# FCC TEST REPORT

| | |
|---|---|
| **FCC ID** | : V8VCNE6609RS |
| **Applicant** | : SKYPINE ELECTRONICS (SHEN ZHEN) CO.,LTD. |
| **Address** | : A1 Building, No.6 Xinxing Industrial Park, Xinhe Village, Fuyong Town, Baoan, Shenzhen, 518000 China |
| **Manufacturer** | : SKYPINE ELECTRONICS (SHEN ZHEN) CO.,LTD. |
| **Address** | : A1 Building, No.6 Xinxing Industrial Park, Xinhe Village, Fuyong Town, Baoan, Shenzhen, 518000 China |

**Equipment Under Test (EUT) :**

| | |
|---|---|
| Product Name | : Entertainment System |
| Model No. | : PR-VW1210, PR-VW1210-EU, PR-TY1210, CNE-6609-RS |
| Brand | : ROSEN(SKYPINE) |
| **Rules** | : FCC CFR47 Part15 C Section 15.247:2010 |

| | |
|---|---|
| **Date of Test** | : Dec. 11 ~ 14, 2012 |
| **Date of Issue** | : Dec. 25, 2012 |
| **Test Result** | : PASS* |

Remark:

* The sample detailed above has been tested to the requirements of FCC rules mentioned above.

The test results have been reviewed against the directives above and found to meet their essential requirements.

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company.

The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

PERPARED BY:
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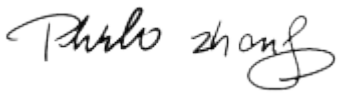
Compiled by:

Zero Zhou / Project Engineer

Approved by:



Philo Zhong / Manager

# 2 Test Summary

| Test Items | Test Requirement | Result |
|---|---|---|
| Conducted Emissions | 15.207 | N/A |
| Radiated Emissions | 15.205(a)<br>15.209<br>15.247(d) | PASS |
| 20dB Bandwidth | 15.247(a)(1) | PASS |
| Maximum Peak Output Power | 15.247(b)(1) | PASS |
| Frequency Separation | 15.247(a)(1) | PASS |
| Number of Hopping Frequency | 15.247(a)(1)(iii) | PASS |
| Dwell time | 15.247(a)(1)(iii) | PASS |
| Antenna Requirement | 15.203 | PASS |
| Maximum Permissible Exposure<br>(Exposure of Humans to RF Fields) | 1.1307(b)(1) | PASS |

# 3 Contents

# 4 General Information

## 4.1 General Description of E.U.T.

**Product Name** : Entertainment System

**Model No.** : PR-VW1210, PR-VW1210-EU, PR-TY1210, CNE-6609-RS

**Model Description** : Only the model name is different.

**Frequency Range** : 2402-2480MHz

**Oscillator** : Crystal 32.768kHz,4MHz,8MHz,12MHz,26MHz and 27MHz

**Antenna installation** : Integrated Antenna

**Type of Modulation** : GFSK,Pi/4DQPSK,8DQPSK

**Note** : All the modulation modes were tested, all the test data deeply conform to the standard and the data of the worst mode (GFSK) were recorded in the following pages. That all modulation methods do not exceed the above mentioned limits.

## 4.2 Details of E.U.T.

**Technical Data** : DC 12V, 15A Max.

## 4.3 Channel List

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

## 4.4 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: IC7760A**

Waltek Services (Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A, July 12, 2012.

- **FCC – Registration No.: 880581**

Waltek Services (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, May 26, 2011.

## 4.5 Test Location

All the tests were performed at:
Waltek Services (Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen, China

## 4.6 General condition

Ambient Condition: 25.5 ℃ 51 %RH

### 4.6.1 Environmental condition of test site

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

The follow condition is not applicable for adapter:

| Test Voltage | Input voltage |
|---|---|
| Rated voltage-15% | |
| normal | |
| Rated voltage+15% | |

The follow condition is applicable.

| Test voltage | Test Voltage |
|---|---|
| Rated voltage | New Battery DC 12V |

### 4.6.2 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

| Test mode | Lower channel | Middle channel | Upper channel |
|---|---|---|---|
| Transmitting | 2402MHz | 2441MHz | 2480MHz |
| Receiving | N/A | N/A | N/A |

# 5 Equipment Used during Test

## 5.1 Equipments List

| 3m Semi-anechoic Chamber for Radiation Emissions | | | | | | |
|---|---|---|---|---|---|---|
| **Item** | **Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Last Calibration Date** | **Calibration Due Date** |
| 1. | EMC Analyzer | Agilent | E7405A | MY45114943 | Aug. 13,2012 | Aug. 13,2013 |
| 2. | Active Loop Antenna | Beijing Dazhi | ZN30900A | - | Aug. 13,2012 | Aug. 13,2013 |
| 3. | Trilog Broadband Antenna | SCHWARZBECK | VULB9163 | 336 | Aug. 13,2012 | Aug. 13,2013 |
| 4. | Broad-band Horn Antenna | SCHWARZBECK | BBHA 9120 D | 667 | Aug. 13,2012 | Aug. 13,2013 |
| 5. | Broad-band Horn Antenna | SCHWARZBECK | BBHA 9170 | 399 | Aug. 13,2012 | Aug. 13,2013 |
| 6. | Broadband Preamplifier | COMPLIANCE DIRECTION | PAP-1G18 | 2004 | Feb .23,2012 | Feb .23,2013 |
| 7. | Broadband Preamplifier | SCHWARZBECK | BBV 9718 | 9718-148 | Aug. 13,2012 | Aug. 13,2013 |
| 8. | 10m Coaxial Cable with N- plug | SCHWARZBECK | AK 9515 H | - | Aug. 13,2012 | Aug. 13,2013 |
| 9. | 10m 50 Ohm Coaxial Cable with N-plug | SCHWARZBECK | AK 9513 | - | Aug. 13,2012 | Aug. 13,2013 |

## 5.2 Measurement Uncertainty

| **Parameter** | **Uncertainty** |
|---|---|
| Radio Frequency | ± 1 x $10^{-6}$ |
| RF Power | ± 1.0 dB |
| RF Power Density | ± 2.2 dB |
| Radiated Spurious Emissions test | ± 5.03 dB<br>(Bilog antenna 30M~1000MHz) |
| | ± 4.74 dB<br>(Horn antenna 1000M~25000MHz) |

## 5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

# 6 Conducted Emissions

| | |
|---|---|
| Test Requirement: | FCC CFR 47 Part 15 Section 15.207 |
| Test Method: | ANSI C63.4:2003 |
| Test Result: | PASS |
| Frequency Range: | 150kHz to 30MHz |
| Class: | Class B |
| Limit: | 66-56 dBμV between 0.15MHz & 0.5MHz<br>56 dBμV between 0.5MHz & 5MHz<br>60 dBμV between 5MHz & 30MHz |
| Detector: | Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit |
| Test Result: | N/A |

Remark:This device is powered by battery,this item do not be required.

# 7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247
Test Method: DA 00-705
Test Result: PASS
Frequency Range: 9 KHz to 25 GHz
Measurement Distance: 3m
15.209 Limit:

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009 -0.490 | 2400/F(kHz) | 300 |
| 0.490 - 1.705 | 24000/F(kHz) | 30 |
| 1.705 - 30.0 | 30 | 30 |
| 30-88 | 100** | 3 |
| 88-216 | 150** | 3 |
| 216-960 | 200** | 3 |
| Above 960 | 500 | 3 |

15.247 (d) Limit:
(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.

## 7.1 EUT Operation:

**Operating Environment:**

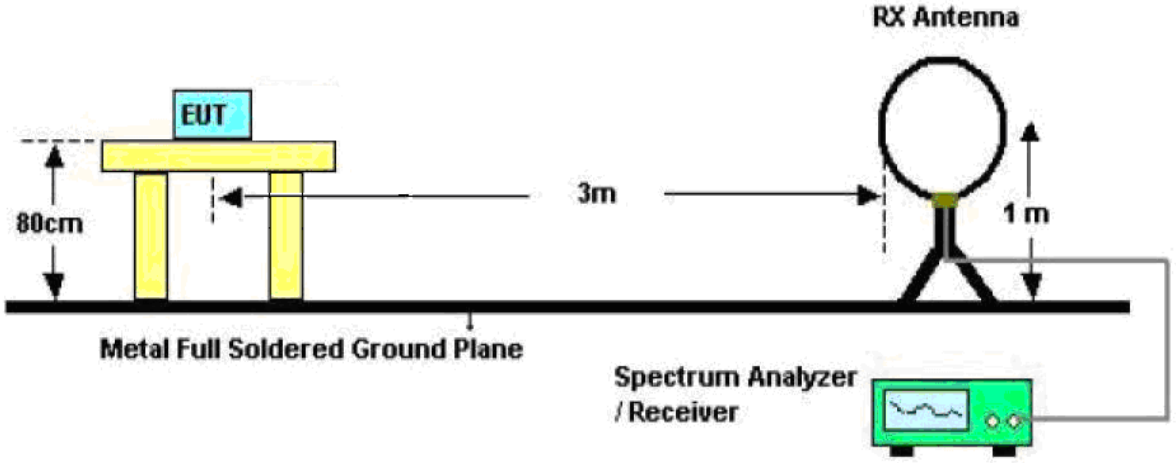
Temperature: 25.5 °C
Humidity: 51 % RH
Atmospheric Pressure: 1011 mbar

**Operation Mode:**

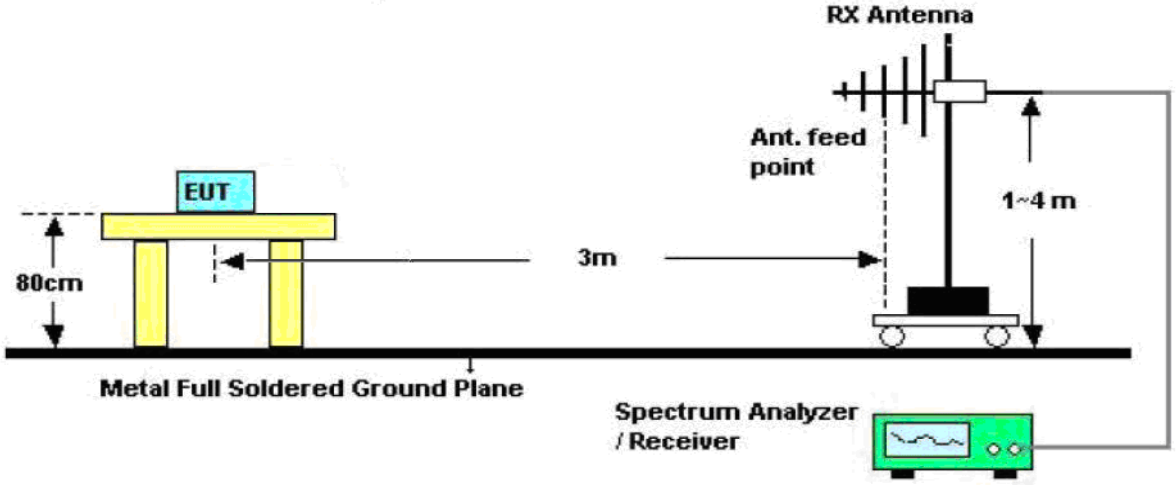
The EUT was tested in bluetooth normal working mode. The test data were shown as follow.

## 7.2 Test Setup

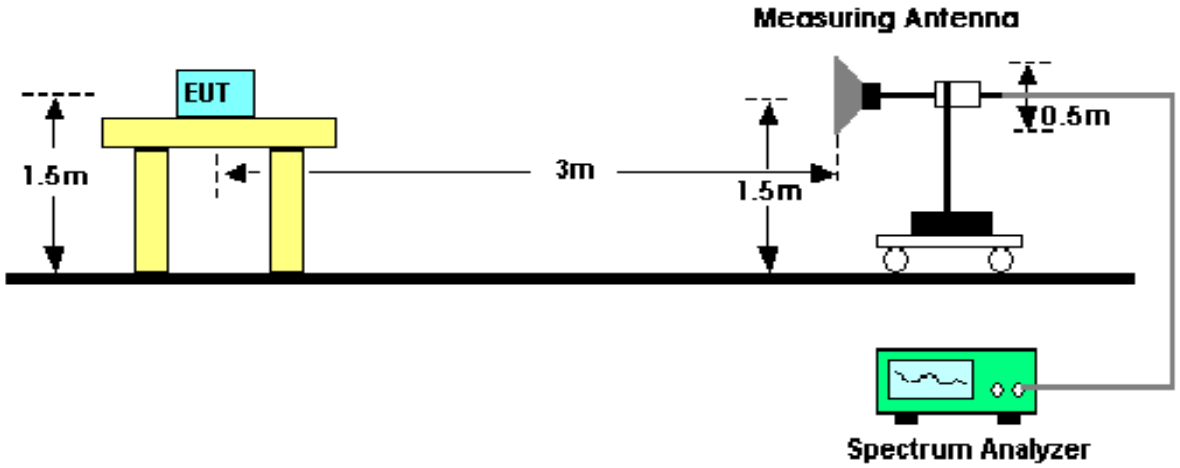
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.
The test setup for emission measurement below 30MHz.




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

According to FCC Part15 Rules, the system was tested from 9 KHz to 25 GHz.

Below 30MHz

Sweep Speed .....Auto
IF Bandwidth .....10KHz
Video Bandwidth .....10KHz

Resolution Bandwidth .....10KHz

30MHz ~ 1GHz

Sweep Speed .....Auto
IF Bandwidth .....120 KHz
Video Bandwidth .....100KHz
Quasi-Peak Adapter Bandwidth .....120 KHz
Quasi-Peak Adapter Mode .....Normal
Resolution Bandwidth.....100KHz

Above 1GHz

Sweep Speed .....Auto
IF Bandwidth .....120 KHz
Video Bandwidth .....3MHz
Quasi-Peak Adapter Bandwidth .....120 KHz
Quasi-Peak Adapter Mode .....Normal
Resolution Bandwidth.....1MHz

## 7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X, Y, Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand). After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

## 7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:
Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain the "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

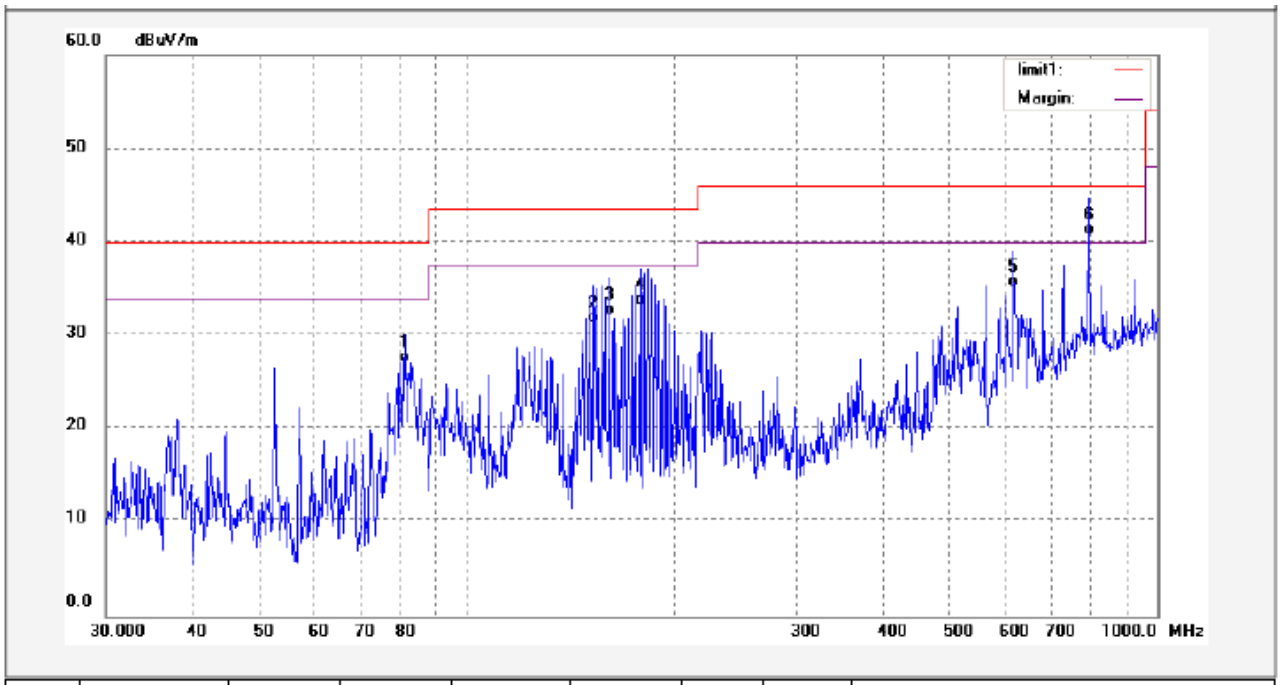
Margin = Corr. Ampl. – Limit

## 7.6 Summary of Test Results

After pretested, the emissions below 30MHz are more than 20dB below the limit, the data do not show in the report.

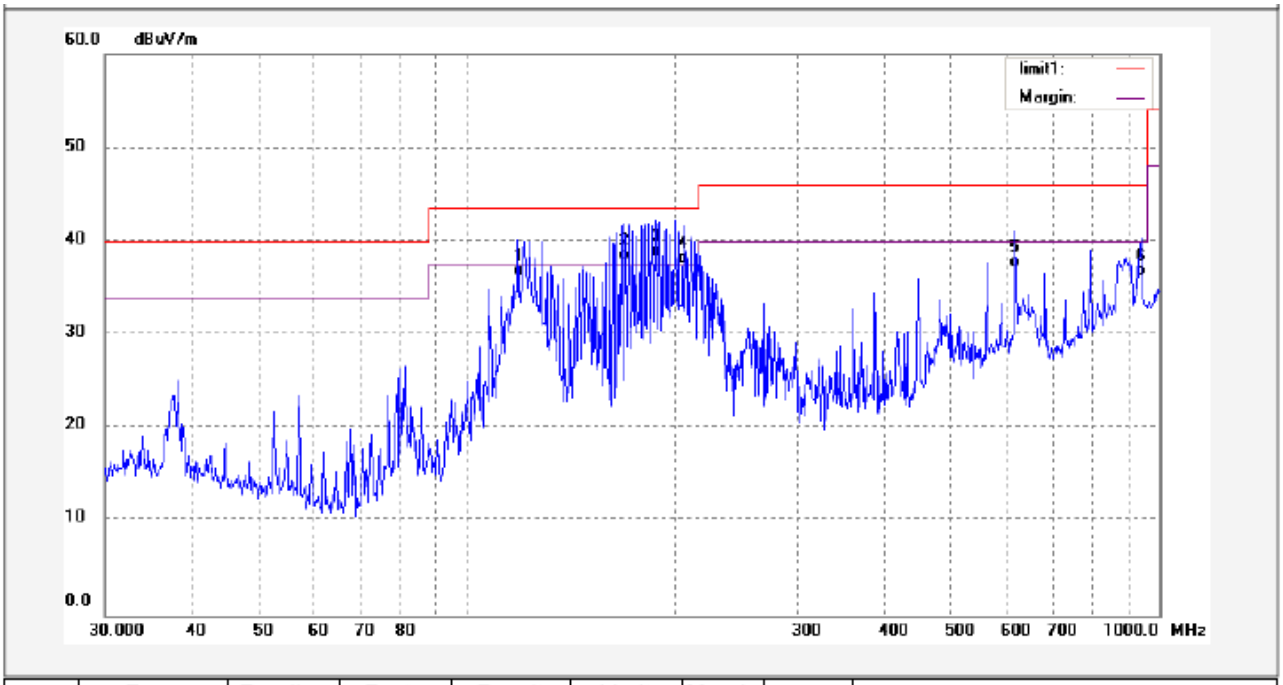
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 81.3739 | 17.73 | 9.38 | 27.11 | 40.00 | -12.89 | QP | |
| 2 | 152.6255 | 20.33 | 10.94 | 31.27 | 43.50 | -12.23 | QP | |
| 3 | 160.8851 | 20.77 | 11.41 | 32.18 | 43.50 | -11.32 | QP | |
| 4 | 178.1426 | 20.38 | 12.78 | 33.16 | 43.50 | -10.34 | QP | |
| 5 | 620.1167 | 9.15 | 25.99 | 35.14 | 46.00 | -10.86 | QP | |
| 6 | 795.8192 | 11.70 | 29.00 | 40.70 | 46.00 | -5.30 | QP | |

Antenna polarization: Horizontal




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 118.5114 | 24.04 | 12.13 | 36.17 | 43.50 | -7.33 | QP | |
| 2 | 168.9970 | 25.83 | 12.05 | 37.88 | 43.50 | -5.62 | QP | |
| 3 | 187.1247 | 24.21 | 14.05 | 38.26 | 43.50 | -5.24 | QP | |
| 4 | 205.0243 | 22.72 | 14.85 | 37.57 | 43.50 | -5.93 | QP | |
| 5 | 620.1167 | 11.14 | 25.99 | 37.13 | 46.00 | -8.87 | QP | |
| 6 | 942.0180 | 4.46 | 31.77 | 36.23 | 46.00 | -9.77 | QP | |

Test Frequency: 1GHz ~ 25GHz radiation test data
And the below is the Fundamental and Harmonic

| Frequency (MHz) | Detector | Antenna Polarization | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Turntable Angle (°) |
|---|---|---|---|---|---|---|---|
| **Lower frequency** | | | | | | | |
| 2402.00 | AV | Vertical | 73.58 | N/A | (Fund.) | 1.1 | 110 |
| 4804.00 | AV | Vertical | 40.11 | 54.00 | 13.89 | 1.4 | 140 |
| 7206.00 | AV | Vertical | 36.26 | 54.00 | 17.74 | 1.6 | 170 |
| 9608.00 | AV | Vertical | 32.52 | 54.00 | 21.48 | 1.4 | 130 |
| 12010.00 | AV | Vertical | 30.05 | 54.00 | 23.95 | 1.8 | 185 |
| 14412.00 | AV | Vertical | 34.91 | 54.00 | 19.09 | 1.2 | 195 |
| 16814.00 | AV | Vertical | 30.02 | 54.00 | 23.98 | 1.9 | 160 |
| 19216.00 | AV | Vertical | 31.74 | 54.00 | 22.26 | 1.4 | 140 |
| 21618.00 | AV | Vertical | 30.22 | 54.00 | 23.78 | 1.4 | 30 |
| 24020.00 | AV | Vertical | 30.41 | 54.00 | 23.59 | 1.1 | 145 |
| 2402.00 | AV | Horizontal | 72.13 | N/A | (Fund.) | 1.7 | 70 |
| 4804.00 | AV | Horizontal | 42.54 | 54.00 | 11.46 | 1.2 | 180 |
| 7206.00 | AV | Horizontal | 36.07 | 54.00 | 17.93 | 1.4 | 100 |
| 9608.00 | AV | Horizontal | 31.81 | 54.00 | 22.19 | 1.4 | 195 |
| 12010.00 | AV | Horizontal | 32.15 | 54.00 | 21.85 | 1.6 | 110 |
| 14412.00 | AV | Horizontal | 33.64 | 54.00 | 20.36 | 1.2 | 190 |
| 16814.00 | AV | Horizontal | 32.02 | 54.00 | 21.98 | 1.7 | 150 |
| 19216.00 | AV | Horizontal | 30.74 | 54.00 | 23.26 | 1.6 | 175 |
| 21618.00 | AV | Horizontal | 31.56 | 54.00 | 22.44 | 1.4 | 160 |
| 24020.00 | AV | Horizontal | 29.84 | 54.00 | 24.16 | 1.4 | 90 |
| 2402.00 | PK | Vertical | 88.63 | N/A | (Fund.) | 1.3 | 30 |
| 4804.00 | PK | Vertical | 41.77 | 74.00 | 32.23 | 1.7 | 145 |
| 7206.00 | PK | Vertical | 31.62 | 74.00 | 42.38 | 2.1 | 160 |
| 9608.00 | PK | Vertical | 30.55 | 74.00 | 43.45 | 1.2 | 240 |
| 12010.00 | PK | Vertical | 29.41 | 74.00 | 44.59 | 1.1 | 100 |
| 14412.00 | PK | Vertical | 30.28 | 74.00 | 43.72 | 1.4 | 155 |
| 16814.00 | PK | Vertical | 31.45 | 74.00 | 42.55 | 1.5 | 185 |
| 19216.00 | PK | Vertical | 30.88 | 74.00 | 43.12 | 1.1 | 190 |
| 21618.00 | PK | Vertical | 31.73 | 74.00 | 42.27 | 1.9 | 110 |
| 24020.00 | PK | Vertical | 32.66 | 74.00 | 41.34 | 1.2 | 165 |
| 2402.00 | PK | Horizontal | 82.19 | N/A | (Fund.) | 2.0 | 120 |
| 4804.00 | PK | Horizontal | 42.51 | 74.00 | 31.49 | 1.7 | 170 |
| 7206.00 | PK | Horizontal | 32.72 | 74.00 | 41.28 | 1.6 | 90 |
| 9608.00 | PK | Horizontal | 30.64 | 74.00 | 43.36 | 1.1 | 85 |
| 12010.00 | PK | Horizontal | 32.11 | 74.00 | 41.89 | 1.7 | 205 |
| 14412.00 | PK | Horizontal | 30.84 | 74.00 | 43.16 | 1.0 | 60 |
| 16814.00 | PK | Horizontal | 32.71 | 74.00 | 41.29 | 1.7 | 220 |
| 19216.00 | PK | Horizontal | 31.23 | 74.00 | 42.77 | 1.7 | 155 |
| 21618.00 | PK | Horizontal | 30.18 | 74.00 | 43.82 | 1.3 | 170 |

| Frequency (MHz) | Detector | Antenna Polarization | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Turntable Angle (°) |
|---|---|---|---|---|---|---|---|
| 24020.00 | PK | Horizontal | 31.44 | 74.00 | 42.56 | 1.5 | 140 |
| Middle frequency | | | | | | | |
| 2441.00 | AV | Vertical | 71.69 | N/A | (Fund.) | 1.7 | 70 |
| 4882.00 | AV | Vertical | 37.12 | 54.00 | 16.88 | 1.4 | 185 |
| 7323.00 | AV | Vertical | 36.11 | 54.00 | 17.89 | 1.1 | 140 |
| 9764.00 | AV | Vertical | 34.52 | 54.00 | 19.48 | 1.5 | 70 |
| 12205.00 | AV | Vertical | 31.63 | 54.00 | 22.37 | 1.7 | 50 |
| 14646.00 | AV | Vertical | 33.45 | 54.00 | 20.55 | 1.4 | 225 |
| 17087.00 | AV | Vertical | 31.68 | 54.00 | 22.32 | 1.6 | 60 |
| 19528.00 | AV | Vertical | 32.58 | 54.00 | 21.42 | 1.5 | 80 |
| 21969.00 | AV | Vertical | 30.12 | 54.00 | 23.88 | 1.9 | 210 |
| 24410.00 | AV | Vertical | 29.66 | 54.00 | 24.34 | 1.7 | 175 |
| 2441.00 | AV | Horizontal | 71.01 | N/A | (Fund.) | 1.5 | 190 |
| 4882.00 | AV | Horizontal | 36.79 | 54.00 | 17.21 | 1.7 | 150 |
| 7323.00 | AV | Horizontal | 35.96 | 54.00 | 18.04 | 1.7 | 310 |
| 9764.00 | AV | Horizontal | 33.46 | 54.00 | 20.54 | 1.0 | 215 |
| 12205.00 | AV | Horizontal | 32.67 | 54.00 | 21.33 | 1.2 | 200 |
| 14646.00 | AV | Horizontal | 34.65 | 54.00 | 19.35 | 1.7 | 250 |
| 17087.00 | AV | Horizontal | 32.77 | 54.00 | 21.23 | 2.1 | 185 |
| 19528.00 | AV | Horizontal | 33.01 | 54.00 | 20.99 | 1.3 | 165 |
| 21969.00 | AV | Horizontal | 31.85 | 54.00 | 22.15 | 1.3 | 210 |
| 24410.00 | AV | Horizontal | 30.09 | 54.00 | 23.91 | 1.7 | 200 |
| 2441.00 | PK | Vertical | 87.34 | N/A | (Fund.) | 1.3 | 30 |
| 4882.00 | PK | Vertical | 45.01 | 74.00 | 28.99 | 1.7 | 175 |
| 7323.00 | PK | Vertical | 35.74 | 74.00 | 38.26 | 1.8 | 170 |
| 9764.00 | PK | Vertical | 37.09 | 74.00 | 36.91 | 1.4 | 180 |
| 12205.00 | PK | Vertical | 35.21 | 74.00 | 38.79 | 1.9 | 220 |
| 14646.00 | PK | Vertical | 34.87 | 74.00 | 39.13 | 1.0 | 95 |
| 17087.00 | PK | Vertical | 31.11 | 74.00 | 42.89 | 1.4 | 50 |
| 19528.00 | PK | Vertical | 32.55 | 74.00 | 41.45 | 1.9 | 190 |
| 21969.00 | PK | Vertical | 29.47 | 74.00 | 44.53 | 2.0 | 185 |
| 24410.00 | PK | Vertical | 30.12 | 74.00 | 43.88 | 1.4 | 195 |
| 2441.00 | PK | Horizontal | 86.25 | N/A | (Fund.) | 1.7 | 60 |
| 4882.00 | PK | Horizontal | 43.12 | 74.00 | 30.88 | 1.7 | 125 |
| 7323.00 | PK | Horizontal | 34.75 | 74.00 | 39.25 | 1.7 | 120 |
| 9764.00 | PK | Horizontal | 35.63 | 74.00 | 38.37 | 1.7 | 145 |
| 12205.00 | PK | Horizontal | 34.14 | 74.00 | 39.86 | 1.8 | 220 |
| 14646.00 | PK | Horizontal | 33.84 | 74.00 | 40.16 | 1.1 | 210 |
| 17087.00 | PK | Horizontal | 32.65 | 74.00 | 41.35 | 1.3 | 160 |
| 19528.00 | PK | Horizontal | 30.11 | 74.00 | 43.89 | 1.3 | 245 |
| 21969.00 | PK | Horizontal | 30.06 | 74.00 | 43.94 | 1.1 | 50 |
| 24410.00 | PK | Horizontal | 31.04 | 74.00 | 42.96 | 1.3 | 215 |

| Frequency (MHz) | Detector | Antenna Polarization | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Turntable Angle (°) |
|---|---|---|---|---|---|---|---|
| **Upper frequency** | | | | | | | |
| 2480.00 | AV | Vertical | 76.37 | N/A | (Fund.) | 1.2 | 220 |
| 4960.00 | AV | Vertical | 35.25 | 54.00 | 18.75 | 1.4 | 95 |
| 7440.00 | AV | Vertical | 31.64 | 54.00 | 22.36 | 1.3 | 170 |
| 9920.00 | AV | Vertical | 31.36 | 54.00 | 22.64 | 1.1 | 130 |
| 12400.00 | AV | Vertical | 31.47 | 54.00 | 22.53 | 2.0 | 140 |
| 14880.00 | AV | Vertical | 32.98 | 54.00 | 21.02 | 1.5 | 195 |
| 17360.00 | AV | Vertical | 31.26 | 54.00 | 22.74 | 1.2 | 160 |
| 19840.00 | AV | Vertical | 30.14 | 54.00 | 23.86 | 1.1 | 260 |
| 22320.00 | AV | Vertical | 32.11 | 54.00 | 21.89 | 1.5 | 150 |
| 24800.00 | AV | Vertical | 29.84 | 54.00 | 24.16 | 1.0 | 220 |
| 2480.00 | AV | Horizontal | 71.85 | N/A | (Fund.) | 1.5 | 190 |
| 4960.00 | AV | Horizontal | 36.46 | 54.00 | 17.54 | 2.3 | 210 |
| 7440.00 | AV | Horizontal | 32.61 | 54.00 | 21.39 | 1.4 | 160 |
| 9920.00 | AV | Horizontal | 32.86 | 54.00 | 21.14 | 1.3 | 275 |
| 12400.00 | AV | Horizontal | 32.77 | 54.00 | 21.23 | 1.2 | 185 |
| 14880.00 | AV | Horizontal | 31.97 | 54.00 | 22.03 | 1.5 | 190 |
| 17360.00 | AV | Horizontal | 30.67 | 54.00 | 23.33 | 1.9 | 230 |
| 19840.00 | AV | Horizontal | 31.12 | 54.00 | 22.88 | 1.5 | 135 |
| 22320.00 | AV | Horizontal | 33.24 | 54.00 | 20.76 | 1.4 | 150 |
| 24800.00 | AV | Horizontal | 30.84 | 54.00 | 23.16 | 2.4 | 170 |
| 2480.00 | PK | Vertical | 89.52 | N/A | (Fund.) | 1.3 | 210 |
| 4960.00 | PK | Vertical | 35.66 | 74.00 | 38.34 | 1.0 | 115 |
| 7440.00 | PK | Vertical | 33.26 | 74.00 | 40.74 | 2.5 | 180 |
| 9920.00 | PK | Vertical | 31.47 | 74.00 | 42.53 | 1.1 | 160 |
| 12400.00 | PK | Vertical | 33.46 | 74.00 | 40.54 | 1.6 | 130 |
| 14880.00 | PK | Vertical | 30.02 | 74.00 | 43.98 | 1.0 | 155 |
| 17360.00 | PK | Vertical | 31.69 | 74.00 | 42.31 | 1.2 | 140 |
| 19840.00 | PK | Vertical | 30.32 | 74.00 | 43.68 | 1.6 | 190 |
| 22320.00 | PK | Vertical | 32.86 | 74.00 | 41.14 | 2.1 | 170 |
| 24800.00 | PK | Vertical | 29.87 | 74.00 | 44.13 | 1.0 | 210 |
| 2480.00 | PK | Horizontal | 82.73 | N/A | (Fund.) | 1.8 | 240 |
| 4960.00 | PK | Horizontal | 34.21 | 74.00 | 39.79 | 1.4 | 140 |
| 7440.00 | PK | Horizontal | 35.74 | 74.00 | 38.26 | 1.6 | 150 |
| 9920.00 | PK | Horizontal | 32.19 | 74.00 | 41.81 | 1.5 | 265 |
| 12400.00 | PK | Horizontal | 32.68 | 74.00 | 41.32 | 1.6 | 160 |
| 14880.00 | PK | Horizontal | 30.22 | 74.00 | 43.78 | 1.6 | 150 |
| 17360.00 | PK | Horizontal | 32.61 | 74.00 | 41.39 | 2.1 | 190 |
| 19840.00 | PK | Horizontal | 31.41 | 74.00 | 42.59 | 1.3 | 245 |
| 22320.00 | PK | Horizontal | 33.26 | 74.00 | 40.74 | 1.9 | 170 |
| 24800.00 | PK | Horizontal | 30.84 | 74.00 | 43.16 | 1.6 | 260 |

# 8 Band Edge Measurements

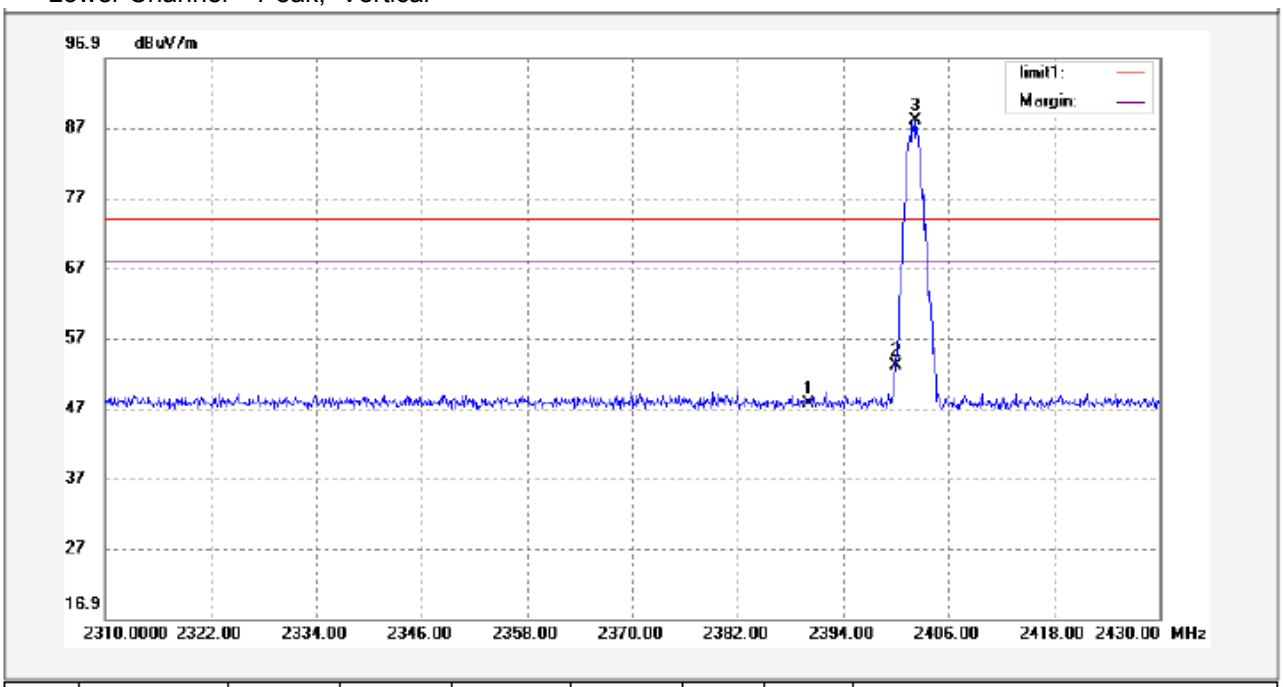
| | |
|---|---|
| Test Requirement: | Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. As defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). |
| Test Method: | DA 00-705 |
| Measurement Distance: | 3m |
| Limit: | 40.0 dBuV/m between 30MHz & 88MHz;<br>43.5 dBuV/m between 88MHz & 216MHz;<br>46.0 dBuV/m between 216MHz & 960MHz;<br>54.0 dBuV/m above 960MHz.<br>74.0 dBuV/m for peak above 1GHz<br>54.0 dBuV/m for AVG above 1GHz |

## 8.1 Test Procedure:

| | |
|---|---|
| Detector: | For Peak value:<br>RBW = 1 MHz for f ≥ 1 GHz<br>VBW ≥ RBW; Sweep = auto<br>Detector function = peak<br>Trace = max hold<br>For AVG value:<br>RBW = 1 MHz for f ≥ 1 GHz<br>VBW = 10Hz; Sweep = auto<br>Detector function = AVG<br>Trace = max hold |
| Test mode: | Test in fixing operating frequency at lower and upper channel. |

## 8.2 Test Result:

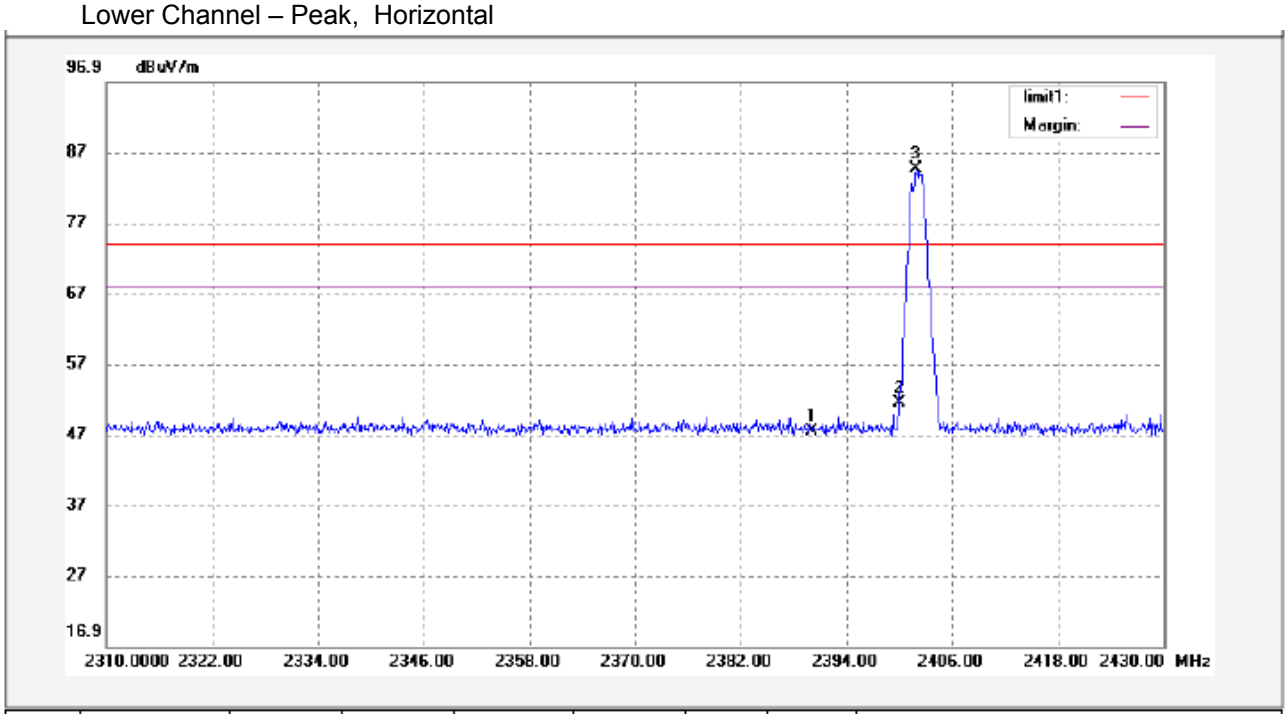
Lower Channel – Peak, Vertical




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 45.07 | 2.53 | 47.60 | 74.00 | -26.40 | peak | |
| 2 | 2400.000 | 50.58 | 2.52 | 53.10 | 74.00 | -20.90 | peak | |
| 3 | 2402.280 | 85.49 | 2.51 | 88.00 | 74.00 | 14.00 | peak | |

Remark:Mark3 is fundamental wave.

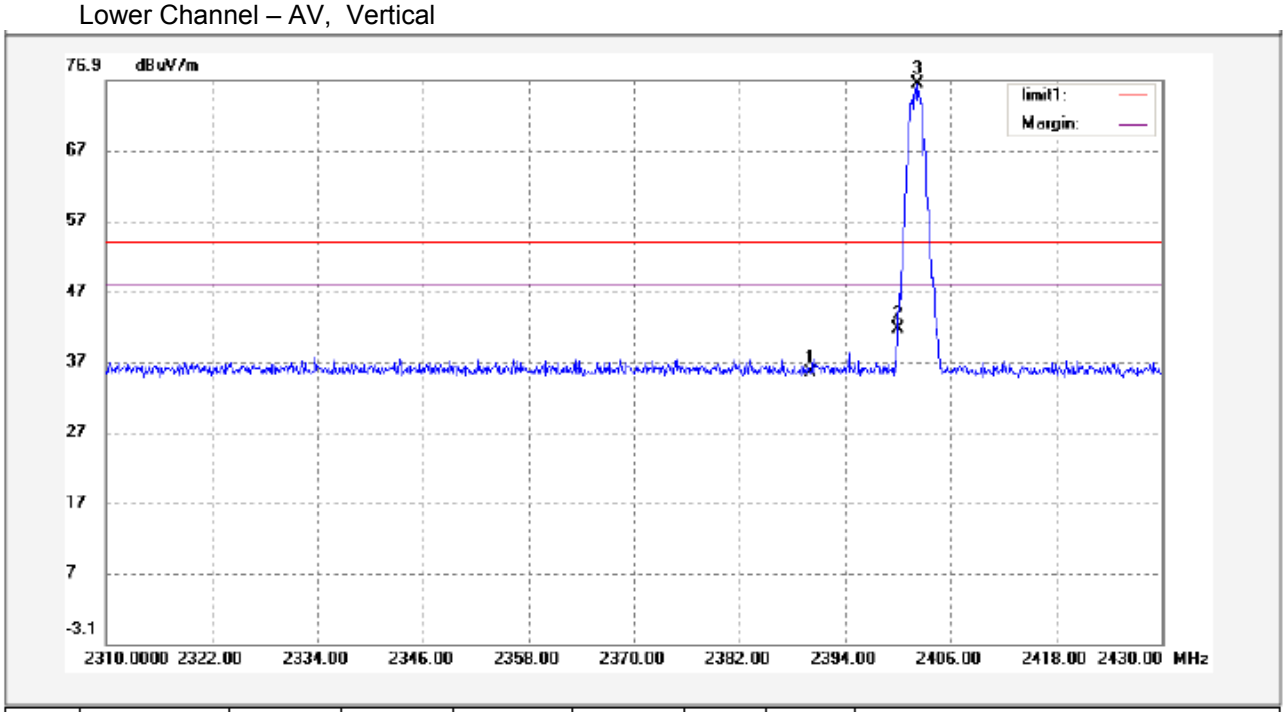
Lower Channel – Peak, Horizontal




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 44.86 | 2.53 | 47.39 | 74.00 | -26.61 | peak | |
| 2 | 2400.000 | 48.84 | 2.52 | 51.36 | 74.00 | -22.64 | peak | |
| 3 | 2401.920 | 82.14 | 2.52 | 84.66 | 74.00 | 10.66 | peak | |

Remark:Mark3 is fundamental wave.

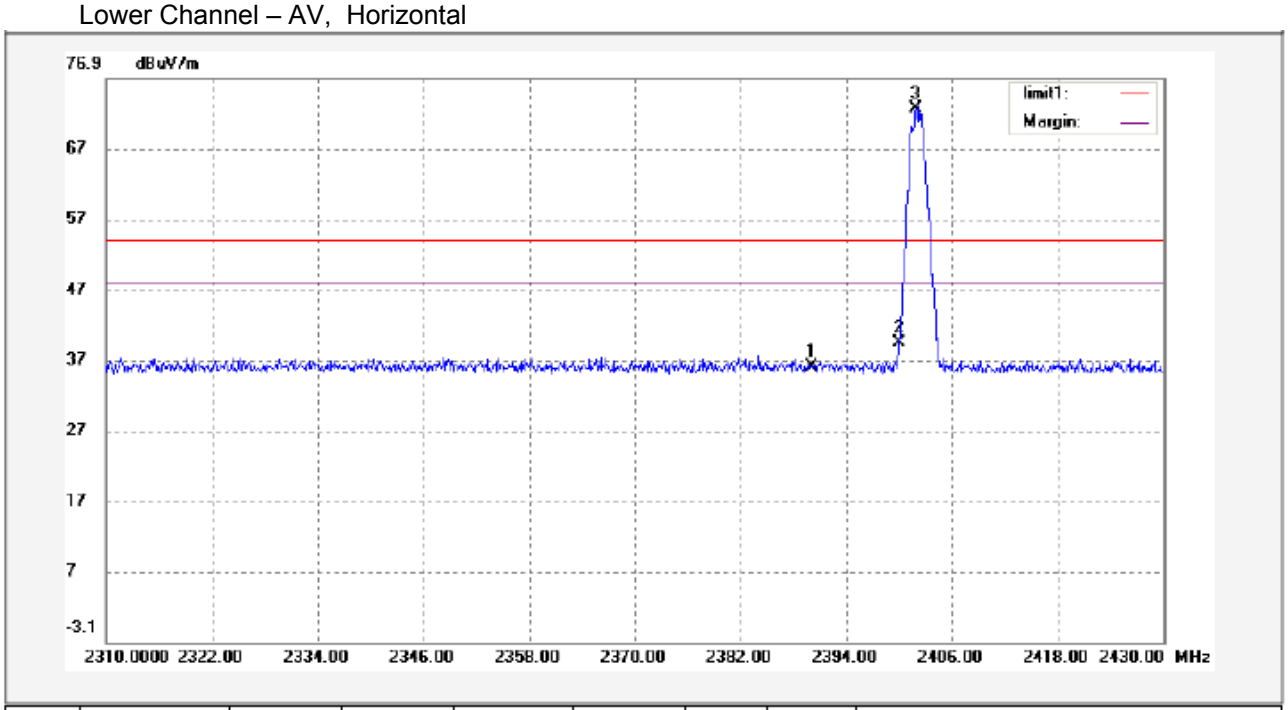
Lower Channel – AV, Vertical




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 44.71 | -9.27 | 35.44 | 54.00 | -18.56 | AVG | |
| 2 | 2400.000 | 50.80 | -9.28 | 41.52 | 54.00 | -12.48 | AVG | |
| 3 | 2402.160 | 85.68 | -9.29 | 76.39 | 54.00 | 22.39 | AVG | |

Remark:Mark3 is fundamental wave.

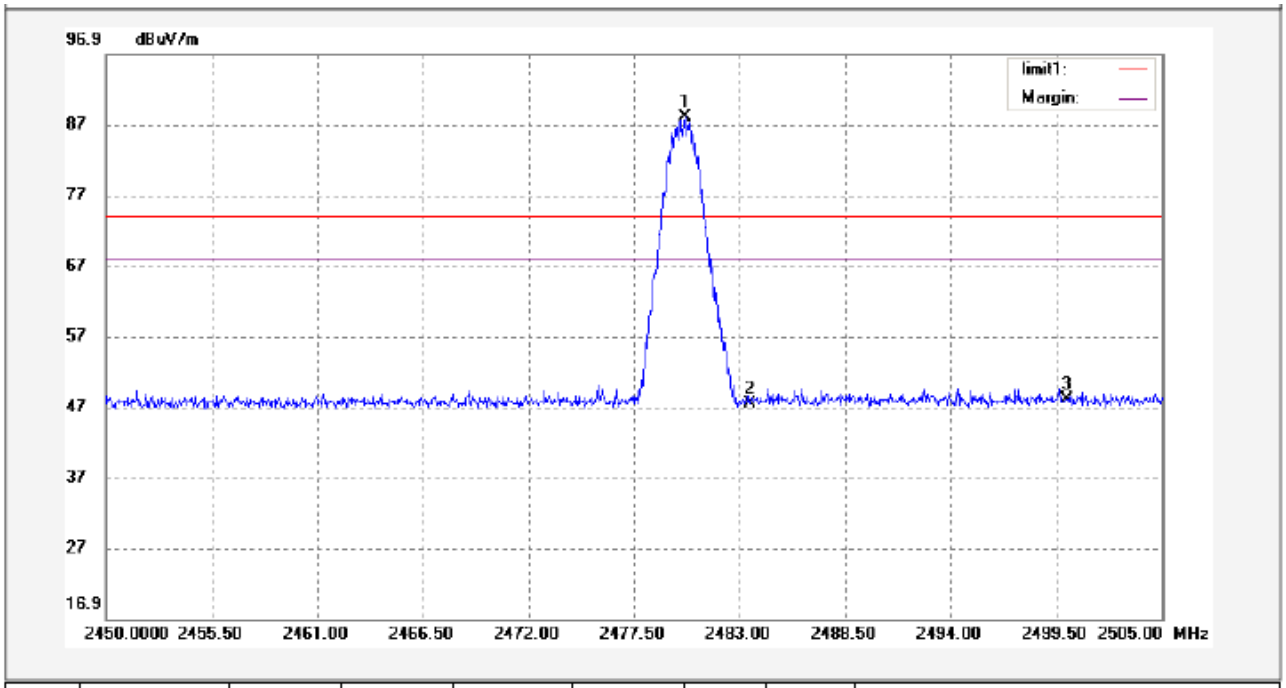
Lower Channel – AV, Horizontal




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2390.000 | 45.24 | -9.27 | 35.97 | 54.00 | -18.03 | AVG | |
| 2 | 2400.000 | 48.72 | -9.28 | 39.44 | 54.00 | -14.56 | AVG | |
| 3 | 2401.920 | 81.80 | -9.28 | 72.52 | 54.00 | 18.52 | AVG | |

Remark:Mark3 is fundamental wave.

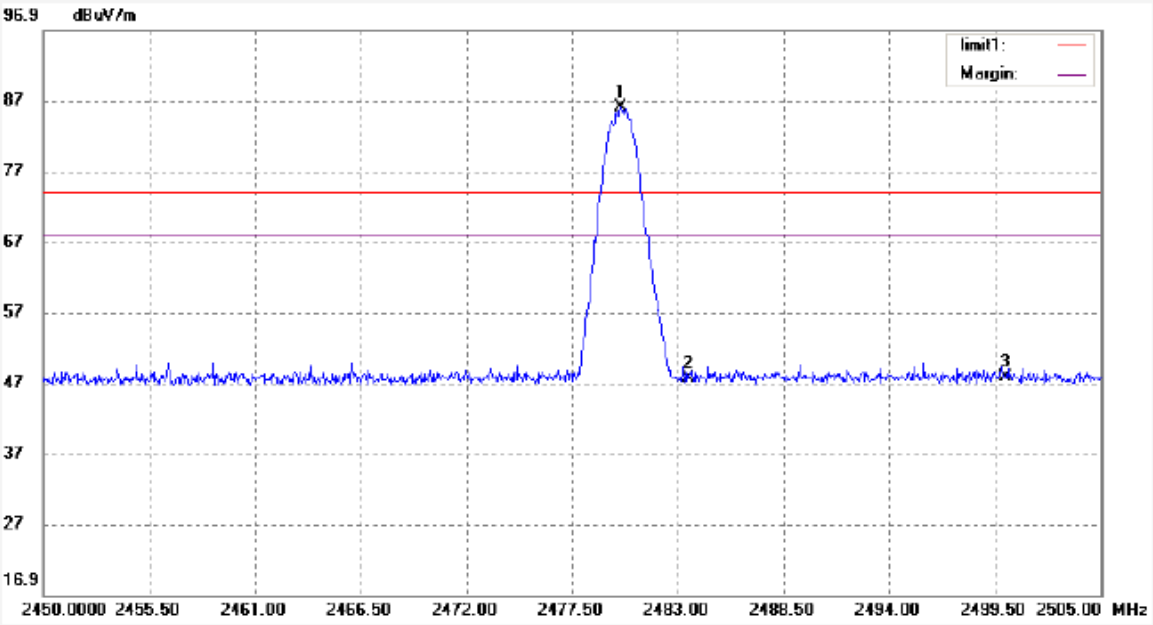
Upper Channel – Peak, Vertical




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2480.140 | 85.44 | 2.58 | 88.02 | 74.00 | 14.02 | peak | |
| 2 | 2483.500 | 44.73 | 2.60 | 47.33 | 74.00 | -26.67 | peak | |
| 3 | 2500.000 | 45.39 | 2.65 | 48.04 | 74.00 | -25.96 | peak | |

Remark:Mark1 is fundamental wave.

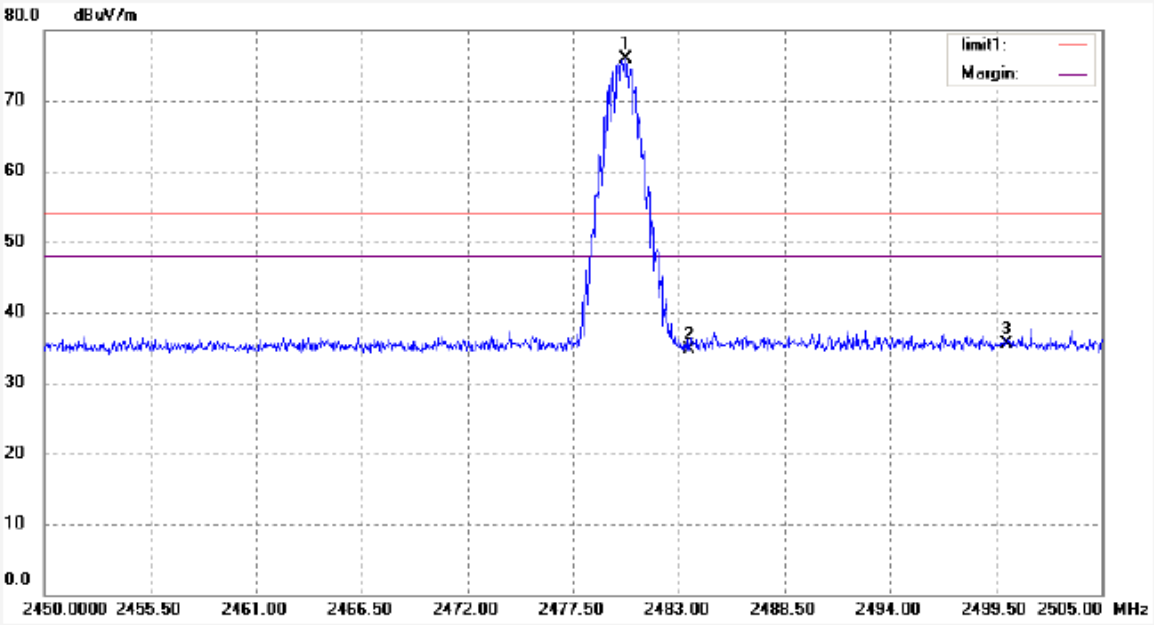
Upper Channel – Peak, Horizontal




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2480.030 | 83.33 | 2.58 | 85.91 | 74.00 | 11.91 | peak | |
| 2 | 2483.500 | 44.95 | 2.60 | 47.55 | 74.00 | -26.45 | peak | |
| 3 | 2500.000 | 45.24 | 2.65 | 47.89 | 74.00 | -26.11 | peak | |

Remark:Mark1 is fundamental wave.

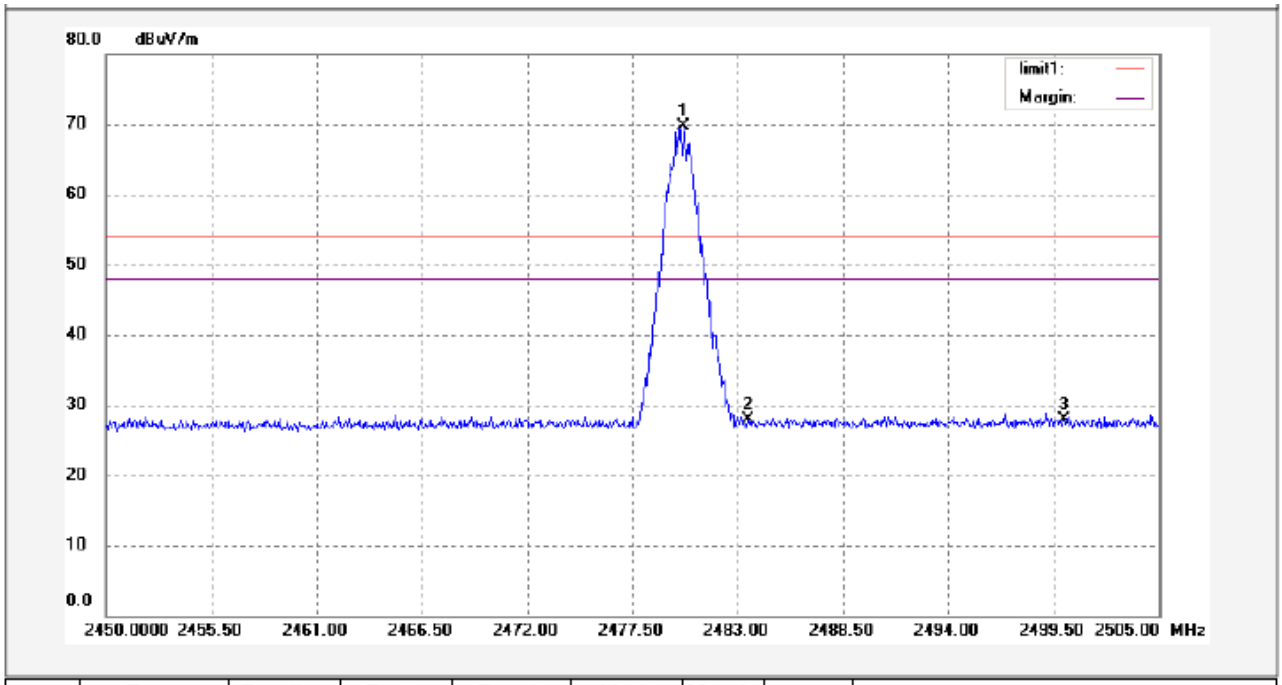
Upper Channel – AV, Vertical




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2480.250 | 85.10 | -9.22 | 75.88 | 54.00 | 21.88 | AVG | |
| 2 | 2483.500 | 43.88 | -9.20 | 34.68 | 54.00 | -19.32 | AVG | |
| 3 | 2500.000 | 44.69 | -9.15 | 35.54 | 54.00 | -18.46 | AVG | |

Remark:Mark1 is fundamental wave.

Upper Channel – AV, Horizontal




| No. | Freq. (MHz) | Reading (dBuV/m) | Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 2480.195 | 78.93 | -9.22 | 69.71 | 54.00 | 15.71 | AVG | |
| 2 | 2483.500 | 37.09 | -9.20 | 27.89 | 54.00 | -26.11 | AVG | |
| 3 | 2500.000 | 36.98 | -9.15 | 27.83 | 54.00 | -26.17 | AVG | |

Remark:Mark1 is fundamental wave.

# 9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247
Test Method: DA 00-705
Test Mode: Test in fixing operating frequency at lower, middle, upper channel.

## 9.1 Test Procedure:

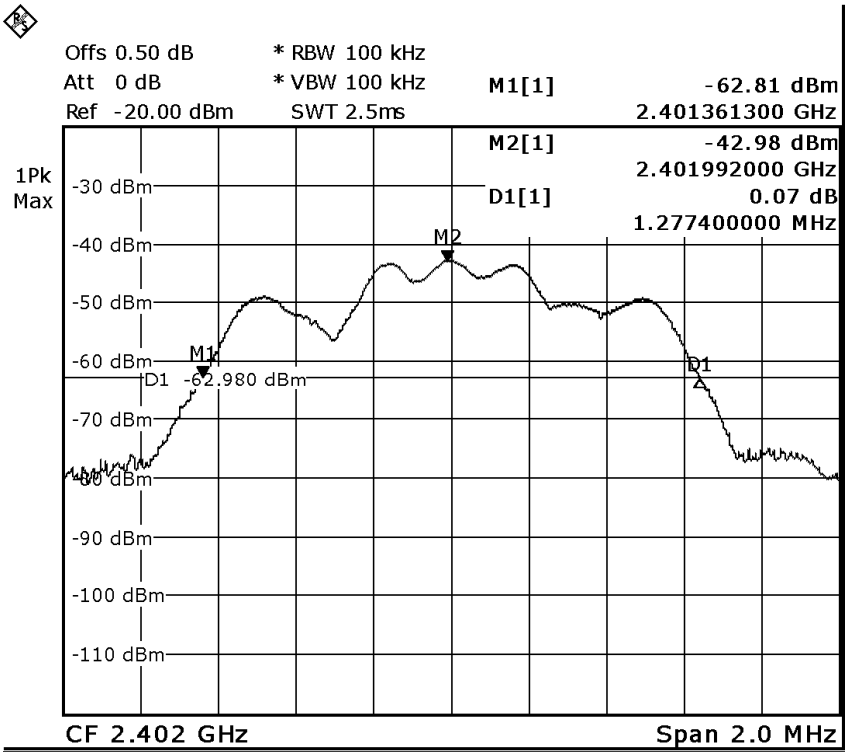
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 100kHz

## 9.2 Test Result:

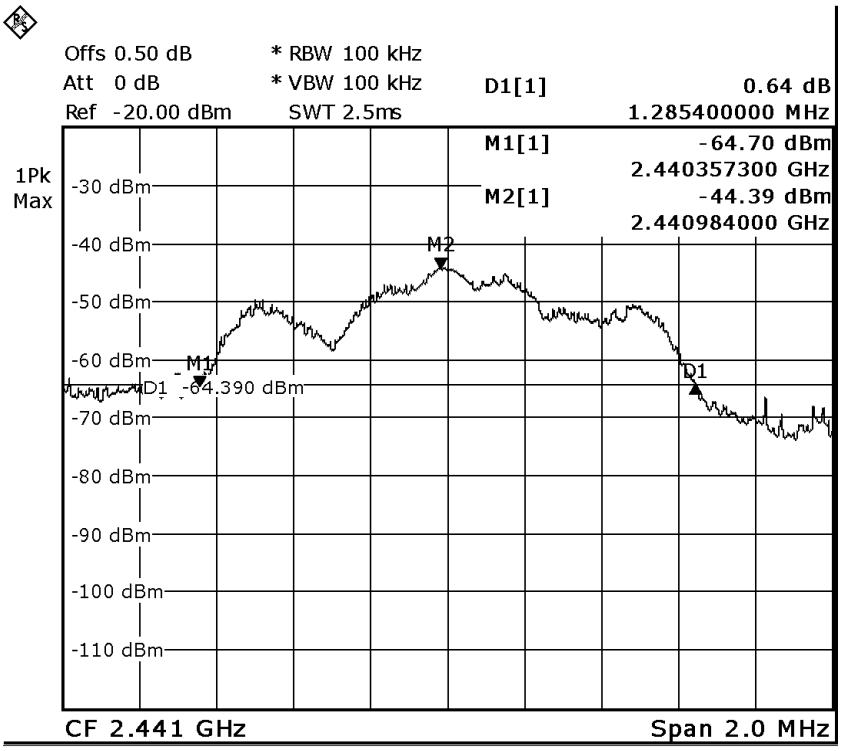
| Test Channel | Bandwidth |
|---|---|
| Lower | 1.27740MHz |
| Middle | 1.28540MHz |
| Upper | 1.24150MHz |

Test result plot as follows:

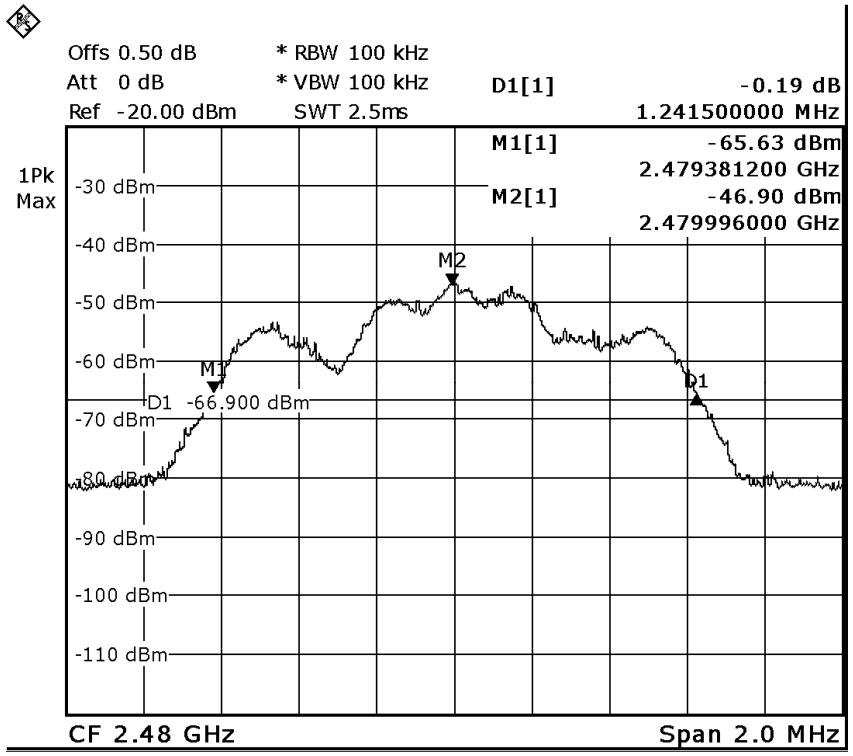
Lower Channel:



Middle Channel




Upper Channel



# 10 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247
Test Method: ANSI C63.4:2003
Test Limit: Regulation 15.247 (b)(1)For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Refer to the result “Number of Hopping Frequency” of this document.
The 1watts (30 dBm) limit applies.
Test Mode: Test in fixing operating frequency at lower, middle, upper channel.

## 10.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1MHz. VBW = 1MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

## 10.2 Test Result:

| Test Channel | Output Power (dBm) | Limit (dBm) |
|---|---|---|
| Lower | -33.90 | 30 |
| Middle | -34.28 | 30 |
| upper | -36.42 | 30 |

# 11 Hopping Channel Separation

| | |
|---|---|
| Test Requirement: | FCC CFR47 Part 15 Section 15.247 |
| Test Method: | DA 00-705 |
| Test Limit: | Regulation 15.247(a) (1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. |
| Test Mode: | Test in fixing operating frequency at lower, middle, upper channel. |

## 11.1 Test Procedure:

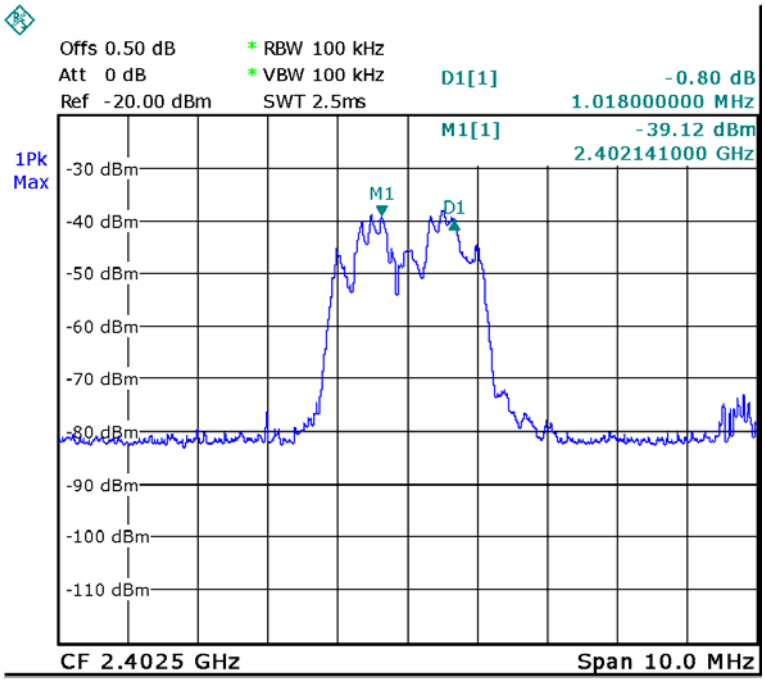
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 100kHz, Span = 10MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

## 11.2 Test Result:

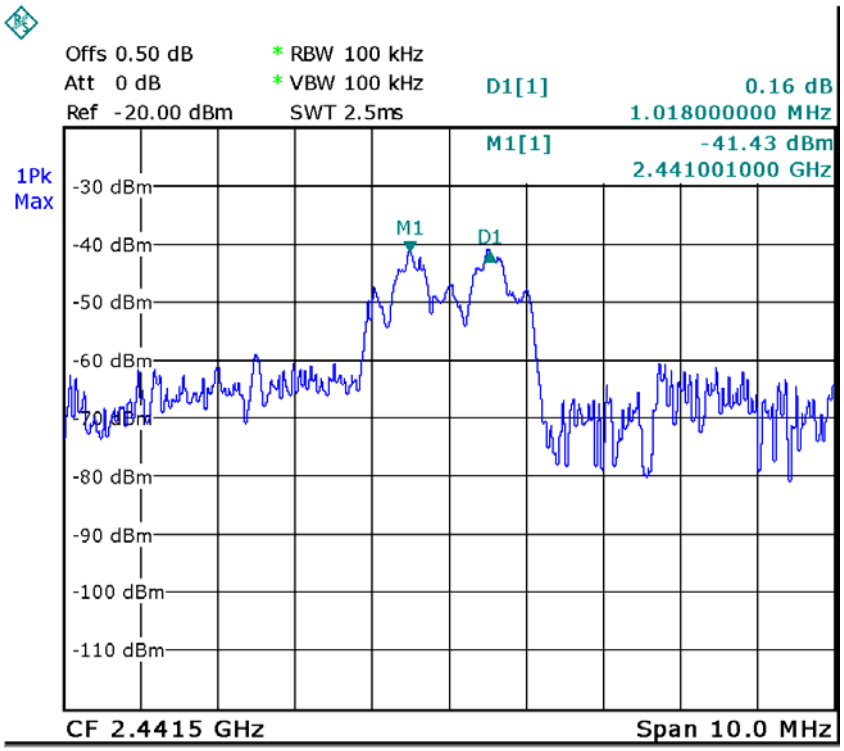
| Test Channel | Separation (MHz) | Result |
|---|---|---|
| Lower | 1.018 | PASS |
| Middle | 1.018 | PASS |
| Upper | 1.018 | PASS |

Test result plot as follows:

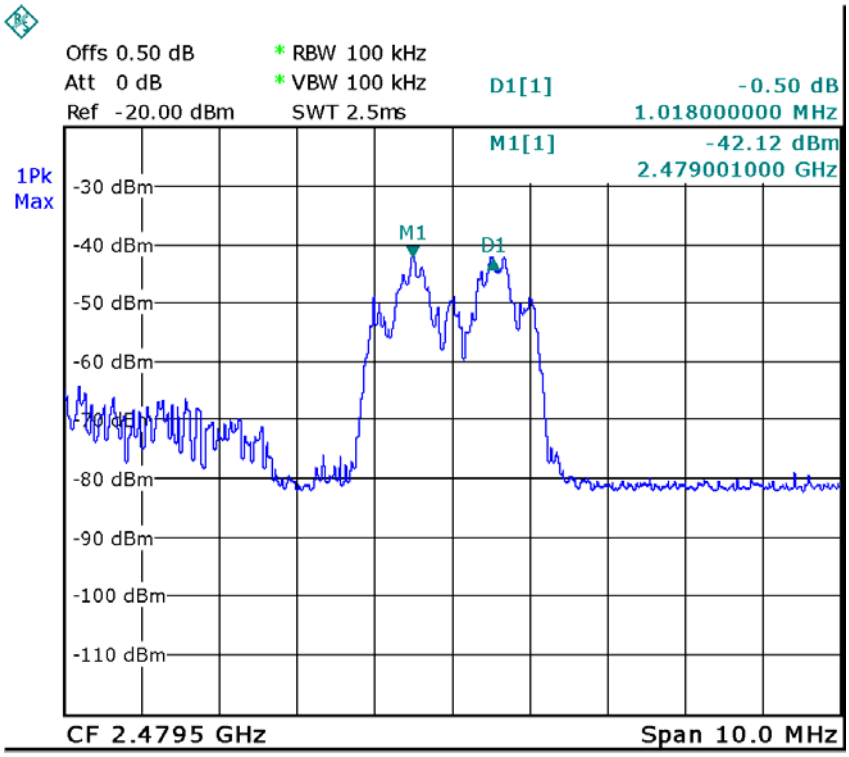
Lower Channel:



Middle Channel




Upper Channel



# 12 Number of Hopping Frequency

| | |
|---|---|
| Test Requirement: | FCC CFR47 Part 15 Section 15.247 |
| Test Method: | DA 00-705 |
| Test Limit: | Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. |
| Test Mode: | Test in hopping transmitting operating mode. |

## 12.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

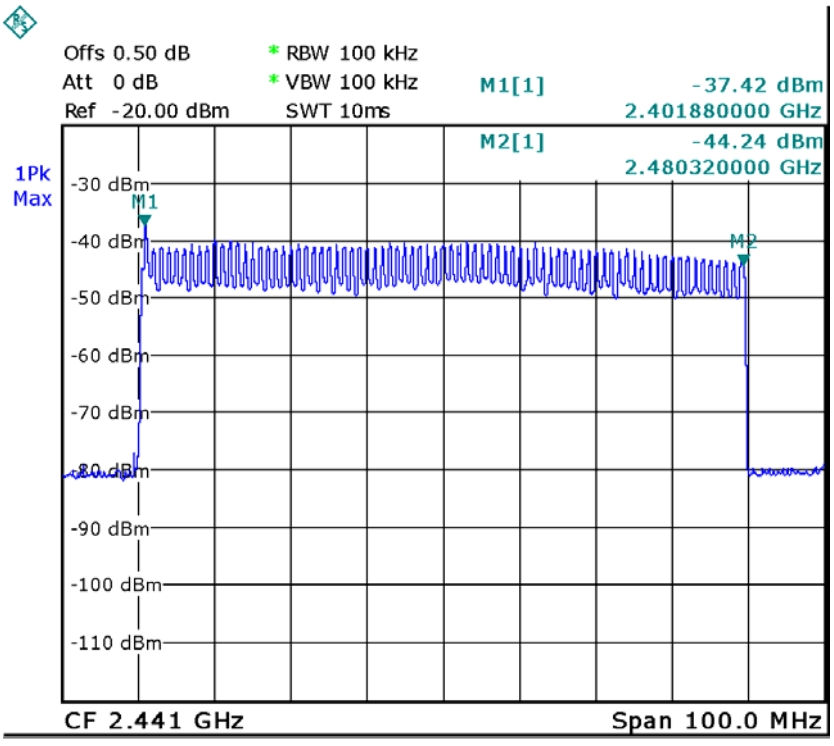
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 100 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.

4. Set the spectrum analyzer: Center Frequency = 2441MHz, Span = 100MHz. Submit the test result graph.

## 12.2 Test Result:

Total Channels are 79 Channels



# 13 Dwell Time

Test Requirement: FCC CFR47 Part 15 Section 15.247
Test Method: DA 00-705
Test Limit: Regulation 15.247(a) (1) (iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
Test Mode: Test in fixing operating frequency at lower, middle, upper channel.

## 13.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. Centered on a hopping channel;
3. Set RBW = 1MHz and VBW = 1MHz.Sweep = as necessary to capture the entire dwell time per hopping channel.
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g. data rate. modulation format. etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

## 13.2 Test Result:

Dwell time = Pulse wide x (Hopping rate / Number of channels) x Period
The test period: T= 0.4(s) * 79 = 31.6 (s)
DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel (5 time slots RX, 1 time slot TX).
DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel (3 time slots RX, 1 time slot TX).
DH1 Packet permit maximum 1600 / 79 / 2 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

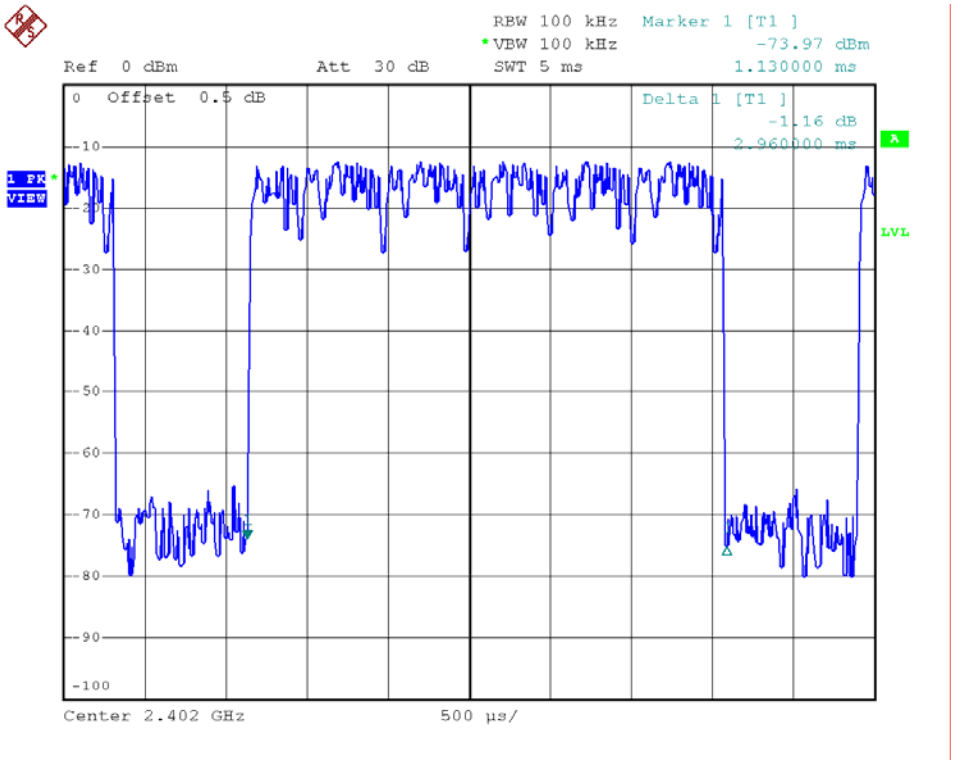
| Data Packet | Dwell Time(s) |
|---|---|
| DH5 | 1600/79/6*31.6*(MkrDelta)/1000 |
| DH3 | 1600/79/4*31.6*(MkrDelta)/1000 |
| DH1 | 1600/79/2*31.6*(MkrDelta)/1000 |

**Note**: Mkr Delta is once pulse time.

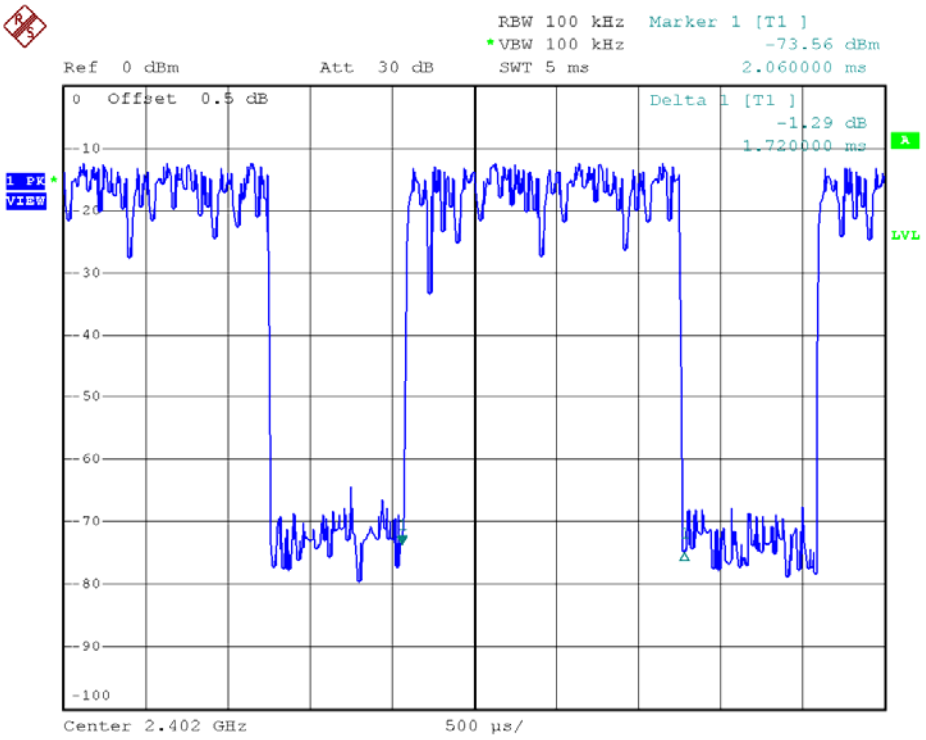
Dwell time of each occupation in this channel as follows:

| Data Packet | Channel | Mkr Delta(ms) | Dwell Time(s) | Limits(s) | Result |
|---|---|---|---|---|---|
| DH5 | Lower | 2.96 | 0.316 | 0.400 | Pass |
| DH3 | Lower | 1.72 | 0.275 | 0.400 | Pass |
| DH1 | Lower | 0.48 | 0.154 | 0.400 | Pass |

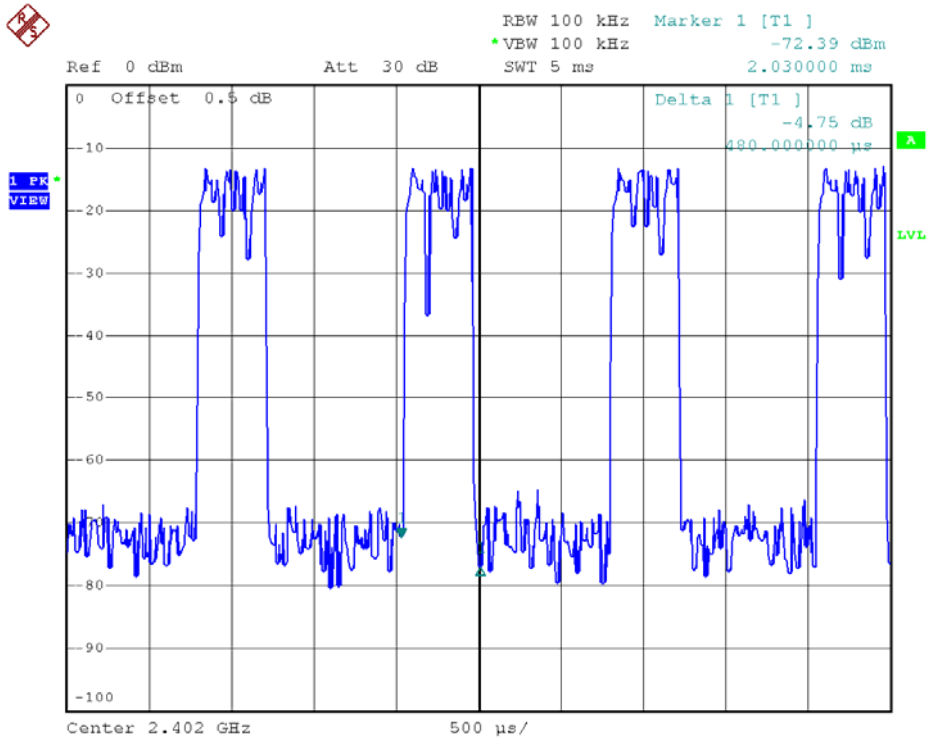
Mode: DH5



Mode: DH3

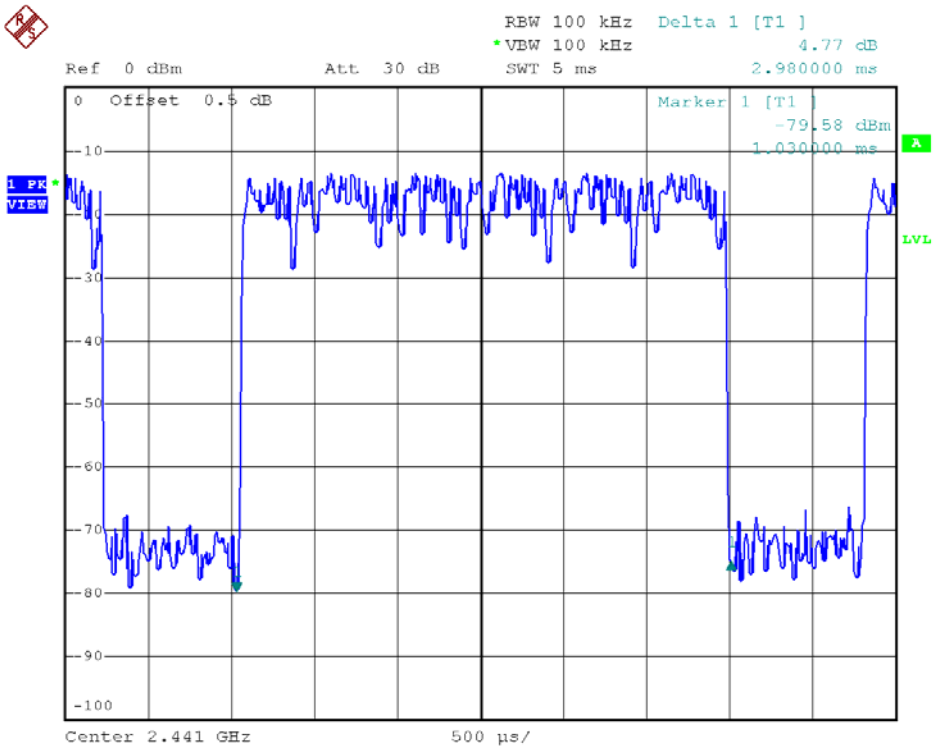



Mode: DH1

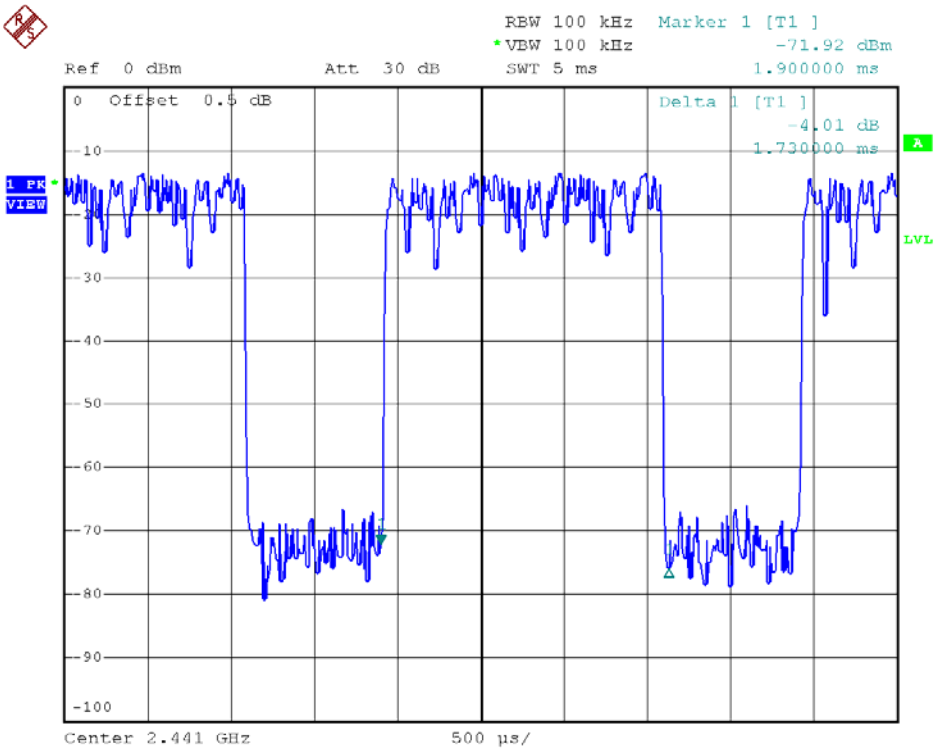


| Data Packet | Channel | Mkr Delta(ms) | Dwell Time(s) | Limits(s) | Result |
|---|---|---|---|---|---|
| DH5 | Middle | 2.98 | 0.318 | 0.400 | Pass |
| DH3 | Middle | 1.73 | 0.277 | 0.400 | Pass |
| DH1 | Middle | 0.46 | 0.147 | 0.400 | Pass |

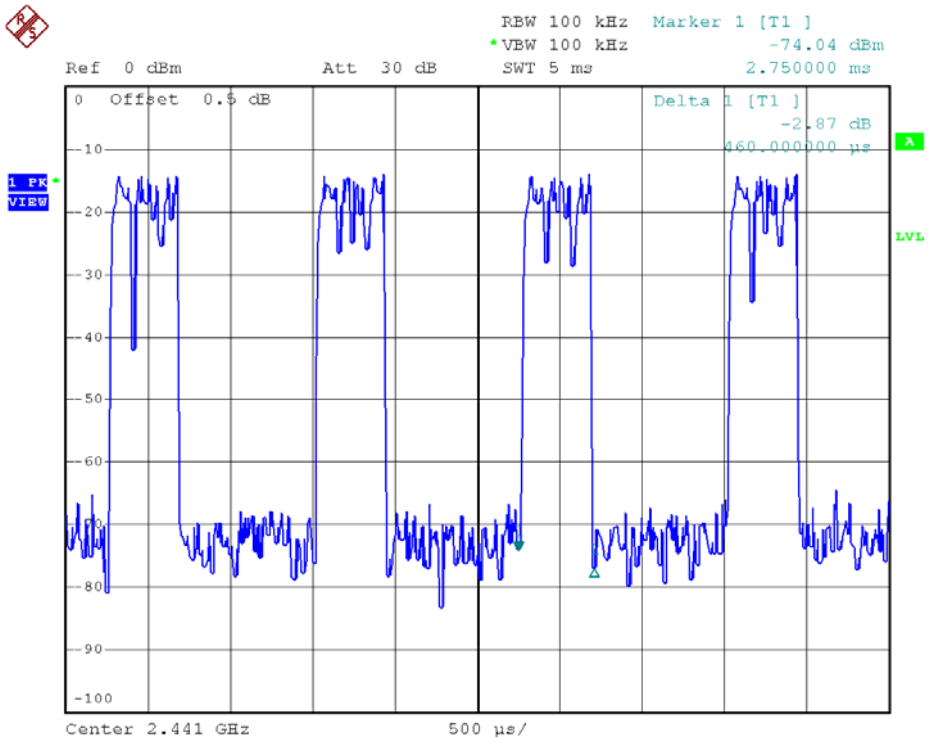
Mode: DH5



Mode: DH3

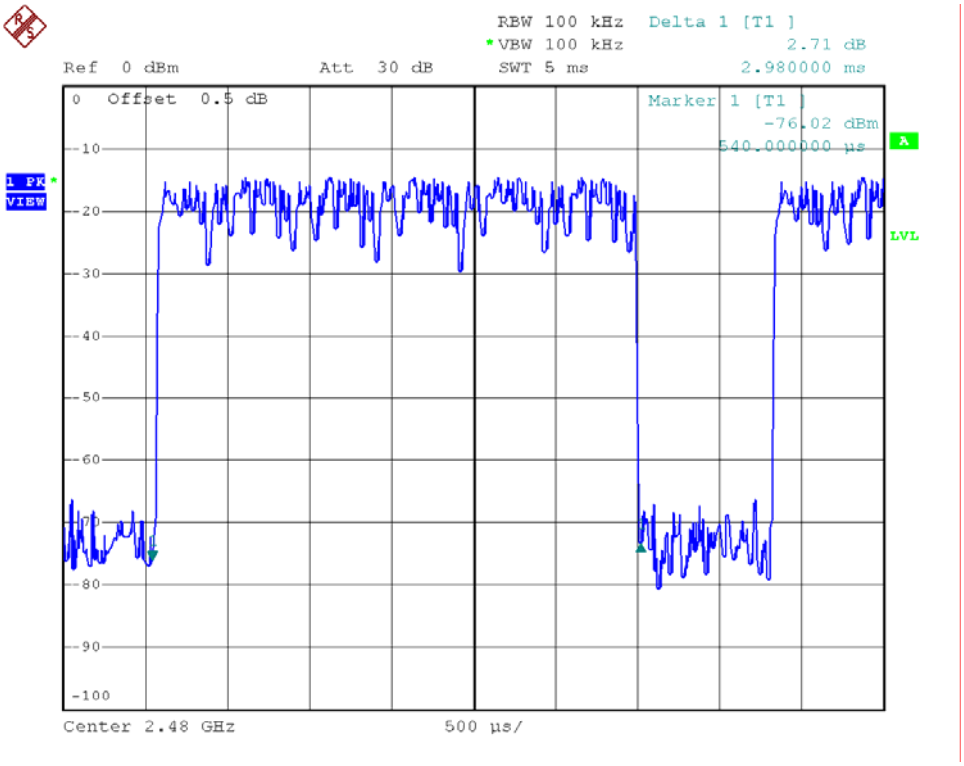



Mode: DH 1

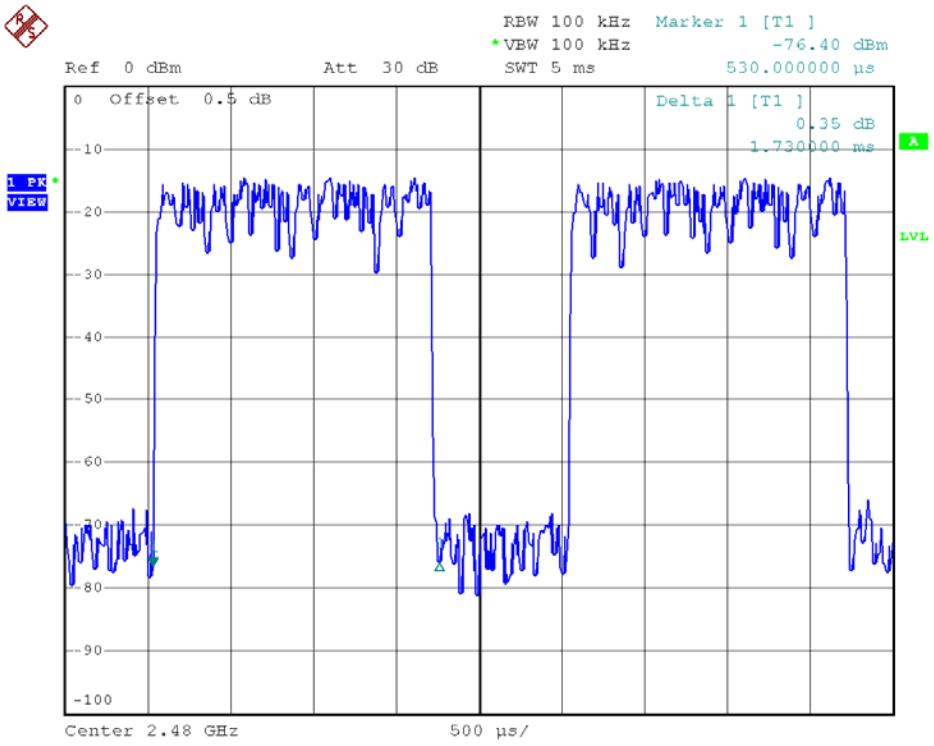


| Data Packet | Channel | Mkr Delta(ms) | Dwell Time(s) | Limits(s) | Result |
|---|---|---|---|---|---|
| DH5 | Upper | 2.98 | 0.318 | 0.400 | Pass |
| DH3 | Upper | 1.73 | 0.277 | 0.400 | Pass |
| DH1 | Upper | 0.45 | 0.144 | 0.400 | Pass |

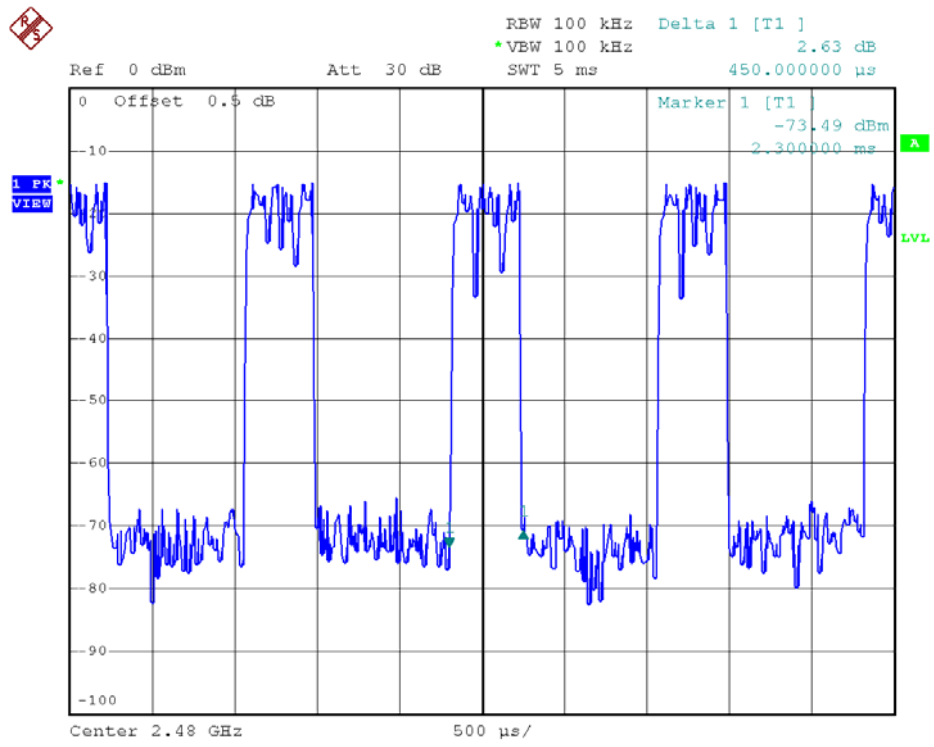
Mode: DH5



Mode: DH3




Mode: DH1



# 14 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has a integrated antenna, fulfil the requirement of this section.

# 15 RF Exposure

## 15.1 Requirements:

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

## 15.2 Measurement Result:

| Channel | Antenna Gain (dBi) | Antenna Gain (numeric) | Conducted Power (dBm) | Conducted Power (mW) |
|---|---|---|---|---|
| Lower | 0 | 1 | -33.90 | 0.00041 |
| Middle | 0 | 1 | -33.19 | 0.00040 |
| Upper | 0 | 1 | -36.42 | 0.00039 |

Formula: dBm=10lg(mw), $Gain_{numeric}=10^{(dBi/10)}$

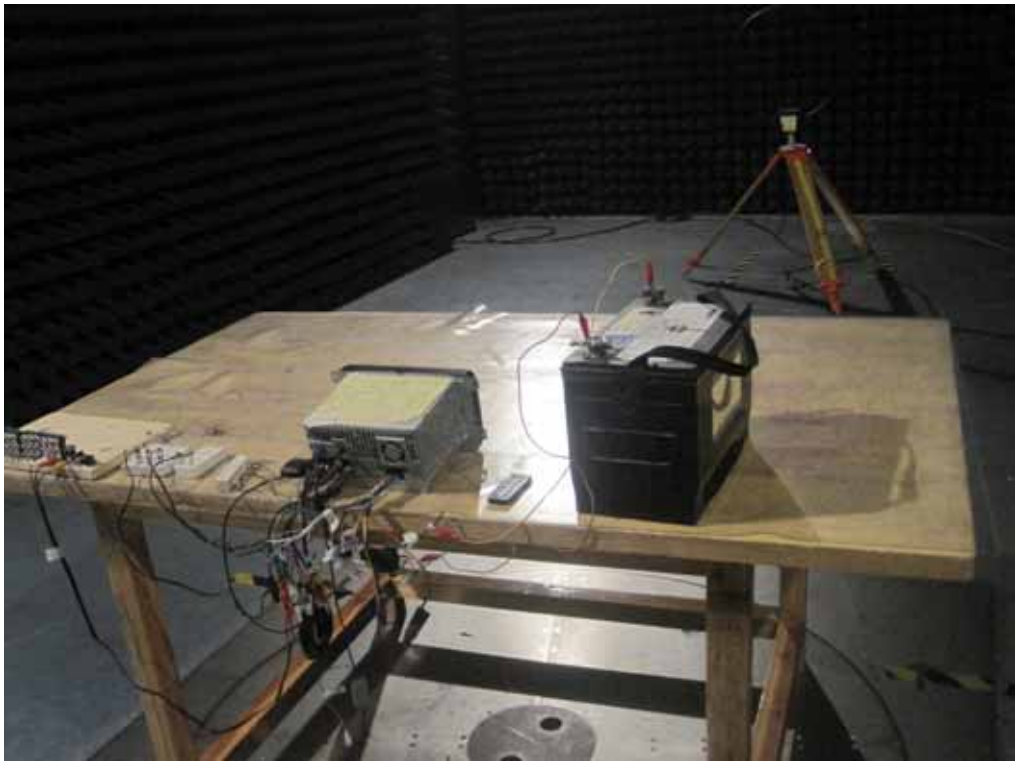
The EUT works on the 2.4GHz ISM band, and the max output power (conducted) of which is 0.0004mW lower than low threshold 60/f (GHz) mW (25mW), d < 2.5cm in general population category.

The SAR evaluation is not required.

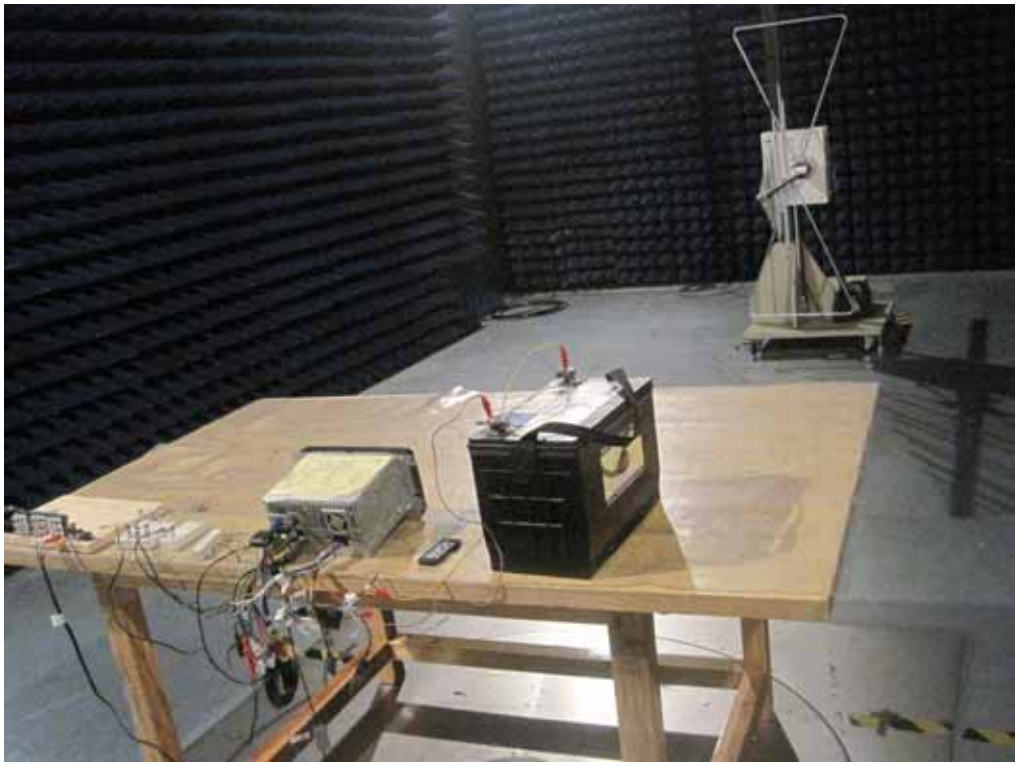
# 16 Photographs –Test Setup

## 16.1 Radiated Emissions

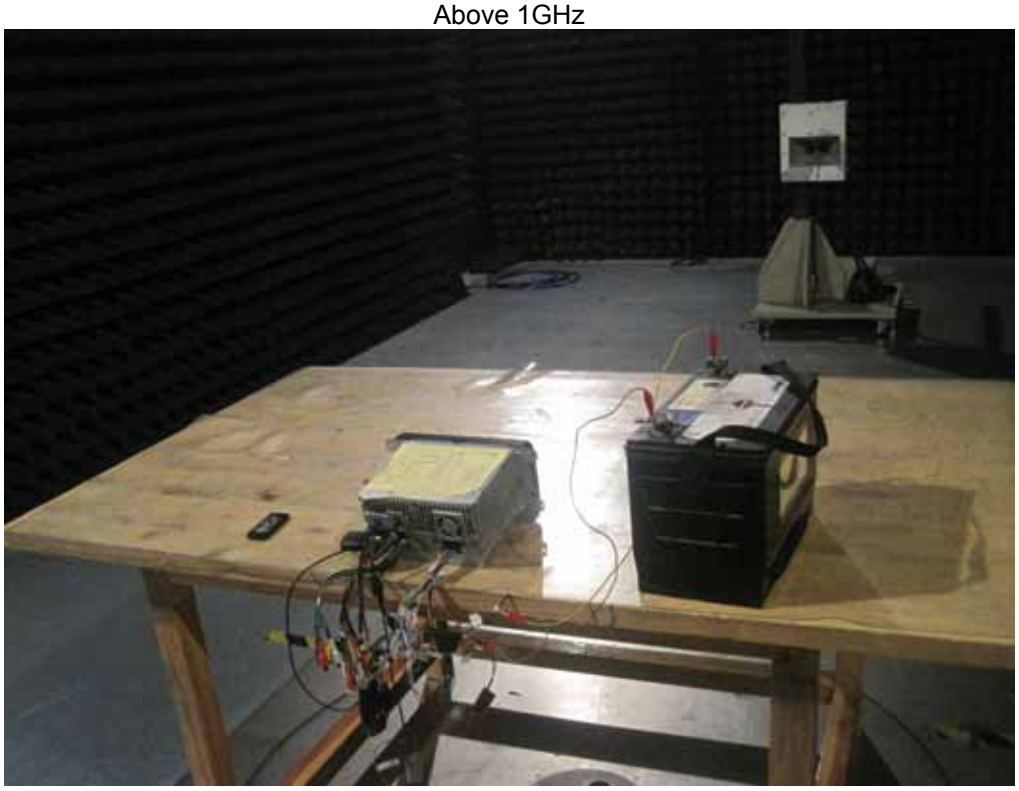
Below 30MHz



From 30-1000MHz



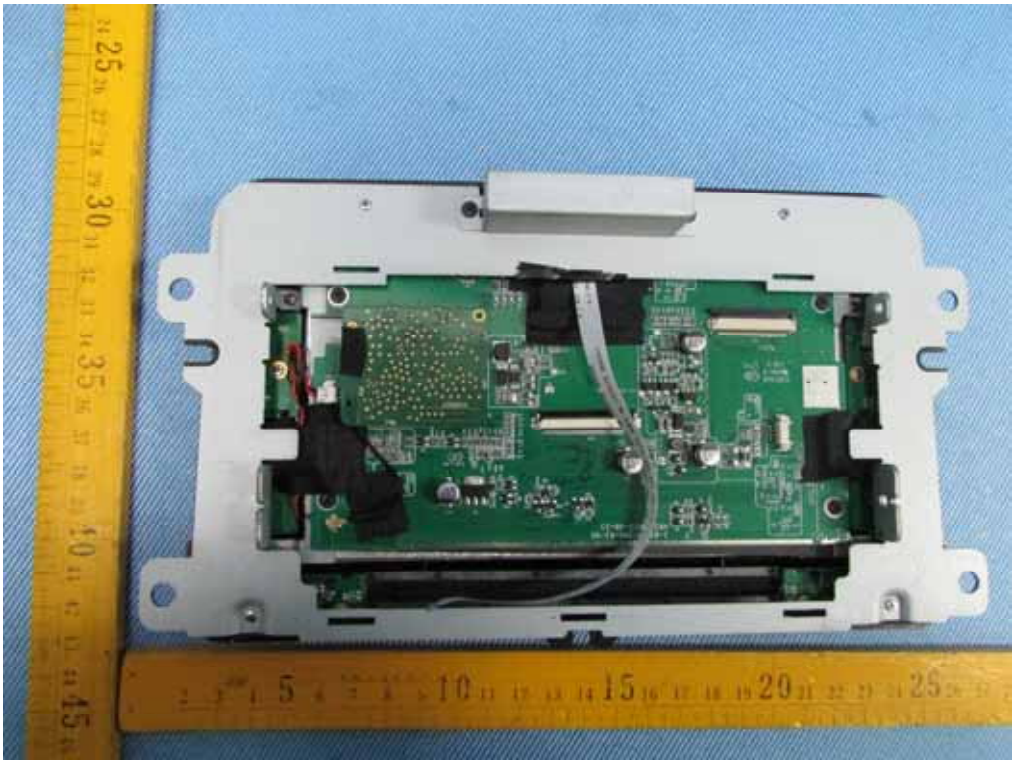
Above 1GHz

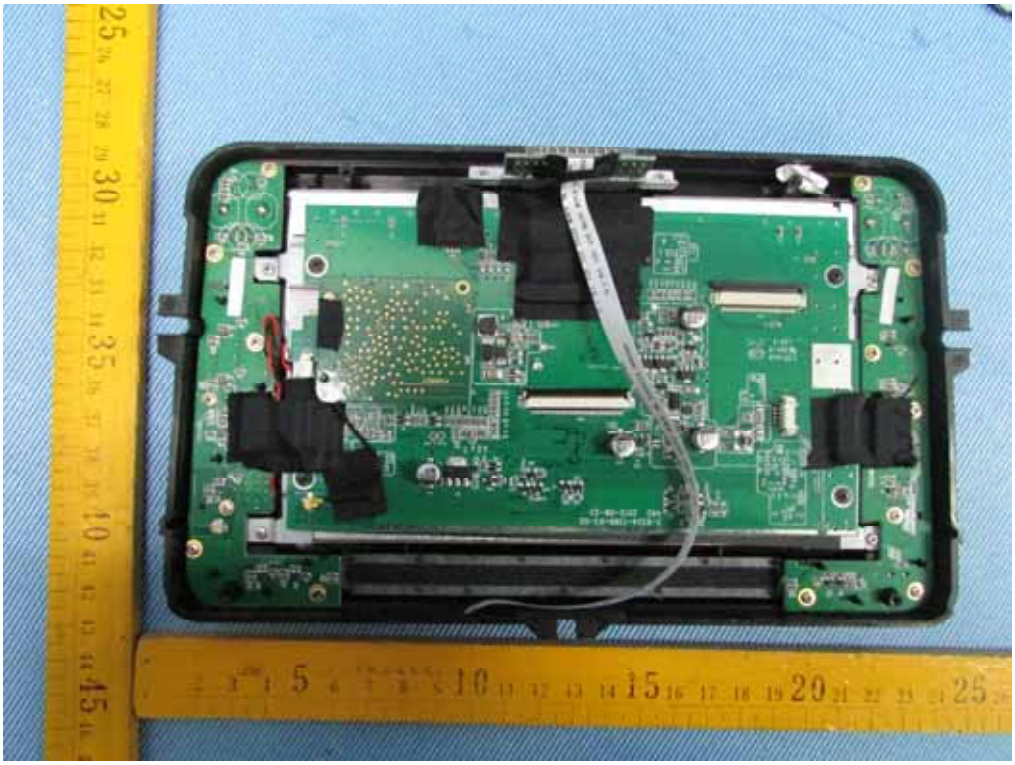


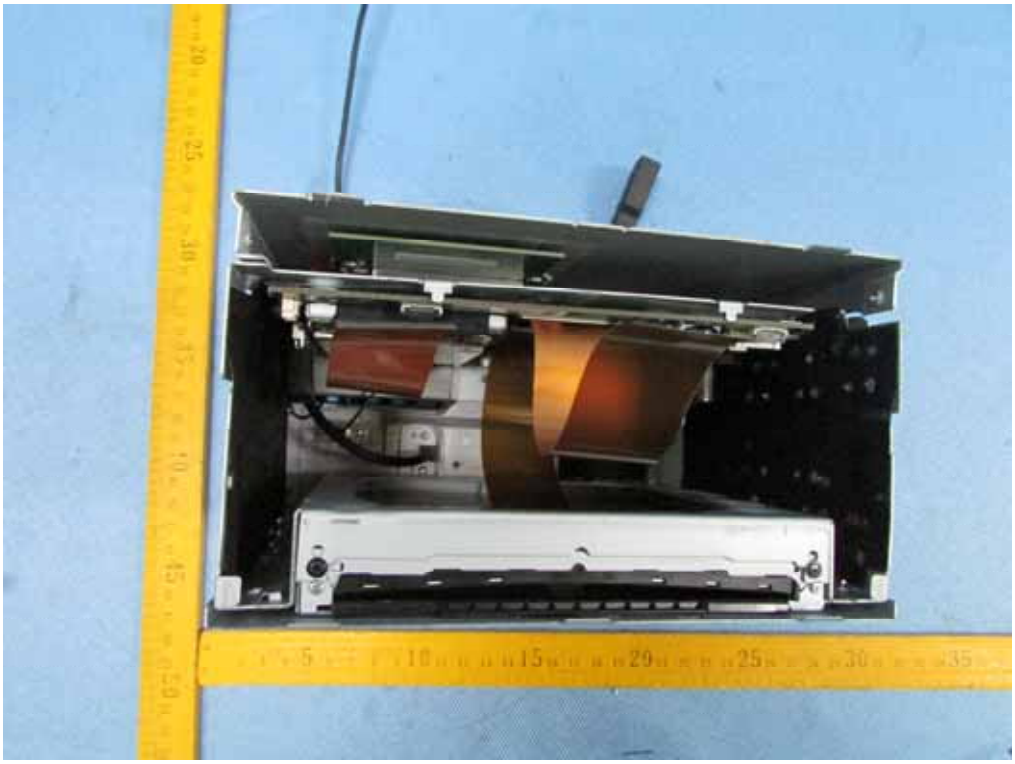
# 17 Photographs - Constructional Details

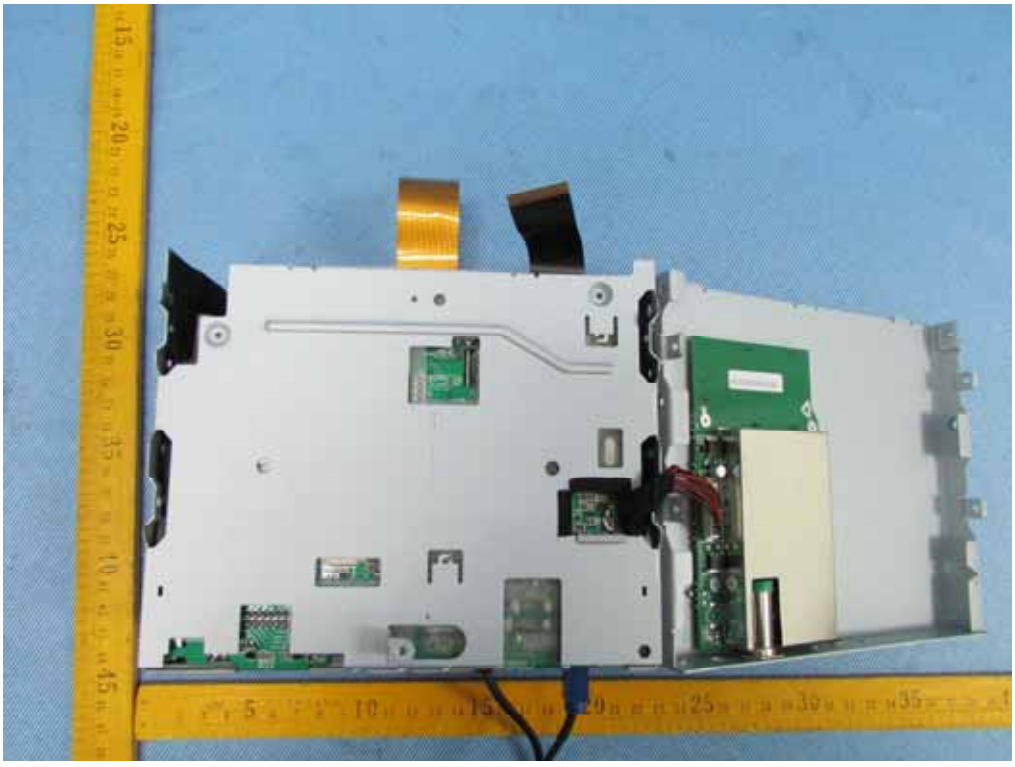
## 17.1 EUT – External View

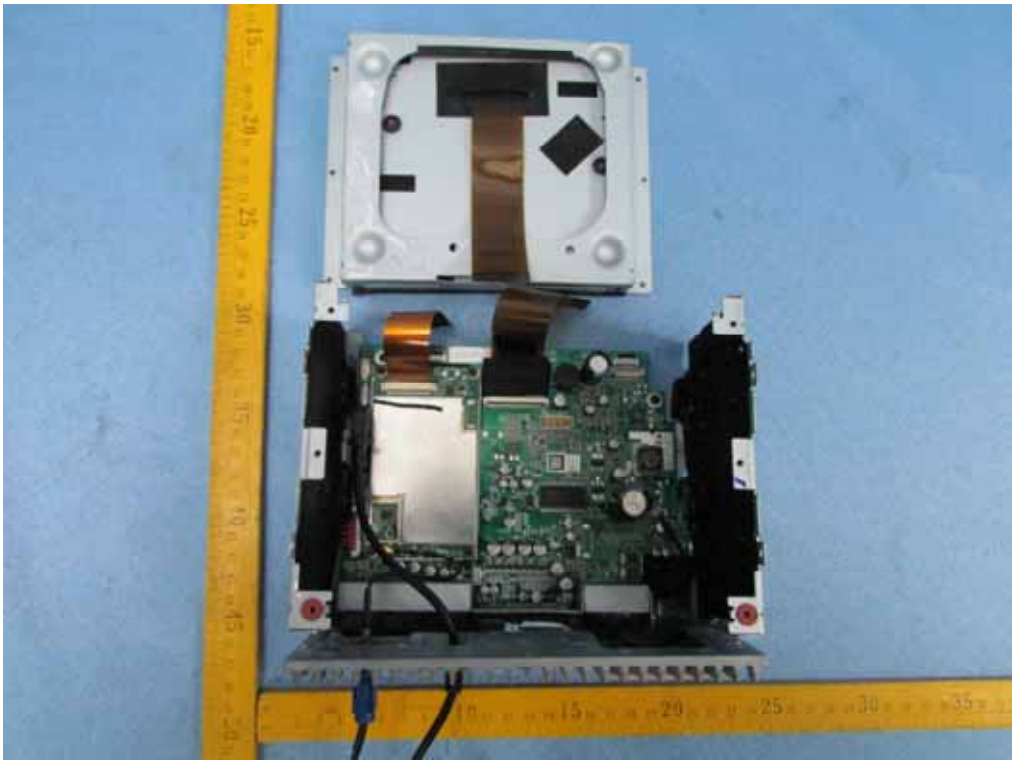
## 17.2 EUT- Internal View

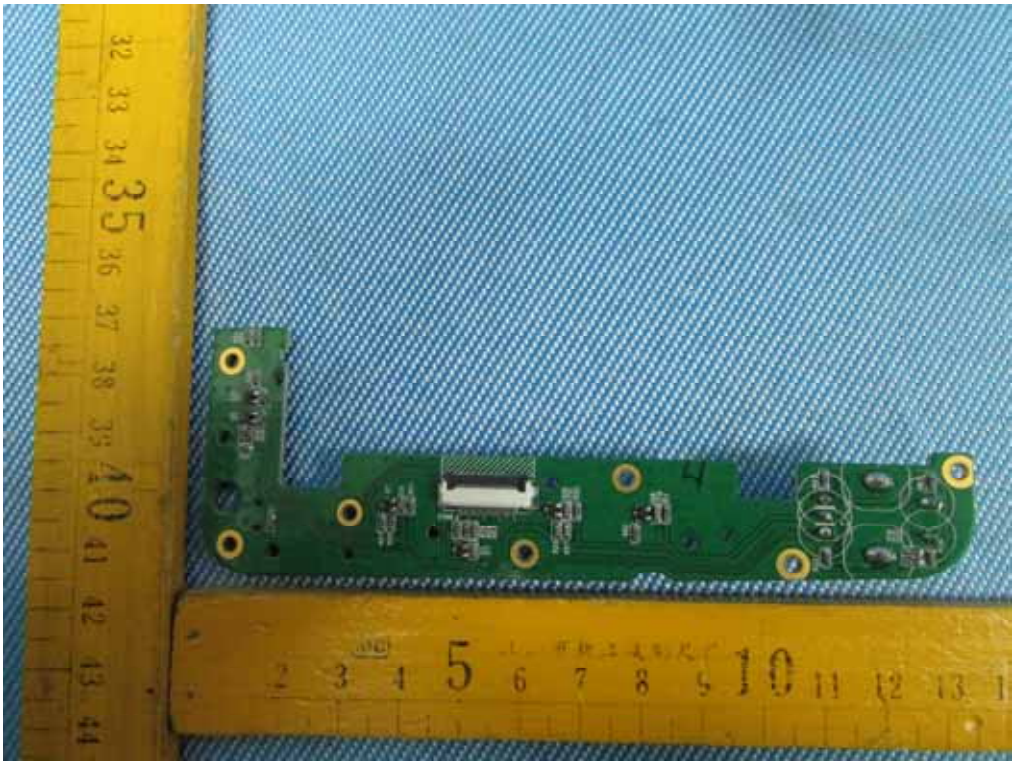


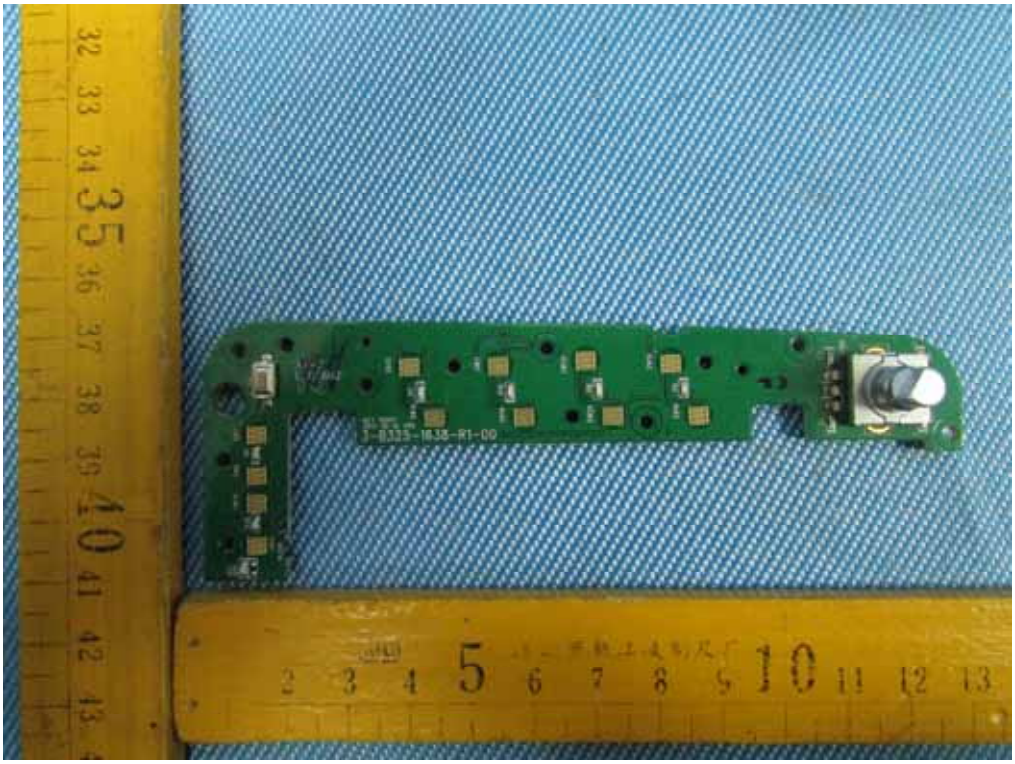


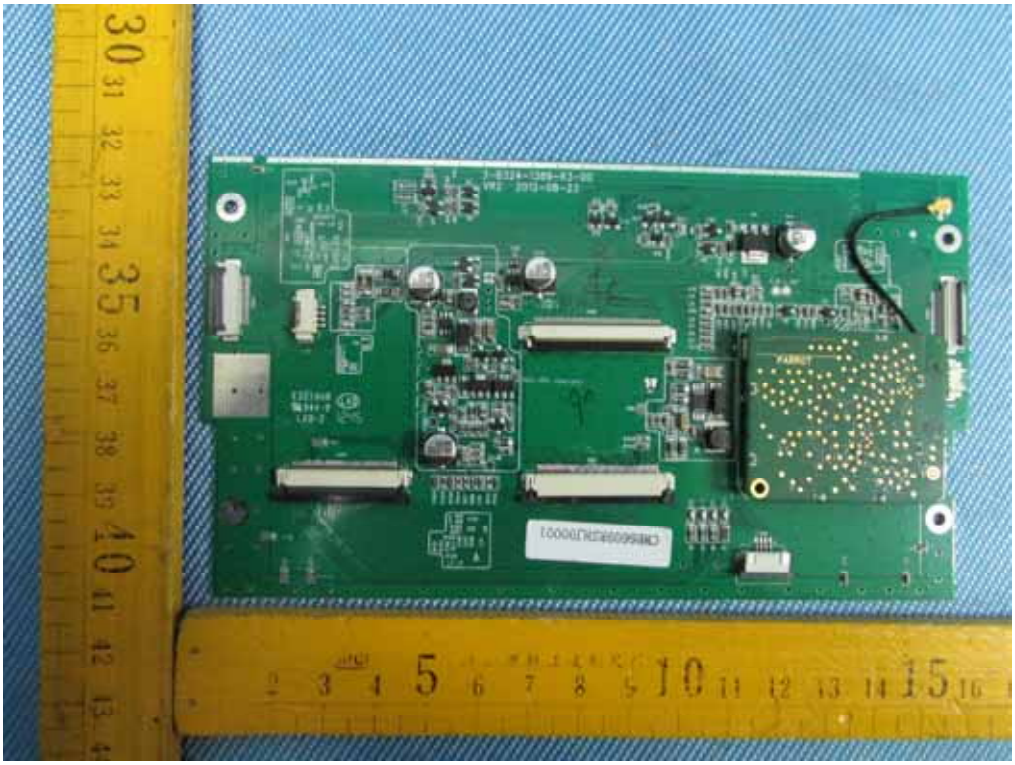


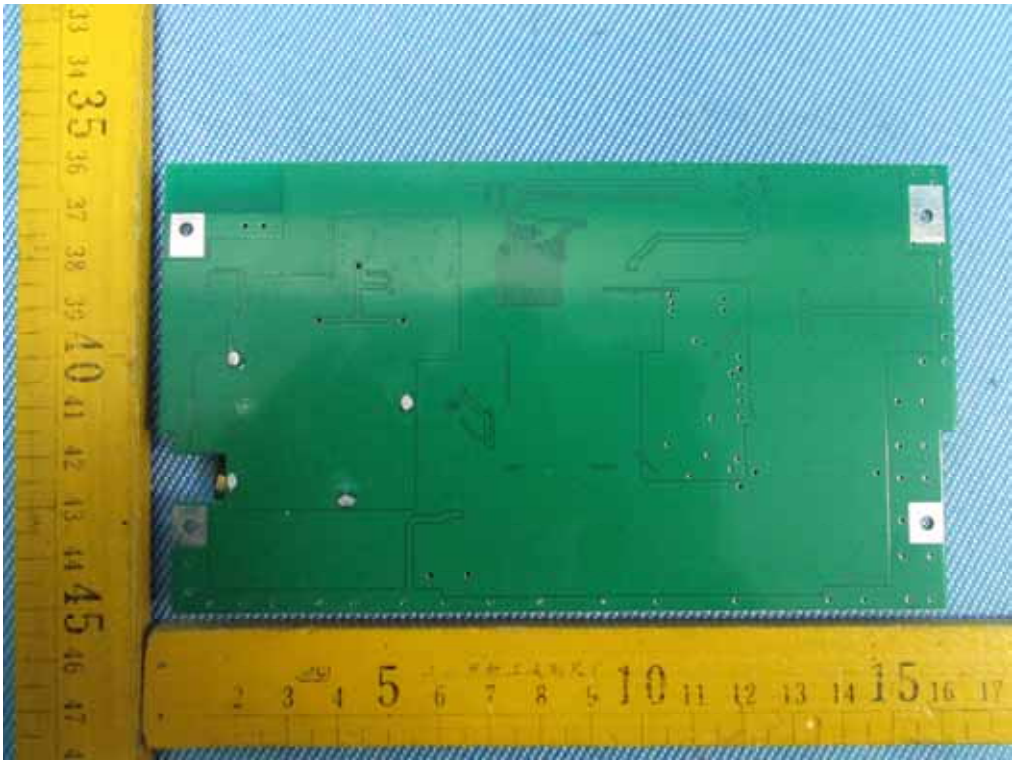


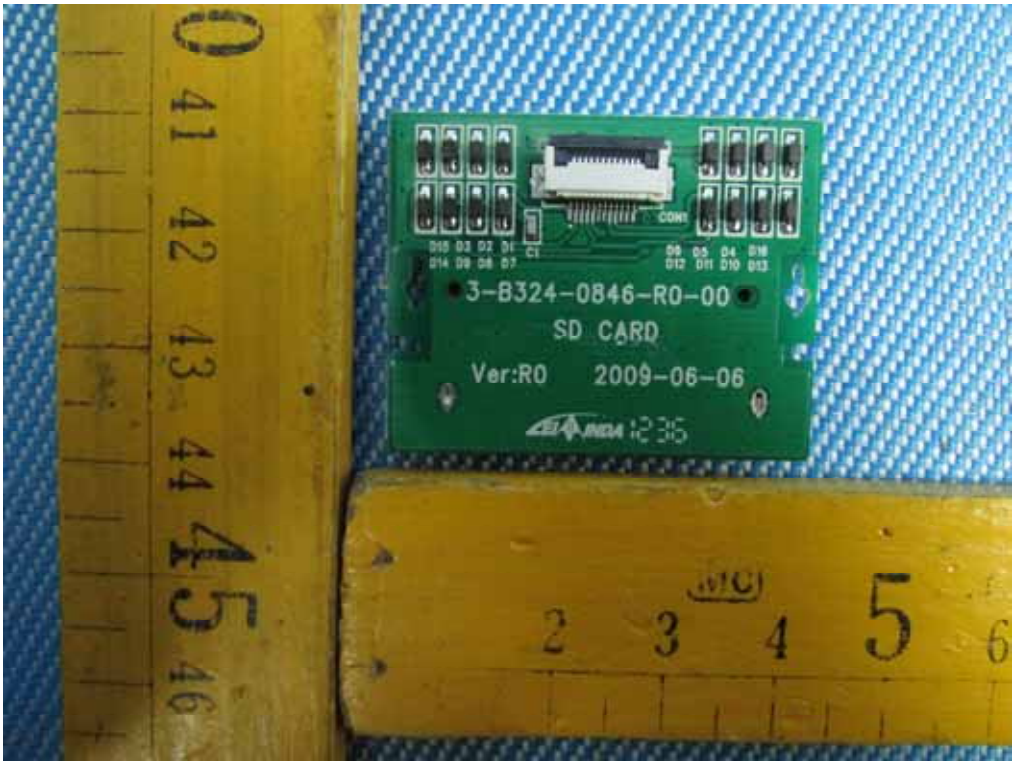








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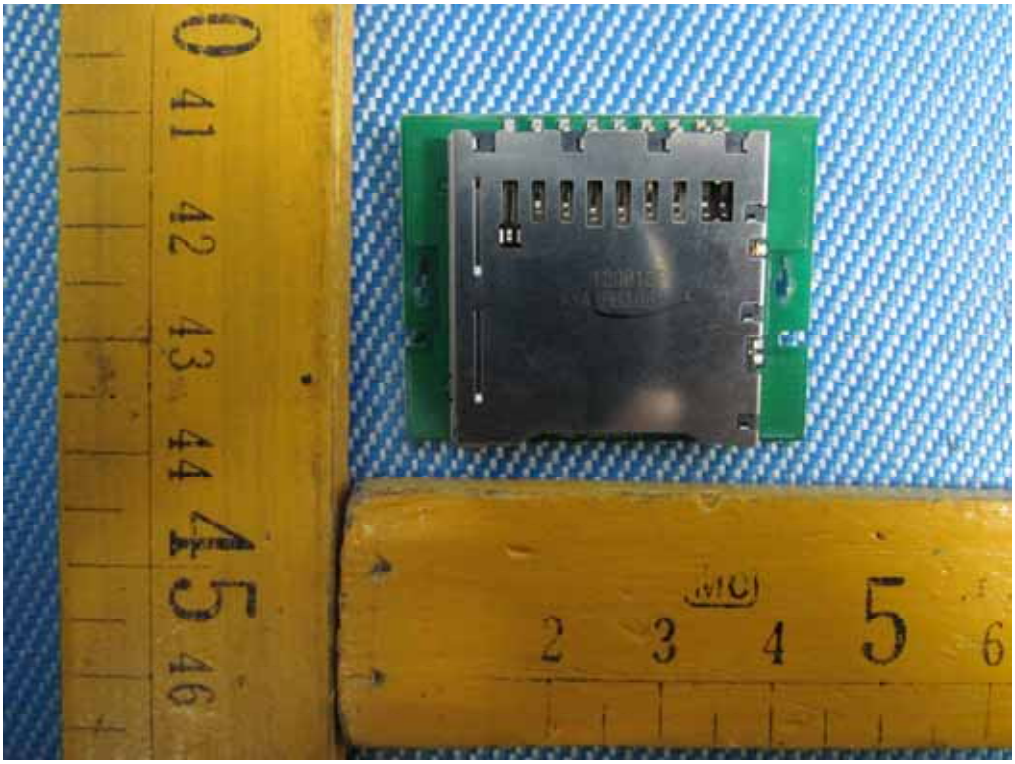
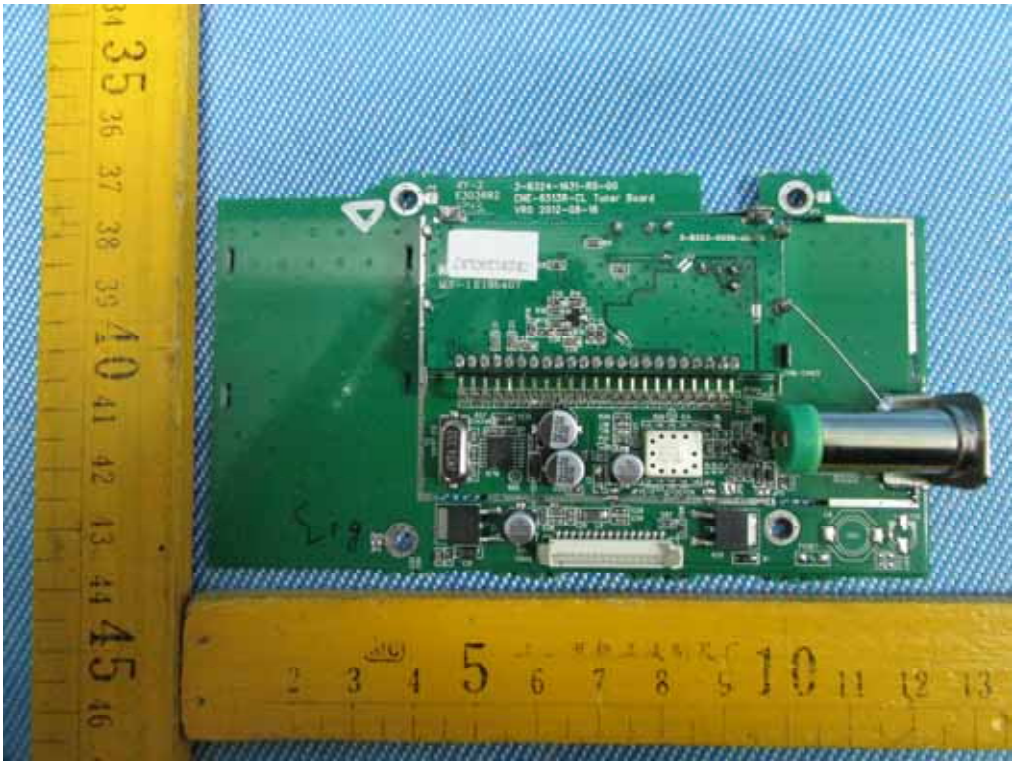
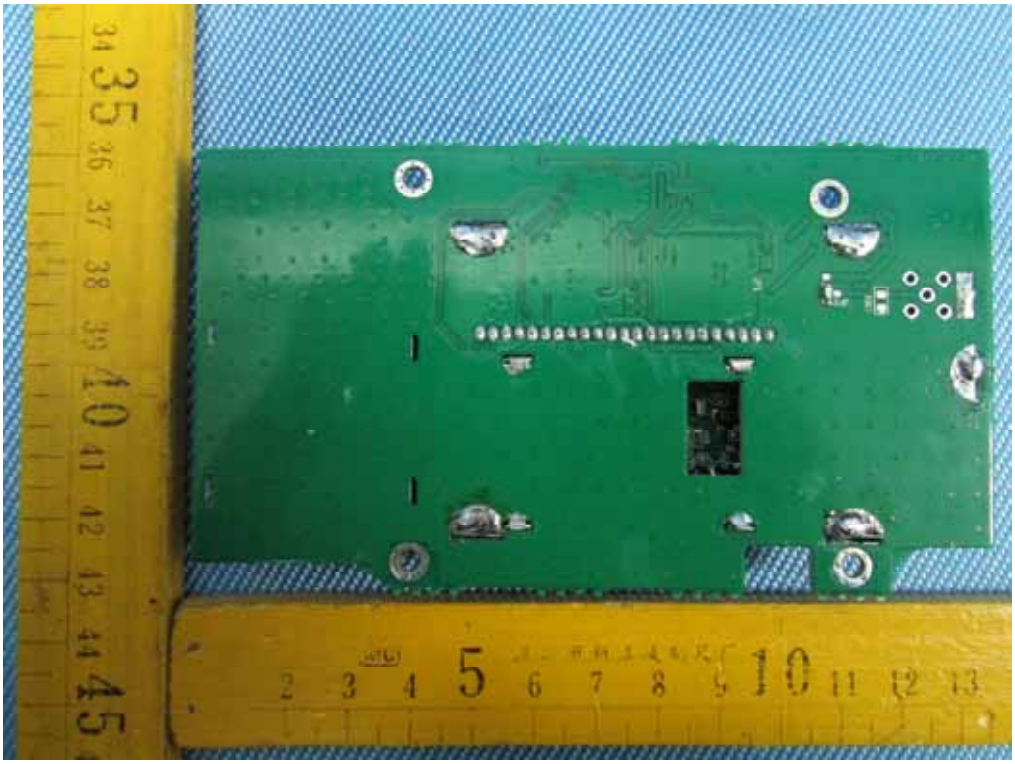
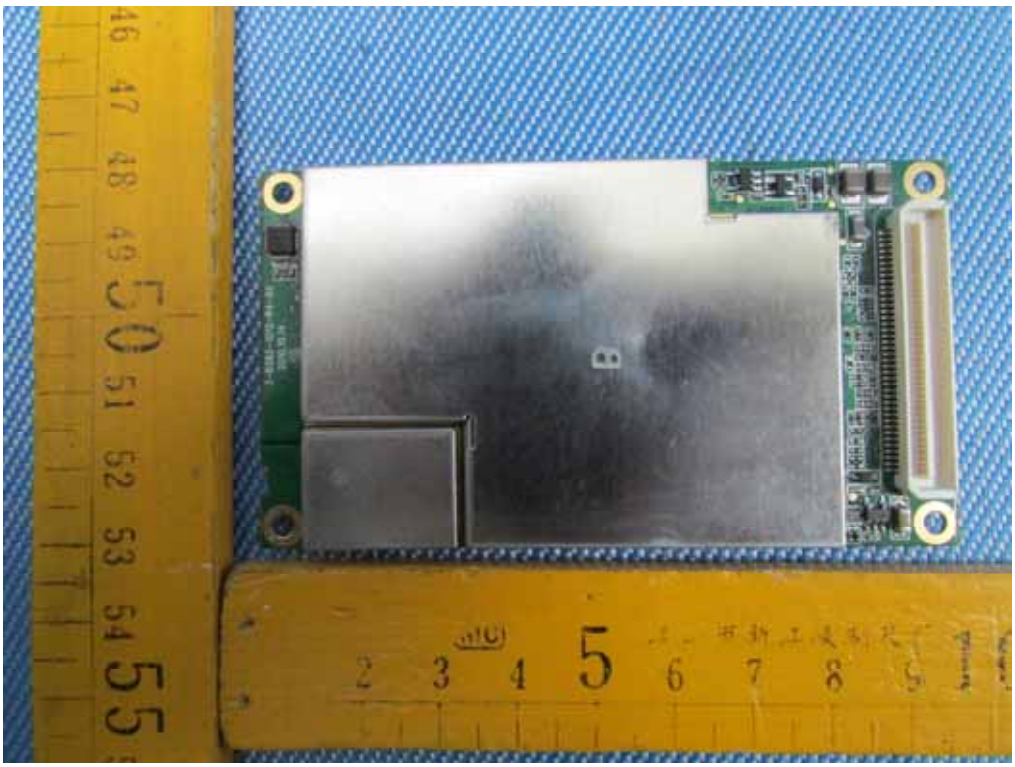
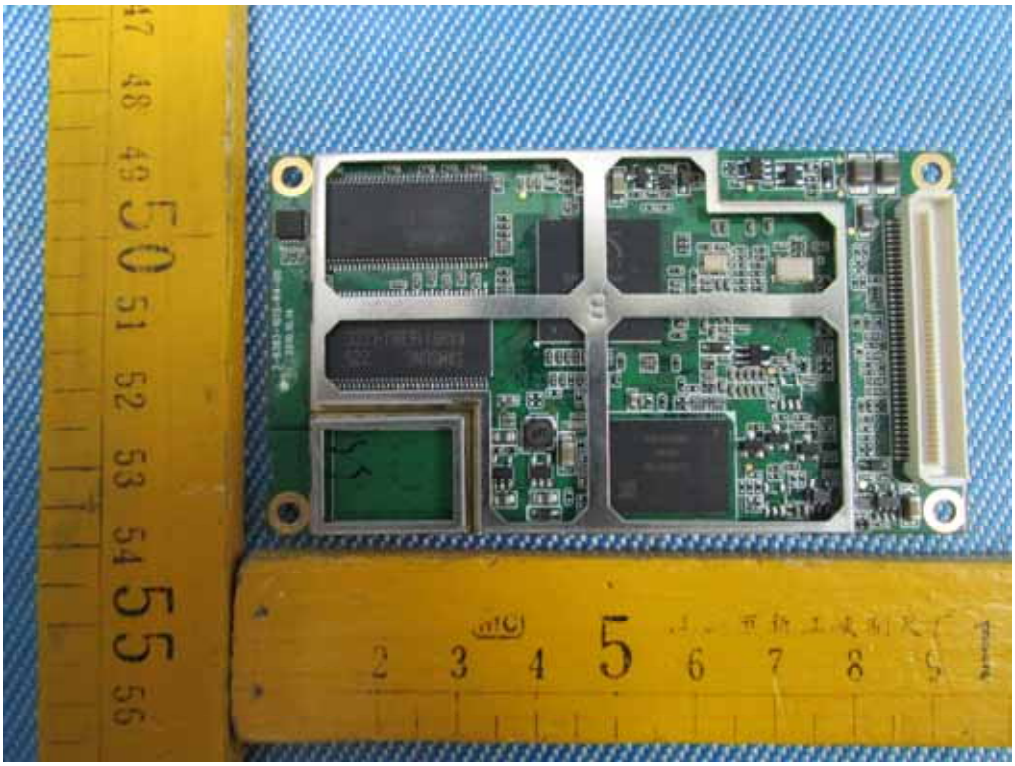
Ver:R0 2009-06-06

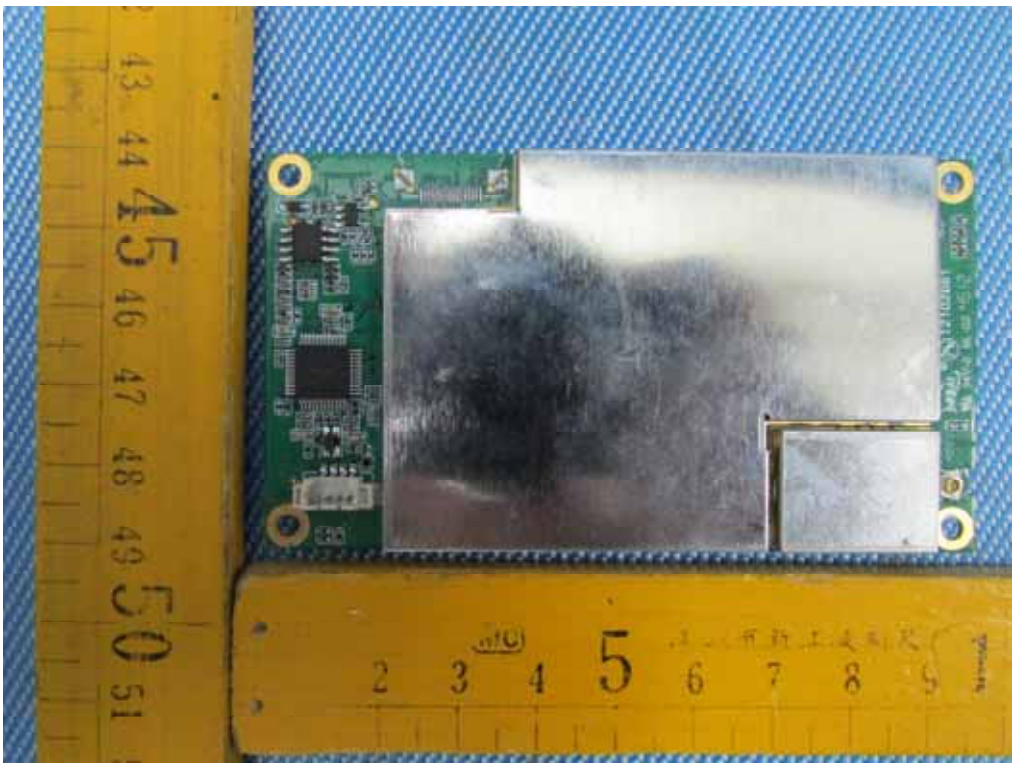


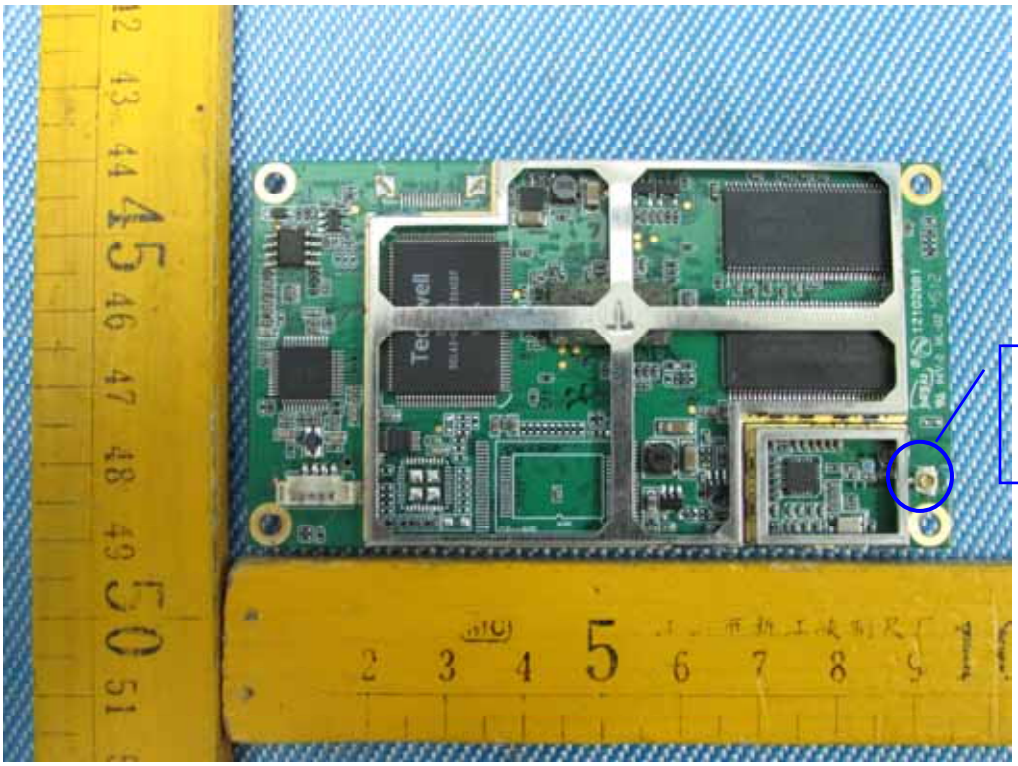













=End of test report==