



TEST REPORT

FCC ID: 2ACFQGYM1100FK

| | | |
|--|---|---|
| Product Name | : | Wireless Keyboard |
| Model Name | : | GYM1100FK, GYM1100CK, GYM2200CK, GYM2200FK, GYM5600CK, GYM5600FK |
| Brand Name | : | Adesso, Kodak, Gyration |
| Report No. | : | PTC20010802902E-FC01 |
| Prepared for | | |
| ADESSO INC. | | |
| 160 Commerce Way Walnut, CA 91789, U.S.A. | | |
| Prepared by | | |
| Precise Testing & Certification Co., LTD. | | |
| Building 1, No.6 Tongxin Road, Dongcheng Street, Dongguan, China | | |
| | | |



1TEST RESULT CERTIFICATION

Applicant's name : ADESSO INC.
Address : 160 Commerce Way Walnut, CA 91789, U.S.A.
Manufacture's name : ADESSO ELECTRONICS INC.
Address : No.5, ChengDa East St., Xiagang Community, Changan, DongGuan, China
Product name : Wireless Keyboard
Model name : GYM1100FK, GYM1100CK, GYM2200CK, GYM2200FK, GYM5600CK, GYM5600FK
Standards : FCC CFR47 Part 15 Section 15.249
Test procedure : ANSI C63.10: 2013
Test Date : January 14, 2020 to February 19, 2020
Date of Issue : February 19, 2020
Test Result : Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:

Handwritten signature of Leo Yang in black ink.

Leo Yang / Engineer

Technical Manager:

Handwritten signature of Chris Du in black ink.

Chris Du / Manager



Contents

| | Page |
|---|-------------|
| 1 TEST RESULT CERTIFICATION | 2 |
| 2 TEST SUMMARY..... | 5 |
| 3 TEST FACILITY | 6 |
| 4 GENERAL INFORMATION..... | 7 |
| 4.1 GENERAL DESCRIPTION OF E.U.T..... | 7 |
| 4.2 TEST MODE | 8 |
| 5 EQUIPMENT DURING TEST | 9 |
| 5.1 EQUIPMENTS LIST | 9 |
| 5.2 MEASUREMENT UNCERTAINTY..... | 10 |
| 5.3 DESCRIPTION OF SUPPORT UNITS..... | 11 |
| 6 CONDUCTED EMISSION..... | 12 |
| 6.1 E.U.T. OPERATION | 12 |
| 6.2 EUT SETUP | 12 |
| 6.3 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) | 13 |
| 6.4 MEASUREMENT PROCEDURE..... | 13 |
| 6.5 CONDUCTED EMISSION LIMIT..... | 13 |
| 6.6 MEASUREMENT DESCRIPTION | 13 |
| 6.7 CONDUCTED EMISSION TEST RESULT..... | 13 |
| 7 FIELD STRENGTH OF FUNDAMENTAL EMISSION AND RADIATED SPURIOUS EMISSIONS | 14 |
| 7.1 EUT OPERATION..... | 15 |
| 7.2 TEST SETUP | 15 |
| 7.3 SPECTRUM ANALYZER SETUP | 17 |
| 7.4 TEST PROCEDURE..... | 17 |
| 7.5 SUMMARY OF TEST RESULTS | 18 |
| 8 20 DB BANDWIDTH MEASUREMENT | 23 |
| 8.1 TEST PROCEDURE..... | 23 |
| 8.2 TEST RESULT | 23 |
| 9 ANTENNA REQUIREMENT..... | 25 |
| 9.1 ANTENNA REQUIREMENT | 25 |



| | | |
|-----|-------------------|----|
| 9.2 | RESULT..... | 25 |
| 10 | TEST PHOTOS | 26 |
| 11 | EUT PHOTOS..... | 27 |



2 Test Summary

| Test Items | Test Requirement | Result |
|---|------------------------|--------------|
| AC Power Conducted Emission | 15.207 | N/A (Note 1) |
| 20dB Bandwidth | 15.215(c) | PASS |
| Field Strength of Fundamental Emissions | 15.249(a) 15.249(c) | PASS |
| Radiated Spurious Emissions | 15.205(a) 15.209(a) | PASS |
| Antenna Requirement | 15.203 | PASS |

Note:

1. The EUT only powered by battery, no need to evaluate AC Power Conducted Emission.
2. The EUT is powered by new batteries during the test.



Report No.: PTC20010802902E-FC01

3 TEST FACILITY

Precise Testing & Certification Co., LTD.

Building 1, No.6 Tongxin Road, Dongcheng Street, Dongguan, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1



4 General Information

4.1 General Description of E.U.T.

| | | |
|---------------------|---|---|
| Product Name | : | Wireless Keyboard |
| Model Name | : | GYM1100FK, GYM1100CK, GYM2200CK, GYM2200FK, GYM5600CK, GYM5600FK (Note: The samples are the same except appearance and model number. So GYM1100FK was selected for full tested.) |
| Operating frequency | : | 2404MHz-2480MHz |
| Numbers of Channel | : | 5 |
| Antenna Type | : | Internal Antenna |
| Antenna Gain | : | 4dBi |
| Type of Modulation | : | GFSK |
| Power supply | : | DC 5V |
| Hardware Version | : | V1.0 |
| Software Version | : | V1.0 |



4.2 Test Mode

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

For Radiated: The EUT's antenna was pre-tested under the following modes:

| Test Mode | Description |
|-----------|-------------|
| Mode A | X-Y axis |
| Mode B | Y-Z axis |
| Mode C | X-Z axis |

From the above modes, the worst case was found in Mode A, Therefore only the test data of the mode was recorded in this report.

Channel List:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 1 | 2404 | 2 | 2424 |
| 3 | 2444 | 4 | 2476 |
| 5 | 2480 | | |

The 3 channels of lower, middle and higher were chosen for test.

| Channel | Frequency(MHz) |
|---------|----------------|
| 1 | 2404 |
| 3 | 2444 |
| 5 | 2480 |



5 Equipment During Test

5.1 Equipments List

RF Conducted Test

| Name of Equipment | Manufacturer | Model | Serial No. | Characteristics | Calibration Due |
|---------------------|--------------|---------|------------|-----------------|-----------------|
| MXG Signal Analyzer | Agilent | N9020A | MY56070279 | 10Hz-30GHz | July 15, 2019 |
| Coaxial Cable | CDS | 79254 | 46107086 | 10Hz-30GHz | July 15, 2019 |
| Power Meter | Anritsu | ML2495A | 0949003 | 300MHz-40GHz | July 15, 2019 |
| Power Sensor | Anritsu | MA2411B | 0917017 | 300MHz-40GHz | July 15, 2019 |

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions

| Radiated Emissions | | | | | | | |
|--------------------|---------------------------|-----------------|-----------|----------------|------------------|------------------|--------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until | Calibration period |
| 1 | EMI Test Receiver | Rohde & Schwarz | ESCI | 101417 | July 15, 2019 | July 14, 2020 | 1 year |
| 2 | EMC Analyzer (9k~26.5GHz) | Agilent | E4407B | MY45109 572 | Aug.04, 2019 | Aug.03, 2020 | 1 year |
| 3 | Trilog Broadband Antenna | SCHWARZB ECK | VULB9160 | 9160- 3355 | July 15, 2019 | July 14, 2020 | 1 year |
| 4 | Amplifier | EM | EM-30180 | 060538 | July 15, 2019 | July 14, 2020 | 1 year |
| 5 | Horn Antenna | SCHWARZB ECK | BBHA9120D | 9120D- 1246 | July 15, 2019 | July 14, 2020 | 1 year |
| 6 | Coaxial Cable(below 1GHz) | LARGE | CALB1 | - | July 15, 2019 | July 14, 2020 | 1 year |
| 7 | Coaxial Cable(above 1GHz) | LARGE | CALB2 | - | July 15, 2019 | July 14, 2020 | 1 year |



5.2 Measurement Uncertainty

| Parameter | Uncertainty |
|---|--------------------------|
| RF output power, conducted | ±1.0dB |
| Power Spectral Density, conducted | ±2.2dB |
| Radio Frequency | ± 1 x 10 ⁻⁶ |
| Bandwidth | ± 1.5 x 10 ⁻⁶ |
| Time | ±2% |
| Duty Cycle | ±2% |
| Temperature | ±1°C |
| Humidity | ±5% |
| DC and low frequency voltages | ±3% |
| Conducted Emissions (150kHz~30MHz) | ±3.64dB |
| Radiated Emission(30MHz~1GHz) | ±5.03dB |
| Radiated Emission(1GHz~25GHz) | ±4.74dB |
| Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95% | |



5.3 Description of Support Units

| Equipment | Model No. | Series No. |
|-----------|-----------|------------|
| Notebook | Y1 | N/A |

6 Conducted Emission

Test Requirement: : FCC CFR 47 Part 15 Section 15.207
Test Method: : ANSI C63.10: 2013
Test Result: : PASS
Frequency Range: : 150kHz to 30MHz
Class/Severity: : Class B

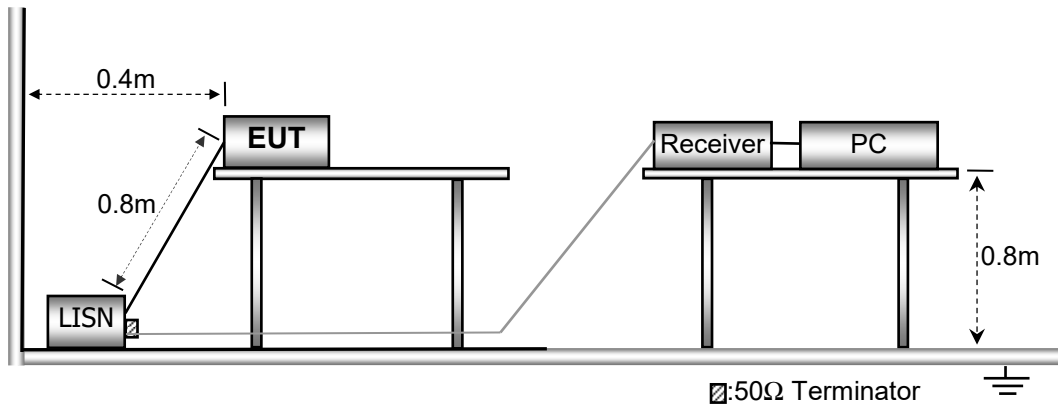
6.1 E.U.T. Operation

Operating Environment :

Temperature: : 25.5 °C
Humidity: : 51 % RH
Atmospheric Pressure: : 101.2kPa

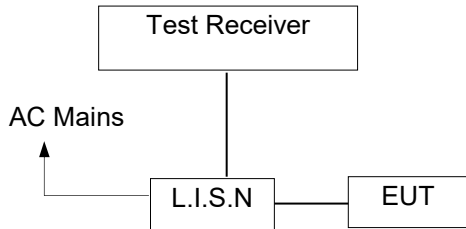
6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.





6.3 Test SET-UP (Block Diagram of Configuration)



6.4 Measurement Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

6.5 Conducted Emission Limit

Conducted Emission

| Frequency(MHz) | Quasi-peak | Average |
|----------------|------------|---------|
| 0.15-0.5 | 66-56 | 56-46 |
| 0.5-5.0 | 56 | 46 |
| 5.0-30.0 | 60 | 50 |

Note:

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

6.6 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.7 Conducted Emission Test Result

N/A.

The EUT only powered by battery, no need to evaluate AC Power Conducted Emission.



7 Field Strength of Fundamental Emission and Radiated Spurious Emissions

Test Requirement: : FCC Part C section 15.205 & 15.209 & 15.249
 Test Method: : ANSI C63.10: 2013
 Test Result: : PASS
 Measurement Distance: : 3m
 Limit: : See the follow table
 15.209 limit:

| Frequency (MHz) | Field Strength | | Field Strength Limit at 3m Measurement Dist | |
|-----------------|----------------|--------------|---|--------------------------------------|
| | uV/m | Distance (m) | uV/m | dBuV/m |
| 0.009 ~ 0.490 | 2400/F(kHz) | 300 | 10000 * 2400/F(kHz) | 20log ^{(2400/F(kHz))} + 80 |
| 0.490 ~ 1.705 | 24000/F(kHz) | 30 | 100 * 24000/F(kHz) | 20log ^{(24000/F(kHz))} + 40 |
| 1.705 ~ 30 | 30 | 30 | 100 * 30 | 20log ⁽³⁰⁾ + 40 |
| 30 ~ 88 | 100 | 3 | 100 | 20log ⁽¹⁰⁰⁾ |
| 88 ~ 216 | 150 | 3 | 150 | 20log ⁽¹⁵⁰⁾ |
| 216 ~ 960 | 200 | 3 | 200 | 20log ⁽²⁰⁰⁾ |
| Above 960 | 500 | 3 | 500 | 20log ⁽⁵⁰⁰⁾ |

Note: 1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

The field strength of emission from intentional radiators operated within these frequency bands shall comply with the following:

15.249(a) Limit:

| Fundamental Frequency (MHz) | Field strength of fundamental | | Field strength of harmonics | |
|-----------------------------|-------------------------------|--------|-----------------------------|--------|
| | mV/m | dBuV/m | uV/m | dBuV/m |
| 902-928 | 50 | 94 | 500 | 54 |
| 2400-2483.5 | 50 | 94 | 500 | 54 |
| 5725-5875 | 50 | 94 | 500 | 54 |
| 24000-24250 | 250 | 108 | 2500 | 68 |

7.1 EUT Operation

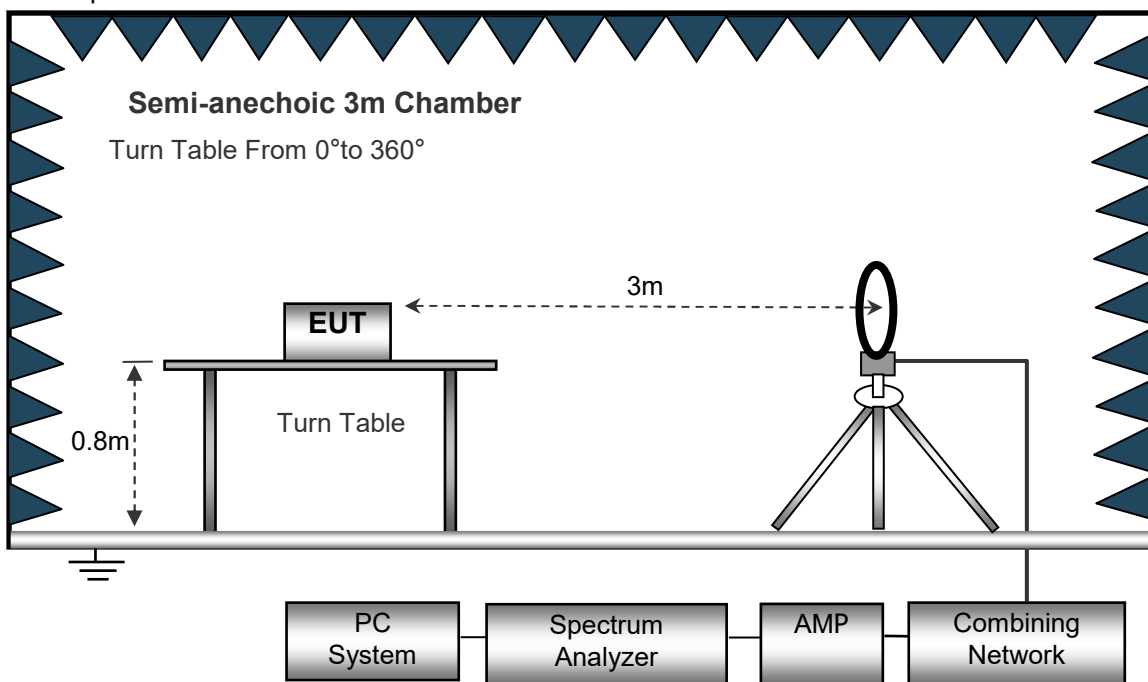
Operating Environment :

- Temperature: : 23.8 °C
- Humidity: : 50 % RH
- Atmospheric Pressure: : 101.12kPa
- Test Voltage : DC 5V

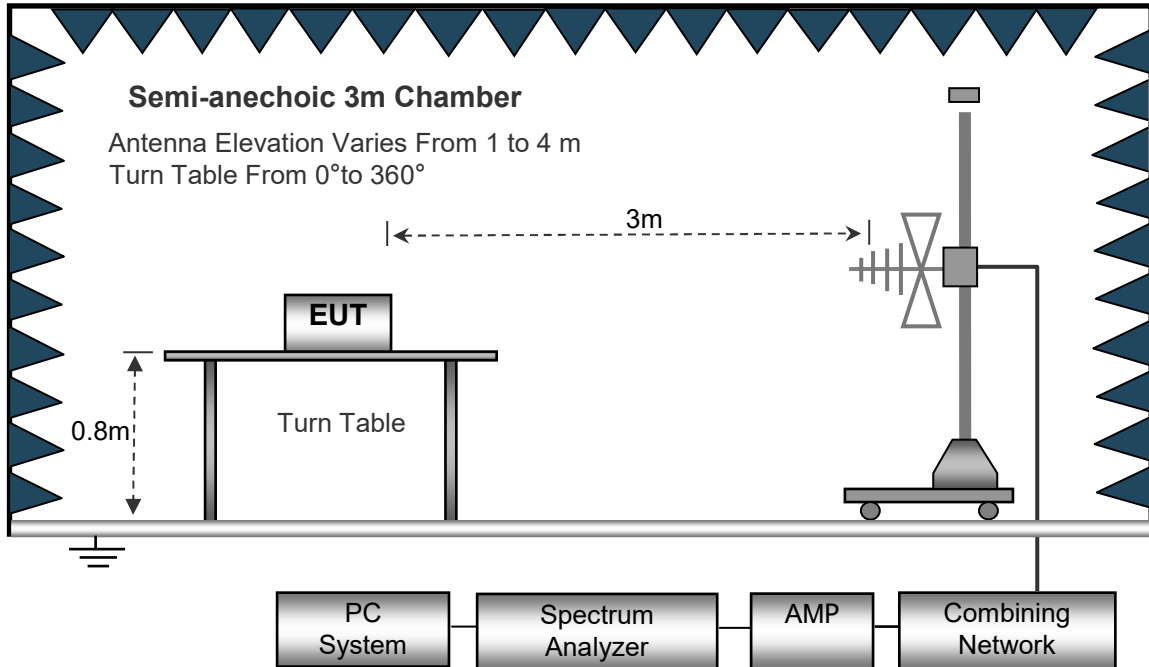
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

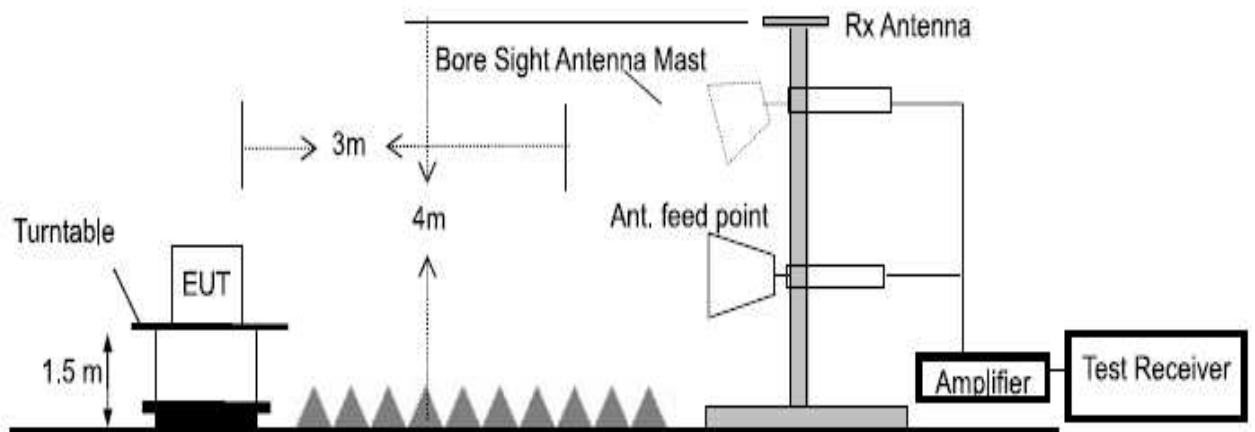
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.





7.3 Spectrum Analyzer Setup

| Spectrum Parameter | Setting |
|---------------------------------------|--|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average |

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

7.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10: 2013.
2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Test Procedure of measurement (For Above 1GHz): Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.



7.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

| Freq. (MHz) | Ant.Pol. H/V | Emission Level (dBuV/m) | Limit 3m (dBuV/m) | Over (dB) |
|----------------|-----------------|----------------------------|----------------------|--------------|
| -- | -- | -- | -- | >20 |

Note:

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

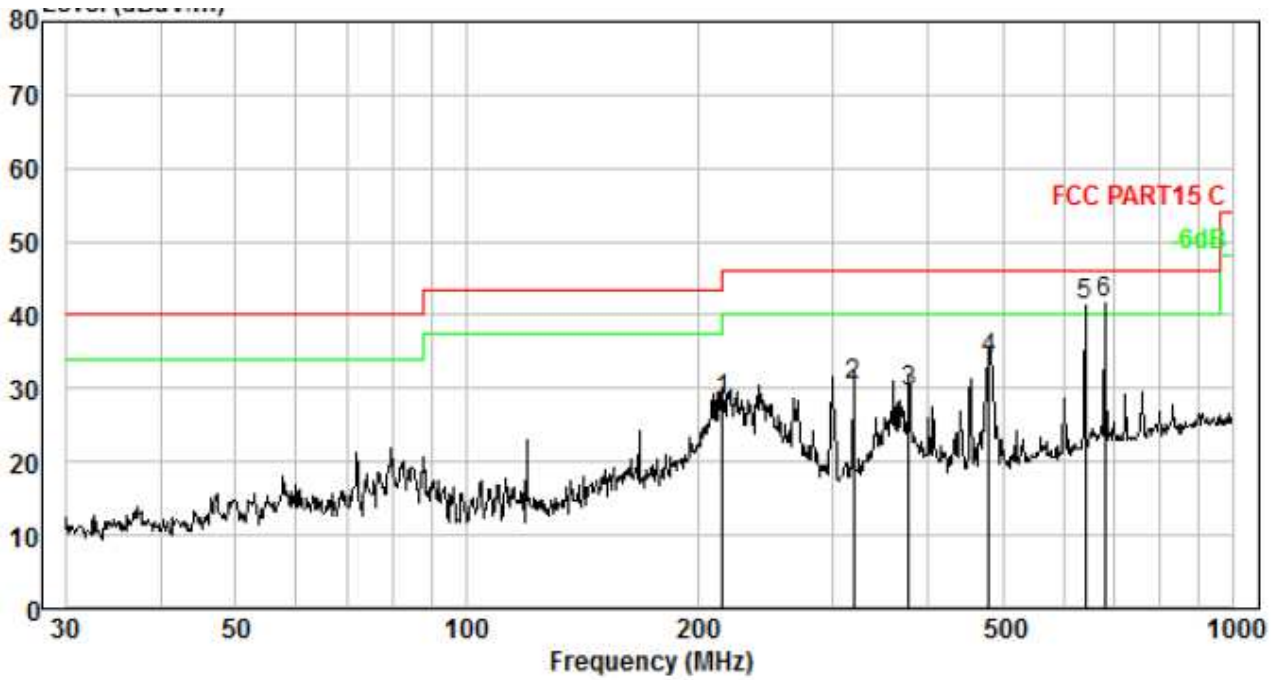
Distance extrapolation factor = $40\log(\text{Specific distance} / \text{test distance})$ (dB);
Limit line = Specific limits (dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Remark: only the worst data were reported.



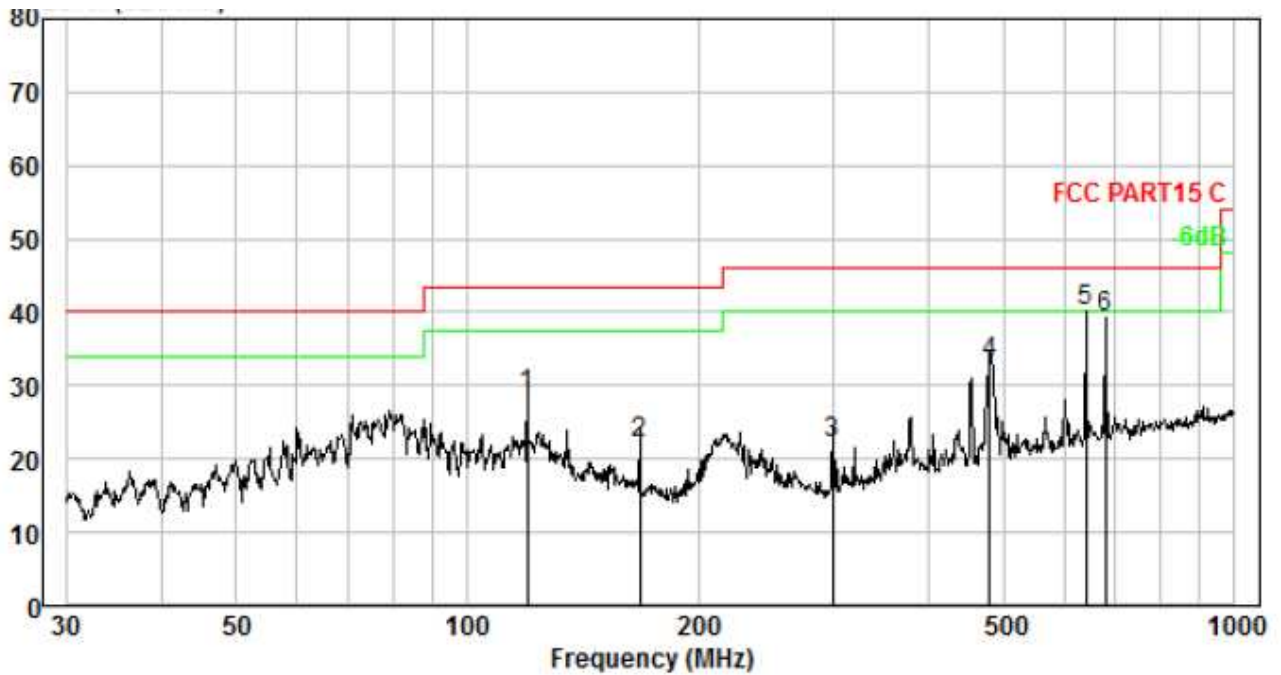
Test plot for Horizontal: 2404MHz



| No. | Freq MHz | Cable Loss dB | ANT Factor dB/m | Receiver Reading dBuV | Preamp Factor dB | Emission Level dBuV/m | Limit dBuV/m | Over Limit dB | Remark |
|-----|----------|---------------|-----------------|-----------------------|------------------|-----------------------|--------------|---------------|--------|
| 1. | 216.024 | 4.59 | 11.52 | 42.19 | 30.09 | 28.21 | 46.00 | -17.79 | QP |
| 2. | 319.937 | 5.27 | 13.70 | 41.84 | 30.40 | 30.41 | 46.00 | -15.59 | QP |
| 3. | 377.259 | 5.56 | 14.62 | 40.01 | 30.62 | 29.57 | 46.00 | -16.43 | QP |
| 4. | 480.528 | 5.97 | 16.65 | 42.06 | 30.86 | 33.82 | 46.00 | -12.18 | QP |
| 5. | 640.611 | 6.46 | 19.44 | 46.34 | 31.04 | 41.20 | 46.00 | -4.80 | QP |
| 6. | 679.960 | 6.57 | 19.90 | 46.21 | 31.07 | 41.61 | 46.00 | -4.39 | QP |



Test plot for Vertical: 2404MHz



| No. | Freq MHz | Cable Loss dB | ANT Factor dB/m | Receiver Reading dBuV | Preamp Factor dB | Emission Level dBuV/m | Limit dBuV/m | Over Limit dB | Remark |
|-----|----------|---------------|-----------------|-----------------------|------------------|-----------------------|--------------|---------------|--------|
| 1. | 119.856 | 3.59 | 11.98 | 43.05 | 30.00 | 28.62 | 43.50 | -14.88 | QP |
| 2. | 167.824 | 4.16 | 13.45 | 34.63 | 30.03 | 22.21 | 43.50 | -21.29 | QP |
| 3. | 299.316 | 5.16 | 13.19 | 34.07 | 30.32 | 22.10 | 46.00 | -23.90 | QP |
| 4. | 480.528 | 5.97 | 16.65 | 41.16 | 30.86 | 32.92 | 46.00 | -13.08 | QP |
| 5. | 640.611 | 6.46 | 19.44 | 45.17 | 31.04 | 40.03 | 46.00 | -5.97 | QP |
| 6. | 679.960 | 6.57 | 19.90 | 43.96 | 31.07 | 39.36 | 46.00 | -6.64 | QP |



Test Frequency Above 1GHz:

| Freq. (MHz) | Ant. Pol. H/V | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Margin(dB) | |
|----------------|------------------|------------------------|-------|------------------|----|------------|--------|
| | | PK | AV | PK | AV | PK | AV |
| 2404(F) | V | 88.12 | 79.19 | 114 | 94 | -25.88 | -14.81 |
| 4808 | V | 58.26 | 48.12 | 74 | 54 | -15.74 | -5.88 |
| 7212 | V | 57.1 | 46.32 | 74 | 54 | -16.9 | -7.68 |
| 9616 | V | 53.11 | 43.29 | 74 | 54 | -20.89 | -10.71 |
| 12020 | V | 52.25 | 40.18 | 74 | 54 | -21.75 | -13.82 |
| 14424 | V | 51.03 | 38.23 | 74 | 54 | -22.97 | -15.77 |
| 16828 | V | 48.24 | 35.41 | 74 | 54 | -25.76 | -18.59 |
| 2404(F) | H | 87.39 | 79.43 | 114 | 94 | -26.61 | -14.57 |
| 4808 | H | 55.28 | 45.34 | 74 | 54 | -18.72 | -8.66 |
| 7212 | H | 53.23 | 44.13 | 74 | 54 | -20.77 | -9.87 |
| 9616 | H | 50.15 | 43.29 | 74 | 54 | -23.85 | -10.71 |
| 12020 | H | 48.29 | 41.32 | 74 | 54 | -25.71 | -12.68 |
| 14424 | H | 45.53 | 40.09 | 74 | 54 | -28.47 | -13.91 |
| 16828 | H | 43.13 | 37.92 | 74 | 54 | -30.87 | -16.08 |

| Freq. (MHz) | Ant. Pol. H/V | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Margin(dB) | |
|----------------|------------------|------------------------|-------|------------------|----|------------|--------|
| | | PK | AV | PK | AV | PK | AV |
| 2444(F) | V | 88.12 | 83.29 | 114 | 94 | -25.88 | -10.71 |
| 4888 | V | 54.03 | 47.25 | 74 | 54 | -19.97 | -6.75 |
| 7332 | V | 53.29 | 45.11 | 74 | 54 | -20.71 | -8.89 |
| 9776 | V | 52.42 | 43.32 | 74 | 54 | -21.58 | -10.68 |
| 12220 | V | 51.04 | 41.35 | 74 | 54 | -22.96 | -12.65 |
| 14664 | V | 49.23 | 40.18 | 74 | 54 | -24.77 | -13.82 |
| 17108 | V | 47.92 | 38.29 | 74 | 54 | -26.08 | -15.71 |
| 2444(F) | H | 86.29 | 84.13 | 114 | 94 | -27.71 | -9.87 |
| 4888 | H | 53.24 | 46.89 | 74 | 54 | -20.76 | -7.11 |
| 7332 | H | 51.34 | 44.82 | 74 | 54 | -22.66 | -9.18 |
| 9776 | H | 49.83 | 42.18 | 74 | 54 | -24.17 | -11.82 |
| 12220 | H | 47.39 | 40.81 | 74 | 54 | -26.61 | -13.19 |
| 14664 | H | 46.23 | 38.01 | 74 | 54 | -27.77 | -15.99 |
| 17108 | H | 42.41 | 36.65 | 74 | 54 | -31.59 | -17.35 |



| Freq. (MHz) | Ant. Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Margin(dB) | |
|----------------|-----------|------------------------|-------|------------------|----|------------|--------|
| | | PK | AV | PK | AV | PK | AV |
| 2480(F) | V | 83.79 | 79.28 | 114 | 94 | -30.21 | -14.72 |
| 4960 | V | 54.29 | 46.22 | 74 | 54 | -19.71 | -7.78 |
| 7440 | V | 52.17 | 44.45 | 74 | 54 | -21.83 | -9.55 |
| 9920 | V | 51.03 | 43.18 | 74 | 54 | -22.97 | -10.82 |
| 12400 | V | 50.39 | 41.39 | 74 | 54 | -23.61 | -12.61 |
| 14880 | V | 49.18 | 36.04 | 74 | 54 | -24.82 | -17.96 |
| 17360 | V | 48.21 | 32.28 | 74 | 54 | -25.79 | -21.72 |
| 2480(F) | H | 84.02 | 76.32 | 114 | 94 | -29.98 | -17.68 |
| 4960 | H | 58.38 | 47.29 | 74 | 54 | -15.62 | -6.71 |
| 7440 | H | 55.73 | 44.28 | 74 | 54 | -18.27 | -9.72 |
| 9920 | H | 53 | 42.93 | 74 | 54 | -21 | -11.07 |
| 12400 | H | 51.28 | 38.18 | 74 | 54 | -22.72 | -15.82 |
| 14880 | H | 49.24 | 37.21 | 74 | 54 | -24.76 | -16.79 |
| 17360 | H | 46.72 | 34.17 | 74 | 54 | -27.28 | -19.83 |

Note: The amplitude of 18GHz to 25GHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.



8 20 dB Bandwidth Measurement

Test Method : ANSI C63.10: 2013

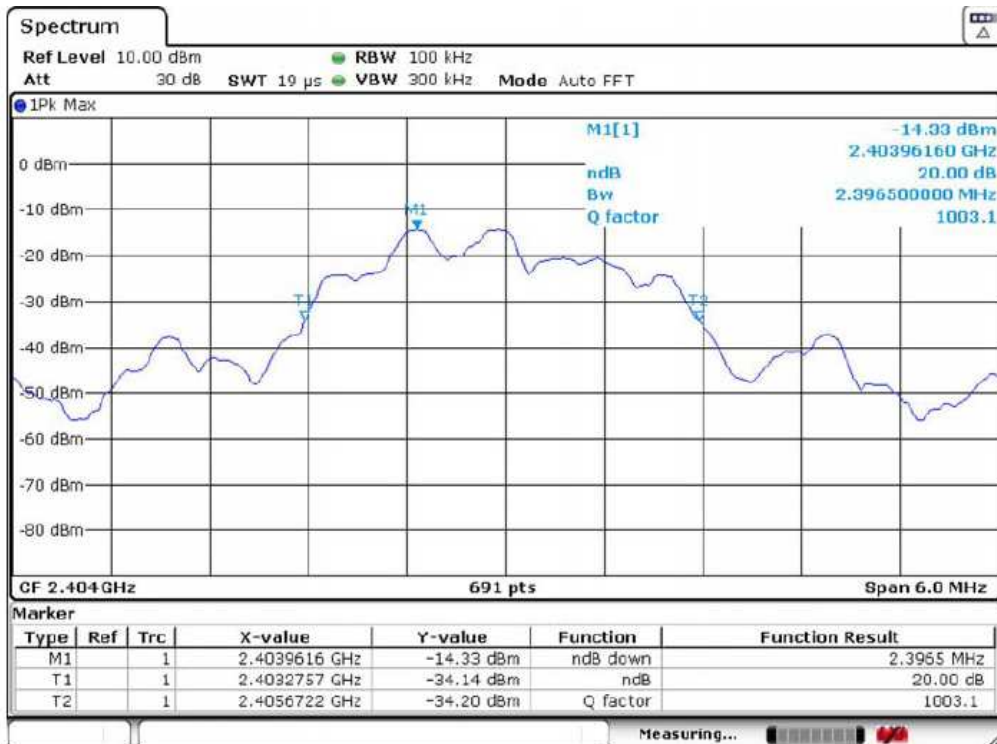
8.1 Test Procedure

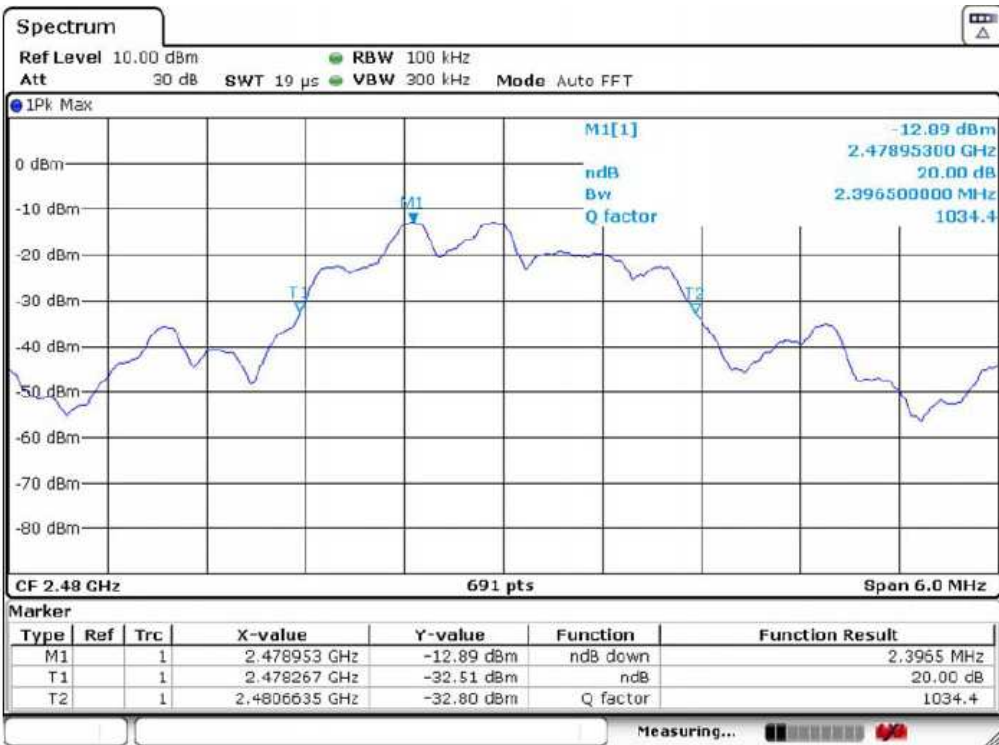
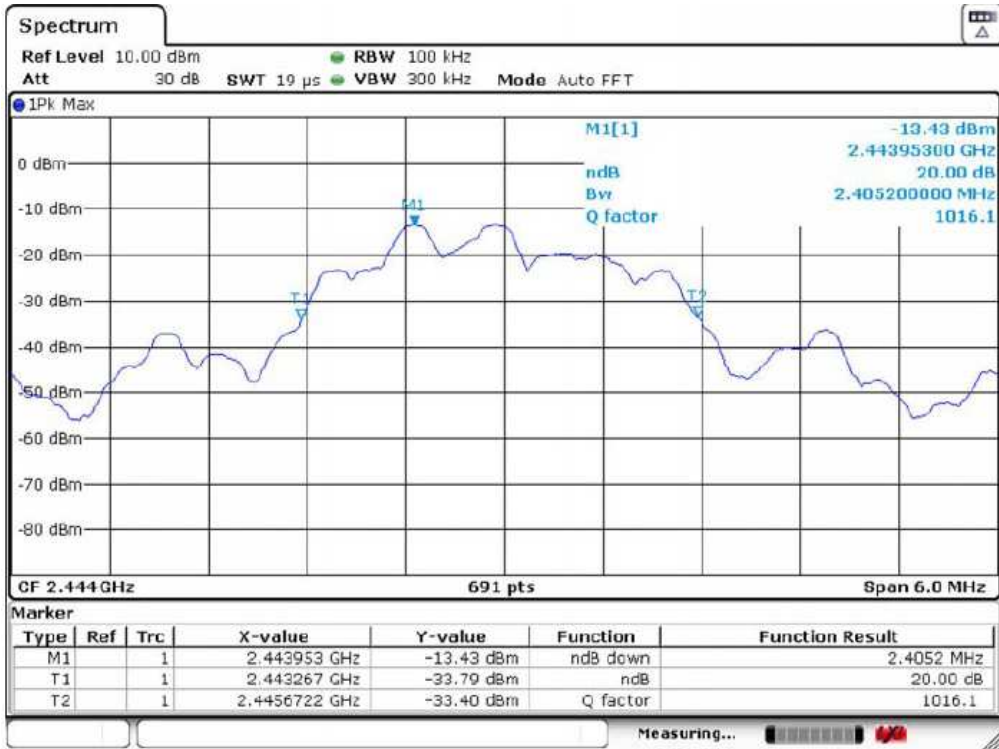
1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. Set the EUT work on the top, the middle and the bottom operation frequency individually.
3. Set Span= approximately 2 to 5 times the 20dB bandwidth, centered on a hopping channel

The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth(VBW) shall be approximately three times RBW; Sweep = auto; Detector function= peak

8.2 Test Result

| Channel number | Channel frequency (MHz) | 20dB Down BW(KHz) |
|----------------|-------------------------|-------------------|
| 1 | 2404 | 2396.5 |
| 3 | 2444 | 2405.2 |
| 5 | 2480 | 2396.5 |







9 Antenna Requirement

9.1 Antenna Requirement

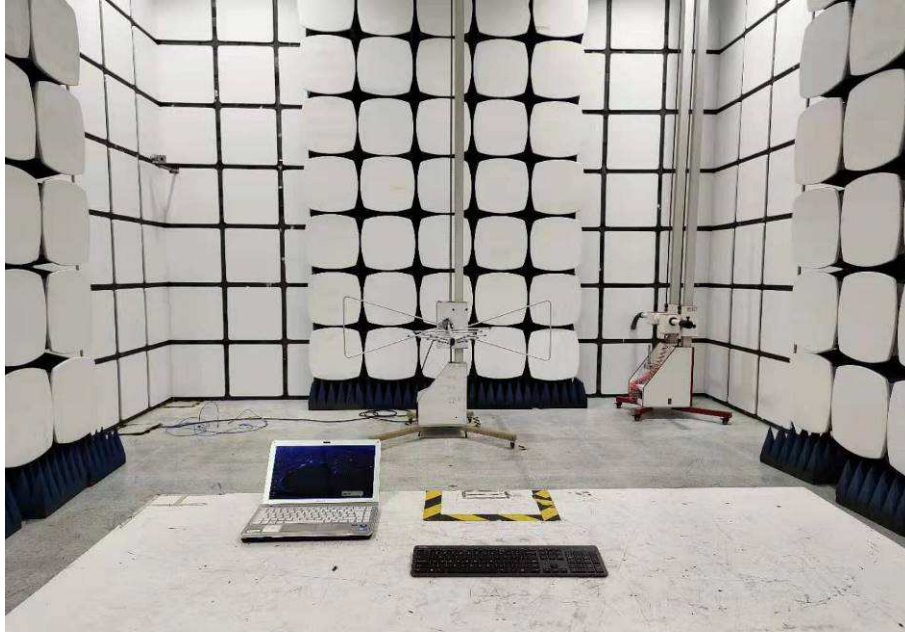
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2 Result

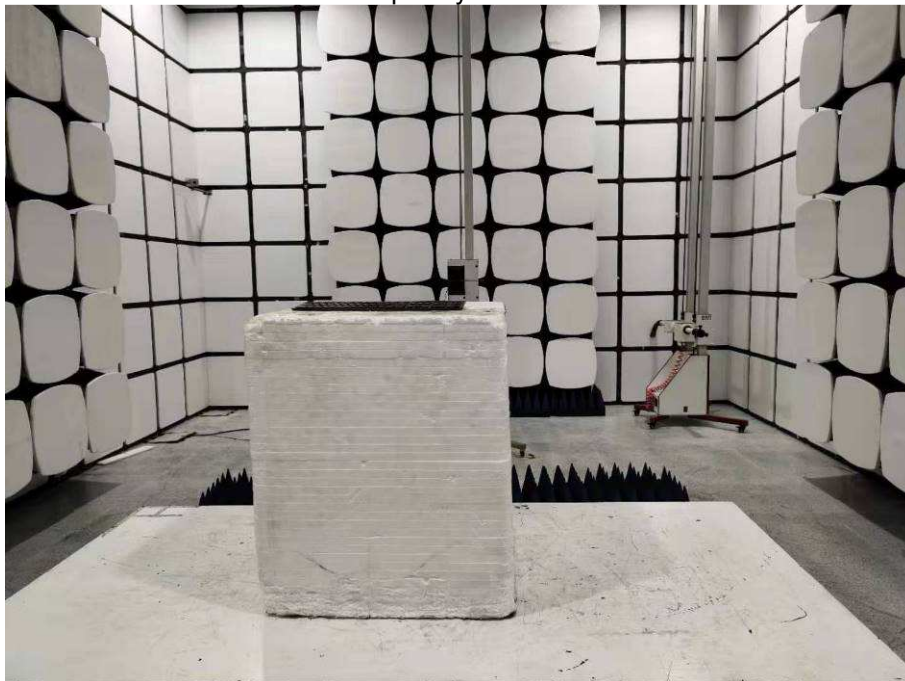
The EUT'S antenna, permanent attached antenna, is internal antenna. The antenna's gain is 4dBi and meets the requirement.

10 TEST PHOTOS

Radiated Spurious Emissions
From 30MHz-1000MHz



Test frequency Above 1GHz

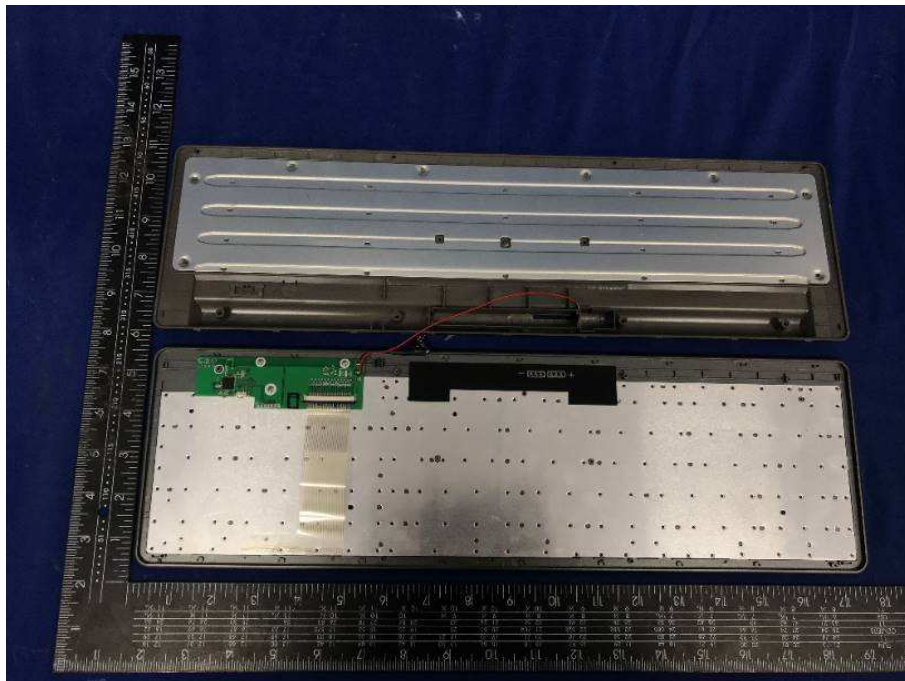
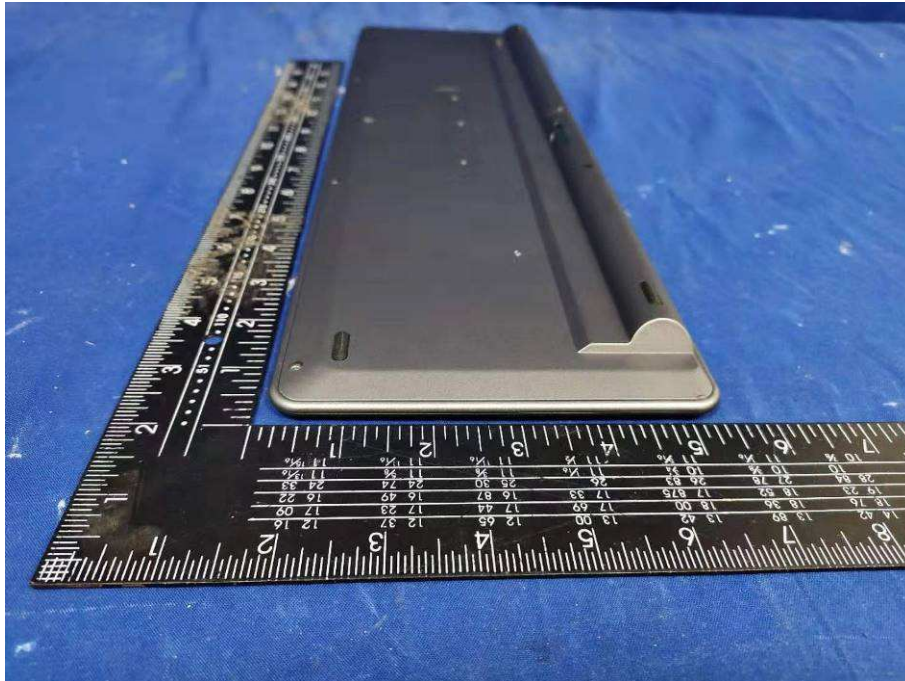


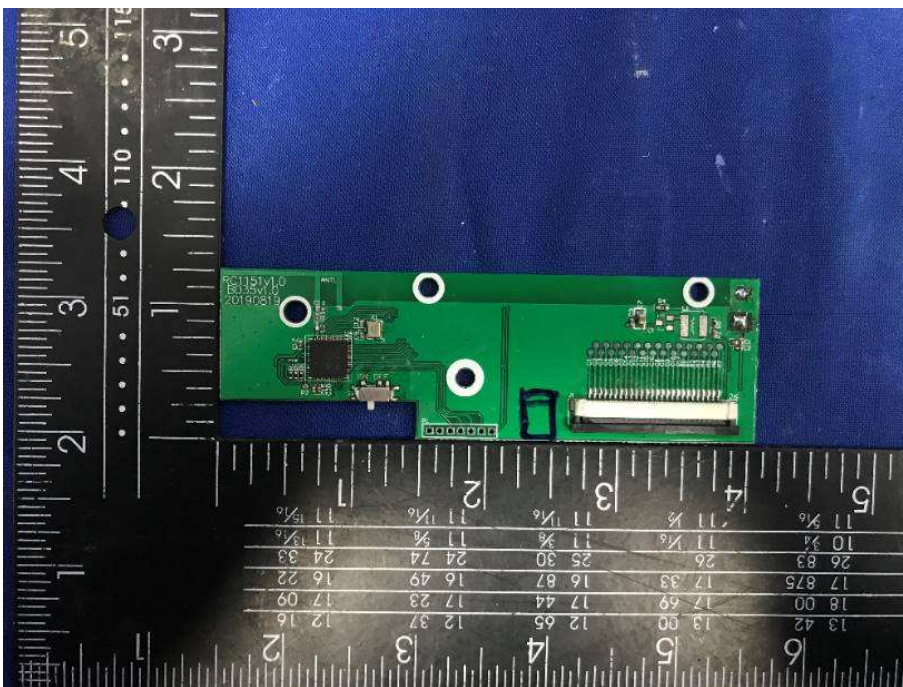
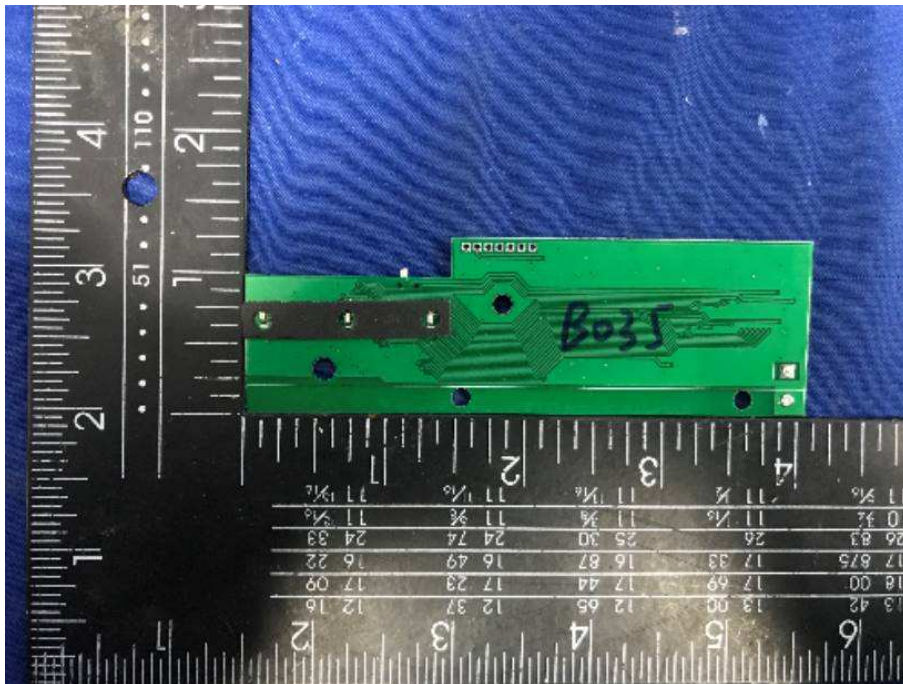
11 EUT PHOTOS

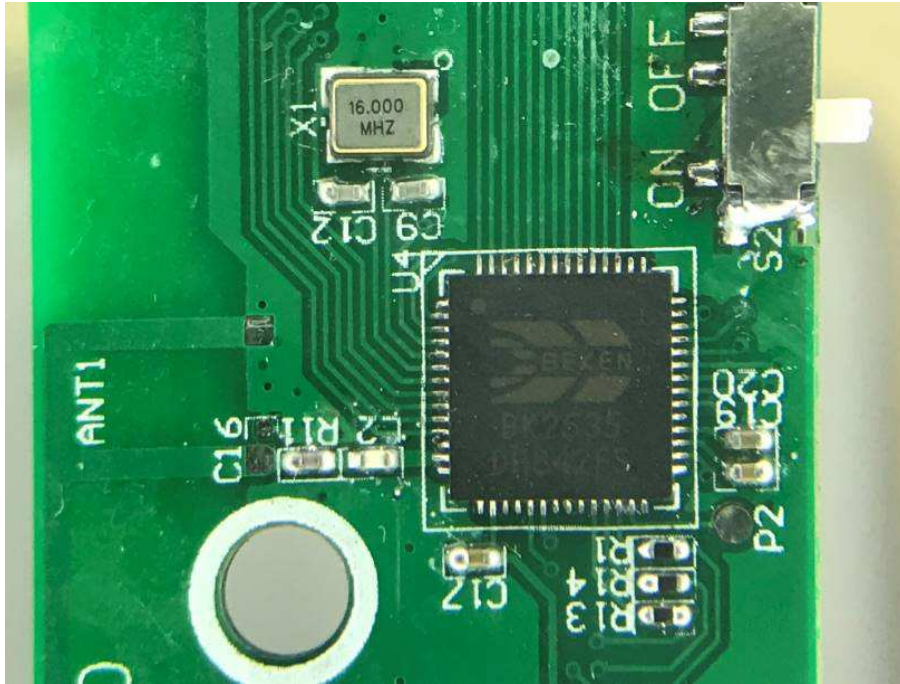












*****THE END REPORT*****