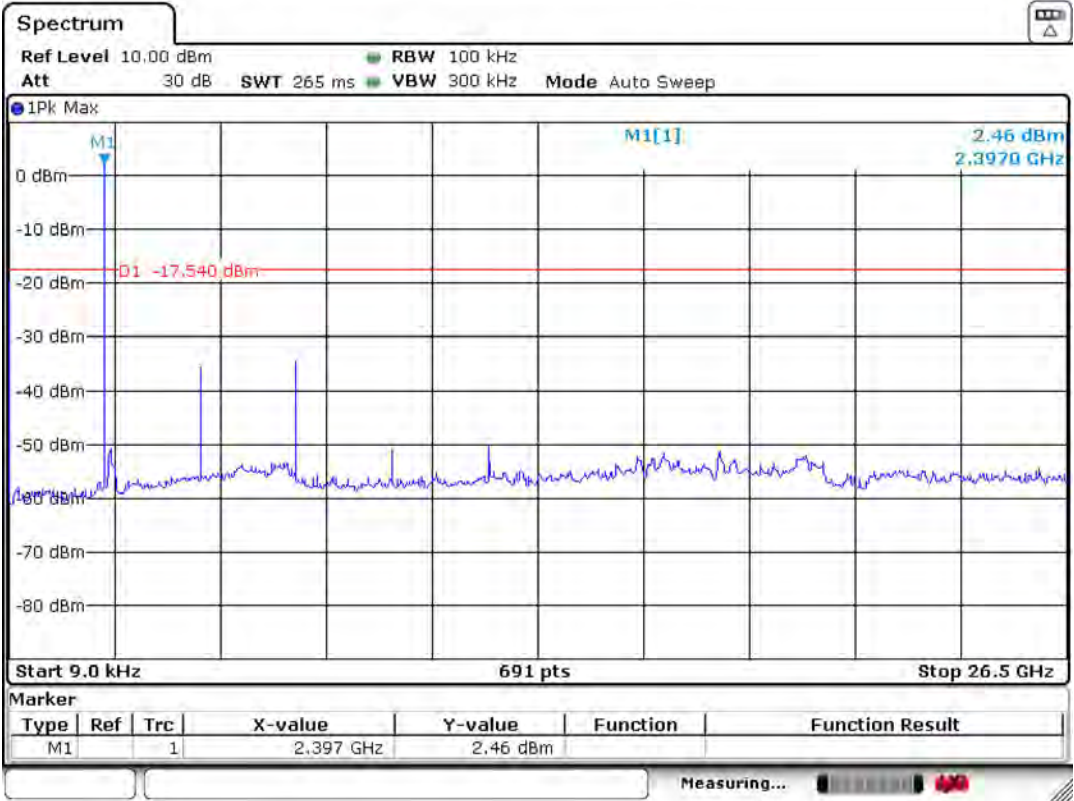
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

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

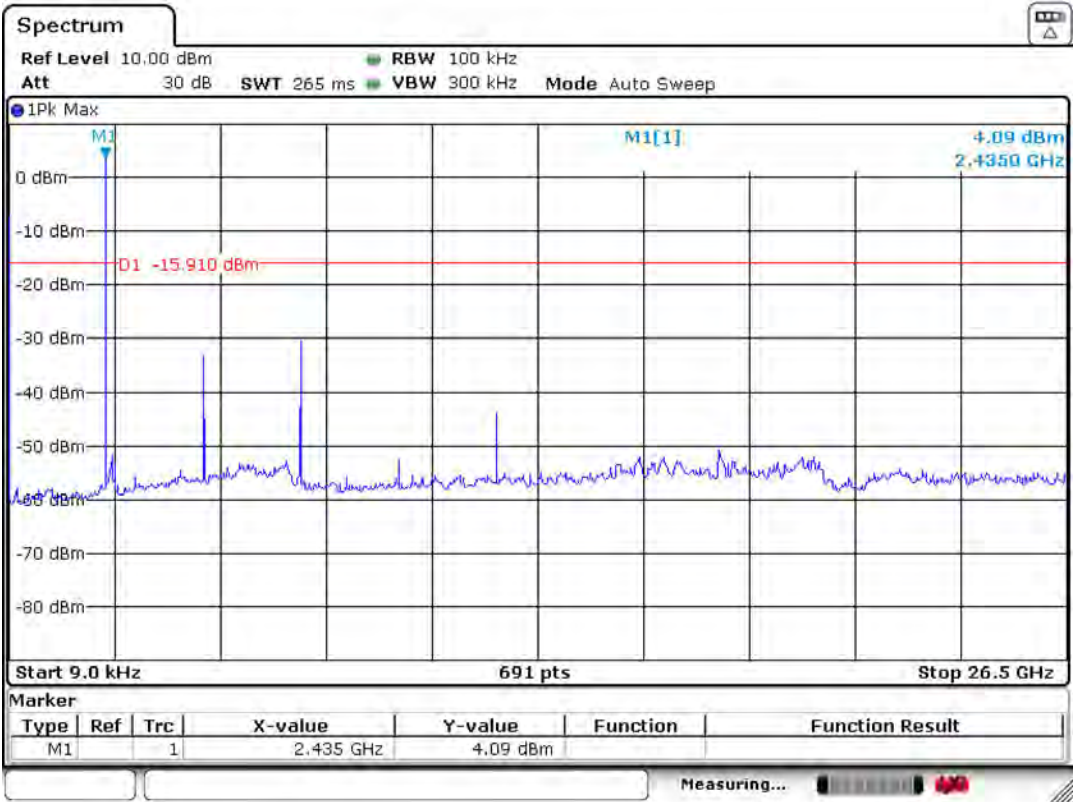
### 6.3 Test Result

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

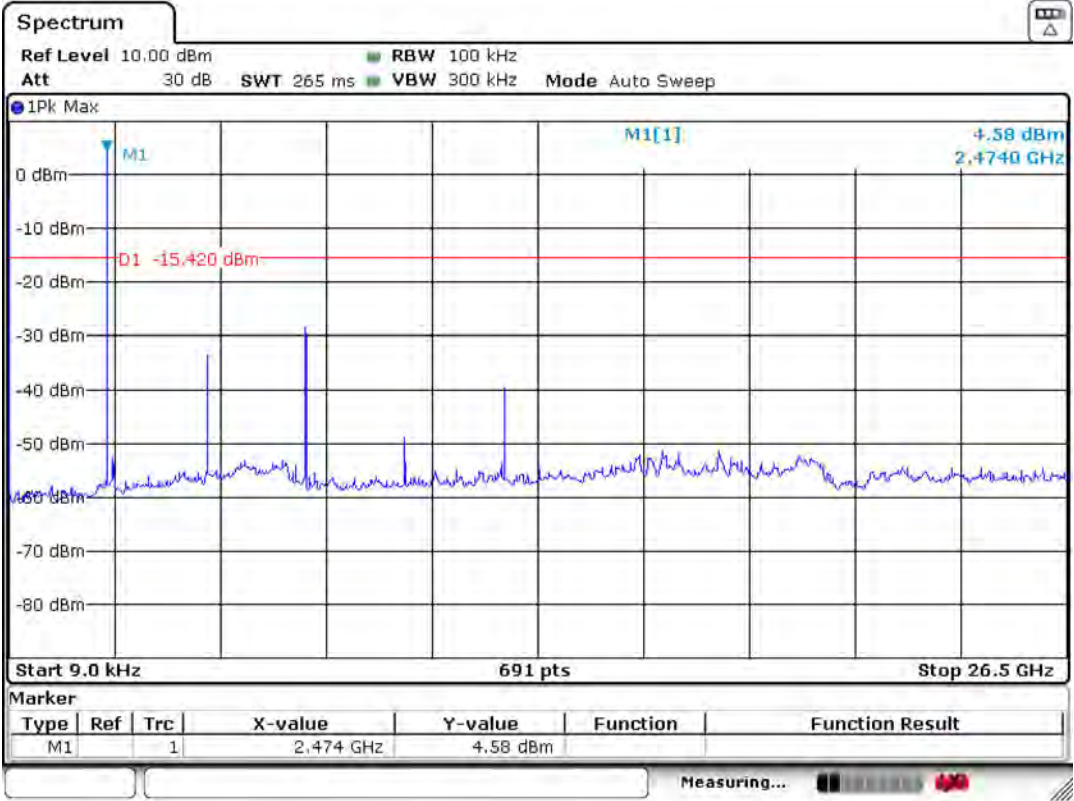
Test Data  
Conducted Spurious Emissions  
Test Mode: GFSK 2402MHz



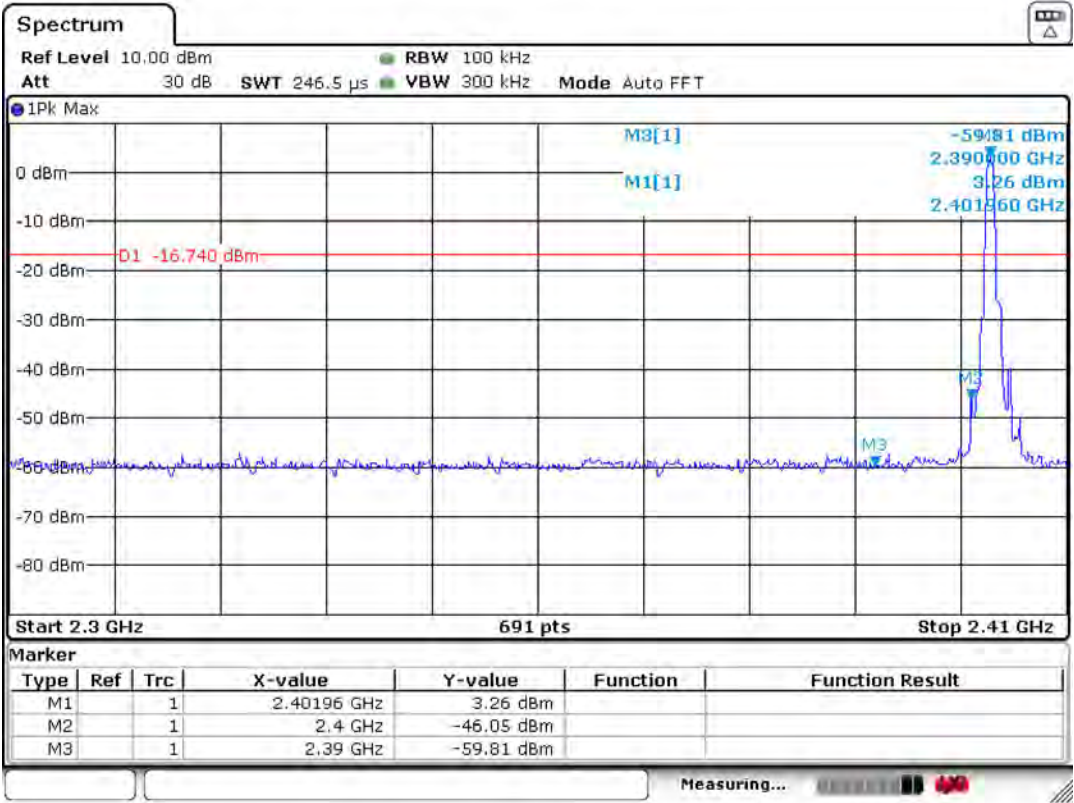
Test Mode: GFSK 2440MHz



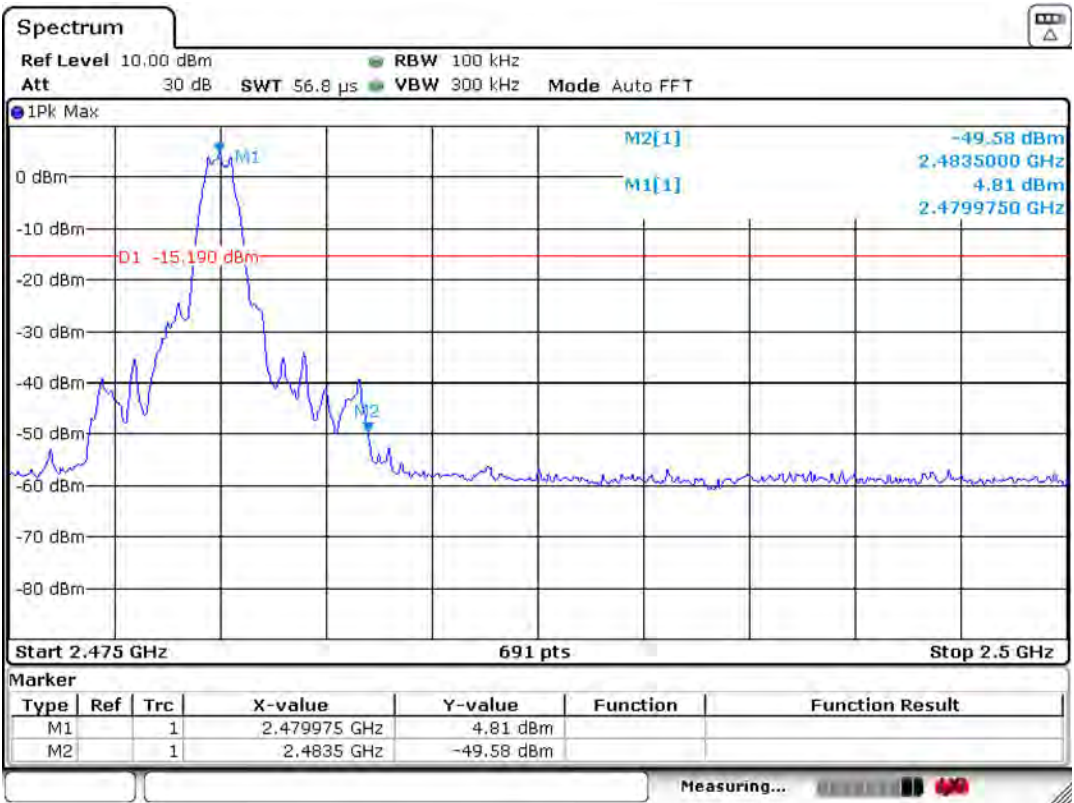
Test Mode: GFSK 2480MHz



Band-edge measurements for conducted emissions  
Test Mode: GFSK 2402MHz



Test Mode: GFSK 2480MHz



## 7 6dB Bandwidth Test

### 7.1 Limit

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

### 7.2 Test Procedure

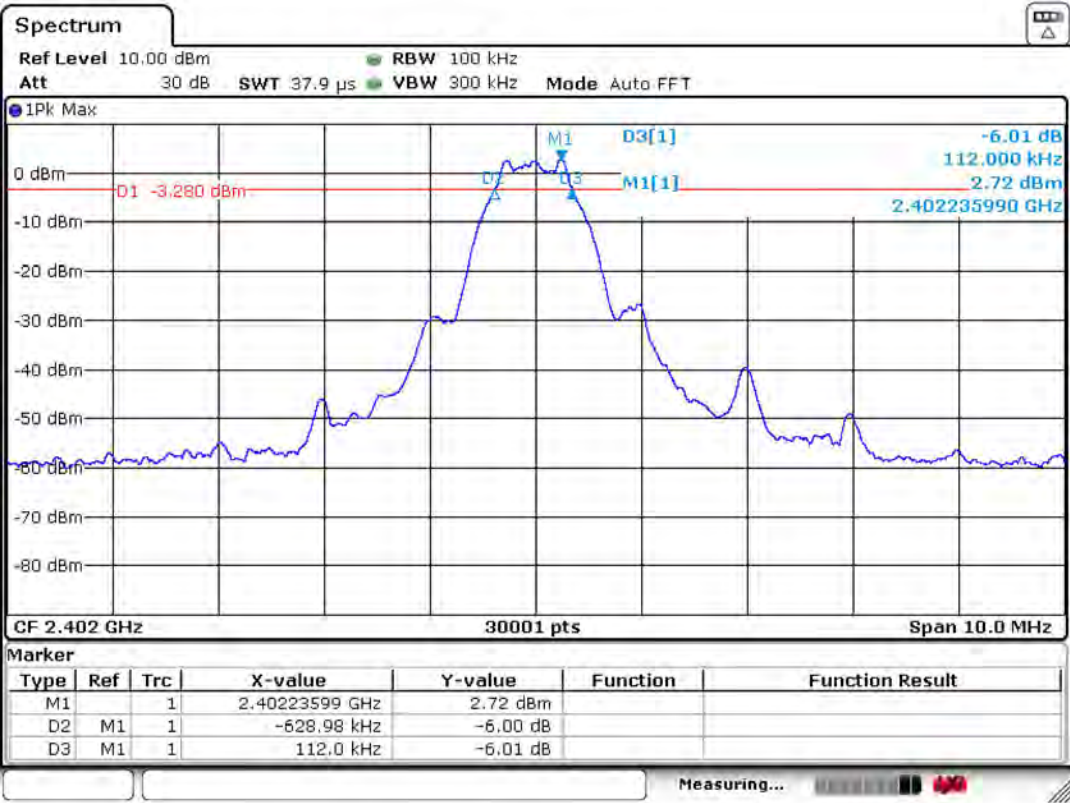
- 1, The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.
- 2, Follow the test procedure as described in KDB 558074
  - (1). Set resolution bandwidth (RBW) = 100 kHz.
  - (2). Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
  - (3). Detector = Peak.
  - (4). Trace mode = max hold.
  - (5). Sweep = auto couple.
  - (6). Allow the trace to stabilize.
  - (7). Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 7.3 Test Result

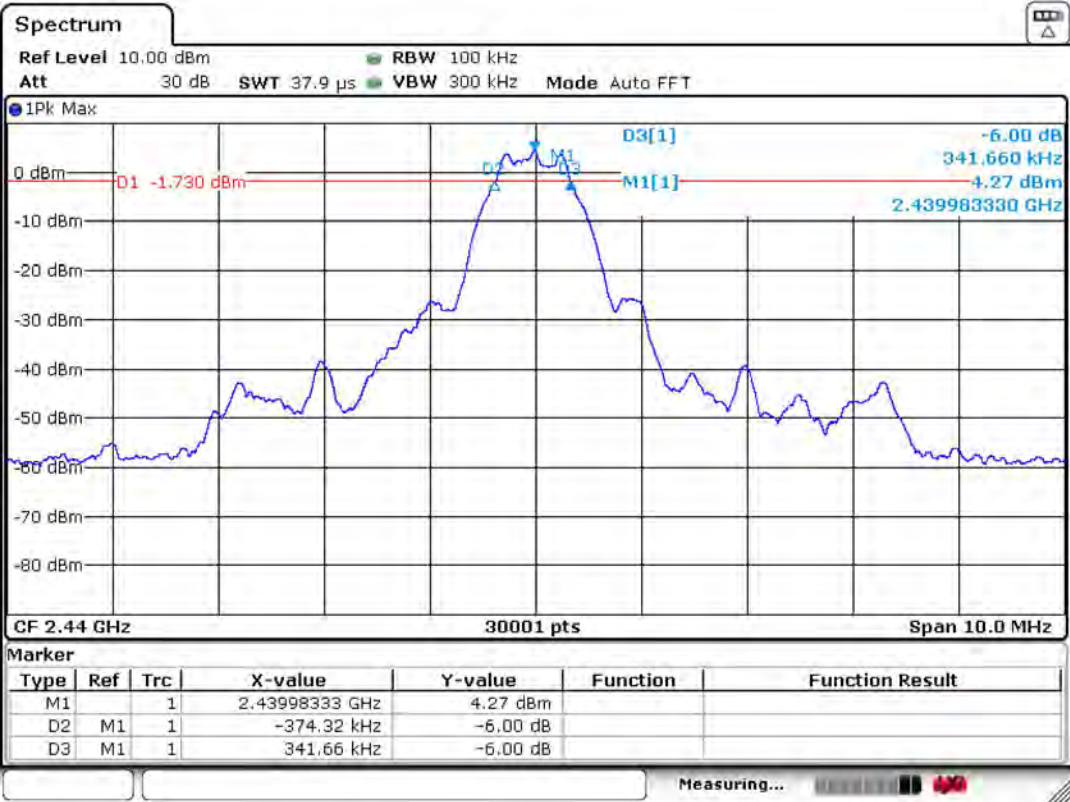
|                           |      |                          |                   |
|---------------------------|------|--------------------------|-------------------|
| EUT: 4 Channels amplifier |      |                          |                   |
| M/N: Z4-B                 |      |                          |                   |
| Test date: 2019-03-12     |      | Test site: RF Site       | Tested by: Viking |
| Test Mode                 | CH   | 6dB bandwidth<br>( MHz ) | Limit<br>(KHz)    |
| BT 4.1-BLE<br>GFSK        | CH1  | 0.741                    | >500              |
|                           | CH20 | 0.716                    | >500              |
|                           | CH40 | 0.736                    | >500              |
| Conclusion : PASS         |      |                          |                   |

7.4 Test Data

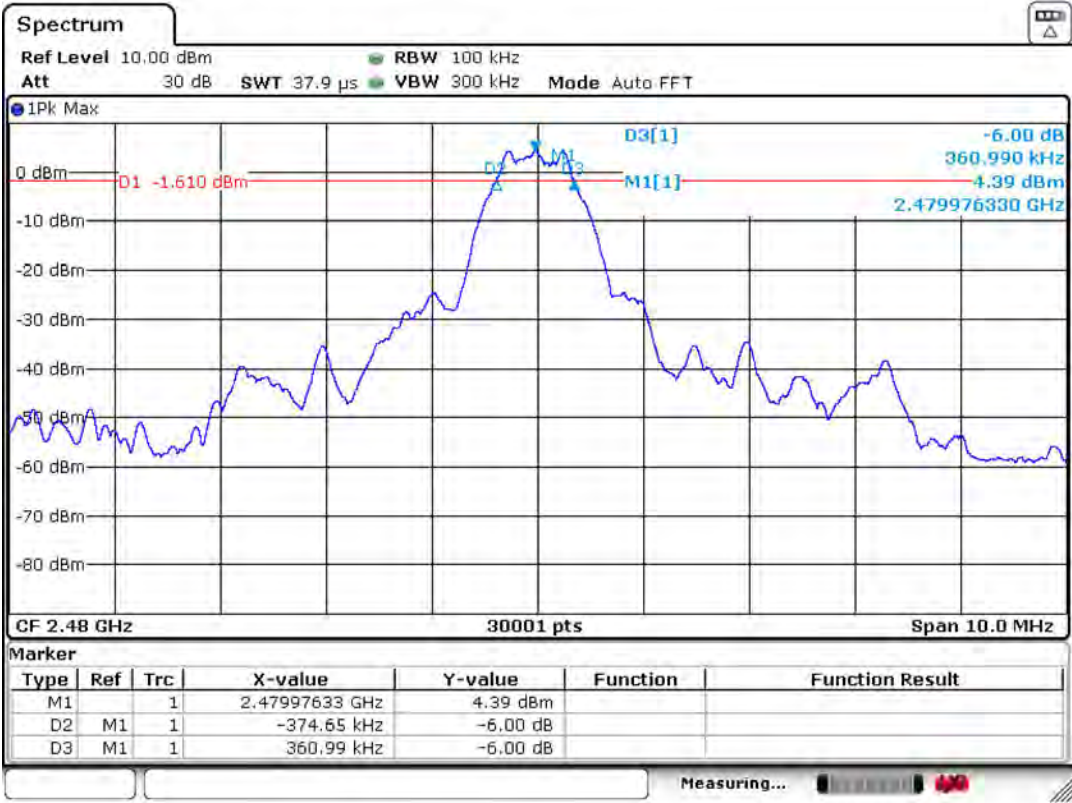
Test Mode: BT 4.1-BLE GFSK 2402MHz



Test Mode: BT 4.1-BLE GFSK 2440MHz



Test Mode: BT 4.1-BLE GFSK 2480MHz



## 8 OUTPUT POWER TEST

### 8.1 Limit

For systems using digital modulation in the 2400—2483.5MHz, The Peak out put Power shall not exceed 1W(30dBm)

### 8.2 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, Follow the test procedure as described in KDB 558074
  - (1). Set the RBW  $\geq$  DTS bandwidth.
  - (2). Set VBW  $\geq$  3 x RBW.
  - (3). Set span  $\geq$  3 x RBW.
  - (4). Sweep time = auto couple.
  - (5). Detector = peak.
  - (6). Trace mode = max hold.
  - (7). Allow trace to fully stabilize.
  - (8). Use peak marker function to determine the peak amplitude level.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

## 8.3 Test Result

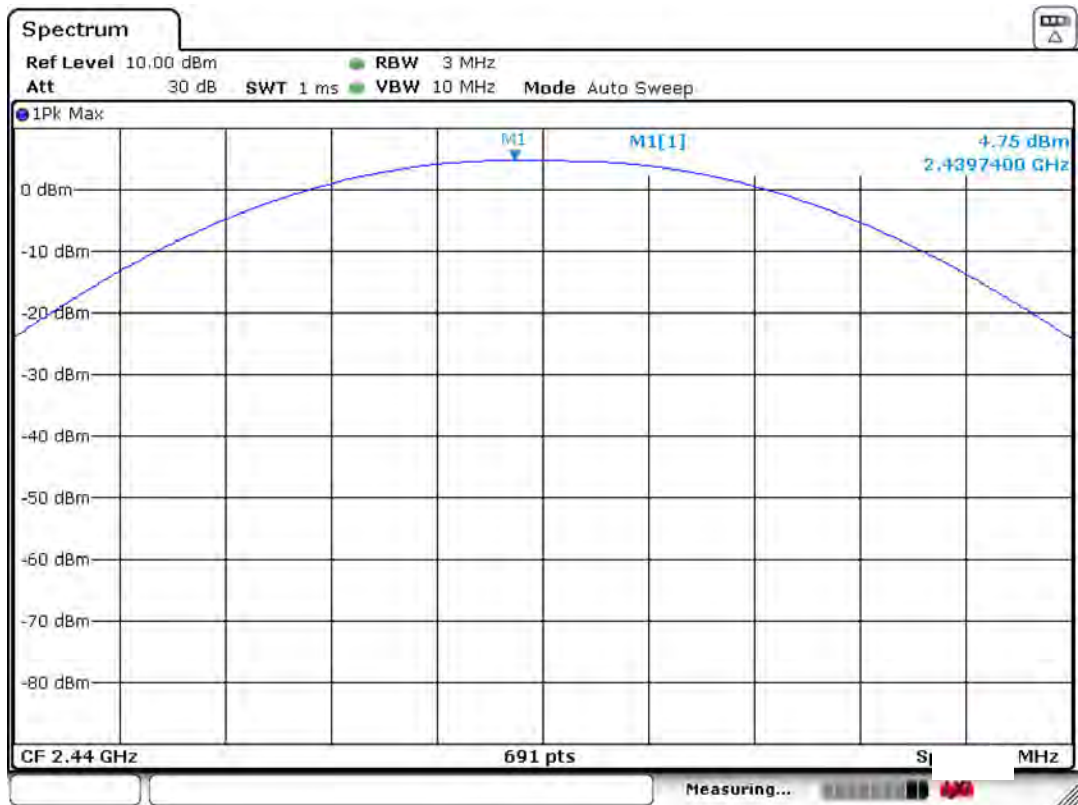
| EUT: 4 Channels amplifier |      |                              |                   |
|---------------------------|------|------------------------------|-------------------|
| M/N: Z4-B                 |      |                              |                   |
| Test date: 2019-03-12     |      | Test site: RF Site           | Tested by: Viking |
| Pass                      |      |                              |                   |
| Test Mode                 | CH   | Peak output Power<br>( dBm ) | Limit<br>(dBm)    |
| BT 4.1-BLE<br>GFSK        | CH1  | 3.81                         | 30                |
|                           | CH20 | 4.75                         | 30                |
|                           | CH40 | 5.11                         | 30                |
| Conclusion : PASS         |      |                              |                   |

8.4 Test Data

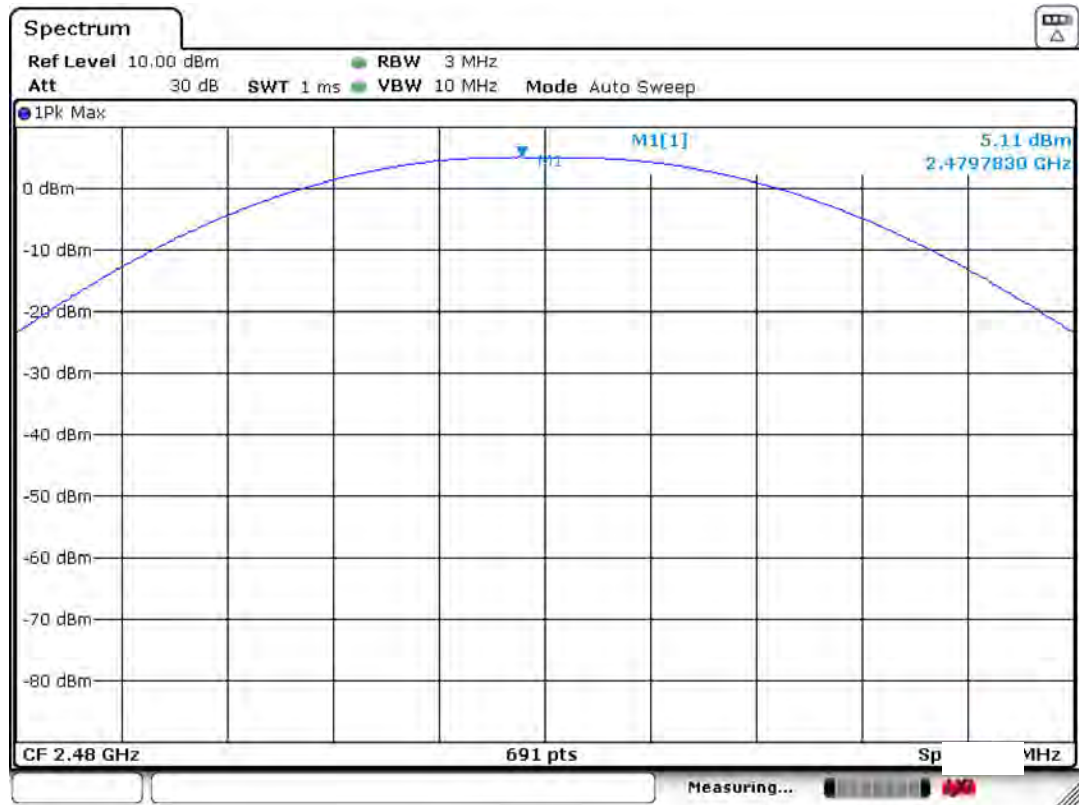
Test Mode: BT 4.1-BLE GFSK 2402MHz



Test Mode: BT 4.1-BLE GFSK 2440MHz



Test Mode: BT 4.1-BLE GFSK 2480MHz



## 9 POWER SPECTRAL DENSITY TEST

### 9.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

### 9.2 Test Procedure

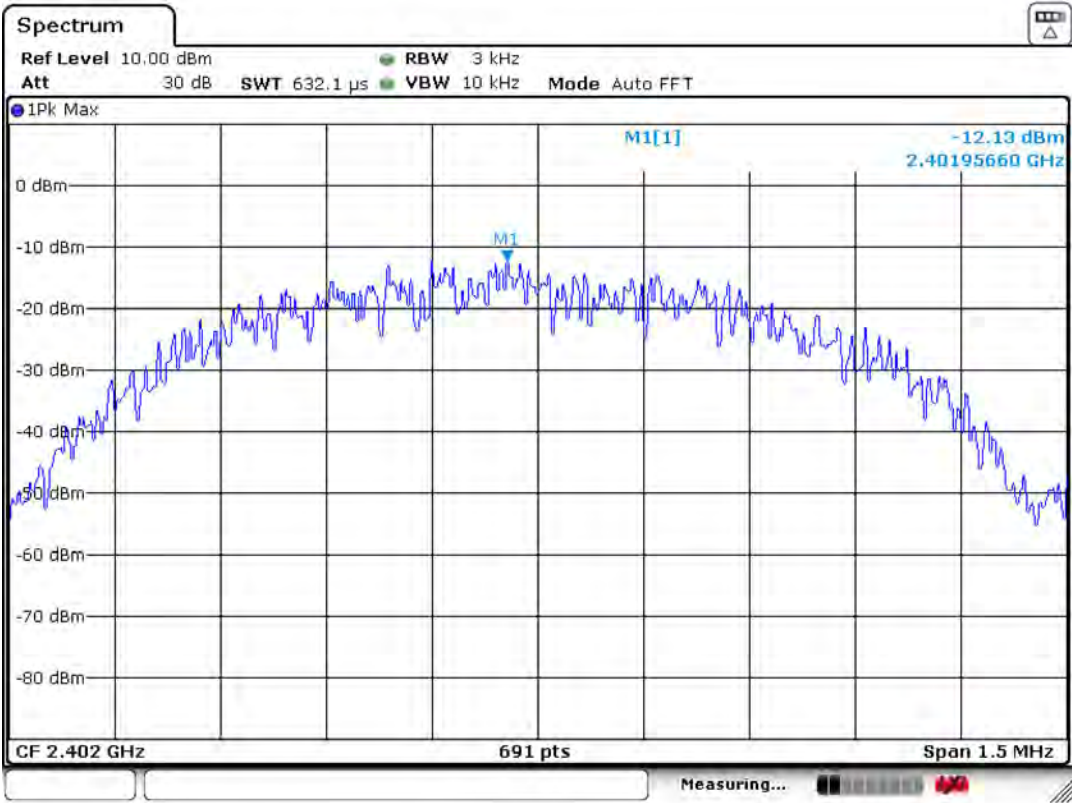
- 1, The transmitter output (antenna port) was connected to the spectrum analyzer. Connect EUT antenna terminal to the spectrum analyzer with a low loss SMA cable.
- 2, Follow the test procedure as described in KDB 558074
  - (1). Set analyzer center frequency to DTS channel center frequency.
  - (2). Set the span to 1.5 times the DTS bandwidth.
  - (3). Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
  - (4). Set the VBW  $\geq 3 \text{ RBW}$ .
  - (5). Detector = peak.
  - (6). Sweep time = auto couple.
  - (7). Trace mode = max hold.
  - (8). Allow trace to fully stabilize.
  - (9). Use the peak marker function to determine the maximum amplitude level.
  - (10). If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 9.3 Test Result

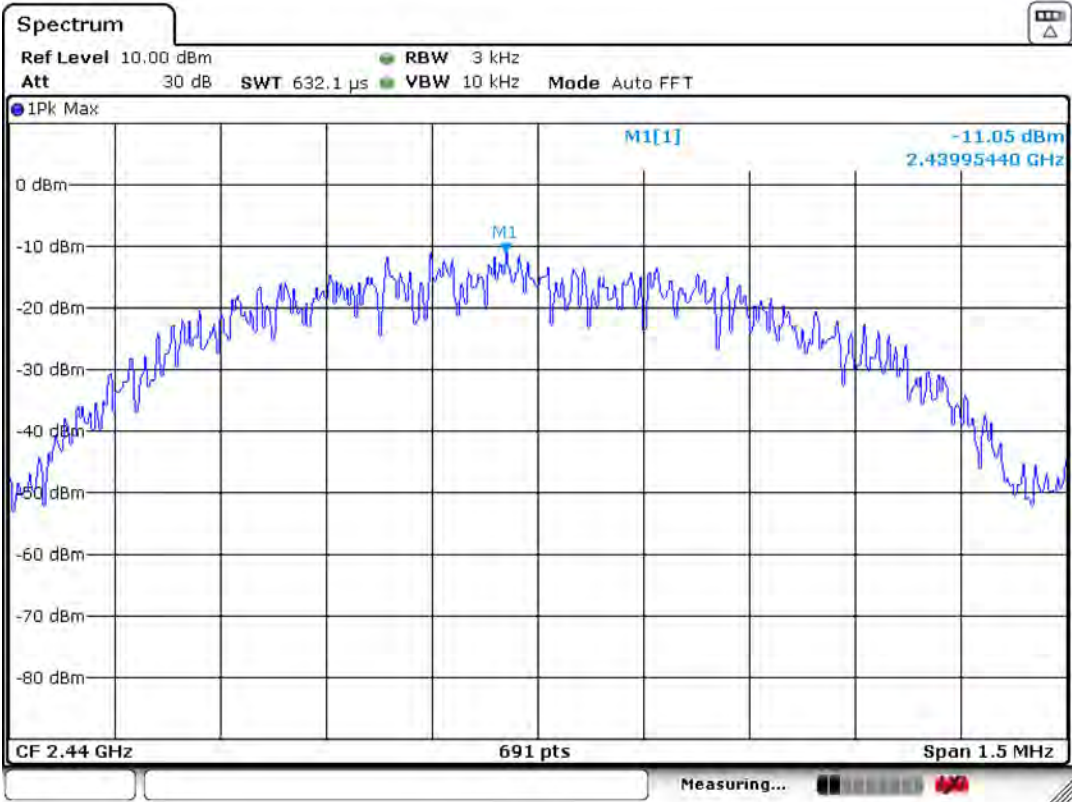
| EUT: 4 Channels amplifier |      |                             |                     |
|---------------------------|------|-----------------------------|---------------------|
| M/N: Z4-B                 |      |                             |                     |
| Test date: 2019-03-12     |      | Test site: RF Site          | Tested by: Viking   |
| Pass                      |      |                             |                     |
| Test Mode                 | CH   | Power density<br>(dBm/3kHz) | Limit<br>(dBm/3kHz) |
| BT 4.1-BLE<br>GFSK        | CH1  | -12.13                      | 8                   |
|                           | CH20 | -11.05                      | 8                   |
|                           | CH40 | -10.64                      | 8                   |
| Conclusion : PASS         |      |                             |                     |

9.4 Test Data

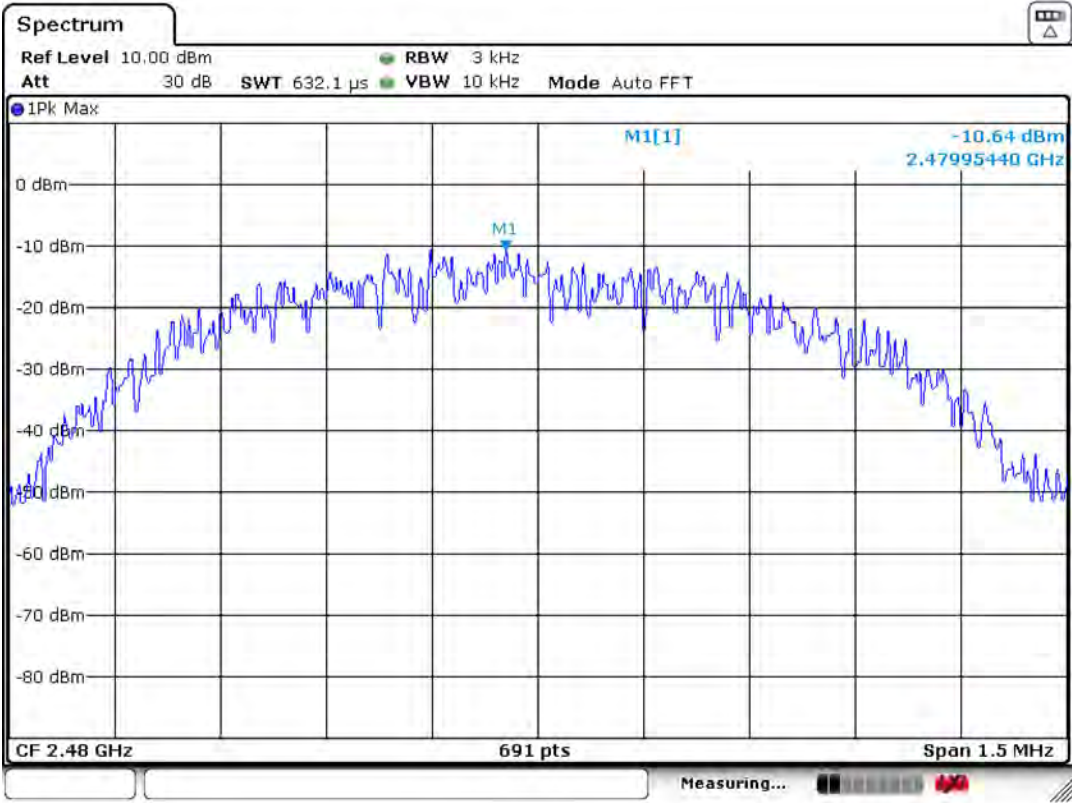
Test Mode: BT 4.1-BLE GFSK 2402MHz



Test Mode: BT 4.1-BLE GFSK 2440MHz



Test Mode: BT 4.1-BLE GFSK 2480MHz



## 10 ANTENNA REQUIREMENTS

### 10.1 Limit

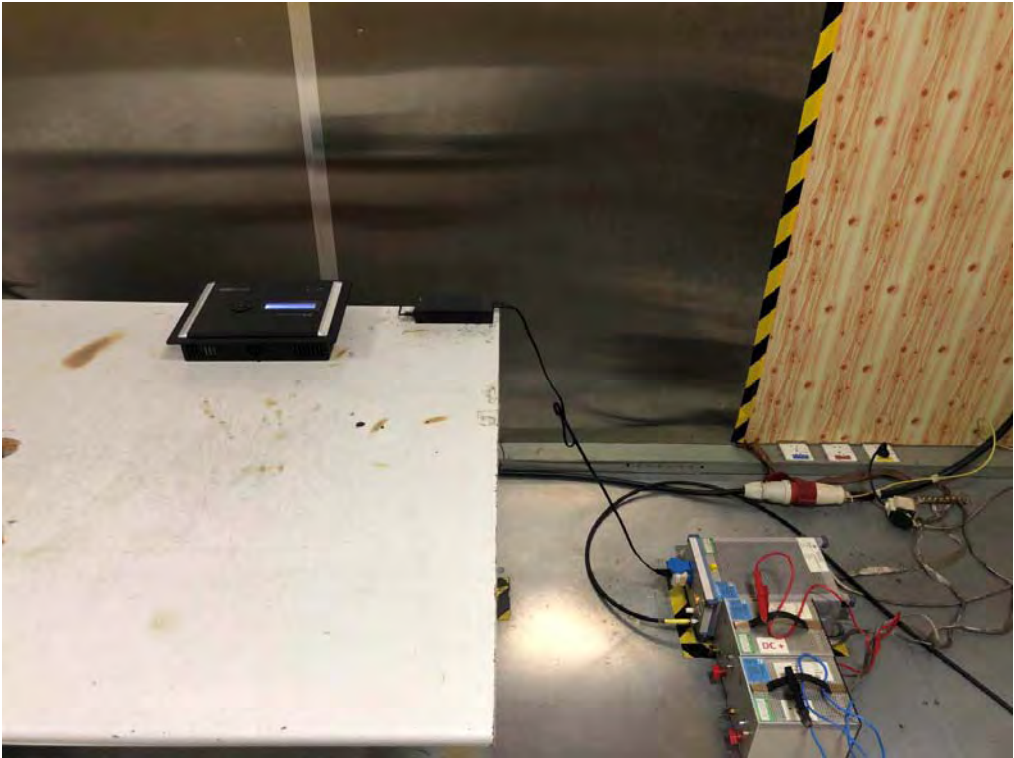
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional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

### 10.2 Result

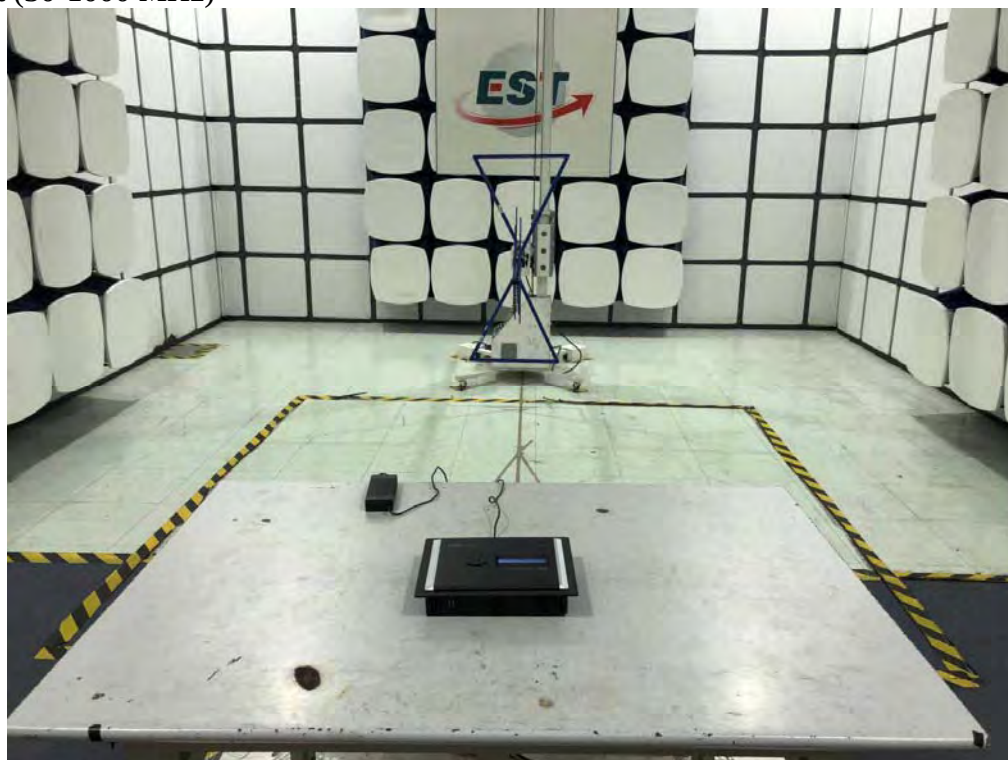
The antennas used for this product are Internal antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only -0.61dBi.

# 11 TEST SETUP PHOTO

Conducted Test



Radiated Test (30-1000 MHz)

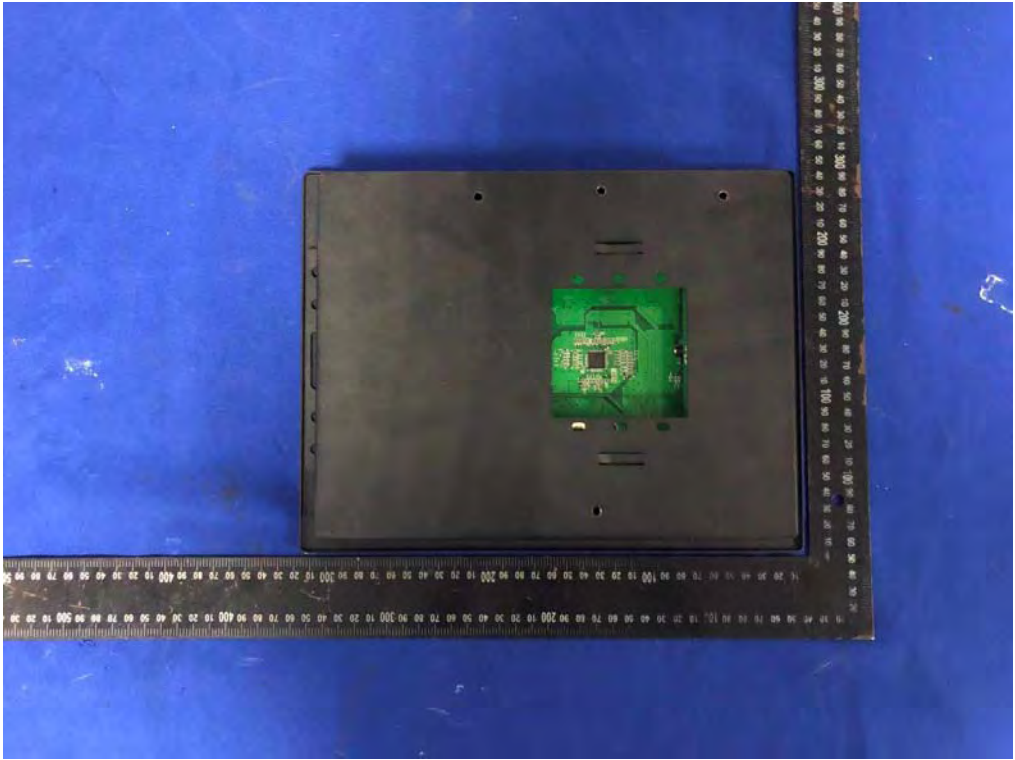


Radiated Test (Above 1GHz)



12PHOTO EUT

External Photos  
M/N: Z4-B



External Photos  
M/N: Z4-B



External Photos  
M/N: Z4-B



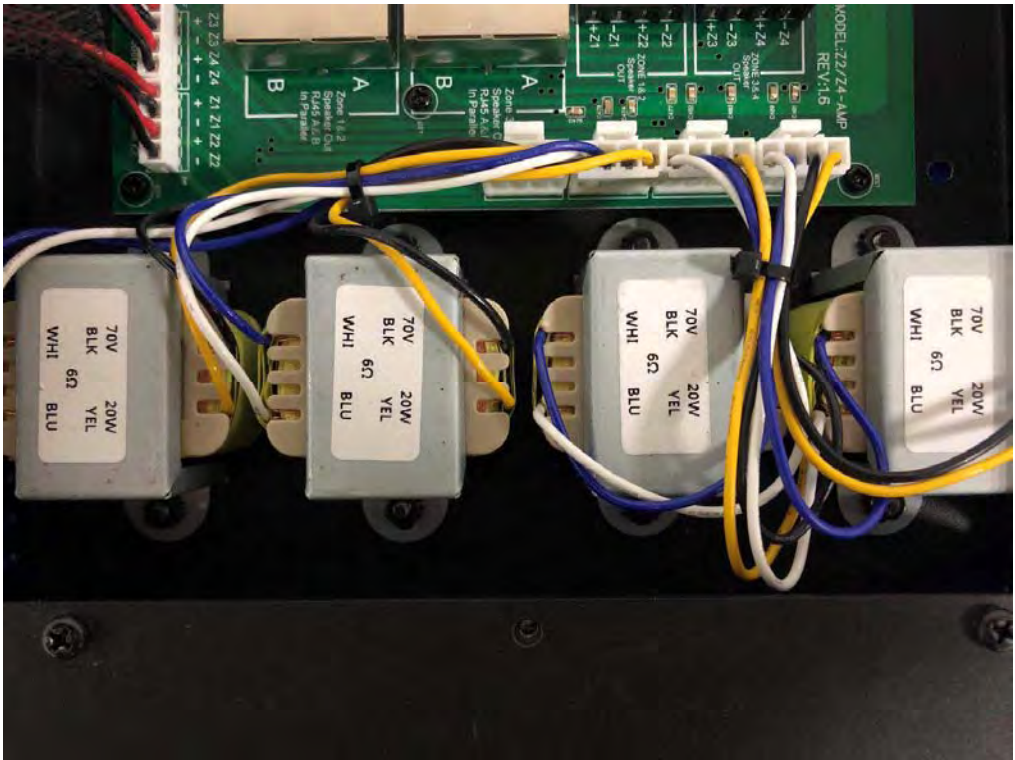
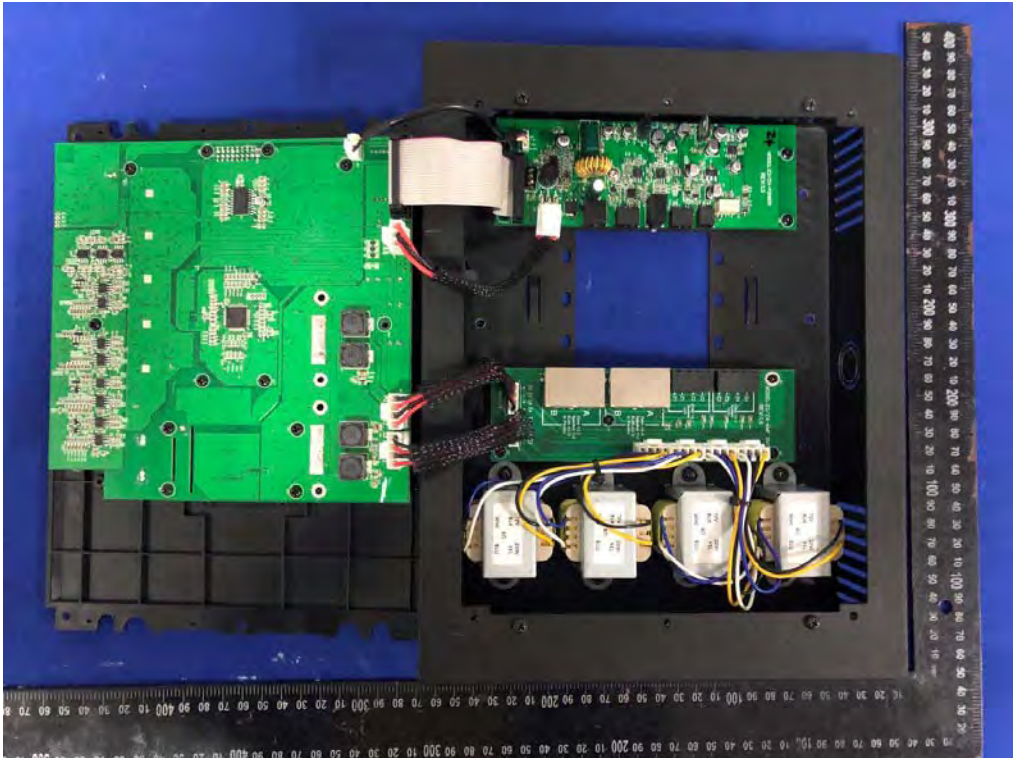
External Photos  
M/N: Z4-B



External Photos  
M/N: Z4-B



Internal Photos  
M/N: Z4-B



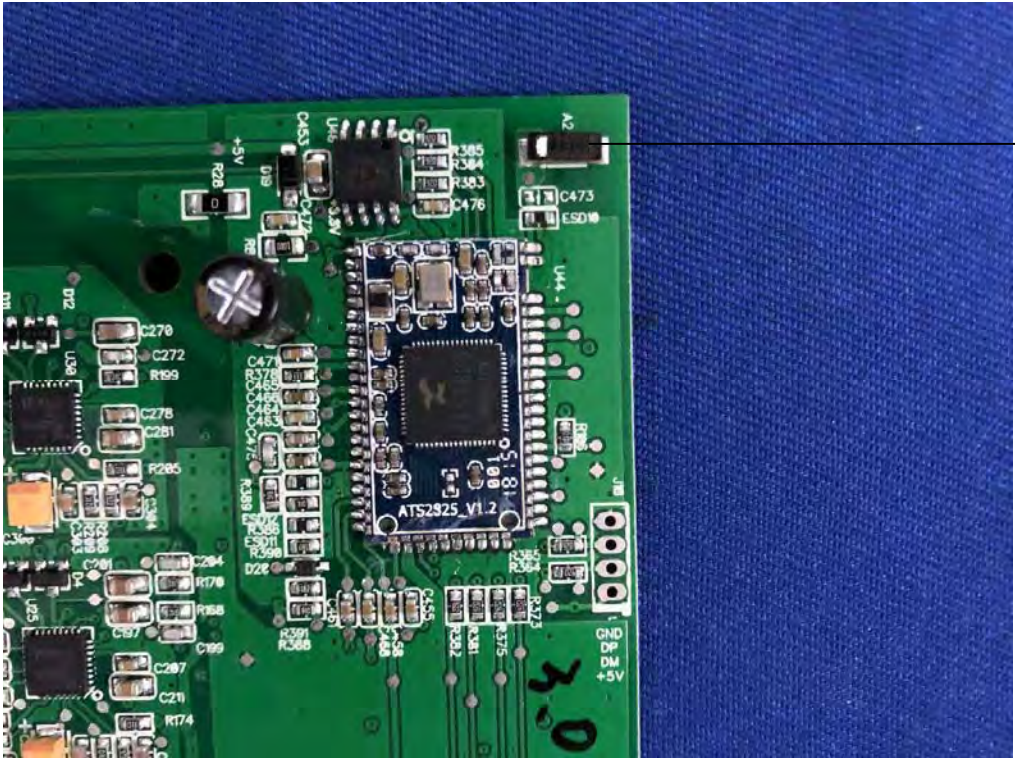
Internal Photos  
M/N: Z4-B



Internal Photos  
M/N: Z4-B

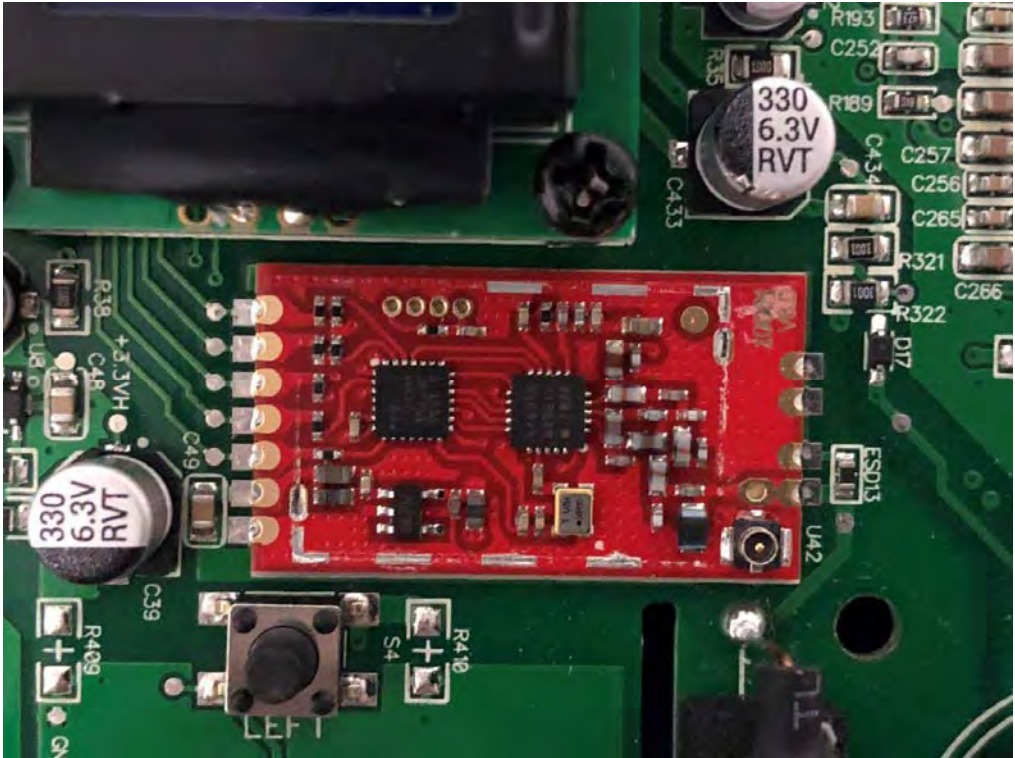


UHF  
Antenna

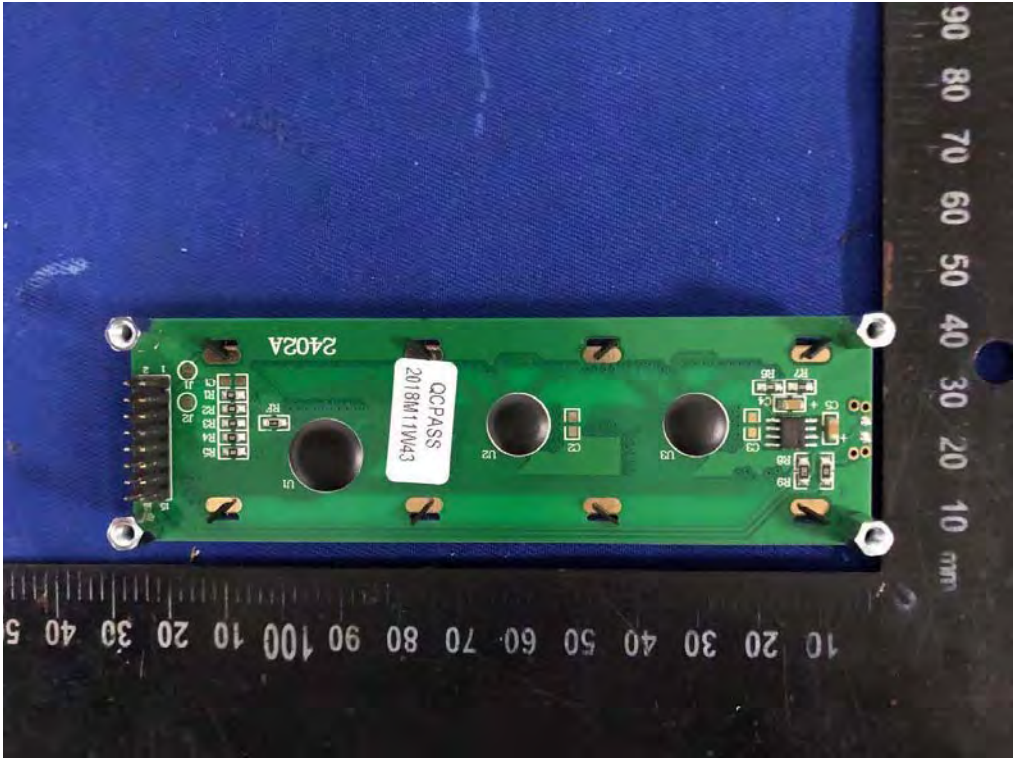
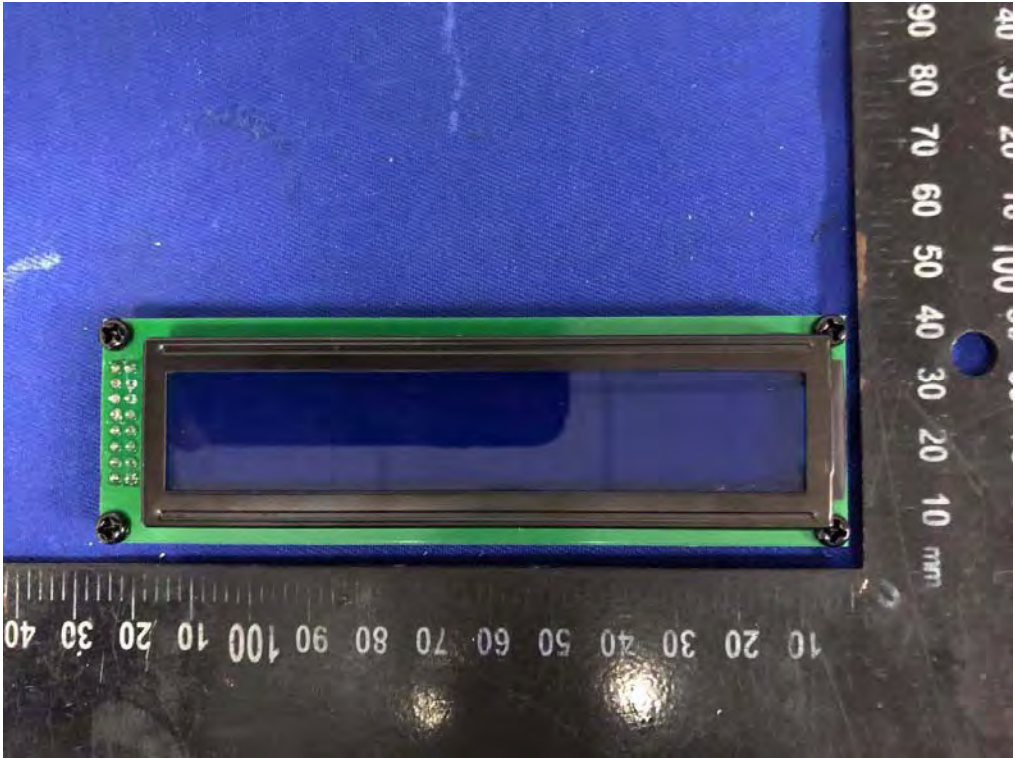


Bluetooth  
Antenna

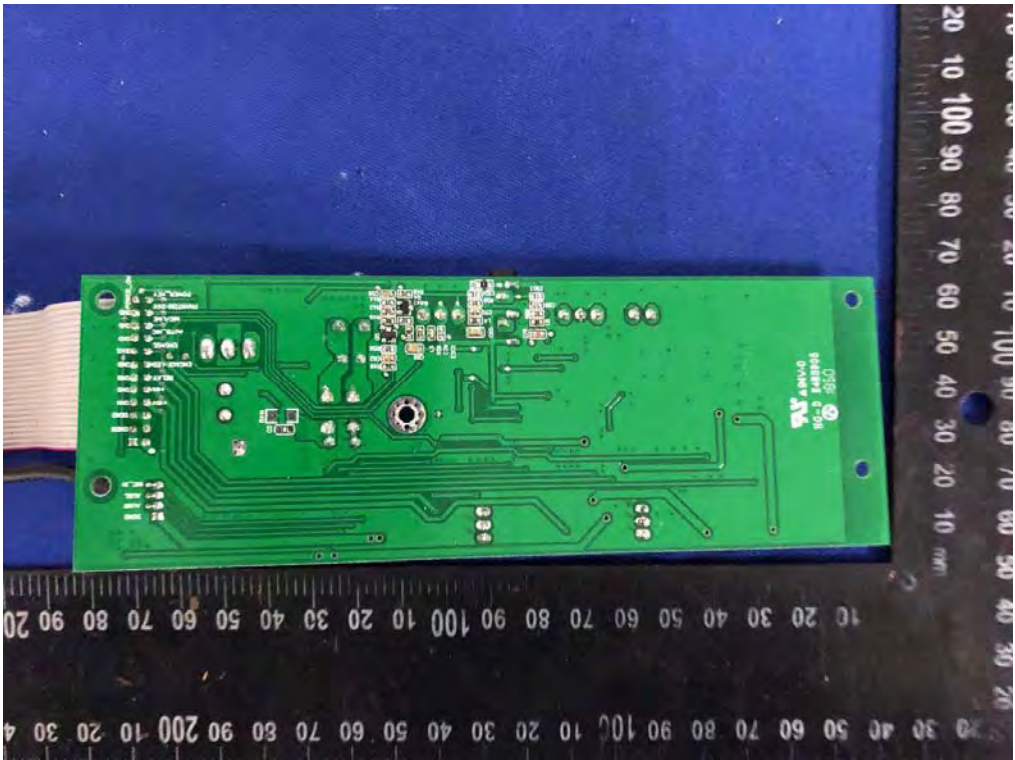
Internal Photos  
M/N: Z4-B



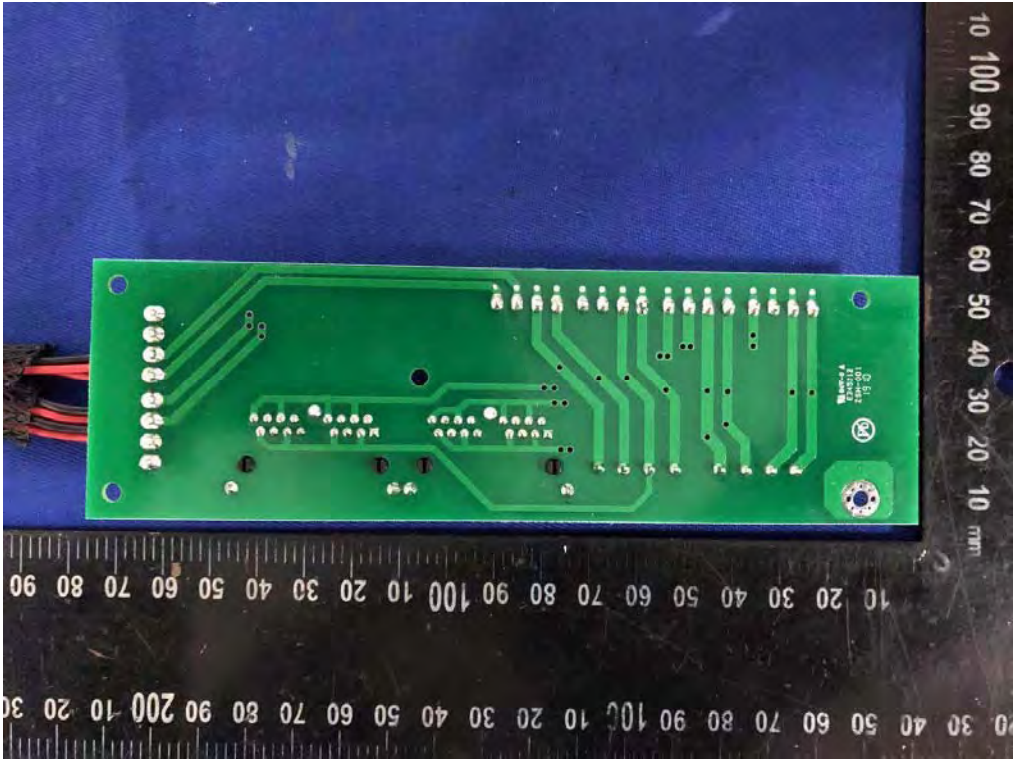
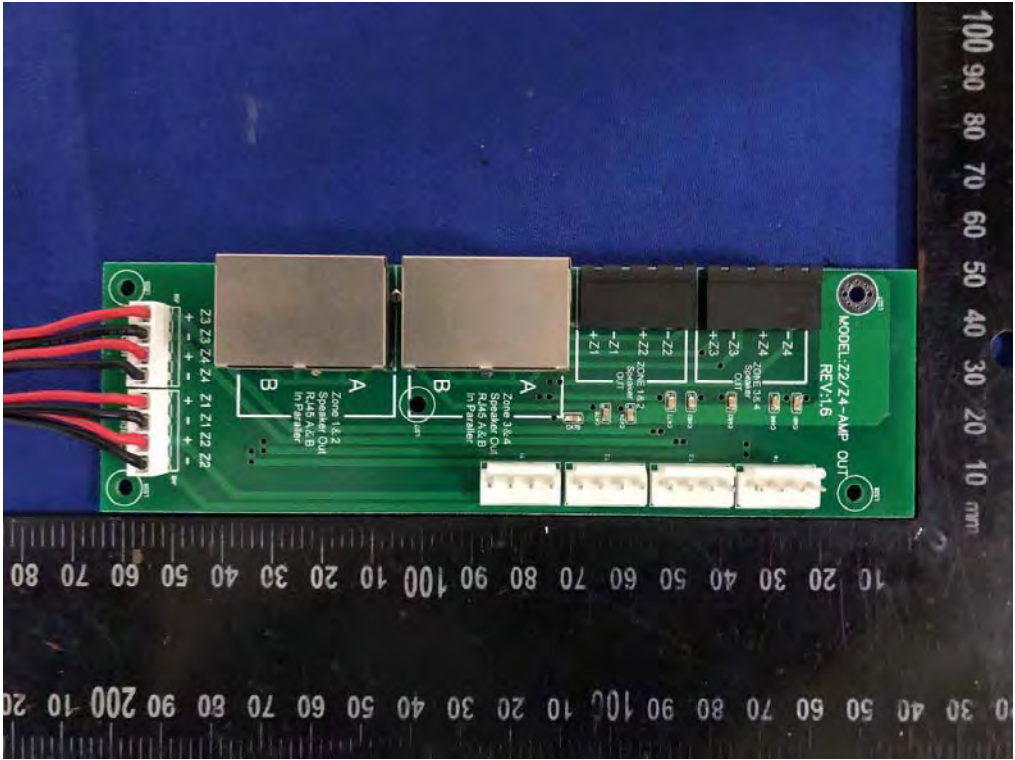
Internal Photos  
M/N: Z4-B



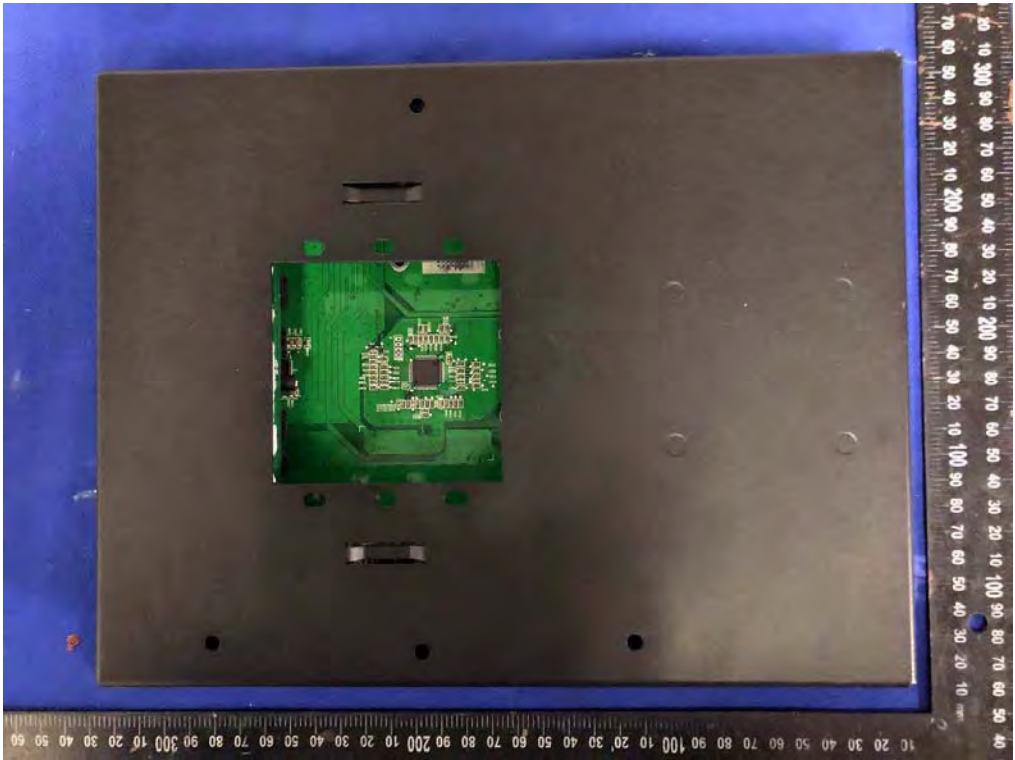
Internal Photos  
M/N: Z4-B



Internal Photos  
M/N: Z4-B



External Photos  
M/N: Z2-B



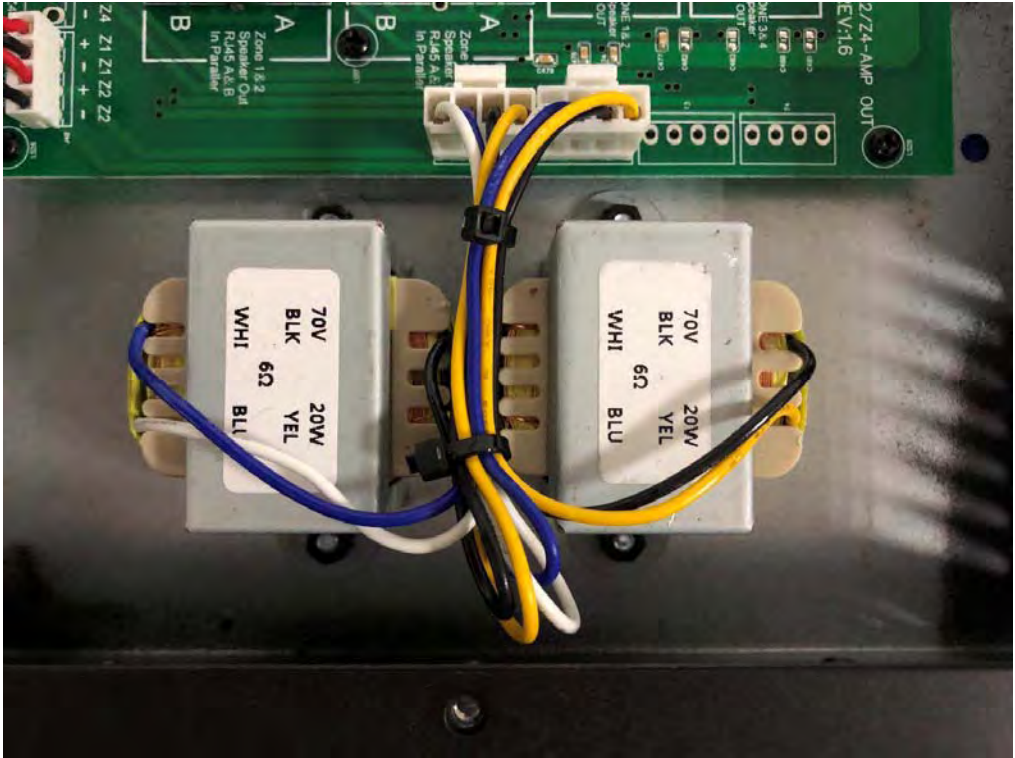
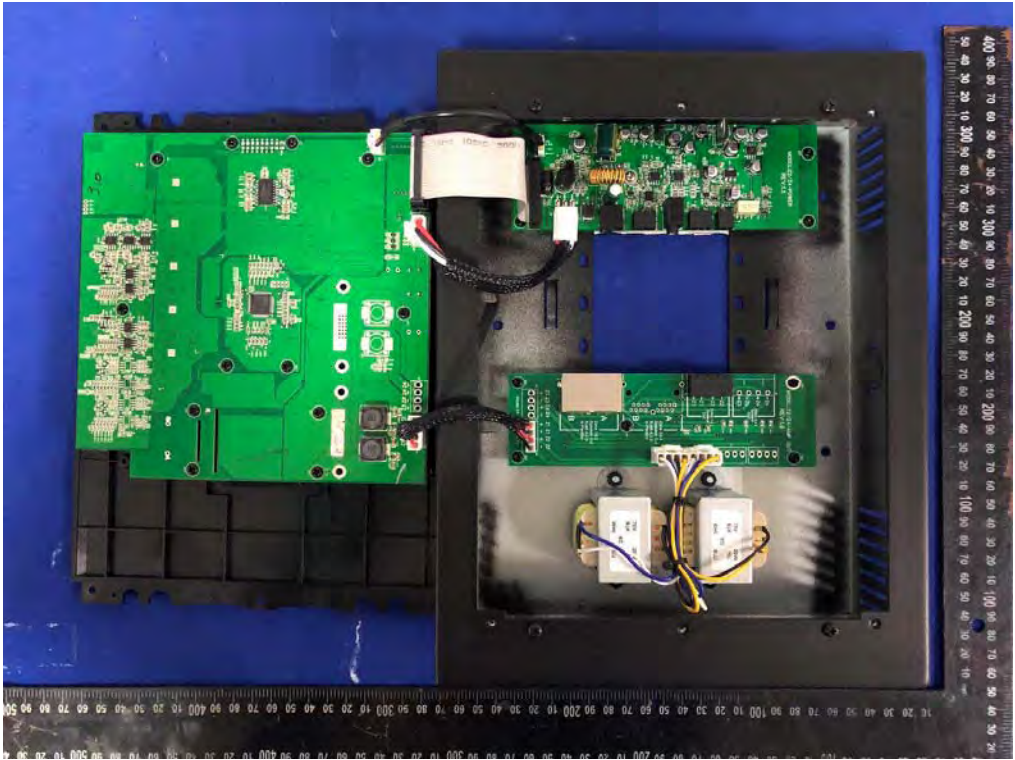
External Photos  
M/N: Z2-B



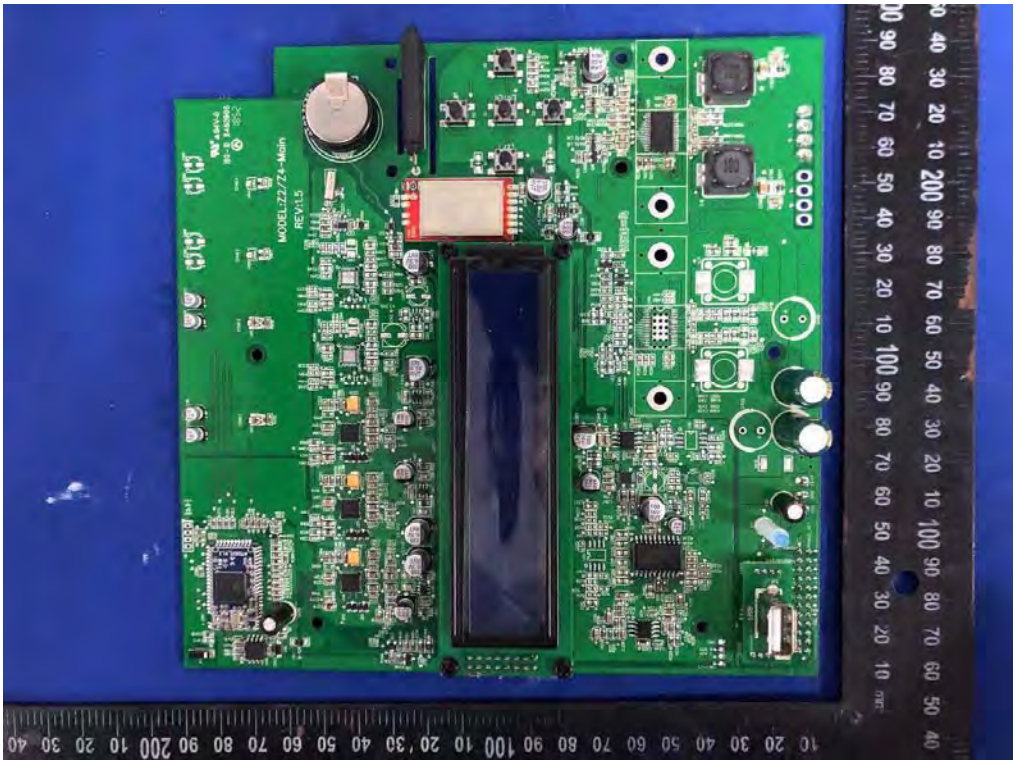
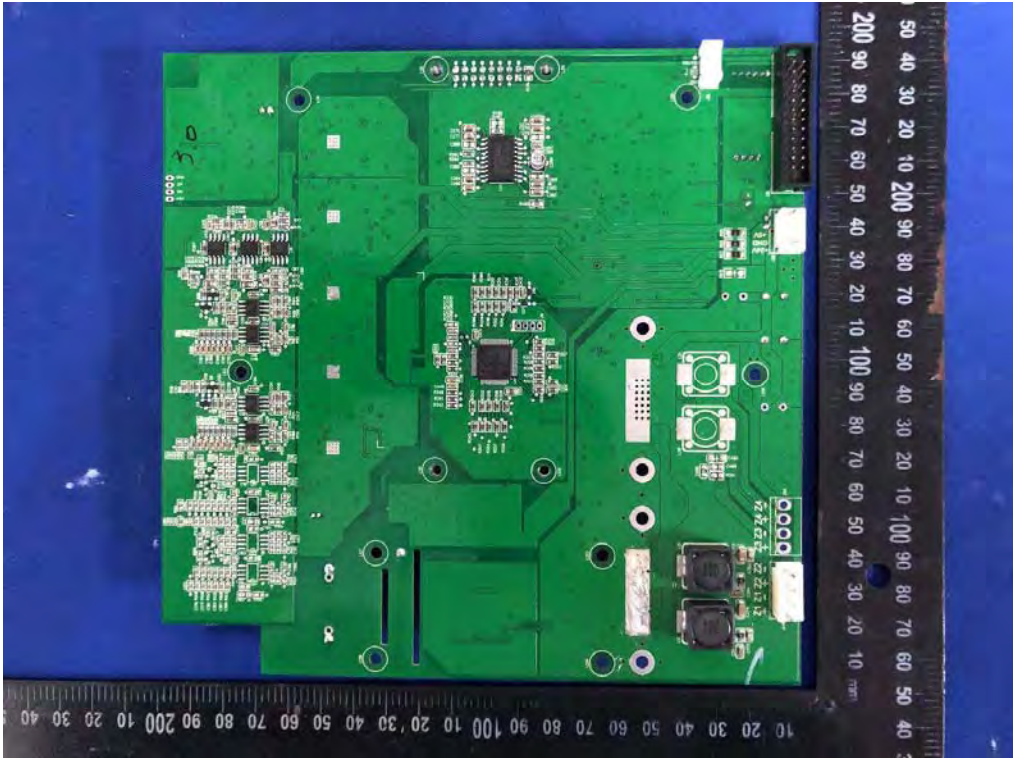
External Photos  
M/N: Z2-B



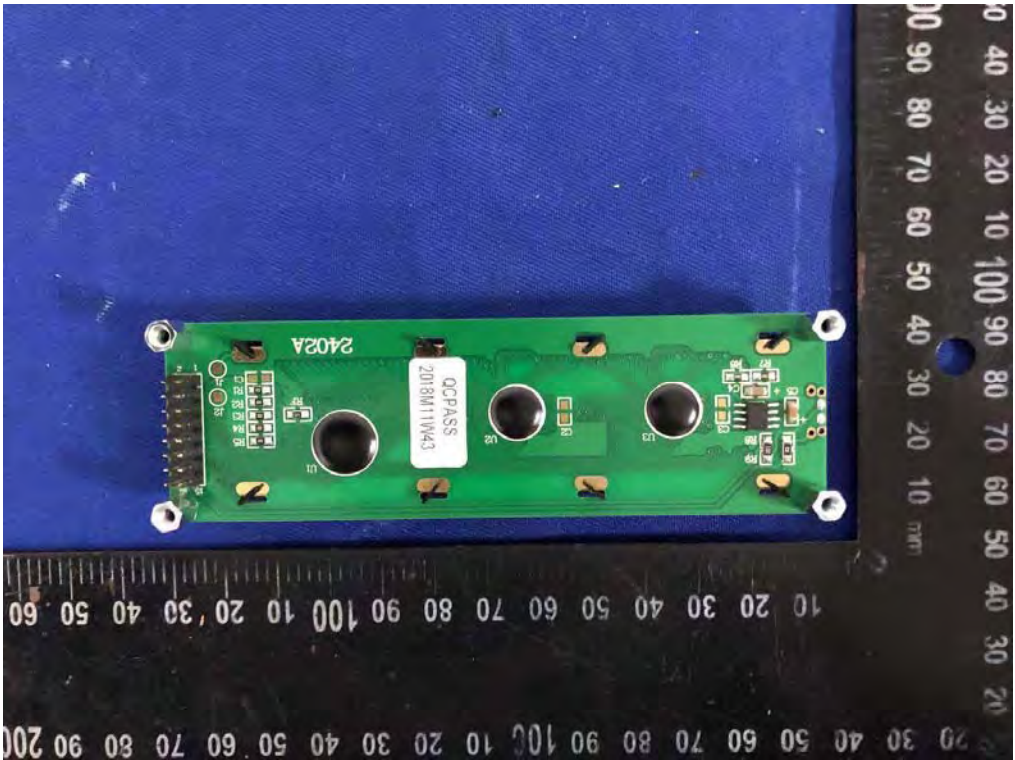
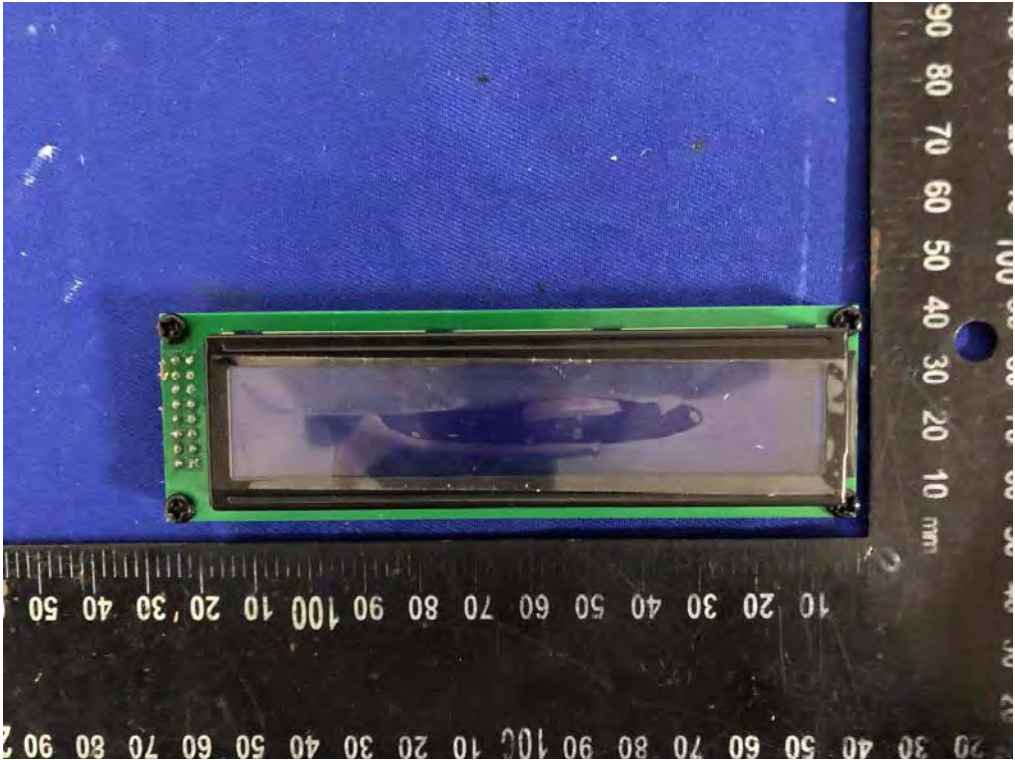
Internal Photos  
M/N: Z2-B



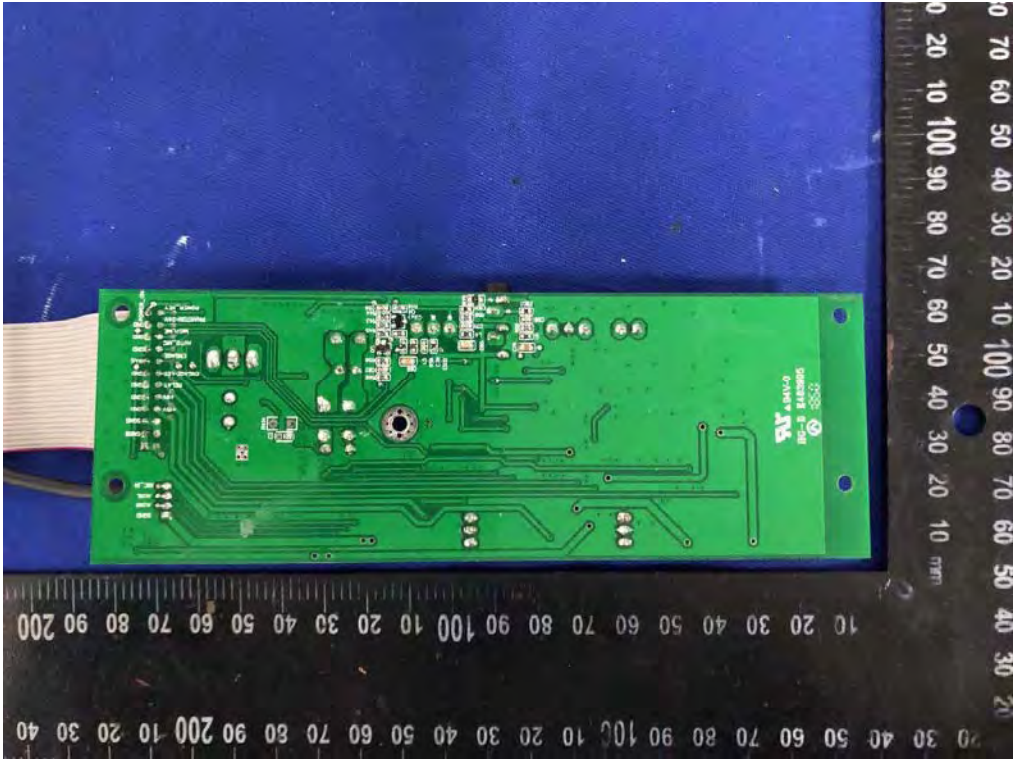
Internal Photos  
M/N: Z2-B



Internal Photos  
M/N: Z2-B



Internal Photos  
M/N: Z2-B



Internal Photos  
M/N: Z2-B

